2019-23

MNCH VERY ESSENTIAL MEDICINES

COSTED FORECAST

DEPARTMENT OF HEALTH
GOVERNMENT OF SINDH

November 2019

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This is a living document and will be updated on regular basis as and when required

First Forecasting Exercise for the Very Essential Maternal, Newborn, and Child Health Commodities Prioritized by the Department of Health, Govt. of Sindh

CONTENTS

ACKNOWLEDGMENTS

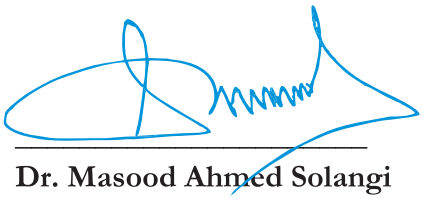
With the technical support of the UNICEF Health LMIS Assessment (HLMIS) Project, the Department of Health, Government of Sindh has developed a province-focused forecast for the MNCH Very Essential Medicines List (VEML) (*Annex A: MNCH VEML Sindh*) approved by the Department of Health Sindh.

This forecast is the result of close collaboration and coordination between the Department of Health and the UNICEF HLMIS Project, and hence will result in sustainable capacity building of the Department's officials in undertaking similar exercises without any technical assistance. This will give rise to successful transition of all forecasting and supply planning functions to the Department, leading towards the achievement of global supply chain planning benchmarks.

I wish to acknowledge all of the public sector stakeholders, development partners, experts, and medical professionals for reviewing, contributing, guiding and supporting the forecasting of MNCH commodities for Sindh.

I would like to recognize Dr. Muhammad Tariq, Country Director, Chemonics International Pakistan, for his leadership role and guidance and his dedicated team for their devoted efforts for the formulation of this report.

Finally, I would like to express my gratitude to Dr. Hanadi Mostafa and Dr. Kamal Asghar from UNICEF for their valuable support and guidance.



Dr. Masood Ahmed Solangi
Director General Health Services
Department of Health
Government of Sindh

DIRECTORATE GENERAL HEALTH SERVICES
SINDH @ HYDERABAD
Phone # 022-9240106 Fax # 022-9240100
E-mail: dghealthsindh@sindhealth.pk

No. DGHSS/ - (PH-Wing-Trg-(58-B)/- 7884/90 Dated 04-12-2019

To,

Dr. Muhammad Tariq,
Country Director
USAID Global Health Supply Chain Program-
Procurement & Supply Management
Islamabad.

SUBJECT: - FORECASTING EXERCISE FOR VERY ESSENTIAL MNCH COMMODITIES PRIORITIZED BY THE DEPARTMENT OF HEALTH GOVERNMENT OF SINDH.

Department of Health acknowledges and appreciates the services and effort of Chemonics International Inc. for the improvement of health system.

The undersigned endorse the documents focused on forecasting of MNCH very Essential Medicine List (VEML).

It is requested that copies of the documentary be printed in booklet form so it can be distributed at all health facilities of Sindh.

(***DR. MASOOD AHMED SLONAGI***)
DIRECTOR GENERAL
HEALTH SERVICES SINDH AT
HYDERABAD

Copy forwarded for information:

- The Secretary, Government of Sindh, Health Department Karachi.
- The PS to Minister Health and Population Welfare Department Gpvpermemt of Sindh Karachi.
- Dr. Syed Kamal Asghar, Health Specialist, UNICEF Karachi.
- Dr. Muhammad Tariq, Country Director, Chemonics International, Islamabad.
- Dr. Tanveer Hussain, Supply Chai Team Lead, UNICEF HLMIS Project Karachi.
- Dr. Mumtaz Brohi Coordinator, UNICEF HLMIS Project, Hyderabad.

ACRONYMS

ANCS	Antenatal corticosteroids
ARI	Acute respiratory infection
CHX	Chlorhexidine
DHIS	District Health Information System
DOH	Department of Health
ECP	Emergency contraceptive pill
EML	Essential Medicines List
EPI	Expanded Program on Immunization
FIGO	Federation of Gynecology and Obstetrics
GDP	Gross domestic product
GOP	Government of Pakistan
HDI	Human Development Index
ICM	International Confederation of Midwives
IM	Intramuscular
IV	Intravenous
MMR	Maternal mortality rate
MNCH	Maternal, newborn, and child health
MWRA	Married women of reproductive age
NGO	Non-governmental organization
ORS	Oral rehydration salts
PBS	Pakistan Bureau of Statistics
PDHS	Pakistan Demographic and Health Survey
PE/E	Pre-eclampsia and eclampsia
PHC	Primary health care center
PHF	Public Health Facility
PPH	Postpartum hemorrhage
PWD	Population Welfare Department
TWG	Technical Working Group
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VEML	Very Essential Medicines List
WHO	World Health Organization
WRA	Women of reproductive age

EXECUTIVE SUMMARY

Maternal, newborn, and child health (MNCH) care statistics in Pakistan are some of the poorest in South Asia. Beyond lack of adequate MNCH related services, unavailability of life saving products is also a predominant factor for maternal and child morbidity and mortality. Absence of a structured mechanism for forecasting commodity needs leads to shortages and unavailability of MNCH products to the last mile.

Chemonics International Inc. has been commissioned a one-year project funded by the Bill and Melinda Gates Foundation (BMGF) through UNICEF. The primary goal of the project is to improve the visibility of MNCH VEML products in Punjab and Sindh through development of the first-ever integrated LMIS for MNCH VEMs for both provinces. The scope of the Project also includes the development of a five-year forecast for the entire country.

Chemonics International Inc., through its Global Health Supply Chain Program-Procurement and Supply Management (GHSC-PSM) project, has been engaged extensively with the provincial governments of Punjab, Sindh and Balochistan in finalizing first ever MNCH VEML long term (five-year) scientific forecast. This articulation was done after a series of consultations with relevant government functionaries and stakeholders. The forecast has different variations as different products require indigenous modelling given the scarcity of the data, considering demographics and PC-1s.

Results from the latest Demographic and Health Survey of 2017-18 showed that Pakistan is still a long way from meeting the Sustainable Development Goal (SDG) goals 4 and 5, which relate to reducing the burden in child and maternal deaths by 2015, respectively. In this survey, the infant and under-5 mortality rate (per 1,000 live births) in Pakistan was estimated at 62 and 74 respectively and the percentage of births attended by skilled health personnel was 69 percent.[1] Immunization rates remain low, especially among rural populations. 14% of children under age 5 showed symptoms of acute respiratory infection (ARI). About 84% of children with ARI symptoms sought treatment or advice from a health service provider. Forty-six percent of children with symptoms of ARI were given antibiotics. Children with symptoms of ARI for whom advice or treatment was sought were taken to either a private sector health facility (83%) or public sector facility (20%). 19% of children under age 5 had diarrhea and 71 percent sought treatment or advice from a health provider. Thirty-seven percent of the children were given oral rehydration salts, and only 8% were given zinc with ORS.

To accelerate progress towards meeting the SDG goals, the DoH and partners have developed a number of strategic interventions, especially at the primary health care level. These interventions aim at increasing basic antenatal, newborn, and child care for the most vulnerable populations, with the goal of saving lives by 2025. The key to these interventions is to provide medicines and health commodities. In 2018, GHSC-PSM Project conducted first ever indigenous forecasting exercise for the very essential Maternal Newborn and Child Health commodities for the Departments of Health-Khyber Pakhtunkhwa, Punjab and Balochistan with funding estimates. These forecasting helped the concerned governments to improve the financing of the MNCH products with optimum availability of products at each service delivery point.

In 2009, the Government of Pakistan without any scientific modelling had 4-5 m dollars forecast of family planning (FP) products for the entire country. Similar forecasting helped the

[1] PDHS - 2017-18 Key indicator Report Aug 2018

government to improve the financing of these FP products but had several limitations. The new forecasting approach is based on scientific modelling and takes into account demographics, as well morbidity data sets, which leads to a more robust and accurate forecast.

This new forecast exercise aims to guide the decision makers in setting up a national system for regular updates to the forecasts and introduce supply planning processes for MNCH VEML commodities. Furthermore, this activity will ensure adequate financing and optimize a data-driven procurement system, minimize stock outs and/or losses through expiry or by over stocking. With this forecasting, we anticipate that the Government of Pakistan will exponentially increase its financing for these priority products.

Using morbidity and demographic information from various sources, the Chemonics International carried out a demographic and morbidity-based forecast. This report includes the findings from the forecast, as well as the funding requirement analysis that can be used for advocacy with key stakeholders to increase the level of funding and eventual availability of commodities for MNCH conditions in Pakistan. The very essential medicines (VEM) / commodities needed for a comprehensive MNCH services program were quantified by commodity groups. These groups were maternal and newborn and child health commodities.

The funding requirements for the prioritized VEM were estimated based on demographics, PC-1 reviews and consultative meetings with provincial technical groups. The Project designed a framework for indigenous modeling forecast of priority products and recommend a financing of approximately USD 185.22 million for the MNCH very essential products, over the 2019-23 forecast period. Breaking down the funding (in millions of USD) by province, 95.39 would be allocated to Punjab, 45.75 to Sindh, 27.23 to Khyber Pakhtunkhwa, and 16.85 to Balochistan.

Moving forward, it is recommended that the results of this forecast and annual funding requirements should be used by the DoH and partners to source their funding. Concurrently, a supply plan that takes into account existing stock levels, as well as commodities that may already be on order needs to be developed to inform the procurement of these commodities. Lastly, a forum for all stakeholders needs to be created to meet regularly and chart a way forward toward creating MNCH commodity security.

INTRODUCTION

In August 2019, the Department of Health, Government of Sindh updated and notified its first ever MNCH VEML for improving access to 25 priority commodities across the Maternal, Newborn, and Child Health (MNCH) continuum. As per mandate of the UNICEF HLMIS Project, the first meeting of Technical Group on Forecasting and Supply Planning (FASP) was held in August 2019. The participants discussed in detail the forecasting strategy / approach for these commodities and improving data quality and availability. For several of these commodities, the data required to estimate needs accurately was unavailable and the forecasts were based on unsubstantiated assumptions and often on data from past procurements.

BACKGROUND

Sindh is located in the Southern part of Pakistan. Sindh is Pakistan's third largest province by area, and second largest province by population after Punjab (http://www.pbs.gov.pk) with an estimated population of 47,886,051 as of 2017. Among those, an estimated 48% live in rural areas. The population growth rate is 2.14% per annum (PBS) while it accounts for 30% of Pakistan's GDP.

According to 2017 Population Census and 2017-18 economic survey of Pakistan, Sindh has the second highest share of population of 23 percent in population pie but its share has declined as compared to 1998. The share of urban population in Sindh has increased from 51.2 percent in 1998 to 52 percent in 2017. (PBS)

According to PDHS 2017-18, in the 5-year period preceding the survey, neonatal mortality was 42 deaths per 1,000 live births, infant mortality was 62 deaths per 1,000 live births, and under-5 mortality was 74 deaths per 1,000 live births. These rates imply that nearly one in 16 children die before reaching their first birthday and one in 14 die before reaching their fifth birthday.

PDHS 2017-18 reflects that Pakistan has shown improvement on infant and child mortality rates. Under-5 mortality has declined from 112 deaths per 1,000 live births in 1990-91 to 74 deaths in 2017-18 -- a 34% decrease over the last 3 decades. Infant mortality declined from 86 to 62 deaths per 1,000 live births. The neonatal mortality that stagnated at roughly 55 deaths per 1,000 live births for a decade has declined to 42 deaths per 1,000 live births in the most recent 5-year period.

Childhood mortality rates are higher in rural areas than in urban areas by 10 deaths per 1,000 live births. Neonatal, infant, and under-5 mortality rates are 45, 68, and 83 deaths per 1,000 live births, respectively, in rural areas, as compared with 37, 50, and 56 deaths per 1,000 live births in urban areas. (PDHS 2017-18)

Deaths of newborns are mainly due to prematurity, asphyxia, and infections. Most of these deaths could have been prevented if newborns had adequate access to resuscitation devices, appropriate umbilical cord care, and timely treatment for sepsis. Substantial presence of acute respiratory infections and diarrhea also contribute to the elevated mortality rates for children. According to WHO Global Health Observatory data estimates, the leading causes of death among children under five in 2017 were preterm birth complications, acute respiratory infections, intrapartum-related complications, congenital anomalies and diarrhea. Neonatal deaths accounted for 47% of under-five deaths in 2017.

The current estimated maternal mortality ratio (MMR) is 178 per 100,000 live births (WHO 2015), one of the highest rates in the world. One of the many factors that contribute to maternal mortality is the inadequate use of health services. 2017-18 Demographic Survey data show that in Pakistan, 66% of the births in the 5 years preceding the survey were delivered in a health facility. Forty-four percent of deliveries took place in private facilities, and only 22% took place in government facilities. There has been great improvement over time in the percentage of deliveries at health facilities; institutional deliveries increased from 13% to 66% between 1990-91 and 2017-18. In the last 5 years, the proportion has increased by 18 percentage points from 48% to 66%. Most of the women die at the time of the birth because of postpartum hemorrhage, eclampsia and other indirect obstetric causes.

As the challenges cited above have demonstrated, strengthening the planning, procurement, and information management of maternal, newborn, and child health (MNCH) life-saving commodities is critical to the survival and quality of care for millions of women and children in Pakistan. The country has made commendable progress in the prevention and control of pneumonia and diarrhea-related complications despite many challenges and now must strive to build on that progress and reinvigorate efforts to address other causes of maternal and child mortality. To this end, it is essential that life-saving commodities be available when and where they are needed.

Forecasting and supply planning (FASP) is the foundation for all other functions further down the supply chain as over estimation or underestimation of commodities can have serious implications on health delivery systems. It is a highly scientific and complex process, wherein numerous factors must be considered including demographics, morbidity rates, service data sets, and logistics data and requires a specialized skill set. Currently, FASP for a complete range of 25 MNCH commodities as per Very Essential Medicines List (VEML) for health department is being undertaken with technical assistance from the UNICEF HLMIS Project on the basis of logistics, demographic and morbidity indicators and enhancement in service delivery. Availability of qualified and experienced human resources, structures, and tools remains a challenge for improved accuracy and timeliness of forecasting and supply planning for all medicines and supplies. Due to gaps identified in FASP projections, serious anomalies persist in district demand (mainly in MNCH products). Health department realize the need for having a structured mechanism for accurate FASP with dedicated trained staff as part of the Integrated Supply Chain Management and Coordination Cell at DOH.

Three data sets: logistics, services, and morbidity will be considered for forecasting and quantification of MNCH commodities depending upon availability of data and its quality. Knowledge and information of health departments' programmatic strategies will be important for accurate forecast and quantification of MNCH commodities. This needs to be ensured through document review and consultations with key stakeholders and / or focal points within the department. A forecasting exercise for MNCH VEML will be done for three to five years and reviewed annually for adjustments, as per recommended models (Figure 1).

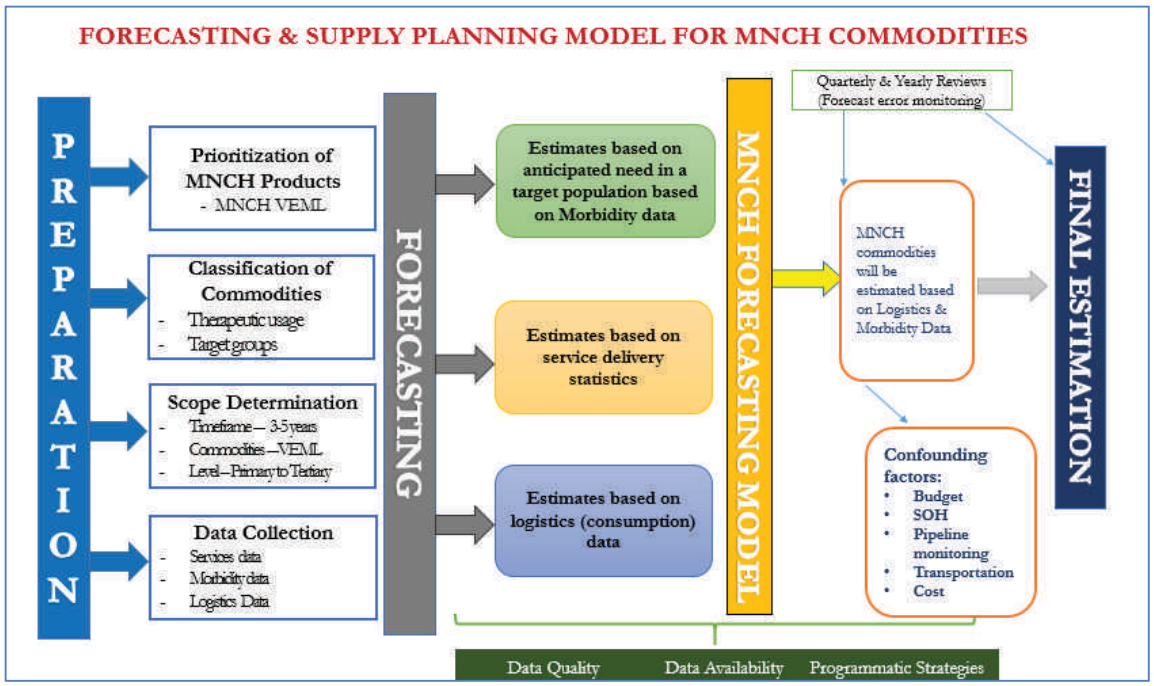


Figure 1: FASP Model for MNCH VEML

Future Roadmap and Implementation plan:

The health department need to carry out following activities to achieve articulated objectives.

