Guide to forecast medicines and health supplies for reproductive, maternal and child health using different sources of data and information

Ministry of Health of Belize

November 2015

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I. Introduction

The Salud Mesoamerica 2015 (SM2015) Initiative is an innovative public-private partnership between the Bill & Melinda Gates Foundation (BMGF), the Carlos Slim Health Institute (ICSS), the Spanish Agency of International Cooperation for Development (AECI), the Inter-American Development Bank (IDB) and the countries of the Mesoamerican region. The SM2015 Initiative seeks to improve the health of women and children under five in the 20 percent of the poorest households in the Mesoamerican region, through the implementation of evidence-based practices in the areas of reproductive health, family planning, maternal, newborn and child health, including immunization and nutrition services; strengthening information systems and capacities for the provision of health services.

In February 2015, the Bank signed a contract with the government of Belize to finance operations under BL-G1002 aimed at improving reproductive health, maternal and child heath through better access, use and quality of health services. The implementing agency (EO) of the operation is the Ministry of Health of Belize (MoH-BLZ).

With the aim to support the Ministry of Health of Belize in the implementation of the operation, IDB hired John Snow, Inc. to provide technical assistance (TA) to the MoH-BLZ to improve the management of the supply chain for reproductive health, maternal and child health.

In this guide, we will focus on an example to estimate contraceptive needs for oral combined hormonal pills for women.

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II. Forecasting demand for medicines and health supplies

In order to understand the forecasting and quantification processes to determine demand and procurement needs for a specific medicine, product or health supply, it's important to define the terminology[1] used throughout this document.

Term	Definition
Forecasting	Forecasting answers the question: "How much is needed, in quantities and cost, to meet the health demand of the population?" It is the process of estimating the expected consumption of commodities based on historical consumption, service statistics, morbidity and/or demographic data or assumptions when data are unavailable, to calculate the quantities of commodities needed to meet demand during a particular time frame.
Quantification	Quantification answers the question: "How much will be procured and when will it be delivered?" It includes both forecasting and supply planning. It is the process of estimating the quantities and costs of the products required for a specific health program (or service), and determining when the products should be delivered to ensure an uninterrupted supply for the program. It takes into account the expected demand for commodities, unit costs, existing stocks, stock already on order, expiries, freight, logistics and other costs, lead times, and buffer stocks. Using this information, the total commodity requirements and costs are calculated and compared with the available financial resources to determine the final quantities to procure.
Supply Planning	This is the final output of quantification. Supply planning details the quantities required to fill the supply pipeline, costs, lead times, and arrival dates of shipments to ensure optimal procurement and delivery schedules.

The forecasting process of any drug or health supply can use any of the following data sources:
1. Consumption data (logistics)
2. Morbidity data
3. Service statistics (number of consultations, users, patients, etc.)
4. Demographic and/or population data

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[1] Source: Systems for Improved Access to Pharmaceuticals and Services (SIAPS) Program. 2014. Promising Practices: Quantification: Forecasting and Supply Planning. Arlington, VA: Management Sciences for Health.

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WHO recommends that countries should have national drug list that meet the following criteria:

1. Proven efficacy for the treatment of prevalent diseases in the population.

2. Security known and acceptable risk / benefit ratio in the light of current knowledge.

3. Available and cost that allows ensuring sustainable procurement.

It's the responsibility of the health services to promote the proper use of the medicines which involves not only the activities of prescribing / dispensing / consumption, but also to ensure the implementation of an appropriate quantification/forecasting methodology to do an efficient procurement and distribution of medicines.

There are several sources of information and data to help estimate consumption for medicines and health supplies and the selection of the source depends on several variables, among which we can mention:
*   the skills and experience of the health staff doing the forecasting
*   the completeness of data available
*   the complexity of the service provided (i.e. HIV/AIDS)
*   the availability, quality and accuracy of data available

III. How to select the data/source of information for the forecasting exercise

a. Forecasting using consumption data

Also called logistics data forecasting, this methodology uses consumption data to forecast future needs. This source of information can be used in those cases where the information system is reliable in terms of collecting dispensed-to-patient/user data from health units (i.e. health centers, health posts, hospitals). It is also useful in situations where the availability of medicines and supplies is stable and where the number of health services does not vary significantly from year to year. If dispensed-to-patient/user data is neither available nor reliable, then the forecasting methodology should not use this data.