- **Formation of Forecasting and Quantification Technical Working Group (TWG) at Provincial Level**
  The health department need to establish and notify a forecasting and quantification TWG at the provincial level. The TWG will systematically determine provincial MNCH commodity requirements, estimate their financial costs, and coordinate fulfillment of projected needs to support the continuous availability of commodities. The TWG will also analyze quantification figures related to MNCH commodity security issues and improve provincial capacity to perform this task independently. Improved intra-departmental coordination will facilitate consensus building on scope and assumptions for forecasting and quantification. It will also minimize duplication of efforts and wastage of resources.

- **Create Professionalized and Trained Human Resources at the Provincial and District Levels**
  At the provincial level, staff may be trained in forecasting and quantification of MNCH commodities. Pre-and in-service training courses should be organized / arranged that will contribute and ultimately lead to building of institutional capacity on forecasting and quantification within the provincial government.

- **Automation of Forecasting and Quantification Function into Web-based MIS**
  To reduce the likelihood of computational inaccuracies, forecasting and supply planning functions need to be automated incrementally and made part of the health information system. The province will design an EML forecasting and supply planning module in the web-based Health LMIS and train users on the module. Thus, forecasting and supply planning will be graduated from manual to automated computation. The automation will help in timely and accurate forecasting and supply planning, which will, in turn, assist in procurement and commodity security.

RATIONALE FOR UNDERTAKING THIS EXERCISE

The Department of Health, Government of Sindh has documented the limited capacity within its structure to conduct the forecast for essential MNCH commodities. This lack of capacity has compelled the provincial health department and MNCH program to rely on the use of past distribution data and estimates of patient flows at facilities to calculate the need for MNCH commodities. The respective officials develop medicine requirements that are not scientifically appropriate to meet the current needs, thus making it difficult to maintain appropriate inventory to meet the needs of clients in the province. This current practice sometimes yields stock imbalances, stock- outs of some important medicines, and a preponderance of emergency orders, which in the end have been threatening the integrity of the MNCH programs. However, with the technical Assistance of UNICEF HLMIS Project, the Directorate General of Health (DOH) of Sindh need to establish mechanisms to undertake the forecasting exercise of MNCH commodities through a Forecasting and Supply Planning Technical Group (FASP-TWG) comprised of technical experts and FASP champions. This approach helps to improve the forecasting and supply planning functions.

The need for a comprehensive harmonized and coordinated forecasting exercise (first of its kind) in the DOH is heightened by a number of factors including:

- The lack of a formalized provincial coordinated system mechanism for forecasting and supply planning of MNCH commodities;
- The need to identify the current funding gap for the needed commodities to ensure efficient allocation of financial resources by the DOH, Government of Sindh; and
- The introduction of new commodities for MNCH for which no distribution or consumption data are available.

This activity is aimed at developing a long term (five-year) provincial forecasting collaboration with the Directorate General of Health (DOH) of Sindh, which will better inform procurement decisions for the MNCH commodities. The exercise will also help DOH Sindh to populate a framework for computing the requirements for the MNCH products during the plan period and to take future procurement actions. Basically, the goal of this forecasting exercise is to optimize a data-driven procurement system and minimize losses through expiry by over stocking. The report will essentially guide the decision makers in setting up a provincial system for regular updates of the forecasts and introduce supply planning process for MNCH commodities.

GOALS AND OBJECTIVES

Goal

Determine the provincial needs for prioritized MNCH commodities

Objectives

1. Prepare the provincial forecast for 25 very essential MNCH commodities for the period 2018-23

2. Discuss data sources and data gaps to support regular forecasting and supply planning and ways to address those gaps

3. Develop recommendations for institutionalization of a formal MNCH forecasting and pipeline monitoring system within Department of Health, Sindh which is capable of conducting updates on the forecast and supply plan

METHODOLOGY

The UNICEF HLMIS Project worked in close coordination with the department of health, Sindh to develop the forecast. Initially, the scope, purpose and period of the forecast were defined. Then, the UNICEF HLMIS Project collected and reviewed existing documents to define assumptions and make adjustments based on recent demographic and morbidity data, and finally developed the algorithms of the forecasting process for each commodity. These were then reviewed by key stakeholders. The steps of the process are detailed below.

Scope:

The forecast was meant to cover the notified very essential MNCH commodities (Table 1) prioritized by the department of health, Sindh and the estimated requirements of these commodities for health services provided at public health facilities in the province. The estimates included requirements for district and sub-district levels of health care system. The agreed upon time frame is 2018-19—2023-24. However, through discussions with the department / program and upon review of existing data, forecasting was done for very essential commodities.

Table 1. Very Essential MNCH Commodities, prioritized by Department of Health, Sindh

Continuum of Care	Commodity	Use
Maternal Health	Misoprostol	Postpartum Hemorrhage
	Oxytocin	
	Sodium Lactate	
	Dextrose	
	Sodium Chloride	
	Magnesium Sulphate	Pre-Eclampsia / Eclampsia
	Diazepam	
	Hydralazine (Hydrochloride)	Hypertension
	Methyldopa	
	Ampicillin (as sodium salt)	Maternal Sepsis
	Ceftriaxone	
	Metronidazole	
	Gentamycin	
	Ferrous salt + folic acid	Anemia
Child and Newborn Health	Dexamethasone	Fetal Lung Maturity
	Low Osmolarity Oral Rehydration Salts	Diarrhea
	Zinc Sulphate	
	Metronidazole	Dysentery
	Amoxicillin	Pneumonia
	Ampicillin (as sodium salt)	
	Ceftriaxone	
	Vitamin A	Vitamin Supplementation
	Vitamin K	Preterm births / VKDB
	Mebendazole	Worm Infestation
	Salbutamol	Asthma
	Paracetamol	Pain and Fever
	Chlorpheniramine maleate	Allergic Diseases
	Chlorhexidine Digluconate	Antiseptics for Cord Care

Forecasting Options

Estimates of commodity needs for multi-year planning are based on population data and linked to defined Provincial MNCH strategies and plans. Three methods of estimating commodity needs are commonly used:

- Estimates based on anticipated need in a target population based on morbidity data (more appropriate at the national and provincial levels);
- Estimates based on previous consumption of a commodity (more appropriate at the provincial level);
- Estimates based on the service delivery statistics (more appropriate at the service delivery level).

Whichever method is used, the accuracy of the estimate depends on the availability and quality of data used as well as the forecasting team's knowledge of the specific conditions of the program. Due to the absence of reliable consumption and service data for the commodities mentioned in Table 1 above, the morbidity method is used for this forecasting.

Four basic sets of data are required for the morbidity method of forecasting commodity requirements:

1. Medicine lists with packaging and price data
2. Budgets in operational plans/procurement plans
3. Standard treatment guidelines in which the recommended treatment regimen is defined
4. A complete morbidity profile of the conditions for which the commodities are used.

The basic formula used in the morbidity method is:

Total quantity of a commodity required for a given health problem	=	Quantity of the commodity specified for a standard course of treatment	×	Number of expected treatment episodes of the health problem

The first element in the formula requires agreement on an average standard treatment regimen for each health problem. Since this average treatment will be multiplied by the total number of treatment episodes for that particular health problem, it is necessary to define an average quantity per course of treatment. Average drug treatment schedules also need to accommodate a system for specifying selection and dosage of drugs for patients of different age and disease severity.

Data and Review of Documents

As part of the forecasting exercise, we considered factors such as the estimated current need, provincial program strategies. This forecast is based on various assumptions regarding MNCH commodity needs. This process included a review of provincial policy and technical documents; we familiarized ourselves with the recommended treatment guidelines and previous activities that could impact the forecasting. In addition, were viewed policy documents to assess information provided on other major policy decisions that may affect the MNCH Program. Several of these documents are listed in bibliography.

Data Analysis

We used basic Excel to forecast the requirements for the MNCH commodities. The target population for respective commodities was determined which will help to analyze, plan, and advocate for improved programming. Excel facilitates the process of determining the quantities of medicines that are required for any health program. For each condition, we used incidence / prevalence / frequency rates obtained from literature to determine the total number of patients who required treatment for one year. We then entered information on all medicines and added the total requirement and costs by the maternal, newborn, and child categories. The specific forecasting methodologies, key assumptions, and forecasting results for each commodity category are included in the corresponding subsections presented in the quantification results.

Steps Used in Forecasting

The following steps were used to forecast the need for each commodity:

1. Calculate the target population (i.e., pregnant women or children) who will require very essential medicines (VEM).
2. Calculate the amount of very essential medicines needed in each case to manage the condition (i.e., prevention or treatment/establish standard or average treatment regimen)
3. Calculate the quantity of VEM needed for the forecast period
4. Adjust for programmatic changes – stakeholder specific
5. Adjust for losses (i.e., expiry and wastage) – stakeholder specific

Target Population

We estimated the target population based on recent population census (Census 2017) results. We obtained other information required to estimate this population from the Pakistan Demographic Health Surveys, Multiple Indicator Cluster Survey and Pakistan Bureau of Statistics website. For population projection for 2017–2018 to 2022-23, we used the growth rate of 2017 census. From this, we determined that our estimated total population would be 47.88 million, 1.38 million births, 1.62 million pregnant women and just 7.18 million under 5 children in 2017. (Table 2).

Table 2. Estimated Target Population (Population, Births, Pregnant Women and Under-Five Children)

Year	Population	Births (2.9%)	Pregnant Women (3.4%)	Children U5 (15%)
2017	47,886,051	1,388,695	1,628,126	7,182,908
2018	49,040,105	1,422,163	1,667,364	7,356,016
2019	50,221,971	1,456,437	1,707,547	7,533,296
2020	51,432,321	1,491,537	1,748,699	7,714,848
2021	52,671,840	1,527,483	1,790,843	7,900,776
2022	53,941,231	1,564,296	1,834,002	8,091,185
2023	55,241,215	1,601,995	1,878,201	8,286,182

Treatment Protocols

To obtain an accurate estimate of provincial needs for MNCH commodities, it is important to have specific treatment protocols for the dosage, frequency of administration and duration of treatment. To estimate a standard list of medicines, we assumed that treatment in primary and secondary health care centers follows the recommendations / standard treatment guidelines of WHO. If no such guideline exists, treatment followed the international best practice guidelines.

Calculation of MNCH Commodities

The calculation of MNCH commodities depends on the provincial MNCH guidelines. This is calculated by multiplying the number of cases requiring the medicines by the amount needed per case.

Consultative Meeting with Stakeholders

After completing the draft forecast, we will conduct consultative technical sessions with the FASP TWG, Sindh including DOH, LHW and MNCH program and development partners i.e. WHO, MERF and UNICEF. The objectives of the consultative meeting were to:

- Present and jointly review draft forecast.
- Review different data sources and ensure data is sufficient and of high-quality in order to build up the forecast
- Review and validate the available data and methodologies
- Review existing assumptions and adjustments based on recent demographic, logistics and services data.
- Discuss data sources and data gaps to support regular forecasting and supply planning, and ways to address gaps
- Reach consensus and agree upon assumptions, data, methodologies, and current forecasting findings

RESULTS

1. Forecasted Need for Oxytocin – Postpartum Hemorrhage (PPH)

Postpartum hemorrhage (PPH), *defined as a blood loss of 500 ml or more within 24 hours after birth (WHO),* is a major cause of mortality, morbidity and long-term disability related to pregnancy and childbirth.

In Pakistan every year around 7%of women suffer from PPH and it accounts for more maternal deaths than any other cause. Most deaths resulting from PPH occur during the first 24 hours after birth; the majority of these could be avoided through the use of prophylactic uterotonics during the third stage of labor and by timely and appropriate management.

Oxytocin is the medicine that is most effective in preventing and treating postpartum hemorrhage. Oxytocin is most often available in 1ml glass vials, containing 10 IU, and is administered by injection into a woman's vein or muscle. All women giving birth should be offered uterotonics during the third stage of labor for the prevention of PPH; doses range between 10 IU for prevention of postpartum hemorrhage and up to 40IU for treatment of PPH. The following input data are used to estimate the required oxytocin for the forecasting period 2018-2023 in the public sector.

Summary of Data Needed for Forecasting Oxytocin

- Target population (Expected pregnancies)
- Prevalence of PPH in Pakistan
- Percent deliveries in public health facilities of Sindh
- Number of public health facility deliveries
- Number of public facility deliveries requiring oxytocin for treatment of PPH
- Standard or average treatment regimen (i.e., 40 IU of Oxytocin required for PPH)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for this calculation of oxytocin is:

Oxytocin Need for PPH treatment	=	Total expected pregnancies	x	Proportion of public facility deliveries	x	Proportion of women who require treatment for PPH	x	Dose per case for PPH treatment

Oxytocin requires storage at between 2 and 8 °C, with possible excursions to room temperature for brief time periods (up to four weeks). In practice, in countries where the average temperature is above 30 °C and where adequate infrastructure for cold chain management is often lacking, maintaining the required storage conditions for oxytocin is a challenge. As a result, compromising its effectiveness and shelf life.

The associated summary outputs for oxytocin are shown in Table 3. By applying the different attributes and assumptions the forecasted number of pregnancies for the year 2019-20 and 2023-24 are estimated at 1.7 and 1.8 million, respectively. We have estimated (by trend analysis) that 22% of women will receive public facility delivery service in 2019-20. Thus, the total number of estimated facility deliveries in the public sector based on this assumption will be 24,529 and 31,864 in 2019-20 and 2023-24, respectively. Applying these parameters, we estimate the number of doses (10 IU) of oxytocin that needs to be procured for public facilities is 98,312 for 2019-20 and 127,710 for 2023-24.

Table 3. Forecasted Oxytocin Requirements

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
C) # of PPH cases (C = A × B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Health Facilities Deliveries (20.1% PDHS 2017-18 Sindh) assuming Health Facility (HF) Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from Public Health Facilities (PHF	21,271	22,868	24,529	26,257	28,054	29,922	31,864
F) Requirement of Oxytocin (40 IU= 4 x 10 IU vial) for Treatment of PPH in Public HF Deliveries	85,086	91,472	98,116	105,027	112,214	119,687	127,455
G) 0.2% Wastage*	170	183	196	210	224	239	255
H) Total Requirement of Oxytocin for Public HF Deliveries (PPH treatment including wastage)	85,256	91,655	98,312	105,237	112,439	119,926	127,710

**Please use stakeholder specific rate*

2. Forecasted Need for Misoprostol – Postpartum Hemorrhage (PPH)

While oxytocin is the recommended choice for prevention and treatment of postpartum hemorrhage, use of oxytocin may not be feasible in low-income settings, where most births occur at home with untrained birth attendants.

Misoprostol has been suggested as an alternative to oxytocin since it has been proven to act as an effective uterotonic. It is inexpensive, can be taken orally, does not need refrigeration, and has a long shelf-life. The International Federation of Gynecology and Obstetrics (FIGO) and the International Confederation of Midwives (ICM) jointly recommended that where home births occur without a skilled birth attendant, misoprostol may be the only available technology to control PPH. Misoprostol is new in Pakistan and the feasibility of scaling up PPH prevention intervention is being assessed. Recognizing a need for strategies to prevent PPH among women who give birth at home without a skilled provider, three 200 μg tablets of misoprostol to women immediately after delivery under the direct supervision of a community midwife / lady health worker should be provided. It should be noted that the current recommendation of the World Health Organization is also for three 200 μg tablets dose. Women should be counseled on the use of misoprostol during antenatal visits.

Summary of Data Needed for Forecasting Misoprostol

- Target population (Expected number of pregnancies)
- Percent deliveries in public health facilities of Sindh
- Number of pregnant women attending public health facility for delivery
- Number of pregnant women attending public facility for delivery given Misoprostol for PPH prevention
- Standard or average treatment regimen (i.e. three 200 μg misoprostol tablets needed for each pregnant woman to prevent risk of PPH)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for this calculation of misoprostol tablets is:

Total misoprostol tablets needed for PPH	=	Expected Pregnancies	x	Proportion of Pregnant women attending public health facility	X	Dose per Pregnant women for PPH prevention/treatment

Table 4 shows the amount of misoprostol tablets required during the forecast period. The trend analysis shows that the number of home births is declining (PDHS 2017-18). The estimated number of public health facility deliveries in 2019-20 is 0.37 million and in 2023-24 is 0.49 million, respectively. The total number of misoprostol tablets required for treatment of PPH is 98,312 during the forecast period 2019-20 and 127,710 during 2023-24, while it is assumed that eighty percent pregnant women will receive three 200 μg misoprostol tablets for prevention of PPH.

Table 4. Forecasted Number of Misoprostol Tablets Required for Prevention of PPH

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) % of Public Health Facility births (20.1%-PDHS 2017-18 Sindh-Assuming increase of 1% per yr.)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
C) # of Public Health Facility Births	327,253	351,814	377,368	403,949	431,593	460,334	490,211
D) Prevention of PPH (Assuming 80% given Misoprostol) D=Cx80%	261,803	281,451	301,894	323,160	345,274	368,268	392,168
E) Requirement of Misoprostol (3 tab x 200ug) for Prevention of PPH(E=D×3)	785,408	844,353	905,683	969,479	1,035,823	1,104,803	1,176,505
F) 0.2% Wastage*	1,571	1,689	1,811	1,939	2,072	2,210	2,353
G) Total Requirement of Misoprostol for PPH prevention including wastage	786,979	846,042	907,494	971,418	1,037,895	1,107,012	1,178,858

**Please use stakeholder specific rate*

Table 4.1. Forecasted Number of Misoprostol Tablets Required for Treatment of PPH

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
(C) # of PPH cases (C = A × B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Facility births (20.1%-PDHS 2017-18 Sindh (Assuming increase of 1% per yr.)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from Health Facilities	21,271	22,868	24,529	26,257	28,054	29,922	31,864
F) Requirement of Misoprostol (4 tab x 200ug) for Treatment of PPH	85,086	91,472	98,116	105,027	112,214	119,687	127,455
G) 0.2% Wastage*	170	183	196	210	224	239	255
H) Net Requirement of Misoprostol for PPH treatment including wastage	85,256	91,655	98,312	105,237	112,439	119,926	127,710

**Please use stakeholder specific rate*

3. Forecasted Need for Sodium Chloride Injection – Postpartum Hemorrhage

Sodium Chloride 0.9% w/v (Normal Saline) is an isotonic crystalloid salt solution. It is a clear, colorless, sterile solution each 25 ml. of which contains, Sodium Chloride B.P. -- 0.225 grams and water. It can be used as a diluting agent for I.V. medication; for reconstitution of various I.V. injections and flushing of I.V. ports and cannula.

The treatment of patients with PPH has 2 major components: (1) resuscitation and management of obstetric hemorrhage and, possibly, hypovolemic shock and (2) identification and management of the underlying cause(s) of the hemorrhage. During PPH, a patient can lose significant amount of blood leading to imbalances in the blood chemistry. This compound could significantly help restore the electrolyte balance as well as the blood loss that can otherwise prove fatal to their life.

0.9% Sodium Chloride Injection is considered to be a physiological solution as it is isotonic and isoosmotic. Infusion of large amounts can expands circulating volume by approximating sodium content of the blood. It provides the following electrolytes in each liter of fluid; Sodium and Chloride each equal to 150 mEq. Each ampoule of 25 mL provides 3.75 mEq of sodium and 3.75 mEq of chloride.

Summary of data needed for forecasting of Sodium Chloride

- Target population (Expected pregnancies)
- Prevalence of PPH in Pakistan
- Number of PPH cases
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Sodium Chloride Injection for management of PPH
- Standard or average management regimen
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Sodium Chloride Injection;

Sodium Chloride Injection Need for PPH Management	=	Total Pregnancies	x	Proportion of facility deliveries	x	Proportion of women requiring Sodium Chloride Injection for PPH management	x	Dose per PPH case for management

The associated summary outputs for Sodium Chloride Injection are shown in Table 5. By applying the different attributes and assumptions, the estimated number of pregnancies for the year 2019-20 and 2023-24 are estimated at 1.70 million and 1.87 million, respectively. The total number of public health facility deliveries estimated as 24,529 in 2019-20 and 31,864 in 2023-24, respectively. Applying these parameters, we estimate the number of Sodium Chloride Injection that needs to be procured for public facilities as 122,706 for 2019-20 and 159,398 for 2023-24 as shown in the table below.

Table 5: Forecasted Injection Sodium Chloride Requirement

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
C) # of PPH cases (C=A × B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Health Facilities (PHF) Births (20.1% PDHS 2017-18 Sindh) assuming PHF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from PHFs	21,271	22,868	24,529	26,257	28,054	29,922	31,864
E) Requirement of Inj. Sodium Chloride 0.9% for management of PPH in PHF Deliveries (5 per PPH case)	106,357	114,339	122,645	131,284	140,268	149,609	159,318
F) 0.05% Wastage*	53	57	61	66	70	75	80
G) Net Requirement of Sodium Chloride 0.9% Injection for PPH management in PHF Deliveries including wastage	106,410	114,397	122,706	131,349	140,338	149,684	159,398

4. Forecasted Need for Sodium Chloride Injection – Postpartum Hemorrhage

Sodium Chloride 0.9% w/v (Normal Saline) is an isotonic crystalloid salt solution. It is a clear, colorless, sterile solution each 25 ml. of which contains, Sodium Chloride B.P. -- 0.225 grams and water. It can be used as a diluting agent for I.V. medication; for reconstitution of various I.V. injections and flushing of I.V. ports and cannula.

The treatment of patients with PPH has 2 major components: (1) resuscitation and management of obstetric hemorrhage and, possibly, hypovolemic shock and (2) identification and management of the underlying cause(s) of the hemorrhage. During PPH, a patient can lose significant amount of blood leading to imbalances in the blood chemistry. This compound could significantly help restore the electrolyte balance as well as the blood loss that can otherwise prove fatal to their life.

0.9% Sodium Chloride Injection is considered to be a physiological solution as it is isotonic and isoosmotic. Infusion of large amounts can expands circulating volume by approximating sodium content of the blood. It provides the following electrolytes in each liter of fluid; Sodium and Chloride each equal to 150 mEq. Each ampoule of 25 mL provides 3.75 mEq of sodium and 3.75 mEq of chloride.

Summary of data needed for forecasting of Sodium Chloride

- Target population (Expected pregnancies)
- Prevalence of PPH in Pakistan
- Number of PPH cases
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Sodium Chloride Injection for management of PPH
- Standard or average management regimen
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Sodium Chloride Injection;

Sodium Chloride Injection Need for PPH Management	=	Total Pregnancies	x	Proportion of facility deliveries	x	Proportion of women requiring Sodium Chloride Injection for PPH management	x	Dose per PPH case for management

The associated summary outputs for Sodium Chloride Injection are shown in Table 5. By applying the different attributes and assumptions, the estimated number of pregnancies for the year 2019-20 and 2023-24 are estimated at 1.70 million and 1.87 million, respectively. The total number of public health facility deliveries estimated as 24,529 in 2019-20 and 31,864 in 2023-24, respectively. Applying these parameters, we estimate the number of Sodium Chloride Injection that needs to be procured for public facilities as 122,706 for 2019-20 and 159,398 for 2023-24 as shown in the table below.

Table 5: Forecasted Injection Sodium Chloride Requirement

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
C) # of PPH cases (C=A × B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Health Facilities (PHF) Births (20.1% PDHS 2017-18 Sindh) assuming PHF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from PHFs	21,271	22,868	24,529	26,257	28,054	29,922	31,864
E) Requirement of Inj. Sodium Chloride 0.9% for management of PPH in PHF Deliveries (5 per PPH case)	106,357	114,339	122,645	131,284	140,268	149,609	159,318
F) 0.05% Wastage*	53	57	61	66	70	75	80
G) Net Requirement of Sodium Chloride 0.9% Injection for PPH management in PHF Deliveries including wastage	106,410	114,397	122,706	131,349	140,338	149,684	159,398

**Please use stakeholder specific rate*

5. Forecasted Need for Sodium Lactate Compound Solution (Ringer's Lactate) – Post Partum Hemorrhage

Ringer's lactate solution (RL), also known as sodium lactate compound solution, is an infusion-based mixture of sodium chloride (6gm), sodium lactate (3.1gm), potassium chloride (0.3gm), and calcium chloride (0.2gm) in sterile water. It is infused for replacing fluids and electrolytes in those who have low blood volume when treating for PPH.

During PPH, a patient can lose significant amount of blood leading to imbalances in the blood chemistry. This compound could significantly help restore the electrolyte balance as well as the blood loss that can otherwise prove fatal to their life.

Summary of data needed for forecasting of Ringer's Lactate

- Target population (Expected pregnancies)
- Prevalence of PPH in Pakistan
- Number of PPH cases
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Ringer's Lactate for management of PPH
- Standard or average management regimen
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Ringer's Lactate;

Ringer's Lactate Need for PPH Management	=	Total Pregnancies	x	Proportion of facility deliveries	x	Proportion of women requiring RL for PPH management	x	Dose per PPH case for management

The associated summary outputs for Ringer's Lactate are shown in Table 6. By applying the different attributes and assumptions, the estimated number of pregnancies for the year 2019-20 and 2023-24 are estimated at 1.70 million and 1.87 million, respectively. The total number of public health facility deliveries estimated as 24,529 in 2019-20 and 31,864 in 2023-24, respectively. Applying these parameters, we estimate the number of Ringer's Lactate injections that needs to be procured for public facilities as 49,156 for 2019-20 and 63,855 for 2023-24 as shown in the table below.

Table 6: Forecasted Injection Ringer's Lactate Requirement

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
C) # of PPH cases (C= A×B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Health Facilities Births (20.1% PDHS 2017-18 Sindh) assuming HF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from Public Health Facilities (PHF)	21,271	22,868	24,529	26,257	28,054	29,922	31,864
F) Requirement of Inj. Ringer's Lactate for management of PPH in PHF Deliveries (2 per PPH case)	42,543	45,736	49,058	52,513	56,107	59,843	63,727
G) 0.2% Wastage*	85	91	98	105	112	120	127
H) Net Requirement of Ringer's Lactate for PPH management including wastage	42,628	45,827	49,156	52,618	56,219	59,963	63,855

**Please use stakeholder specific rate*

6. Forecasted Need for Dextrose Injection – Postpartum Hemorrhage

Intravenous sugar solution, also known as dextrose solution, is a mixture of dextrose (glucose) and water. It is used to treat low blood sugar or water loss without electrolyte loss. Fluid resuscitation is an important component of managing patients with PPH. Crystalloids and colloids are intravenous fluids used to expand the volume within the circulatory system in situations of blood loss. Examples of crystalloids include normal saline (sodium chloride 0.9%), 5% dextrose in water, and Ringer's lactate.

Summary of data needed for forecasting of Dextrose

- Target population (expected pregnancies)
- Percent deliveries in public health facilities Sindh
- Number of public health facility deliveries
- Standard or average management requirement per delivery
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Dextrose;

Forecasted Need for Dextrose	=	Total pregnancies	x	Proportion of public facility deliveries	x	Number of Injection required per delivery

The associated summary outputs for Dextrose are shown in Table 7. By applying the different attributes and assumptions, the estimated number of pregnancies for the year 2019-20 and 2023-24 are estimated at 1.70 million and 1.87 million, respectively. An estimated number of 24,529 pregnant women will deliver at public health facilities in 2019-20. Applying these parameters, we estimate the number of injection Dextrose that needs to be procured for public facilities is 24,553 for 2019-20 and 31,896 for 2023-24.

Table 7: Forecasted Inj. Dextrose requirements

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Prevalence of PPH	7%	7%	7%	7%	7%	7%	7%
C) # of PPH cases (C = A × B)	105,828	108,379	110,991	113,665	116,405	119,210	122,083
D) % of Public Health Facilities (PHFs) Births (20.1% PDHS 2017-18 Sindh) assuming 1% annual increase	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of PPH Cases seeking treatment from PHFs	21,271	22,868	24,529	26,257	28,054	29,922	31,864
F) Requirement of Inj. Dextrose for management of PPH (1 per PPH case)	21,271	22,868	24,529	26,257	28,054	29,922	31,864
G) 0.1% Wastage*	21	23	25	26	28	30	32
H) Net Requirement of Inj. Dextrose for PPH management including wastage	21,293	22,891	24,553	26,283	28,082	29,952	31,896

**Please use stakeholder specific rate*

7. Forecasted Need for Magnesium Sulfate – Eclampsia

Hypertensive disorders of pregnancy affect about 10% of all pregnant women around the world and are an important cause of severe acute morbidity, long term disability and death among mothers and babies. This group of diseases and conditions includes pre-eclampsia and eclampsia, gestational hypertension and chronic hypertension.

Pre-eclampsia is characterized by presence of hypertension, proteinuria and maternal organ dysfunction, while Eclampsia is characterized by the occurrence of generalized seizures in women with pre-eclampsia, provided that the Grand mal seizures are not attributable to other causes (e.g. epilepsy).

Magnesium sulfate is a lifesaving drug and should be available in all healthcare facilities throughout the health system. It is recommended for the prevention and treatment of pre- and eclampsia in preference to other anticonvulsants. Magnesium sulfate (injection 500 mg/ml in 2 ml ampoule) is needed at every level of the health care system where deliveries occur, from urban hospitals to rural clinics [WHO 2012].

Summary of Data Needed for Forecasting Magnesium Sulfate

- Target population (Expected number of pregnancies)
- Percent deliveries in public health facilities of Sindh
- Number of public health facility deliveries
- Number of pregnancies complicated by PE/E
- Standard or average prevention/treatment regimen (i.e., amount of magnesium sulfate needed for management of each case of PE/E (magnesium sulfate injection: 500 mg/ml in 2 -ml ampoule)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for this calculation of magnesium sulfate is:

Magnesium Sulfate Need for Eclampsia treatment (500mg/ml)	=	Total expected pregnancies	x	Proportion of public facility deliveries	x	Treatment dose per PPH case (2 ml ampoule = 1 gm MgSO4)

By applying the information on pregnancy complication (3% pregnancies are complicated), we estimated the number of women who require magnesium sulfate during pregnancy. Out of total 1.70 million pregnancies, 11,321 pregnant women are estimated to visit public facility for prevention /treatment of PE/E during the forecasting period of 2019-20. A total of 498,375 gm. (2 ml Ampoule) magnesium sulfate is required for 2019-20 while a total of 99,675 gm. (10 ml Ampoule) is required for the same year, which is to be administered using Pritchard Regime. Table 8 shows the complete factorization for the forecast of Magnesium sulfate.

Table 8. Forecasted Doses of Magnesium Sulfate Required for Treatment of Pre-Eclampsia / Eclampsia

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) # of Pregnancies estimated to be complicated with PE/E (3%)	48,844	50,021	51,226	52,461	53,725	55,020	56,346
C) % of Public Health Facilities Births (20.1% PDHS 2017-18 Sindh) assuming HF Deliveries increases by 1% annually	20%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
D) # of HF Births (D = B × C)	9,818	10,554	11,321	12,118	12,948	13,810	14,706
E) Requirement of MgSO4 (in GMs) for Treatment of Eclampsia in HF Deliveries (E=44 x D) (Pritchard Regime= 44 gm. /case of Eclampsia)	431,974	464,394	498,126	533,213	569,703	607,641	647,078
F) 0.05% Wastage* -in GMs	216	232	249	267	285	304	324
G) Net Requirement of MgSO4 (in GMs) for Eclampsia (including wastage) G= E+F	432,190	464,626	498,375	533,480	569,988	607,945	647,401
H) Requirement of Inj. MgSO4 (2 ml Ampoule -- 500 mg /ml) H=G	432,190	464,626	498,375	533,480	569,988	607,945	647,401
I)Requirement of Inj. MgSO4 (10 ml Ampoule -- 500 mg /ml) I =G/5 gm.	86,438	92,925	99,675	106,696	113,998	121,589	129,480

**Please use stakeholder specific rate*

8. Forecasted Need for Diazepam - Pre-Eclampsia/Eclampsia (PE/E)

Eclampsia, defined as the occurrence of a seizures in association with pre-eclampsia, remains a serious complication of pregnancy. Several different anticonvulsants are used to control eclamptic fits and to prevent further fits. The drug of choice for both the prevention and treatment of eclampsia is magnesium sulphate. If magnesium sulphate is not available, diazepam may be given. Fits or convulsions which are prolonged or recurrent may be controlled by intravenous diazepam.

Summary of Data Needed for Forecasting Diazepam

- Target population (total expected pregnancies)
- Number of pregnancies complicated by PE/E
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring diazepam for treatment of PE/E
- Standard or average treatment regimen i.e. amount of diazepam needed for each case to prevent PE/E (diazepam rectal gel)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of diazepam is:

Diazepam (Gel) Need for PE/E cases	=	Expected pregnancies	x	Proportion of public facility deliveries	x	Proportion of PE/E cases requires diazepam gel / Inj.	x	Dose per PE/E case

By applying the information on pregnancies complicated with PE/E (3% pregnancies are complicated), we estimated the number of pregnant women likely to develop PE/E and hence would require Diazepam. It is estimated that 51,226 pregnancies will be complicated with pre-eclampsia/eclampsia and will require diazepam for the treatment during the forecasting year (2019-20). Out of these, 11,321 pregnant women will seek treatment from public health facilities. Approximately, 11,327 gel / ampoules of diazepam are estimated to be required for the same year. Table 9 shows the complete factorization for the forecast of diazepam gel / injection.