Advantages: Relatively easy to implement because it simply uses past consumption data, plus a percentage increase based on past trend and expected program/services expansion;

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the forecasting assumptions are easily established (i.e. % increase based on previous consumption growth and program expansion).

Disadvantages: The accuracy of the forecasts depends largely on the steady availability of supplies and the rate of consumption, assuming there are no stock-outs during the previous consumption period (i.e. most recent year). This methodology is not suitable for forecasting medicines for a new program or a new health service as you can perpetuate inappropriate consumption patterns (i.e. changes in data consumption and irrational drug use).

b. Forecasting using morbidity data

The forecasting based on morbidity data requires a great deal of knowledge regarding morbidity indicators, supply and demand of health services. It is useful in the event of the start-up of new health services, especially in those health units where the resolution level is upgraded from health center to a hospital. An example of morbidity data is the number/percentage of pregnant women who may suffer from anemia, parasitizes in children by age group, etc.

Advantages: It favors a systemic approach of the health issues and does not focused exclusively on the use/consumption of medicines. It promotes the rational use of medicines through the use of protocols to address burden of disease.

Disadvantages: it requires a constant and precise knowledge of the required indicators. It requires proper documentation of health events, and standardized criteria for the use of the required medicines to treat the different diseases which is not always possible due to inefficient/weak health information systems.

c. Forecasting using service statistics data

As with the morbidity data, the forecasting based on service statistics data requires a Program or a health facility to keep updated and complete records on number of consultations provided for a specific illness, treatment, number of patients/users treated/served during a specific period of time, adherence to prescription protocols and resupply of drugs by patient/user (i.e. for contraceptives, 1 oral cycle dispensed to a new user, and 3 cycles dispensed to a continuing user) and it requires that health facilities keep a steady flow of supplies throughout the period being used as the basis for forecasting. Using this source of data is appropriate when the Program or health facility has accurate data on number of patients, has not experienced stock-outs in the previous period and there's adherence to dispensing and prescription protocols.

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The advantages and disadvantages of using this source of data are similar to those described for the morbidity data.

d. Forecasting using demographic data

Demographic data is mainly used when a Program doesn't have accurate and reliable data on consumption, service statistics and morbidity. Even though demographic data is not updated very regularly (i.e. national population census, demographic and health surveys - DHS), for programs such as family planning, nutrition, using demographic data may be the only reliable source of information that provides a sound basis for forecasting and it will give health facilities and National Programs enough data to carry out a forecasting exercise that can be validated with other sources of data, once these become available through the national health information systems and the logistics data collection systems.

This source of data is recommended for family planning, micronutrients and drugs to treat parasitic diseases.

Advantages: the sources (i.e. national population census, DHS) are very reliable and offer a great deal of information. If the data is older than 5 years, there are always ways to adjust the data using different sources (i.e. reports from UNICEF, Population Reference Bureau) to update the information.

Disadvantages: it requires knowledge and skills from the health personnel on how to interpret and use the data from DHS and to translate the data into forecasts of medicines and health supplies. Data may only reflect the national situation (i.e. in FP, it may reflect contraceptive prevalence rate at the national level only) and data by region may not be available.

IV. Recommended data source to estimate demand for medicines and health supplies for the MCH Program of Belize

The decision to use one source of data over the other to forecast medicines and health supplies for the MCH Program is based on the following criteria that data should meet:

- Completeness
- Accuracy
- Reliability
- Timeliness

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In the case of Belize, the fact that at the time of the assessment of the supply chain, the MCH Program doesn't have consumption records at any level of the system, we recommend that the MCH Program uses demographic data for contraceptives and micronutrients, and morbidity data for the rest of the medicines.

Previous quantification and forecasting exercises have been based on historical quantities procured by the Program which don't necessarily reflect the demand of MCH services at the country level. Once the MCH Program implements a data collection system that allows them to forecast demand in a more accurate manner, it is recommended that the Program combines, if at all possible, the consumption data and the morbidity data to do more accurate forecasting of medicines and health supplies for the MCH Program.

Keep in mind that the forecasting of medicines may not be accurate, because many variables are either unknown, hard to anticipate or difficult to change (i.e. epidemics, unexpected demand, etc.).

Therefore, the purpose of this combined exercise is to allow the MCH program to estimate quantities to cover the needs of the (estimated) population for at least one year, ensuring that there is not a significant surplus that will result in a potential loss because of expiry dates; on the other hand, the quantities to procure have to be enough in order to avoid stock-outs at any point in time during the forecasted period (usually, a year).