Table 9: Forecasted Number of Diazepam Gel / Injection Required

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Number of Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) # of Pregnancies estimated to be complicated with PE/E (3%)	48,844	50,021	51,226	52,461	53,725	55,020	56,346
C) % of public health facilities deliveries (20.1%-PDHS 2017-18 Sindh) - assuming an increase of 1% per year)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
D) # of women seeking treatment of PE/E from public health facilities (D = B × C)	9,818	10,554	11,321	12,118	12,948	13,810	14,706
E) Requirement of Diazepam Gel / Inj. for Control / Treatment of Seizures in pre-eclampsia /eclampsia (E= 1 x D)	9,818	10,554	11,321	12,118	12,948	13,810	14,706
F) 0.05% Wastage *	5	5	6	6	6	7	7
G) Net Requirement of Diazepam Gel / Inj. for Control of Seizures in pre-eclampsia / eclampsia in HF Deliveries (including wastage) G= E+F	9,823	10,560	11,327	12,125	12,954	13,817	14,714
H) Requirement of Diazepam Gel / Injection (10 mg in 2 ml injection) for control / treatment of seizures in pre-eclampsia / eclampsia (dose 10 mg) H= 1x D)	9,818	10,554	11,321	12,118	12,948	13,810	14,706
I) 0.05% Wastage *	5	5	6	6	6	7	7
J) Total requirement of Diazepam Gel / Injection 10 mg for control of seizures in pre-eclampsia / eclampsia in public health facility deliveries (including wastage) J= H+I	9,823	10,560	11,327	12,125	12,954	13,817	14,714

**Please use stakeholder specific rate*

9. Forecasted Need for Hydralazine - Hypertension

Hydralazine is used with or without other medications to treat high blood pressure. It works by relaxing blood vessels (vasodilator) so blood can flow through the body more easily. It is a drug of choice for gestational hypertension or pregnancy-induced hypertension (PIH) which is the development of new hypertension in a pregnant woman after 20 weeks' gestation without the presence of protein in the urine or other signs of pre-eclampsia. Anti-hypertensive drugs should be given if the diastolic blood pressure is 110mm Hg or more. The aim is to keep the diastolic blood pressure between 90–100mm Hg to prevent cerebral hemorrhage.

Summary of Data Needed for Forecasting Hydralazine

- Target population (total expected pregnancies)
- Number of pregnancies complicated by Hypertensive disorders of pregnancy (HDP)
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Hydralazine management of HDP
- Standard or average treatment regimen i.e., amount of hydralazine needed for each case to manage hypertension (hydralazine injection 20 mg powder or 25 mg and 50 mg tablets).
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Hydralazine is:

Hydralazine Need for management of hypertension	=	Expected pregnancies	x	Proportion of facility deliveries	x	Proportion of women who require Hydralazine for management of hypertension	x	Dose per case of hypertension

By applying the information on pregnancies complicated with hypertensive disorders of pregnancy (5% pregnancies are complicated), we estimated the number of women who require hydralazine during pregnancy. A total of 18,868 pregnant women are estimated to require hydralazine for the treatment of hypertension during the forecasting period (2019-20). A total of 18,887 injections, 3 .39 million 25 / 50 mg tablets of hydralazine would be require for the year 2019-20. Table 10 shows the complete factorization for hydralazine forecast.

Table 10: Forecasted Hydralazine Injections to manage Hypertensive Disorders of Pregnancy (HDP)

**Please use stakeholder specific rate*

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2022-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies)	81,406	83,368	85,377	87,435	89,542	91,700	93,910
C) % of Pregnant Women seeking care from Public Health Facilities (20.1% PDHS 2017-18 Sindh) assuming 1% increase / year	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
D) # of Pregnant Women with HDP seeking care from Public Health Facilities (PHFs)	16,363	17,591	18,868	20,197	21,580	23,017	24,511
E) Requirement of Hydralazine HCl (25 mg tablet Twice daily during 3rd trimester) for management of HDP (E= D x 2 x 90 days)	2,945,279	3,166,323	3,396,311	3,635,545	3,884,337	4,143,010	4,411,895
F) 0.01% Wastage* -in tablets	295	317	340	364	388	414	441
G) Total Requirement of Hydralazine HCl (25 mg tablet Twice daily during 3rd trimester) for management of HDP G= E+F	2,945,574	3,166,640	3,396,651	3,635,909	3,884,726	4,143,424	4,412,336
H) Requirement of Hydralazine HCl (50 mg tablet OD during 3rd trimester) for management of HDP (E= D x 1 x 90 days)	1,472,640	3,166,323	3,396,311	3,635,545	3,884,337	4,143,010	4,411,895
I) 0.01% Wastage* -in tablets	147	317	340	364	388	414	441
J) Total Requirement of Hydralazine HCl (50 mg tablet OD during 3rd trimester) for management of HDP	1,472,787	3,166,640	3,396,651	3,635,909	3,884,726	4,143,424	4,412,336
K) Requirement of Hydralazine HCl (1 Ampoule of 20 mg) for management of HDP =Dx1	16,363	17,591	18,868	20,197	21,580	23,017	24,511
L) 0.1% Wastage* -Ampoules	16	18	19	20	22	23	25
M) Total Requirement of Hydralazine HCl (1 Ampoule of 20 mg) for management of HDP	16,379	17,608	18,887	20,218	21,601	23,040	24,535

10. Forecasted Need for Methyldopa – Hypertension

Methyldopa is used with or without other medications to treat high blood pressure. It works by relaxing blood vessels (vasodilator) so blood can flow through the body more easily. It is a drug of choice for Gestational hypertension or pregnancy-induced hypertension (PIH) which is the development of new hypertension in a pregnant woman after 20 weeks gestation without the presence of protein in the urine or other signs of pre-eclampsia. Anti-hypertensive drugs should be given if the diastolic blood pressure is 110mm Hg or more. The aim is to keep the diastolic blood pressure between 90–100mm Hg to prevent cerebral hemorrhage.

Summary of Data Needed for Forecasting Methyldopa

- Target population (total expected pregnancies)
- Number of pregnancies complicated by Hypertension Disorders of Pregnancy(HDP)
- Percent deliveries in public health facilities of Sindh
- Number of pregnancies complicated with HDP seeking treatment at public health facility
- Standard or average treatment regimen (i.e. 2 x 250mg tablets per day per case)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Methyldopa is

Methyldopa Tablet Need for Hypertensive Disorders of Pregnancy	=	Expected pregnancies	x	Percent pregnancies complicated with HDP	x	Percent deliveries in public health facility	x	Dose of Methyldopa tablets per HDP case

Table 11 shows the forecasted amount of Methyldopa yearly. A total of 6.79 million 250 mg tablets of Methyldopa are forecasted for the period (2019-20).

Table 11: Forecasted Number of Methyldopa Tablets

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies)	81,406	83,368	85,377	87,435	89,542	91,700	93,910
C) % of Pregnant Women seeking care from Public Health Facilities (20.1% PDHS 2017-18 Sindh) assuming 1% increase / year	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
D) # of Pregnant Women with HDP seeking care from Health Facilities	16,363	17,591	18,868	20,197	21,580	23,017	24,511
E) Requirement of Methyldopa 500 mg tablet (180 tablets per case i.e. OD for 180 days --2nd and 3rd trimesters) for prevention / treatment of HDP (E= D x 180 Tablets)	2,945,279	3,166,323	3,396,311	3,635,545	3,884,337	4,143,010	4,411,895
F) 0.01% Wastage*	295	317	340	364	388	414	441
G) Total Requirement of Methyldopa 500 mg tablet for the prevention / treatment of HDP G= E+F	2,945,574	3,166,640	3,396,651	3,635,909	3,884,726	4,143,424	4,412,336
H) Requirement of Methyldopa 250 mg (360 tablets per case i.e. 2 per day for 180 days) for prevention/treatment of HDP H= D x 360 Tablets)	5,890,559	6,332,647	6,792,622	7,271,090	7,768,675	8,286,020	8,823,790
I) 0.01% Wastage*	589	633	679	727	777	829	882
J) Total Requirement of Methyldopa 250 mg for the prevention/treatment of HDP J= H + I	5,891,148	6,333,280	6,793,301	7,271,817	7,769,452	8,286,849	8,824,672

**Please use stakeholder specific rate*

WHO estimates that the global prevalence of maternal sepsis is 4·4% among live births, representing more than 5·7 million cases per year. Important variations exist between regions, with higher incidence in low-income and middle-income countries (up to 7%) compared with high-income countries (1–2%). Despite the relative low prevalence and the availability of interventions for its prevention and treatment, maternal sepsis remains a life-threatening condition and one of the leading direct causes of maternal mortality worldwide, accounting for up to 10% of maternal deaths.

The new WHO definition of maternal sepsis says, "Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period". Undetected or poorly managed maternal infections can lead to sepsis, death or disability for the mother and increased likelihood of early neonatal infection and other adverse outcomes.

Several factors have been associated with increased risk of maternal peripartum infections, including pre-existing maternal conditions (e.g., malnutrition, diabetes, obesity, severe anemia, bacterial vaginosis) and spontaneous or provider-initiated conditions during labor and childbirth (e.g., prolonged rupture of membranes, multiple vaginal examinations, manual removal of the placenta, caesarean section). Strategies to reduce maternal peripartum infections and their complications have been largely directed at preventive measures where such risk factors exist.

Globally, the most common intervention for preventing morbidity and mortality related to maternal infection is the use of antibiotics for prophylaxis and treatment. Ampicillin is recommended as first line antibiotic for prevention and treatment of peripartum infections.

Summary of Data Needed for Forecasting Ampicillin

- Target population (total expected births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Ampicillin for treatment of Maternal Sepsis
- Standard or average treatment regimen (i.e., amount of Ampicillin needed for each case to treat maternal sepsis)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Ampicillin is:

Ampicillin Need of for Maternal Sepsis Treatment	=	Expected births	x	Proportion of public facility deliveries	x	Proportion of deliveries complicated with maternal sepsis and requires Ampicillin for treatment	x	Dose per case for treatment

By applying the information on pregnancy/deliveries complications (7% pregnancies/deliveries are complicated), we estimated the number of women who require Ampicillin for the treatment of maternal sepsis. A total of 101,951 pregnant women are estimated to require Ampicillin for the treatment of maternal sepsis during the forecasting period (2019-20). Out of these, 22,531 pregnant women are estimated to seek treatment from public health facility. A total of 338,135 injections / capsules of Ampicillin 250/500 mg are required for 2019-20.

Table 12 shows the complete factorization for the estimated forecast for ampicillin.

Table 12: Forecasted Number of Doses of Ampicillin Required for the Treatment of Maternal Sepsis

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2022-24**
A) Total births (2.9%)	1,388,695	1,422,163	1,456,437	1,491,537	1,527,483	1,564,296	1,601,995
B) Incidence of Maternal Sepsis (average pregnancy + postpartum sepsis) according to WHO definition	7%	7%	7%	7%	7%	7%	7%
C) number of Maternal Sepsis cases (C= B x A)	97,209	99,551	101,951	104,408	106,924	109,501	112,140
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (20.1% PDHS 2017-18 Sindh) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	19,539	21,005	22,531	24,118	25,769	27,485	29,268
F) Number of Ampicillin 250/500 mg Capsules required for M/Sepsis patients (F= E x 15 cap /pt.)	293,084	315,080	337,966	361,772	386,530	412,270	439,027
G) 0.05% Wastage*	147	158	169	181	193	206	220
H) Total Requirement of Ampicillin 250/500 mg capsule for Maternal Sepsis patients H= F+G	293,231	315,238	338,135	361,953	386,723	412,476	439,246
I) Number of Ampicillin 250/500mg Injections required for M/Sepsis patients (F= E x 15 (3x5days) Injs. /patient)	293,084	315,080	337,966	361,772	386,530	412,270	439,027
J) 0.05% Wastage*	147	158	169	181	193	206	220
K) Total Requirement of Ampicillin 250/500mg Injections for Maternal Sepsis patients K= I+J	293,231	315,238	338,135	361,953	386,723	412,476	439,246

**Please use stakeholder specific rate*

11. Forecasted Need for Ceftriaxone - Treatment of Maternal Sepsis

WHO estimates that the global prevalence of maternal sepsis is 4·4% among live births, representing more than 5·7 million cases per year. Important variations exist between regions, with higher incidence in low-income and middle-income countries (up to 7%) compared with high-income countries (1–2%). Despite the relative low prevalence and the availability of interventions for its prevention and treatment, maternal sepsis remains a life-threatening condition and one of the leading direct causes of maternal mortality worldwide, accounting for up to 10% of maternal deaths.

The new WHO definition of maternal sepsis says, "Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period". Undetected or poorly managed maternal infections can lead to sepsis, death or disability for the mother and increased likelihood of early neonatal infection and other adverse outcomes.

Several factors have been associated with increased risk of maternal peripartum infections, including pre-existing maternal conditions (e.g., malnutrition, diabetes, obesity, severe anemia, bacterial vaginosis) and spontaneous or provider-initiated conditions during labor and childbirth (e.g., prolonged rupture of membranes, multiple vaginal examinations, manual removal of the placenta, caesarean section). Strategies to reduce maternal peripartum infections and their complications have been largely directed at preventive measures where such risk factors exist.

Globally, the most common intervention for preventing morbidity and mortality related to maternal infection is the use of antibiotics for prophylaxis and treatment. Ampicillin is recommended as first line antibiotic for prevention and treatment of peripartum infections.

Summary of Data Needed for Forecasting Ceftriaxone

- Target population (total expected births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Ceftriaxone for treatment of Maternal Sepsis
- Standard or average treatment regimen (i.e., amount of Ceftriaxone needed for each case to treat maternal sepsis)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Ceftriaxone n is:

Ceftriaxone Need of for Maternal Sepsis Treatment	=	Expected births	x	Proportion of public facility deliveries	x	Proportion of deliveries complicated with maternal sepsis and requires Ceftriaxone for treatment	x	Dose per case for treatment

By applying the information on pregnancy/deliveries complications (7% pregnancies/deliveries are complicated), we estimated the number of women who require Ceftriaxone for the treatment of maternal sepsis. A total of 101,951 pregnant women are estimated to require Ceftriaxone for the treatment of maternal sepsis during the forecasting period (2019-20). Out of these, 22,531 pregnant women are estimated to seek treatment from public health facility.

A total of 338,000 injections of Ceftriaxone 250/500 mg are required for 2019-20.

Table 13 shows the complete factorization for the estimated forecast for ampicillin.

Table 13: Forecasted Number of Doses of Ceftriaxone Required for the Treatment of Maternal Sepsis

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total births (2.9%)	1,388,695	1,422,163	1,456,437	1,491,537	1,527,483	1,564,296	1,601,995
B) Incidence of Maternal Sepsis (average pregnancy + postpartum sepsis) according to WHO definition	7%	7%	7%	7%	7%	7%	7%
C) number of Maternal Sepsis cases (C= B x A)	97,209	99,551	101,951	104,408	106,924	109,501	112,140
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (20.1% PDHS 2017-18 Sindh) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	19,539	21,005	22,531	24,118	25,769	27,485	29,268
F) Number of Ceftriaxone 250/500 mg Injections required for M/Sepsis patients (F= E x 15 Inj. /pt.)	293,084	315,080	337,966	361,772	386,530	412,270	439,027
G) 0.01% Wastage*	29	32	34	36	39	41	44
H) Total Requirement of Ceftriaxone 250/500 mg Injections for Maternal Sepsis patients H= F+G	293,113	315,112	338,000	361,809	386,568	412,311	439,071

**Please use stakeholder specific rate*

12. Forecasted Need for Metronidazole – Treatment of Maternal Sepsis

Bacterial infections around the time of childbirth account for about one tenth of the global burden of maternal death. Apart from severe morbidity and death, women who experience peripartum infections are also prone to long-term disabilities such as chronic pelvic pain, fallopian tube blockage and secondary infertility. Maternal infections before or during childbirth are also associated with an estimated 1 million newborn deaths annually.

Several factors have been associated with increased risk of maternal peripartum infections, including pre-existing maternal conditions (e.g., malnutrition, diabetes, obesity, severe anemia, bacterial vaginosis) and spontaneous or provider-initiated conditions during labor and childbirth (e.g., prolonged rupture of membranes, multiple vaginal examinations, manual removal of the placenta, caesarean section). Strategies to reduce maternal peripartum infections and their complications have been largely directed at preventive measures where such risk factors exist.

Globally, the most common intervention for preventing morbidity and mortality related to maternal infection is the use of antibiotics for prophylaxis and treatment. Metronidazole is recommended for prevention and treatment of peripartum infections.

Summary of Data Needed for Forecasting Metronidazole

- Target population (total Births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Metronidazole for treatment of Maternal Sepsis
- Standard or average treatment regimen (i.e., amount of Metronidazole needed for each case to treat maternal sepsis)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Metronidazole is:

Metronidazole Need for Treatment of Maternal Sepsis	=	Total Expected Births	x	Proportion of facility births	X	Proportion of women requiring Metronidazole for Maternal Sepsis treatment	x	Dose per Maternal Sepsis case for treatment

By applying the information on pregnancy/deliveries complications (7% pregnancies/deliveries are complicated), we estimated the number of women who require Metronidazole for the treatment of maternal sepsis. A total of 101,951 pregnant women are estimated to require Metronidazole for the treatment of maternal sepsis during the forecasting period (2019-20). Out of these, 22,531 pregnant women are estimated to seek treatment from public health facility. A total of 0.33 million tablets / infusions of Metronidazole are required for 2019-20 which are to be administered orally / intravenously. Table 14 shows the complete factorization for the forecast of Metronidazole.

Table 14: Forecasted Number of Doses of Metronidazole Required for Management of Maternal Sepsis

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total births (2.9%)	1,388,695	1,422,163	1,456,437	1,491,537	1,527,483	1,564,296	1,601,995
B) Incidence of Maternal Sepsis (average preg. + postpartum sepsis) according to WHO definition	7%	7%	7%	7%	7%	7%	7%
C) number of Maternal Sepsis cases (C= B x A)	97,209	99,551	101,951	104,408	106,924	109,501	112,140
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (20.1% PDHS 2017-18 Sindh) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	19,539	21,005	22,531	24,118	25,769	27,485	29,268
F) Number of Metronidazole 200/400mg tablets required for M/Sepsis patients (F= E x 15 (3x5days) tablets / patient)	293,084	315,080	337,966	361,772	386,530	412,270	439,027
G) 0.05% Wastage*	147	158	169	181	193	206	220
H) Total Requirement of Metronidazole 200/400mg tablets for Maternal Sepsis patients H= F+G	293,231	315,238	338,135	361,953	386,723	412,476	439,246
I) Number of Metronidazole Infusion required for M/Sepsis patients (F= E x 15 (3x5days) infusions /patient)	293,084	315,080	337,966	361,772	386,530	412,270	439,027
J) 0.005% Wastage*	15	16	17	18	19	21	22
K) Total Requirement of Metronidazole 500 mg/100ml infusions for Maternal Sepsis patients K=J+I	293,099	315,096	337,983	361,790	386,549	412,291	439,049

**Please use stakeholder specific rate*

13. Forecasted Need for Gentamycin - Treatment of Maternal Sepsis

WHO estimates that the global prevalence of maternal sepsis is 4·4% among live births, representing more than 5·7 million cases per year. Important variations exist between regions, with higher incidence in low-income and middle-income countries (up to 7%) compared with high-income countries (1–2%). Despite the relative low prevalence and the availability of interventions for its prevention and treatment, maternal sepsis remains a life-threatening condition and one of the leading direct causes of maternal mortality worldwide, accounting for up to 10% of maternal deaths.

The new WHO definition of maternal sepsis says, "Maternal sepsis is a life-threatening condition defined as organ dysfunction resulting from infection during pregnancy, childbirth, post-abortion, or postpartum period". Undetected or poorly managed maternal infections can lead to sepsis, death or disability for the mother and increased likelihood of early neonatal infection and other adverse outcomes.

Several factors have been associated with increased risk of maternal peripartum infections, including pre-existing maternal conditions (e.g., malnutrition, diabetes, obesity, severe anemia, bacterial vaginosis) and spontaneous or provider-initiated conditions during labor and childbirth (e.g., prolonged rupture of membranes, multiple vaginal examinations, manual removal of the placenta, caesarean section). Strategies to reduce maternal peripartum infections and their complications have been largely directed at preventive measures where such risk factors exist.

Globally, the most common intervention for preventing morbidity and mortality related to maternal infection is the use of antibiotics for prophylaxis and treatment.

Gentamycin, is recommended as first line antibiotic for prevention and treatment of peripartum infections

Summary of Data Needed for Forecasting Gentamycin

- Target population (expected births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Sindh
- Number of public facility deliveries requiring Gentamycin for treatment of Maternal Sepsis
- Standard or average treatment regimen (i.e. 3mg/kg/dayx5days=3x70kg=210mg/40mg = 5 Injs. approx.)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for forecasting Gentamycin is:

Gentamycin Need for Treatment of Maternal Sepsis	=	Expected Births	x	Proportion of public facility deliveries	x	Proportion of deliveries complicated with maternal sepsis and requires Gentamycin	x	Dose per case for treatment

By applying the information on births /deliveries complication (7% pregnancies/deliveries are complicated), we estimated the number of women who require Gentamycin for the treatment of maternal sepsis. A total of 22,531 pregnant women with maternal sepsis seeking treatment from public health facility are estimated to require Gentamycin injection for the treatment of maternal sepsis during the forecasting period (2019-20).

A total of 0.56 million injections of Gentamycin are required for 2019-20 which are to be administered intravenously.

Table 15 shows the complete factorization for the forecast of Gentamycin.

Table 15: **Forecasted Number of Doses of Gentamycin Required for Treatment of Maternal Sepsis**

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total births (2.9%)	1,388,695	1,422,163	1,456,437	1,491,537	1,527,483	1,564,296	1,601,995
B) Incidence of Maternal Sepsis (average pregnancy + postpartum sepsis) according to WHO definition	7%	7%	7%	7%	7%	7%	7%
C) number of Maternal Sepsis cases (C= B x A)	97,209	99,551	101,951	104,408	106,924	109,501	112,140
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (20.1% PDHS 2017-18 Sindh) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	19,539	21,005	22,531	24,118	25,769	27,485	29,268
F) Number of Gentamicin 40mg Injections required for M/Sepsis patients (F= E x 5x5) (3mg/kg/day x5 days = 3 x70kg=210mg/40mg Inj.=5 Injs. approx. /patient) Inj. 80 mg = 2.5 inj. / patient	488,474	525,134	563,277	602,954	644,216	687,117	731,711
G) 0.01% Wastage*	49	53	56	60	64	69	73
H) Total Requirement of Gentamicin 40mg Injections for Maternal Sepsis patients H= F+G	488,522	525,186	563,333	603,014	644,281	687,186	731,784

**Please use stakeholder specific rate*

14. Forecasted Need for Ferrous salt + Folic Acid Tablets – Anemia / Antenatal Care

It is estimated that 41.8% of pregnant women worldwide are anemic. At least half of this anemia burden is assumed to be due to iron deficiency. Daily oral iron and folic acid supplementation is recommended by WHO as part of the antenatal care to reduce the risk of low birth weight, maternal anemia and iron deficiency. Ferrous salt in combination with Folic acid is a supplement used to prevent iron deficiency and folic acid deficiency during pregnancy. It can also be used to treat iron deficiency anemia. It is a fixed dose combination of ferrous salt and folic acid. It is taken by mouth. Ferrous salt + folic acid was approved for medical use in the United States as early as 1946. It is on the World Health Organization's list of Essential Medicines, the most effective and safe medicines needed in a health system.

WHO suggested scheme for daily iron and folic acid supplementation in pregnant women is;

i. Iron: 30–60 mg of elemental iron
ii. Folic acid: 400 μg (0.4 mg)

Summary of Data Needed for Forecasting Ferrous Salt + Folic Acid (FS+FA) Tablets

- Target population (total expected pregnancies)
- Proportion of pregnant women receiving Ante Natal Care (ANC).
- Percent deliveries in public health facilities of Sindh
- Number of public facility pregnancies requiring FS+FA tablets for prevention & treatment of anemia
- Standard or average treatment regimen (i.e., amount of FS+FA tablets needed for each case to treat and prevent anemia)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula for calculation of ferrous salt + Folic acid is:

Need for Ferrous salt + Folic acid tablets to prevent/ treat anemia in pregnancy	=	Total expected pregnancies	x	Proportion of women who received ANC	x	Proportion of at risk women seeking anemia prevention / treatment from public health facility	x	Dose per pregnant women to prevent/ treat anemia

Table 16 shows the forecasted quantities of ferrous salt + folic acid tablet for the period 2019-20 to 2023-24. A total of 204,896 pregnant women are estimated to visit public health facilities during 2019-20, and 36.88 million tablets of ferrous salt + Folic acid tablets are estimated to be required to prevent / treat anemia in these pregnant women for the year 2019-20. Table 16 shows the complete factorization for the forecast of ferrous salt + folic acid tablet.

Table 16: Forecasted Number of Ferrous Salt + Folic Acid Tablets

**Please use stakeholder specific rate*

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Number of Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Percentage of pregnant women receiving ANC from a skilled provider (86% -PDHS -2017-18) assuming 1% increase annually	86%	87%	88%	89%	90%	91%	92%
C) # of pregnant women who received ANC from a skilled provider (C= A× B) Skilled provider include doctor, nurse, midwife, and lady health visitor	1,400,188	1,450,606	1,502,641	1,556,342	1,611,758	1,668,942	1,727,945
D) Percentage who received ANC and took Iron (59.7 PDHS 2017-18 Sindh) assuming 1% increase annually	59.7%	60.7%	61.7%	62.7%	63.7%	64.7%	**65.7%**
E) Number of pregnant women who received ANC and took Iron	835,912	880,518	927,130	975,826	1,026,690	1,079,805	1,135,260
F) % of Public Health Facilities Births (20.1% PDHS 2017-18 Sindh) assuming PHF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
G) # of pregnant women who receive Ferrous Salt + Folic Acid Tablets during ANC visit from Public Health Facilities (PHF) (G =E × F)	168,018	185,789	204,896	225,416	247,432	271,031	296,303
H) Number of Ferrous salt + Folic Acid Tablets required (recommend dose is 1 tablet daily x throughout Pregnancy (Average taken= 6 months=30 tablets x 6=180 tablets / pregnant woman)	30,243,308	33,442,075	36,881,221	40,574,864	44,537,814	48,785,602	53,334,515
I) 0.01% Wastage*	3,024	3,344	3,688	4,057	4,454	4,879	5,333
J) Total Requirement of Ferrous salt + Folic Acid Tablets for PHF ANC Visits J= H+I	30,246,332	33,445,419	36,884,909	40,578,921	44,542,268	48,790,481	53,339,848

15. Forecasted Need for Dexamethasone (Antenatal Corticosteroids) – Preterm Births

Preterm birth is a leading cause of perinatal death and disability and is an important global public health problem. Preterm birth accounts for approximately 6–7% of all births (WHO 2012). It is also the leading cause of neonatal mortality both in developed and developing countries, accounting for an estimated 24% of neonatal deaths. Preterm birth occurs most often in economically disadvantaged communities and those with high rates of urinary and genital tract infection. The administration of certain corticosteroids to women at risk of preterm birth yields a considerable reduction in risk of complications of prematurity, such as respiratory distress syndrome, intraventricular hemorrhage, and perinatal death.

Dexamethasone is a fluorinated glucocorticoid steroid that is administered through intramuscular injections to prevent these complications—with the greatest effect seen when there is a 24-48-hourtime span between the first dose and birth. According to the WHO, 7%of pregnant women are assumed to be at risk of preterm delivery (WHO 2012), whereas in Pakistan studies shows 16% of pregnant women are at risk of preterm delivery. An injection of 4 mg dexamethasone phosphate (as disodium salt) in a 1ml ampoule is needed to promote fetal lung maturation before preterm delivery.

Summary of Data Needed for Forecasting Antenatal Corticosteroid (ANCS)

- Target population (Expected Pregnant women)
- Number of pregnant women at risk of preterm birth
- Proportion of public health facility deliveries
- Standard or average treatment regimen (i.e., amount of dexamethasone needed for each case to prevent risks of preterm birth)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of dexamethasone is:

Total Need of Inj. dexamethasone (ampoule of 1 ml)	=	Total Pregnancies	x	Proportion of pregnant women at risk of preterm delivery	x	Proportion of pregnant women attending public health facility	x	Dose per case

As shown in table 17 that approximately 273,208 pregnant women are at risk of preterm birth during the forecast period, 2019-20 and 300,512 in year 2023-24. Further, to prevent the risk of preterm delivery a total of 362,454 ampoules for 2019-20 and 470,837 ampoules of dexamethasone (1 ml each) for 2023-24 need to be procured during the forecast periods, as depicted in Table 17.

Table 17. Forecasted Need for Dexamethasone

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Number of Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) Percentage of pregnant women at risk of preterm delivery (Meta-Analysis 2017 /Every Preemie Scale-Pakistan Profile / WHO 2015	16%	16%	16%	16%	16%	16%	16%
C) # of pregnant women at risk of preterm delivery (C = A × B)	260,500	266,778	273,208	279,792	286,535	293,440	300,512
D) % of Public Health Facilities Births (20.1% PDHS 2017-18 Sindh) assuming HF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) # of pregnant women at risk attending public health facility (E = C × D) for delivery	52,361	56,290	60,379	64,632	69,055	73,654	78,434
F) Number of dexamethasone ampoules required (F= E x 6 amp) WHO recommend total 24 mg in divided doses (4mg in 1-ml amp)	314,163	337,741	362,273	387,791	414,329	441,921	470,602
G) 0.05% Wastage	157	169	181	194	207	221	235
H) Total Requirement of Dexamethasone Ampoules for Public HF Deliveries Management for Preterm Births/deliveries H= G+F	314,320	337,910	362,454	387,985	414,536	442,142	470,837

16. Forecasted Need for Oral Rehydration Salts (ORS) –Diarrhea in 0-59 months Children

Diarrheal disease is the second leading cause of death in children under five years old. Loss of water and salts resulting from diarrhea can result in severe dehydration which results in severe morbidity and mortality. In Pakistan, on an average each child under the age of 5 years, gets 3-4 episodes of diarrhea per year. According to PDHS 2017-, prevalence of diarrhea in Sindh province is 14% among children under the age of 5 years.

Although the total number of deaths globally from diarrheal diseases remains high, the overall mortality rate has steadily declined over the last few decades. This decline especially in developing countries is largely due to the use of early and appropriate oral rehydration therapy (ORT) with oral rehydration salt (ORS) being its main component as well as improved nutrition and water sanitation measures.

ORS is the non-propriety name for a balanced glucose-electrolyte mixture, approved, recommended and distributed by WHO and UNICEF as a drug for the treatment of clinical dehydration throughout the world. Oral rehydration therapy (ORT) is a type of fluid replacement used to prevent and treat dehydration, especially that due to diarrhea.

Oral rehydration salts (ORS) when properly mixed with safe water can help rehydrate the body when a significant amount of fluid has been lost due to diarrhea. An ORS estimate is provided for children under 5. Assuming two packs per case, the total number of ORS is estimated at 6.9 million for the forecast period 2017-18 and 11.0 million for 2022-23 (Table12).

Summary of Data Needed for Forecasting of ORS

- Target Population -- estimated number of children less than 5 years of age
- Prevalence of Diarrhea in children 0-59 months
- Incidence of Diarrhea in children 0-59 months
- Percent seeking diarrhea treatment from public health facility
- Standard or average treatment regimen (i.e., two packs per episode)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for the calculation of ORS need is;

Need for ORS	=	Estimated Population of <5 children	x	Prevalence and Incidence of diarrhea in <5 children	x	Proportion of <5 children who received ORS	x	Percent <5 children seeking ORS from public health facility	x	2 packets per episode

Table 18 shows that there will be 3.25 million estimated number of diarrhea episodes in 2019-20 and out of these 1.75 million will be treated with ORS. Out of these, 0.38 million will seek ORS from public health facilities of Sindh Health Department. This means that a total of 0.77 million ORS is required for the year 2019-20 to treat diarrhea episodes. Pakistan Bureau of Statistics and PDHS data were used to estimate the need for ORS.

Table 18. Forecasted Number of ORS for 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% under 5 children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Number / Population of < 5 children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of Diarrhea in < 5 Children in Sindh-- PDHS 2017-18	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%
D) Total number of children with Diarrhea (B x C)	1,034,339	1,059,266	1,084,795	1,110,938	1,137,712	1,165,131	1,193,210
E) Incidence of Diarrhea in < 5 Children (# episodes/child /year) -- study in Lahore 18	3.0	3.0	3.0	3.0	3.0	3.0	3.0
F) Total number of Diarrhea Episodes (D x E)	3,103,016	3,177,799	3,254,384	3,332,814	3,413,135	3,495,392	3,579,631
G) Percentage who received ORS (52% PDHS 2017-18 Sindh) assuming 1% increase annually	52%	53%	54%	55%	56%	57%	58%
H) Number of diarrhea patients treated with ORS	1,613,568	1,684,233	1,757,367	1,833,048	1,911,356	1,992,373	2,076,186
I) % of patients seeking ORS from Public Health Facilities (20.1% PDHS 2017-18 Sindh) assuming Public HF utilization increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
J) Number of patients seeking ORS from Public Health Facilities (J=H x I)	324,327	355,373	388,378	423,434	460,637	500,086	541,884
K) Number of ORS packet required (K = J x 2 packet/episode)	648,654	710,746	776,756	846,868	921,273	1,000,171	1,083,769
L) 0.01% Wastage*	65	71	78	85	92	100	108
M) Total Requirement of ORS packets M= K+L	648,719	710,818	776,834	846,953	921,366	1,000,271	1,083,877

**Please use stakeholder specific rate*

17. Forecasted Need for Zinc Sulphate - Diarrhea

Every year more than a million children under five years of age succumb to the fluid loss and dehydration associated with the majority of diarrhea related deaths. Diarrhea is second only to pneumonia as the leading cause of death globally among children under 5. There are two simple and effective treatments recommended by WHO for the clinical management of acute diarrhea:

- use of low concentration oral rehydration salts (ORS)
- routine use of zinc supplementation, at a dosage of 20 milligrams per day for children older than six months or 10 mg per day in those younger than six months, for 10–14 days.

Zinc supplementation has been found to reduce the duration and severity of diarrheal episodes and likelihood of subsequent infections for 2–3 months (WHO) Zinc is essential for the normal growth and development of children and is naturally found in the diet, mainly in foods of animal origin. Dietary deficiency of zinc can lead to an increased risk of gastrointestinal infections and impaired gastrointestinal and immune function.