A. Forecasting demand for contraceptives

Using demographic and population Data for contraceptive forecasting

Based on demographic data, a forecast was prepared based on the estimated number of women of reproductive age. We will describe, step by step, the process of doing the forecasting using this source of data.

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Step 1: choose population figures
Total Population of Belize (estimated 2015)[2]   368,310

Step 2: estimate total women based on total population
Estimated women in 2015   184,838 (51% of total population)

Step 3: determine the number of women of reproductive age
Women of reproductive age   100,921 (54.6% of female population)

Step 4: choose the most recent data on total prevalence rate
Contraceptive Prevalence Rate 2011:   55.2 %

Step 5: calculate total number of women using any method
Total women using any method   55,709 (55.2% of 100,921 women)

Once you have organized these data, proceed to prepare the forecasting, using the information on method mix, prevalence rates, and other relevant data, as described below:

As of 2011, data in Belize showed that the most popular method is female sterilization which is used by 20.7 percent of married women. The next most popular method is the pill, which accounts for 12.5 percent of married women and this is followed closely by injectables at 11.4 percent. Male condom use (5.2 percent) and use of IUD (1.6 percent) play a small role. Less than 2.1 percent use periodic abstinence, withdrawal, male sterilization, vaginal methods, or the lactational amenorrhea method (LAM).

Step 6: calculate number of women using a specific method and estimate quantities to cover demand for each method

Once you have estimated number of women using any method, you can proceed with the calculations of total number of women by prevalence rate by method and convert these numbers into quantities of contraceptives, as shown in Table 1.

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[2] Source: Belize Multiple Indicator Cluster Survey 2011 Final Report. UNICEF. The conversion factors are based on USAID's standards and in other cases, MCH Program dispensing norm. In the case of condoms, we used 30 units/month to ensure 100% protection from unwanted pregnancy/HIV infections

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Table 1: Contraceptives Needs (in units) for 2016, for all Regions, based on women of reproductive age and contraceptive prevalence rates (2011*)

A= Contraceptives	B= Prevalence Rate for each method Cluster Survey 2011.	C= Total Women using any method	D= B x C Total women using the method base on method mix and prevalence rate	E= Quantity to dispense to each couple per month, based on couple years of protection factor/MCH program dispensing norm	F= (DxE) x 12 months Total forecast for one year (in units).
Microlut (cycles)	2.10%	55,709	1,170	1.08	15,163
Microynon (cycles)	12.50%	55,709	6,964	1.08	90,253
Emergency contraceptive (cycles=2 pills)	2.10%	55,709	1,170	0.16	2,246
Medroxyprogesterone Sol. Injection 150 mg / 1 ml.	11.40%	55,709	6,350	0.33	25,146
Noristerat (1dose vials)	11.40%	55,709	6,350	0.5	38,100
Norigynon (1dose vials)	11.40%	55,709	6,350	1	76,200
Copper T IUD (units)	1.60%	55,709	891	0.083	887
Male Condom	5.20%	55,709	2,897	30	1,042,920
Implanon	2.10%	55,709	1,170	0.083	1,165

*Source: Belize Multiple Indicator Cluster Survey 2011 Final Report. UNICEF. The conversion factors are based on USAID's standards and in other cases, MCH Program dispensing norm. In the case of condoms, we used 30 units/month to ensure 100% protection from unwanted pregnancy and HIV infections.

B. Forecasting demand for women's health medicines and supplies

Using morbidity data for women's health
The following example is based on number of pregnant women data provided by the MCH Program. We will use morbidity data to estimate needs for Ferrous Sulfate + folic acid, to provide treatment to pregnant women with minor and moderate anemia in 2016.

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Women's health: Anemia in pregnant women. Ferrous Sulfate + Folic Acid for prophylaxis and treatment in Belize.

Scenario: The MCH Program of the Ministry of Health of Belize reported 7,800 expected pregnancies in 2015. Total coverage by the MoH-BLZ is 96% of total expected pregnancies and expected uptake rates are 42.1% of total pregnancies in the first quarter, 50.2% in the second quarter and 7.7% in the third quarter of the pregnancy cycle.

Steps to estimate needs for Ferrous Sulfate + Folic Acid, Tab. 60 mg + 400 mcg

For the calculation of quantities to use for prophylaxis, the prenatal program needs to know:

- The number of expected pregnancies for the year of the forecast (following year)
- The expected percentage of pregnant women estimated to cover for the following year
- The percentage uptake of pregnant women per trimester based on data from previous year
- Prophylaxis administered to all pregnant women, based on current standard protocols.