Summary of Data Needed for Forecasting of Zinc Sulphate

- Target population – estimated number of children 0-59 months
- Prevalence of Diarrhea in children 0-59 months
- Incidence of Diarrhea in children 0-59 months
- Percent seeking diarrhea treatment from public health facility
- Standard or average treatment regimen (i.e., 5 Zinc Sulphate tablets per episode in 0-6 and 10 tablets per episode in 6-59 months children)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for Zinc Sulphate forecast calculation is;

Total Need for Zinc Sulphate tablets	=	Estimated number of 0-59 months children	x	Incidence and Prevalence of diarrhea in under-5 children (case/child/year)	x	Percent 0-59 months who received Zinc Sulphate tablets	x	Percent 0-59 months seeking Zinc Sulphate from public facility	x	Dose per episode

Based on prevalence and incidence of diarrhea among children less than 5 years of age, the estimated requirement of the zinc Sulphate 20 mg tablet for the year 2019-20 is 1.03 million, while for the year
2023-24 it is 1.7 million, as shown in (Table 19)

Table 19. Forecasted Number of Zinc Sulphate Tablets

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% under 5 children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Number of 0-6 months children (1.35% - Operational Guidance on Infant Feeding in Emergencies (OG-IFE) version 3.0)	646,462	613,001	627,775	642,904	658,398	674,265	690,515
D) Number of 6-59 months children (B-C)	6,536,446	6,743,014	6,905,521	7,071,944	7,242,378	7,416,919	7,595,667
E) Prevalence of Diarrhea in < 5 Children in Sindh-- PDHS 2017-18	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%	14.4%
F) Total number of 0-6 months children with Diarrhea (E x C)	93,090	88,272	90,400	92,578	94,809	97,094	99,434
G) Total number of 6-59 months children with Diarrhea (E x D)	941,248	970,994	994,395	1,018,360	1,042,902	1,068,036	1,093,776
H) Incidence of Diarrhea in 0-59 months children - study in Lahore (episodes / child / year)18	3.0	3.0	3.0	3.0	3.0	3.0	3.0
I) Total Number of diarrhea episodes in 0-6 months children	279,271	264,817	271,199	277,735	284,428	291,283	298,303
J) Total Number of diarrhea episodes in 6-59 months children	2,823,745	2,912,982	2,983,185	3,055,080	3,128,707	3,204,109	3,281,328
K) % of patients seeking treatment from Public Health Facilities (20.1% PDHS 2017-18 Sindh) assuming PHF utilization increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
L) Number of 0-6 months patients seeking treatment from PHF	56,134	55,876	59,935	64,157	68,547	73,112	77,857
M) Number of 6-59 months patients seeking treatment from PHF	567,573	614,639	659,284	705,723	754,018	804,231	856,427
N) Percentage who received Zinc (13% PDHS 2017-18) 1% increase annually	13%	14%	15%	16%	17%	18%	19%
O) Number of 0-6 months diarrhoea patients who received Zinc	7,297	7,823	8,990	10,265	11,653	13,160	14,793
P) Number of 6-59 months diarrhoea patients who received Zinc	73,784	86,049	98,893	112,916	128,183	144,762	162,721
Q) Number of Zinc Sulphate 20 mg tablet requirement for 0-6 months children (10mg/ day x 10 days = 10x 10=100/20 mg = 5 tablets (Ox5)	36,487	39,113	44,951	51,325	58,265	65,801	73,964
R) Number of Zinc Sulphate 20 mg tablet requirement for 6-59 months children (I= H x20mgx10 days=20x10 =200/20=10 tablets) (Px10)	737,844	860,495	988,926	1,129,158	1,281,831	1,447,617	1,627,211
S) 0.01% Wastage*	77	90	103	118	134	151	170
T) Total Requirement of Zinc Sulphate 20 mg tablets for 0-59 months children with diarrhea (Q+R+S)	774,409	899,698	1,033,980	1,180,601	1,340,230	1,513,569	1,701,345

**Please use stakeholder specific rate*

18. Forecasted Need for Metronidazole - Treatment of Dysentery

Dysentery is the infection of the intestines resulting in severe diarrhoea with the presence of blood and mucus in the faeces. Bacterial dysentery is caused by infection with bacteria from *Shigella, Campylobacter, Salmonella etc.* Amebic dysentery is caused by a single-celled parasite – *Entamoeba Histolytica* that infects the intestines and is also known as amebiasis. The amoebic dysentery is treated with a 10-day course of an antimicrobial medication, such as Flagyl (metronidazole).

Amoebiasis is still one of major health problem and predominantly affects individuals of lower socioeconomic status who live in developing countries (Simonetta et al., 2002). It is estimated that *Entamoeba histolytica* may infect half a billion people annually, with 100,000 deaths worldwide (Villalba-Magdaleno et al., 2007). Entamoeba histolytica is prevalent worldwide; endemic foci are particularly common in the tropics and
especially in areas with low socio-economic and sanitary standards. Humans are the major reservoir. It is
estimated that this disease, though usually asymptomatic, is associated with an annual mortality of
40,000-110,000 deaths/year; amoebiasis is the third leading parasitic cause of death on a global scale. It is
highly endemic in Africa, Latin America, India and Southeast Asia.

Summary of Data Needed for Forecasting of Metronidazole

- Target population – estimated number of children 0-59 months
- Prevalence of Dysentery in children 0-59 months
- Percent seeking treatment from public health facility
- Standard or average treatment regimen (i.e., metronidazole for 10 days)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for Metronidazole forecast calculation is;

Total Need for Metronidazole Syrup 200 mg	=	Estimated number of 0-59 months children	x	Prevalence of dysentery in < 5 children	x	Percent 0-59 months seeking treatment from public facility	x	Dose per epode

Based on prevalence of dysentery among children less than 5 years of age, the estimated requirement of the Metronidazole Syrup 200 mg / 5 ml for the year 2019-20 is 236,101 bottles while for the year
2023-24 it is 306,701 bottles, as shown in (Table 20).

Table 20: Forecasted Number of Metronidazole Syrup for Treatment of Dysentery in under 5 children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2022/24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of Amoebic Dysentery in 0-59 months Children Study in Multan Punjab	7%	7%	7%	7%	7%	7%	7%
D) number of 0-59 months children affected with Amoebic Dysentery(D= B x C)	509,268	521,542	534,111	546,983	560,165	573,665	587,490
E) Percentage 0-59 months taken to Public Health Facility for treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
F) Number of 0-59 months patients visiting Public Health Facilities	102,363	110,045	118,038	126,353	135,000	143,990	153,335
G) Percentage receiving Antibiotics (46% PDHS 2017-18) assuming 1% increase annually	100%	100%	100%	100%	100%	100%	100%
H) Number of 0-59 months patients requiring Metronidazole for treatment from Health Facilities	102,363	110,045	118,038	126,353	135,000	143,990	153,335
I) Number of Metronidazole Syrup 200mg required for 0-59 months patients (H x 2 bottle /episode for 10 days treatment)	204,726	220,091	236,077	252,706	270,000	287,980	306,670
J) 0.01% Wastage*	20	22	24	25	27	29	31
K) Total Requirement of Metronidazole Syrup 200 mg syrup for 0-59 months dysentery patients	204,746	220,113	236,101	252,731	270,027	288,009	306,701

**Please use stakeholder specific rate*

19. Forecasted Need for Ampicillin – ARI / Pneumonia in 0-59 Months Children

Childhood pneumonia is among the leading causes of death in low-income countries, causing 18% of deaths in children under 5 years of age. With an estimated 10 million cases occurring each year, childhood pneumonia is a primary cause of under-five mortality in Pakistan (Black *et al.* 2010, Rudan *et al.* 2008). Ampicillin is recommended by WHO for the treatment of pneumonia in children less than five years of age. The forecast below shows estimated requirement of Ampicillin for treatment of ARI/pneumonia in children under five years of age.

Summary of Data Needed for Forecasting of Ampicillin for ARI/Pneumonia in Children

- Target Population -- Number of children under five years of age
- Incidence of ARI/pneumonia in 0-59 months of children
- Standard or average treatment regimen (dose of ampicillin per case of ARI/pneumonia)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of Ampicillin is:

Total Need for Ampicillin	=	Estimated Number of under five children	×	Prevalence/ Incidence of ARI/pneumonia in under five children	×	Percent ARI/pneumonia patients attending public health facility	×	Dose per episode

Table 21 and 21.1 shows the forecasted number of Ampicillin required for the management of ARI/pneumonia in children less than five years of age. A total of 0.21/0.12 million bottles of syrup (125 mg; 250 mg) and 1.59/0.95 million injections (250 mg; 500 mg) of Ampicillin are required to treat childhood ARI/pneumonia during the period 2019-20. Pakistan Bureau of Statistics and PDHS 2017-18 data were used to estimate this drug.

Table 21. Forecasted Number of Ampicillin for Management of ARI in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) number of 0-59 months children with ARI Symptoms(D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Percentage of children with ARI symptoms for whom advice/ treatment sought (85.4% PDHS 2017-18 Sindh) assuming 1% increase annually	85.4%	86.4%	87.4%	88.4%	89.4%	90.4%	91.4%
F) Number children for whom advice/treatment sought	901,728	934,273	967,863	1,002,529	1,038,304	1,075,221	1,113,315
G) Percentage 0-59 months children for whom treatment was sought from Public Health Facility (19.8% PDHS 2017-18) assuming 1% annual increase	19.8%	20.8%	21.8%	22.8%	23.8%	24.8%	25.8%
H) Number of 0-59 months ARI patients visiting Public Health Facilities	178,542	194,329	210,994	228,577	247,116	266,655	287,235
I) Percentage receiving Antibiotics (48.4% PDHS 2017-18 Sindh)	48.4%	49.4%	50.4%	51.4%	52.4%	53.4%	54.4%
J) Number of 0-59 months ARI patients requiring Ampicillin for treatment from Public Health Facilities	86,414	95,998	106,341	117,488	129,489	142,394	156,256
K) Number of Ampicillin Syrup 125/250mg required = J x 2 bottle /episode) (125mg=25% & 250 = 75%)	172,829	191,997	212,682	234,977	258,978	284,787	312,512
L) 0.01% Wastage*	17	19	21	23	26	28	31
M) Total Requirement of Ampicillin Syrup 250/125 mg syrup for 0-59 months ARI patients N+O	172,846	192,016	212,703	235,000	259,004	284,816	312,543
N) Number of Ampicillin Inj. 250/500 mg required for 0-59 months patients (= J x 15 Injs. /episode) (50% each)	1,296,216	1,439,976	1,595,115	1,762,326	1,942,335	2,135,906	2,343,840
O) 0.01% Wastage*	130	144	160	176	194	214	234
P) Total Requirement of Ampicillin Inj. 250/500 mg for 0-59 months ARI patients =Q+R	1,296,345	1,440,120	1,595,275	1,762,502	1,942,529	2,136,119	2,344,074

**Please use stakeholder specific rate*

Table 21.1 Forecasted Number of Ampicillin for Management of Pneumonia in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) Number of 0-59 months children with ARI Symptoms(D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Incidence of Pneumonia in 0-59 months children (# episodes/child-year) 14, 46	0.26	0.26	0.26	0.26	0.26	0.26	0.26
F) Number of pneumonia episodes in 0-59 months children(F= E x D)	274,531	281,147	287,923	294,861	301,968	309,245	316,698
G) Percentage 0-59 months patients taken to Public Health Facility for pneumonia treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
H) Number of 0-59 months pneumonia patients requiring Ampicillin treatment from PHFs	55,181	59,322	63,631	68,113	72,774	77,621	82,658
I) Number of Ampicillin Syrup 125/250mg required for 0-59 months patients (L = H x 2 bottle /episode) (125mg=25% & 250 = 75%)	110,361	118,644	127,262	136,226	145,548	155,241	165,316
J) 0.01% Wastage*	11	12	13	14	15	16	17
K) Total Requirement of Ampicillin Syrup 250/125 mg syrup for 0-59 months pneumonia patients N= L+M	110,372	118,656	127,274	136,240	145,563	155,257	165,333
L) Number of Ampicillin Inj. 250/500 mg required for 0-59 months patients (O = H x 15 Injs. /episode) (50% each)	827,710	889,830	954,463	1,021,695	1,091,613	1,164,308	1,239,872
M) 0.01% Wastage*	83	89	95	102	109	116	124
N) Total Requirement of Ampicillin Inj. 250/500 mg for 0-59 months pneumonia patients Q= O+P	827,793	889,919	954,559	1,021,797	1,091,722	1,164,424	1,239,996

**Please use stakeholder specific rate*

20. Forecasted Need for Ceftriaxone – ARI/Pneumonia in 0-59 Months Children

Childhood pneumonia is among the leading causes of death in low-income countries, causing 18% of deaths in children under 5 years of age. With an estimated 10 million cases occurring each year, childhood pneumonia is a primary cause of under-five mortality in Pakistan (Black *et al.* 2010, Rudan *et al.* 2008). Ceftriaxone is recommended by WHO for the treatment of pneumonia in children less than five years of age. The forecast below shows estimated requirement of Ceftriaxone for treatment of ARI/pneumonia in children under five years of age.

Summary of Data Needed for Forecasting of Ceftriaxone for ARI/Pneumonia in Children

- Target Population -- Number of children under five years of age
- Incidence of ARI/pneumonia in 0-59 months of children
- Standard or average treatment regimen (dose of Ceftriaxone per case of ARI/pneumonia)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of Ceftriaxone is:

Total Need for Ceftriaxone	=	Estimated Number of under five children	×	Prevalence/Incidence of ARI/pneumonia in under five children	×	Percent ARI/pneumonia patients attending public health facility	×	Dose per episode

Table 22 and 22.1 shows the forecasted number of Ceftriaxone required for the management of childhood pneumonia. A total of 1.59/0.95 million injections (250 mg; 500 mg) of Ceftriaxone are required to treat childhood pneumonia during the period (2019-20). Pakistan Bureau of Statistics and PDHS 2017-18 data were used to estimate this drug.

Table 22. Forecasted Number of Ceftriaxone for Management of ARI in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) number of 0-59 months children with ARI Symptoms (D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Percentage of children with ARI symptoms for whom advice/treatment sought (85.4% PDHS 2017-18 Sindh) assuming 1% increase annually	85.4%	86.4%	87.4%	88.4%	89.4%	90.4%	91.4%
F) Number of children with ARI symptoms for whom advice / treatment sought	901,728	934,273	967,863	1,002,529	1,038,304	1,075,221	1,113,315
G) Percentage 0-59 months children for whom advice or treatment was sought from Public Health Facility (19.8% PDHS 2017-18) assuming 1% increase annually	19.8%	20.8%	21.8%	22.8%	23.8%	24.8%	25.8%
H) Number of 0-59 months ARI patients visiting Public Health Facilities	178,542	194,329	210,994	228,577	247,116	266,655	287,235
I) Percentage receiving Antibiotics (48.4% PDHS 2017-18 Sindh) assuming 1% increase annually	48.4%	49.4%	50.4%	51.4%	52.4%	53.4%	54.4%
J) Number of 0-59 months ARI patients requiring Ceftriaxone from Public Health Facilities	86,414	95,998	106,341	117,488	129,489	142,394	156,256
K) Number of Ceftriaxone Inj. 250 / 500 mg required for 0-59 months patients (= J x 15 Injs. / episode) (50% each)	1,296,216	1,439,976	1,595,115	1,762,326	1,942,335	2,135,906	2,343,840
L) 0.01% Wastage*	130	144	160	176	194	214	234
M) Total Requirement of Ceftriaxone Inj. 250/ 500 mg for 0-59 months pneumonia patients =K+L	1,296,345	1,440,120	1,595,275	1,762,502	1,942,529	2,136,119	2,344,074

**Please use stakeholder specific rate*

Table 22.1. Forecasted Number of Ceftriaxone for Management of Pneumonia in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) number of 0-59 months children with ARI Symptoms(D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Incidence of Pneumonia in 0-59 months children (# episodes / child-year) 14,46	0.26	0.26	0.26	0.26	0.26	0.26	0.26
F) number of Pneumonia Episodes in 0-59 months children(F= E x D)	274,531	281,147	287,923	294,861	301,968	309,245	316,698
G) Percentage 0-59 months patients taken to Public Health Facility for treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
H) Number of 0-59 months pneumonia patients requiring Ceftriaxone treatment from Public Health Facilities	55,181	59,322	63,631	68,113	72,774	77,621	82,658
I) Number of Ceftriaxone Inj. 250 / 500 mg required for 0-59 months patients (I = H x 15 Injs. / episode) (50% each)	827,710	889,830	954,463	1,021,695	1,091,613	1,164,308	1,239,872
J) 0.01% Wastage*	83	89	95	102	109	116	124
K) Total Requirement of Ceftriaxone Inj. 250/ 500 mg for 0-59 months pneumonia patients K= I+J	827,793	889,919	954,559	1,021,797	1,091,722	1,164,424	1,239,996

**Please use stakeholder specific rate*

21. Forecasted Need for Amoxicillin – ARI/Pneumonia in 0-59 Months Children

Childhood pneumonia is among the leading causes of death in low-income countries, causing 18% of deaths in children under 5 years of age. With an estimated 10 million cases occurring each year, childhood pneumonia is a primary cause of under-five mortality in Pakistan (Black *et al.* 2010, Rudan *et al.* 2008). Amoxicillin is recommended by WHO for the treatment of ARI/pneumonia in children less than five years of age. The forecast below shows estimated requirement of Amoxicillin for treatment of ARI/pneumonia in children under five years of age.

Summary of Data Needed for Forecasting of Amoxicillin for ARI/Pneumonia in Children

- Target Population -- Number of children under five years of age
- Incidence of pneumonia in 0-59 months of children
- Standard or average treatment regimen (dose of amoxicillin per case of ARI/pneumonia)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of Amoxicillin is:

Total Need for Amoxicillin = Estimated Number of under five children × Prevalence/ Incidence of ARI/pneumonia in under five children × Percent ARI/pneumonia patients attending public health facility × Dose per episode

Table 23 and 23.1 shows the forecasted number of Amoxicillin required for the management of childhood ARI/pneumonia. A total of 1.59/0.95 million dispersible tablets, 0.21/0.12 million bottles of syrup (125 mg; 250 mg) and 1.59/0.95 million injections (250 mg; 500 mg) of Amoxicillin are required to treat childhood ARI/pneumonia during the period (2019-20). Pakistan Bureau of Statistics and PDHS 2017-18 data were used to estimate this drug.

Table 23. Forecasted Number of Amoxicillin for Management of ARI in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) number of 0-59 months children with ARI Symptoms(D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Percentage of children with ARI symptoms for whom advice/treatment sought (85.4% PDHS 2017-18 Sindh)	85.4%	86.4%	87.4%	88.4%	89.4%	90.4%	91.4%
F) Number of children with ARI symptoms for whom treatment sought	901,728	934,273	967,863	1,002,529	1,038,304	1,075,221	1,113,315
G) Percentage 0-59 months children for whom treatment was sought from Public Health Facility (19.8% PDHS 2017-18)	19.8%	20.8%	21.8%	22.8%	23.8%	24.8%	25.8%
H) Number of 0-59 months ARI patients visiting Public Health Facilities	178,542	194,329	210,994	228,577	247,116	266,655	287,235
I) Percentage receiving Antibiotics (48.4% PDHS 2017-18 Sindh) assuming 1% increase annually	48.4%	49.4%	50.4%	51.4%	52.4%	53.4%	54.4%
J) Number of 0-59 months patients requiring Amoxicillin for treatment from Public Health Facilities	86,414	95,998	106,341	117,488	129,489	142,394	156,256
K) Number of Amoxicillin 250/500 mg tablets required (= J x 15 tablets / episode)	1,296,216	1,439,976	1,595,115	1,762,326	1,942,335	2,135,906	2,343,840
L) 0.01% Wastage*	130	144	160	176	194	214	234
M) Total Requirement of Amoxicillin 250/500 mg tablets =K+L	1,296,345	1,440,120	1,595,275	1,762,502	1,942,529	2,136,119	2,344,074
N) Number of Amoxicillin Syrup 125/250mg (= J x 2 bottle /episode) (125mg=25% & 250= 75%)	172,829	191,997	212,682	234,977	258,978	284,787	312,512
O) 0.01% Wastage*	17	19	21	23	26	28	31
P) Total Requirement of Amoxicillin Syrup 250/125 mg bottles for 0-59 months pneumonia patients = N+O	172,846	192,016	212,703	235,000	259,004	284,816	312,543
Q) Number of Amoxicillin Inj. 250/500 mg required(=J x 15 Injs. /episode) (50% each)	1,296,216	1,439,976	1,595,115	1,762,326	1,942,335	2,135,906	2,343,840
R) 0.01% Wastage*	130	144	160	176	194	214	234
S) Total Requirement of Amoxicillin Inj. 250/500 mg for 0-59 months patients = Q+R	1,296,345	1,440,120	1,595,275	1,762,502	1,942,529	2,136,119	2,344,074

**Please use stakeholder specific rate*

Table 23.1. Forecasted Number of Amoxicillin for Management of Pneumonia in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Sindh)	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%	14.7%
D) number of 0-59 months children with ARI Symptoms(D= B x C)	1,055,887	1,081,334	1,107,394	1,134,083	1,161,414	1,189,404	1,218,069
E) Incidence of Pneumonia in 0-59 months Children (# episodes/child-year)14, 46	0.26	0.26	0.26	0.26	0.26	0.26	0.26
F) number of Pneumonia Episodes in 0-59 months children(F= E x D)	274,531	281,147	287,923	294,861	301,968	309,245	316,698
G) Percentage 0-59 months taken to Public Health Facility for treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
H) Number of 0-59 months pneumonia patients requiring Amoxicillin treatment from Public Health Facilities	55,181	59,322	63,631	68,113	72,774	77,621	82,658
I) Number of Amoxicillin 250/500 mg tablets required for 0-59 months patients (I = H x 15 tablets/episode)	827,710	889,830	954,463	1,021,695	1,091,613	1,164,308	1,239,872
J) 0.01% Wastage*	83	89	95	102	109	116	124
K) Total Requirement of Amoxicillin 250/500 mg tablets for 0-59 months pneumonia patients K= I+J	827,793	889,919	954,559	1,021,797	1,091,722	1,164,424	1,239,996
L) Number of Amoxicillin Syrup 125/250mg required for 0-59 months patients (L = H x 2 bottle /episode) (125mg=25% & 250 = 75%)	110,361	118,644	127,262	136,226	145,548	155,241	165,316
M) 0.01% Wastage*	11	12	13	14	15	16	17
N) Total Requirement of Amoxicillin Syrup 250/125 mg bottles for 0-59 months pneumonia patients N= L+M	110,372	118,656	127,274	136,240	145,563	155,257	165,333
O) Number of Amoxicillin Inj. 250/500 mg required for 0-59 months patients (O = H x 15 Injs. /episode) (50% each)	827,710	889,830	954,463	1,021,695	1,091,613	1,164,308	1,239,872
P) 0.01% Wastage*	83	89	95	102	109	116	124
Q) Total Requirement of Amoxicillin Inj. 250/500 mg for 0-59 months pneumonia patients Q= O+P	827,793	889,919	954,559	1,021,797	1,091,722	1,164,424	1,239,996

**Please use stakeholder specific rate*

22. Forecasted Need for Vitamin K Injection- Hemorrhagic Disease of the Newborn.

Hemorrhagic disease of the newborn is a bleeding problem that can occur after birth. It's a potentially life-threatening condition. The condition is caused by vitamin K deficiency and is often called vitamin K deficiency bleeding or VKDB. All newborns are born with low levels of vitamin K, an important factor that helps in blood clotting. Newborns do not get enough vitamin K from their mothers during pregnancy, or later when babies are breast feeding. VKDB can cause bleeding into the brain and may result in brain damage or even death. VKDB can be prevented by giving newborn babies extra vitamin K1.

WHO recommends that all newborns should be given 1 mg of vitamin K intramuscularly (IM) after birth to prevent Vitamin K deficiency bleeding (VKDB), formally known as hemorrhagic disease of the newborn. Although, both term and preterm infants are at risk of developing VKDB, preterm infants may be at particular risk of vitamin K deficiency bleeding, as they have hemostatic and hepatic immaturity and, although they benefit from maternal milk, it contains low concentrations of vitamin K.

As per WHO recommendation all neonates should be given Vitamin K to prevent VKDB.

Summary of Data Needed for Forecasting Vitamin K1

- Target population (total live births)
- Number of newborns at risk of developing hemorrhagic disease
- Percent births in public health facilities of Sindh.
- Number of newborn requiring vitamin K1 injection to prevent/treat hemorrhagic disease
- Standard or average treatment regimen (i.e., amount of vitamin K1 needed for each case to prevent hemorrhagic disease)
- Expected projected changes in consumption (potential loss or scale-up in use

The formula used for this calculation of Vitamin K1 is:

Vitamin K1 need to protect newborns against hemorrhagic disease of the newborn.	=	Total live births	x	Proportion of facility births	x	Proportion of newborn at risk of hemorrhagic disease	x	Dose per newborn for protection

Table 24 shows the forecasted amount of Vitamin K1 by year. A total of 29,982 injections (10mg) are forecasted for the period (2019-20).

Table 24: Forecasted Number of Vitamin K1 Injections - Hemorrhagic Disease of Newborn

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Number of live births (2.7%)	1,292,923	1,324,083	1,355,993	1,388,673	1,422,140	1,456,413	1,491,513
B) % of Deliveries at Public Facilities (20.1%-PDHS 2017-18 Sindh (Assuming an increase of 1% per year)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
C) # of newborn at risk that need to be administered Vitamin K1 1 mg / ml or 0.5 ml Injection (C = A × B)	259,878	279,381	299,675	320,783	342,736	365,560	389,285
D) Number of Vitamin K1 Injection (10 mg Injection) required (D = C x 1/10) recommend dose is 1 mg / newborn	25,988	27,938	29,967	32,078	34,274	36,556	38,928
E) 0.05% Wastage*	13	14	15	16	17	18	19
F) Total Requirement of Vitamin K1 Injection (10mg) for newborns for Prevention/ treatment of Hemorrhagic Disease	26,001	27,952	29,982	32,094	34,291	36,574	38,948

**Please use stakeholder specific rate*

23. Forecasted Need for Vitamin A – Vitamin Supplementation

Infants and children have increased vitamin A requirements to support rapid growth and to help those combat infections. Vitamin A is essential for the functioning of the immune system and the healthy growth and development of children and is usually acquired through a healthy diet. The fourth Millennium Development Goal is to reduce by two thirds the mortality rate among children under five years of age by 2015. Vitamin A supplementation is an important component of the strategies required to reach this goal.

WHO has developed guidelines on the effects and safety of vitamin A supplementation in infants and children 6–59 months of age as a public health strategy to help its member states efforts in achieving the Millennium Development Goals (MDGs). Provision of vitamin A supplements every four to six months is an inexpensive, quick, and effective way to improve vitamin A status and reduce child morbidity and mortality in the long term. In areas where vitamin A deficiency is a public health problem, routine vitamin A supplementation is recommended in infants and children

Summary of Data Needed for Forecasting Vitamin A

- Target population (0-59 months children)
- Percent deliveries in public health facilities of Sindh
- Number 0-59 months children approached by public health facility.
- Standard or average dose for Vitamin A
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the Calculation of Vitamin A

$$\text{Forecasted Need for Vitamin A} = \text{6-59 months children population} \times \text{Recommended dose of Vitamin A capsule for 6-59 months children}$$

The associated summary outputs for Vitamin A are shown in Table 25. The estimated number of 6-59 months children requiring Vitamin A from public health facility for the year 2019-20 is 6,855,299. Applying these parameters, we estimated the number of Vitamin A 100,000 IU capsules for children 6-11 months to be acquired from public health facilities is 138,752 for the forecast year 2019-20. Similarly, we estimated the number of Vitamin A 200,000 IU capsules for children 12-59 months to be acquired from public health facilities as 11,010,373 for the forecast year 2019-20.

Table 25: Forecasted Vitamin A Capsules Requirement

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% under 5 (0-59 months) children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Number / Population of 0- 59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Number of 0-5 months children (1.35% - Operational Guidance on Infant Feeding in Emergencies (OG-IFE) version 3.0)	646,462	662,041	677,997	694,336	711,070	728,207	745,756
D) Number of 6-11 months children (1.25% - Operational Guidance on Infant Feeding in Emergencies (OG-IFE) version 3.0)	598,576	613,001	627,775	642,904	658,398	674,265	690,515
E) Number of 12-59 months children (E=B-C-D)	5,937,870	6,080,973	6,227,524	6,377,608	6,531,308	6,688,713	6,849,911
F) % of children seeking Vitamin A 100,000 / 200, 000 IU supplementation from Public Health Facilities (20.1% PDHS 2017-18) assuming Public HF utilization increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
G) Number of 6-11 months children seeking Vitamin A 100,000 IU Supplementation from Public Health Facilities	120,314	129,343	138,738	148,511	158,674	169,241	180,224
H) Number of 12-59 months children seeking Vitamin A 200,000 IU Supplementation from Public Health Facilities	1,193,512	1,283,085	1,376,283	1,473,227	1,574,045	1,678,867	1,787,827
I) Requirement of Cap. Vitamin A 100,000 IUs for 6-11 months children (1 cap / child ONCE)	120,314	129,343	138,738	148,511	158,674	169,241	180,224
J) Requirement of Cap. Vitamin A 200,000 IUs for 12-59 months children (1 cap / child every 6 months =4x2=8 capsules)	9,548,095	10,264,682	11,010,263	11,785,819	12,592,362	13,430,935	14,302,613
K) 0.1% Wastage* 100,000 IU Capsules	12	13	14	15	16	17	18
L) 0.001% Wastage* 200,000 IU Capsules	95	103	110	118	126	134	143
M) Total Requirement of Capsule Vitamin A 100,000 IUs	120,326	129,356	138,752	148,526	158,690	169,258	180,242
N) Total Requirement of Capsule Vitamin A 200,000 IUs	9,548,191	10,264,785	11,010,373	11,785,937	12,592,488	13,431,069	14,302,756

**Please use stakeholder specific rate*

24. Forecasted Need for Mebendazole – Treatment of Worm Infestations

Mebendazole came into use in 1971, after it was developed by Janssen Pharmaceutica in Belgium. It is on the World Health Organization's List of Essential Medicines, the most effective and safe medicines needed in a health system. Mebendazole is available as a generic medication.

Mebendazole is a highly effective, broad-spectrum anthelmintic indicated for the treatment of nematode infestations, including roundworm, hookworm, whipworm, threadworm, pinworm etc. Worm infestation in children is very commonly seen in Pakistan. The common worm infestations are Threadworm, Round Worm and Hookworm, and deworming children is a common practice.

In the past, treatment of pregnant or lactating women was discouraged because of concerns about potential teratogenicity. Currently, these persons are recognized as being at higher risk for more severe anemia; thus, treatment may be warranted after careful clinical consideration of the risks and benefits. The World Health Organization recommends deworming treatment (e.g. albendazole, mebendazole, or pyrantel pamoate) during the second or third trimester for pregnant women with heavy hookworm infections.

Summary of Data Needed for Forecasting Mebendazole

- Target population (6-59 months children and pregnant women)
- Percentage of children / pregnant women who took deworming medication
- Percent deliveries in public health facilities of Sindh
- Number 6-59 month children & pregnant women requiring Mebendazole for treatment of worm infestation.
- Standard or average treatment regimen (100 mg twice daily for three days OR 500 mg as single dose)
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Mebendazole;

Need for Mebendazole	=	Under 5 children / pregnant women population	x	Percentage of 6-59 months children / pregnant women who took deworming medication	Proportion of 6-59 months children / pregnant women visiting public health facility	x	Dose per child / pregnant women

The associated summary outputs for Mebendazole are shown in Table 26. Estimated number of 6-59 months children and pregnant women visiting public sector health facility for the year 2019-20 is 351,008 and 14,664 respectively. Applying these parameters, we estimate the number of doses pertaining to Mebendazole for children (6 – 59 months.) for forecasted year 2019-20 is 351,043 syrups and 86,048 tablets for pregnant women.

Table 26: Forecasted Mebendazole Requirements

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% under 5 (0-59 months) children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Number of 0-5 months children (1.35% - Operational Guidance on Infant Feeding in Emergencies (OG-IFE) version 3.0)	646,462	613,001	627,775	642,904	658,398	674,265	690,515
D) Number of 6-59 months children (D=B-C)	6,536,446	6,743,014	6,905,521	7,071,944	7,242,378	7,416,919	7,595,667
C) Percentage of 6-59 months children who receive deworm medication (21% PDHS 2017-18)	21%	22%	23%	24%	25%	26%	27%
D) Number of 6-59 months children who will receive deworm medication	1,372,654	1,483,463	1,588,270	1,697,267	1,810,594	1,928,399	2,050,830
E) Percent of 6-59 months children seeking deworm medication from public health facilities assuming 1% increase annually (20.1% PDHS 2017-18)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
F) Number of 6-59 months children seeking deworm medication from public health facilities	275,903	313,011	351,008	392,069	436,353	484,028	535,267
G) Requirement of Mebendazole Syrup (100mg/5ml) for 12-59 months children	275,903	313,011	351,008	392,069	436,353	484,028	535,267
H) 0.01% Wastage*	28	31	35	39	44	48	54
I) Total Requirement of Mebendazole Syrup for 12-59 months children (100mg twice daily x 3 days)	275,931	313,042	351,043	392,108	436,397	484,077	535,320
A) Number of Pregnancies (3.4%)	1,628,126	1,667,364	1,707,547	1,748,699	1,790,843	1,834,002	1,878,201
B) % of Pregnant women who took deworming medication (1.8% PDHS 2017-18)	1.8%	2.8%	3.8%	4.8%	5.8%	6.8%	7.8%
C) Number of pregnant women who will receive deworming medication	29,306	46,686	64,887	83,938	103,869	124,712	146,500
D) % of pregnant women seeking deworm medication from public health facilities assuming 1% increase annually (20.1% PDHS 2017-18)	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
E) Number of pregnant women seeking deworm medication from public health facilities	5,891	9,851	14,340	19,390	25,032	31,303	38,236
F) Requirement of Mebendazole tablet 100mg for pregnant women	35,343	59,105	86,040	116,337	150,194	187,816	229,419
G) 0.01% Wastage*	4	6	9	12	15	19	23
H) Total Requirement of Mebendazole tablet 100mg for pregnant women (100mg twice daily x 3 days)	35,347	59,111	86,048	116,349	150,209	187,835	229,441

**Please use stakeholder specific rate*

25. Forecasted Need for Salbutamol - Asthma in 0-59 Months Children

Salbutamol, also known as albuterol and marketed as Ventolin among other brand names, is a medication that
opens up the medium and large airways in the lungs. It is used to treat asthma, including asthma attacks,
exercise-induced bronchoconstriction, and chronic obstructive pulmonary
disease (COPD). Salbutamol is usually used with an inhaler or nebulizer, but it is also available in a tablet, liquid/syrup, and intravenous
solution. It is on the World Health Organization's List of Essential Medicines, which lists the most effective and safe medicines needed in a health system. Salbutamol is available as a generic medication.