Step 1: Review norm/protocols, identify health situation and proposed calculation of targets

Table 2: Description of health condition, therapeutic approach and calculation of targets

Health condition	Therapeutic approach	Calculation of targets
Anemia (dietary iron deficiency)	Prophylaxis	(A) Average monthly of pregnancy consultations expected for the year of the forecast
	Treatment	(B) Average monthly of pregnancy consultations that will require treatment for anemia

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Step 2: Estimate number of pregnant women with minor/moderate anemia, by trimester of pregnancy and type of therapeutic approach

A. PROPHILAXIS TO PREVENT ANEMIA

Table 3: Previous Goals and Expected prenatal services coverage by the Prenatal Control Program*

Data	Year 2014	Year 2015
1. Expected number of pregnancies	7,800	7,800
2. Expected % of pregnant women under coverage	96%	96%
3. Number of pregnant women to receive treatment	7,800 x 96%= 7,488	7,800 x 96%= 7,488
4. Expected uptakes during I trimester of pregnancy	39.3%	42.1%
5. Expected uptakes during II trimester of pregnancy	51.3%	50.2%
6. Expected uptakes during I trimester of pregnancy	9.5%	7.7%

*Source: MCH Program, 2015

Step 3: Calculate the quantity of the product needed to provide prophylaxis

Table 4. Forecasting of ferrous sulfate + folic acid for prophylaxis of anemia in pregnant women, for 2016, MCH Program, Belize

Trimester	% of uptakes	Total Uptakes	Number of months needed for prophylaxis	Accumulated months	Dosage: 30 tablets per month*
I trimester	42.1%	7,488 x 42.1%= 3,152	9	9 x 3,152 = 28,368	28,368 x 30 = 851,040
II trimester	50.2%	7.488 x 50.2% = 3,759	6	6 x 3,759 = 22,554	22,554 x 30 = 676,620
III trimester	7.7%	7,488 x 7.7% = 577	3	3 x 577 = 1,731	577 x 30 =17,310
TOTAL FOR 2016		7,488		51,499	1,544,970

*Standard usage

B. TREATMENT FOR ANEMIA

Step 1. Estimate number of pregnant women with minor/moderate anemia who require treatment

Table 5. Number of pregnant women who required treatment for anemia, 2014-2015

Data	Year 2014	Year 2015
1. Expected number of pregnancies	7,800	7,800
2. Expected % of pregnant women under coverage	96%	96%
3. Number of pregnant women under coverage	7,800 x 96%= 7,488	7,800 x 96%= 7,488
4. Expected % of pregnant women to receive treatment	8.3%	9.5%
5. Number of pregnant women to receive treatment for anemia	7,488 x 8.3%= 622	7,488 x 9,5%= 711

Step 2. Calculate the number of tablets needed to treat pregnant women with minor/moderate anemia, for the MCH Program, in 2016.

Table 6. Forecasting of ferrous sulfate + folic acid for treatment of anemia in pregnant women, for 2016, MCH Program, Belize

Morbidity/event	Total cases 2015	Dosage per case (number of tablets)*	Total tablets needed for 2016 (based on 2015 data)
Minor/moderate anemia	711	2 tablets x total days/month x 3 months	2 tablets x 30 days x 3 months x 711 pregnant women = 127,980 tablets

*standard use

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To summarize the total quantities for ferrous sulfate + folic acid required by the MCH Program in 2016, the following table illustrates these amounts:

Ferrous sulfate + Folic acid for prophylaxis	Ferrous sulfate + Folic acid for treatment	Annual Forecast	Monthly requirement
1,544,970	127,980	1,544,970 + 127,980= 1,672,950	1,672,950/12= 139,413

V. Forecasting of contraceptives and ferrous sulfate + folic acid: examples applicable to other maternal and child health supplies.

In the previous exercises, we illustrated the steps that the MCH Program can follow in order to forecast contraceptives and other maternal and child health medicines and supplies. These examples are applicable to other medicines and supplies, as long as minimum data is available.

Even though we were able to forecast needs for contraceptives and ferrous sulfate + folic acid, it is important to bear in mind that, ideally, consumption data should be compared to these forecasting figures in order to validate the accuracy. If both figures are close enough (±5%), then no adjustments are needed.

If the difference is higher than 5%, the Program should use the higher estimated figure, until a more reliable source of data is available.

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