Childhood asthma is the most common chronic pulmonary disease of children. The prevalence of asthma and allergies in general has considerably increased over the last two decades, particularly among children. Although, precise reasons for this increase are unknown, it is likely that a number of environmental factors are at least partly responsible. There are very few studies that attempted to explore the role of risk factors for asthma in populations of children in Pakistan.

Summary of Data Needed for Forecasting of Salbutamol for Childhood Asthma

- Target Population -- Number of children under five years of age
- Prevalence of Asthma in 0-59 months of children
- Standard or average treatment regimen (dose of salbutamol per case of pneumonia)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of salbutamol is:

$$\text{Total Need for Salbutamol} = \text{Estimated Number of under five children} \times \text{Prevalence of asthma in under five children} \times \text{Percent asthma patients attending public health facility} \times \text{Dose per episode}$$

Table 27 shows the forecasted number of salbutamol required for the management of childhood asthma. A total of 1.27 million tablets and 169,833 bottles each of syrup and solution of salbutamol are required to treat childhood asthma during the period (2019-20). Pakistan Bureau of Statistics and PDHS 2017-18 data were used to estimate this drug.

Table 27. Forecasted Number of Salbutamol for Management of Asthma in 0-59 Months Children

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of Asthma in 0-59 months Children (Global Asthma Report 2018; WHO; Study in Karachi)	10.2%	10.2%	10.2%	10.2%	10.2%	10.2%	10.2%
D) number of asthma cases in 0-59 months children(D= B x C)	732,657	750,314	768,396	786,915	805,879	825,301	845,191
E) Percentage 0-59 months patients taken to Public Health Facility for asthma treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
F) Number of 0-59 months asthma patients visiting Public Health Facilities	147,264	158,316	169,816	181,777	194,217	207,151	220,595
G) Number of Salbutamol 2/4mg tablets required for 0-59 months patients (G = F x 5 tablets/episode) Children 2-6 years: The recommended dose is 1-2mg three or four times a day. (1 mg x 3 times per day x 5 days = 3x5 = 15 mg = 15/2mg = 7.5 tablets 15/4mg = 4 tablets	1,104,480	1,187,371	1,273,617	1,363,329	1,456,627	1,553,629	1,654,461
H) 0.01% Wastage*	110	119	127	136	146	155	165
I) Total Requirement of Salbutamol 2/4 mg tablets for 0-59 months asthma patients	1,104,590	1,187,490	1,273,744	1,363,466	1,456,772	1,553,784	1,654,626
J) Number of Salbutamol Syrup required for 0-59 months patients (J = F x 1 bottle /episode) (Tab=25% and Syrup = 75%)	147,264	158,316	169,816	181,777	194,217	207,151	220,595
K) 0.01% Wastage*	15	16	17	18	19	21	22
L) Total Requirement of Salbutamol syrups for 0-59 months patients	147,279	158,332	169,833	181,795	194,236	207,171	220,617
M) Number of Salbutamol Solution required for 0-59 months patients (O = F x 1 solution /episode)	147,264	158,316	169,816	181,777	194,217	207,151	220,595
N) 0.01% Wastage*	15	16	17	18	19	21	22
O) Total Requirement of Salbutamol Solution for 0-59 months patients	147,279	158,332	169,833	181,795	194,236	207,171	220,617

**Please use stakeholder specific rate*

26. Forecasted Need for Paracetamol – Fever and Pain

Paracetamol is a synthetic derivative of p-aminophenol with analgesic and antipyretic activity but no anti-inflammatory action. Its plasma half-life is about 2 hours. It is extensively metabolized in the liver and subsequently excreted in the urine. It is used in Symptomatic relief of fever and mild to moderate pain.

Fever is a major manifestation of malaria and other acute respiratory infections in young children. Malaria
and fever contribute to high levels of malnutrition and mortality. According PDHS 2017-18, fever (38%) was the most common illness reported among children under age 5 during the 2 weeks preceding the survey. The prevalence of fever is similar in both urban and rural areas, urban children are more likely to receive advice or treatment than rural children (85% and 80%, respectively).

Summary of Data Needed for Forecasting Paracetamol

- Target population (0-59 months children)
- Number of children suffering from pain / fever
- Percent deliveries in public health facilities of Sindh
- Number 0-59 Months children requiring Paracetamol for treatment of pain and fever.
- Standard or average treatment regimen (i.e., amount of Paracetamol (syrup / suppository) needed for each case to treat pain / fever).
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Paracetamol is;

Need for Paracetamol to relieve fever and pain.	=	Under 5 children population	x	Prevalence of fever in < 5 children	Proportion of children visiting public health facility	x	Dose per child for relief of pain and fever

The associated summary outputs for Paracetamol are shown in Table 28. Estimated number of under 5 children with fever visiting public sector health facility for the year 2019-20 is 559,392. Applying these parameters, we estimate the requirement of Paracetamol for children (<5 yrs.) for forecasted year 2019-20 as 485,042 syrups/tablets/injection/suppository.

Table 28: Forecasted Paracetamol Requirements

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% under 5 children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Prevalence of Fever in < 5 Children in Sindh-- PDHS 2017-18	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%	33.6%
D) Total number of Children with Fever (B x C)	2,413,457	2,471,621	2,531,187	2,592,189	2,654,661	2,718,638	2,784,157
E) % of patients seeking treatment from Public Health Facilities (20.1% PDHS 2017-18 Sindh) assuming PHF utilization increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
F) Number of patients seeking treatment from Public Health Facilities (F=D x E)	485,105	521,512	559,392	598,796	639,773	682,378	726,665
G) Percentage for whom treatment was sought from health facility (84.7% PDHS 2017-18 Sindh) assuming 1% increase annually	84.7%	85.7%	86.7%	87.7%	88.7%	89.7%	90.7%
H) Number of children with fever for whom treatment was sought	410,884	446,936	484,993	525,144	567,479	612,093	659,085
I) Number of Paracetamol 500 mg tablet / syrup (120 mg / 5 ml) / Injection 150 mg/ml / suppository 100 mg required (I= H x 1/episode)	410,884	446,936	484,993	525,144	567,479	612,093	659,085
J) 0.01% Wastage*	41	45	48	53	57	61	66
K) Total Requirement of Paracetamol 500 mg tablet / syrup (120 mg / 5 ml) / Injection 150 mg/ml / suppository 100 mg for 0-59 months children with fever K= I+J	410,925	446,981	485,042	525,196	567,536	612,154	659,151

**Please use stakeholder specific rate*

27. Forecasted Need for Chlorpheniramine – Treatment of Allergic Diseases

Chlorpheniramine is an antihistamine that reduces the effects of natural chemical histamine in the body. Histamine can produce symptoms of sneezing, itching, watery eyes, and runny nose.

Allergy and Asthma is a global health problem and according to W.H.O, more than 150 million people suffer from asthma. The International Study of Asthma and Allergies in Childhood (ISAAC) demonstrated that large variations exist in the prevalence of asthma, allergic rhino-conjunctivitis and eczema throughout the world. Environmental factors and lifestyle are major determinants of the increase in prevalence and severity of these allergic diseases.

Summary of Data Needed for Forecasting Chlorpheniramine

- Target population (0-59 months children)
- Number of children suffering from Allergic Diseases
- Prevalence of Allergic Diseases
- Percent deliveries in public health facilities of Sindh
- Number 0-59 month children requiring Chlorpheniramine for treatment of allergic diseases.
- Standard or average treatment regimen (i.e., amount of Chlorpheniramine (tablets /syrup / injection /suppository) needed for each case to treat allergic diseases).
- Expected projected changes in consumption (potential loss or scale-up in use)

Formula used for the calculation of Chlorpheniramine is;

Need for Chlorpheniramine	=	Under 5 children population	x	Prevalence of allergic diseases in < 5 children	Proportion of children visiting public health facility	x	Dose per child

The associated summary outputs for Chlorpheniramine are shown in Table 29. Estimated number of under 5 children visiting public sector health facility for the year 2019-20 is 377,756. Applying these parameters, we estimate the number of doses pertaining to Chlorpheniramine for children (<5 yrs.) for forecasted year 2019-20 as 1,890,671 tablets and 378,134 syrups / injections.

Table 29: Forecasted Chlorpheniramine Requirements

Total Population (GR 2.41%) Census 2017	47,886,051	49,040,105	50,221,971	51,432,321	52,671,840	53,941,231	55,241,215
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A)% 0-59 months children in Sindh -- PBS 2012-13	15%	15%	15%	15%	15%	15%	15%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	7,182,908	7,356,016	7,533,296	7,714,848	7,900,776	8,091,185	8,286,182
C) Average Prevalence of Allergic Diseases in 0-59 months Children in Sindh	22.69%	22.69%	22.69%	22.69%	22.69%	22.69%	22.69%
D) number of Allergic disease cases in 0-59 months children(D= B x C)	1,629,802	1,669,080	1,709,305	1,750,499	1,792,686	1,835,890	1,880,135
E) Percentage 0-59 months patients taken to Public Health Facility for treatment (20.1% PDHS 2017-18) assuming 1% increase annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
F) Number of 0-59 months patients visiting Public Health Facilities and requiring CPM for treatment	327,590	352,176	377,756	404,365	432,037	460,808	490,715
G) Number of CPM 4mg tablets required for 0-59 months patients (G = F x 5 tablets / episode)	1,637,951	1,760,879	1,888,782	2,021,826	2,160,187	2,304,042	2,453,576
H) 0.1% Wastage*	1,638	1,761	1,889	2,022	2,160	2,304	2,454
I) Total Requirement of CPM 4 mg tablets for 0-59 months pneumonia patients I=G+H	1,639,589	1,762,640	1,890,671	2,023,848	2,162,347	2,306,346	2,456,029
J) Number of CPM Syrup required for 0-59 months patients (= F x 1 bottle /episode) (Tab=25% and Syrup = 75%)	327,590	352,176	377,756	404,365	432,037	460,808	490,715
K) 0.1% Wastage*	328	352	378	404	432	461	491
L) Total Requirement of CPM Syrup bottles for 0-59 months patients	327,918	352,528	378,134	404,770	432,469	461,269	491,206
M) Number of CPM Inj. required for 0-59 months patients (O = F x 1 Injs. /episode)	327,590	352,176	377,756	404,365	432,037	460,808	490,715
N) 0.1% Wastage*	328	352	378	404	432	461	491
O) Total Requirement of CPM Inj. for 0-59 months patients = M+N	327,918	352,528	378,134	404,770	432,469	461,269	491,206

**Please use stakeholder specific rate*

28. Forecasted Need for Chlorhexidine - Cord Care in Newborns

Pakistan has one of the highest newborn mortality rates in the world and up to a third are because of infections. Unsafe conventions, such as cutting the birth cord with un-sterilized instruments, and the application of substances such as ash, surma, oil and even cow dung are practiced in many rural areas of Pakistan, and often associated with an increased risk of cord infection and death. A baby's newly cut umbilical cord can be an entry point for bacteria, which can lead to cord infection and potentially life-threatening sepsis. WHO recommends daily application of chlorhexidine (7.1% chlorhexidine digluconate aqueous solution or gel, delivering 4% chlorhexidine) application to the umbilical cord stump during the first week of life for newborns who are born at home in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births).

Summary of Data Needed for CHX Forecasting

- Target population (total births)
- Standard or average treatment regimen (i.e. of CHX needed per treatment) (single dose 5 ml Gel)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of Chlorhexidine is:

Total Need (Chlorhexidine) = Total birth × Dose (5 ml) Gel per birth

According to the current provincial guidelines, Chlorhexidine will be used for all births. Table 30 shows the forecasted amount of Chlorhexidine gel by year. A total of 0.299 million gel tubes of 5 ml (7.1% CHX digluconate) will be procured for public health facilities to implement the provincial policy guidelines during the forecast period (2019-20).

Table 30: Forecasted Number of Chlorhexidine Gel Required for Cord Care

Total Population (GR 2.41%) Census 2017	**47,886,051**	**49,040,105**	**50,221,971**	**51,432,321**	**52,671,840**	**53,941,231**	**55,241,215**
Parameters	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**	**2023-24**
A) Total live Births (2.7%)	1,292,923	1,324,083	1,355,993	1,388,673	1,422,140	1,456,413	1,491,513
B) % of Public Health Facilities (PHFs) Births (20.1% PDHS 2017-18) assuming HF Deliveries increases by 1% annually	20.1%	21.1%	22.1%	23.1%	24.1%	25.1%	26.1%
C) # of PHFs Births (C = A × B)	259,878	279,381	299,675	320,783	342,736	365,560	389,285
D) Prevention of Cord Infection (Assuming 100% of PHFs Births given Chlorhexidine) D= Cx100%	259,878	279,381	299,675	320,783	342,736	365,560	389,285
E) Requirement of Chlorhexidine digluconate Enzichlor 7.1% Gel (One 5ml Gel / birth) for Prevention / Treatment of cord infection in PHF Births (E = D × 1)	259,878	279,381	299,675	320,783	342,736	365,560	389,285
F) 0.1% Wastage*	260	279	300	321	343	366	389
G) Total Requirement of Chlorhexidine Gel for Prevention/ Treatment of cord infection in PHF Births G= E+F	260,137	279,661	299,974	321,104	343,078	365,925	389,674

**Please use stakeholder specific rate*

Overall Funding Estimates for Very Essential MNCH Commodities (2019 to 2023)

Based on the results of the forecasted requirement of MNCH commodities, we have estimated financing needs, as shown in the following tables and figures. The estimates are shown by commodity category and health condition. Figure 2 shows the overall financing requirement for MNCH commodities for the Department of Health, Govt. of Sindh. We estimated a total requirement of PKR. 6,862,315,978. Of this requirement, 74 percent is for the newborn and children less than 5 years of age.

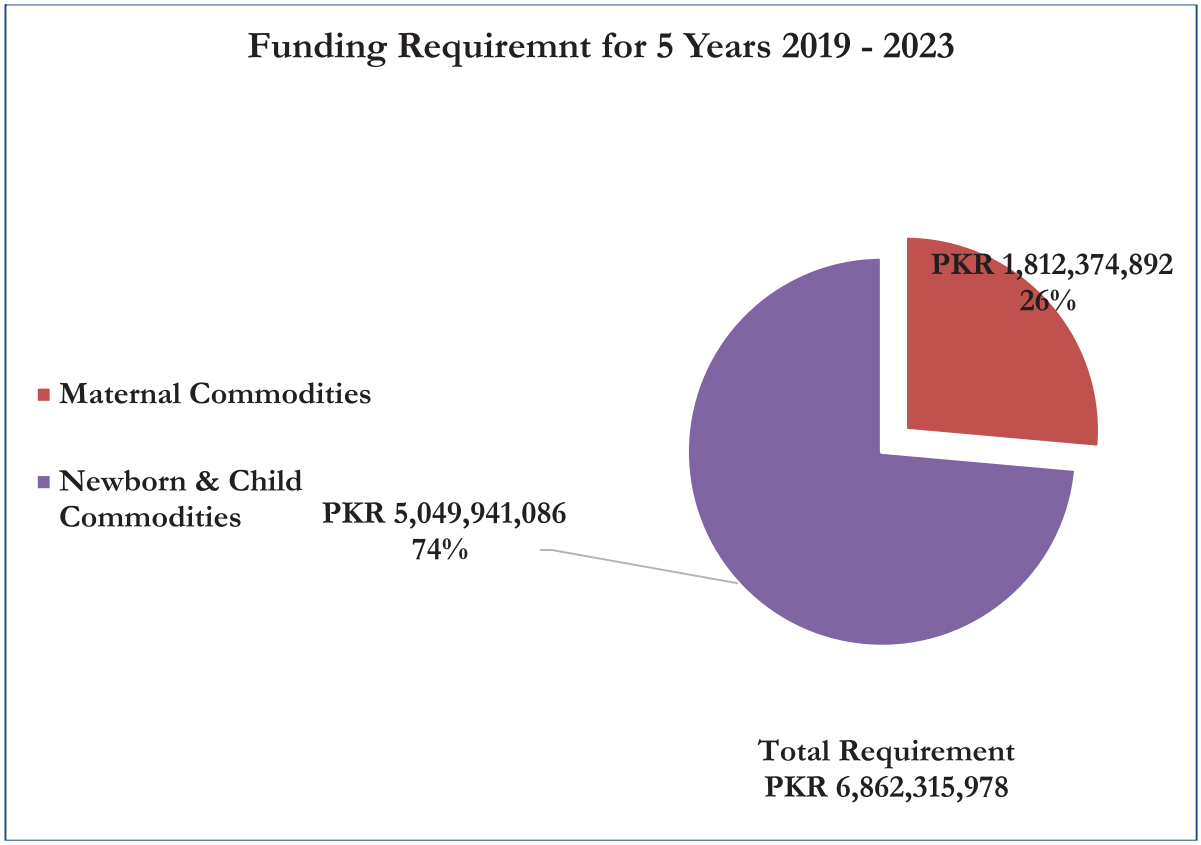


Figure 2: Overall Provincial Financing Requirement of Very Essential MNCH Commodities for Department of Health, Sindh.

Year-wise Funding Requirement for Very Essential MNCH Commodities

Figure 3 shows the year wise financing requirement for MNCH commodities for the Department of Health, Govt. of Sindh. It also reflects the year wise financing requirement for maternal and newborn and child commodities. Of this year wise requirement, generally over the years, approximately 74 percent is for the newborn and children less than 5 years of age.

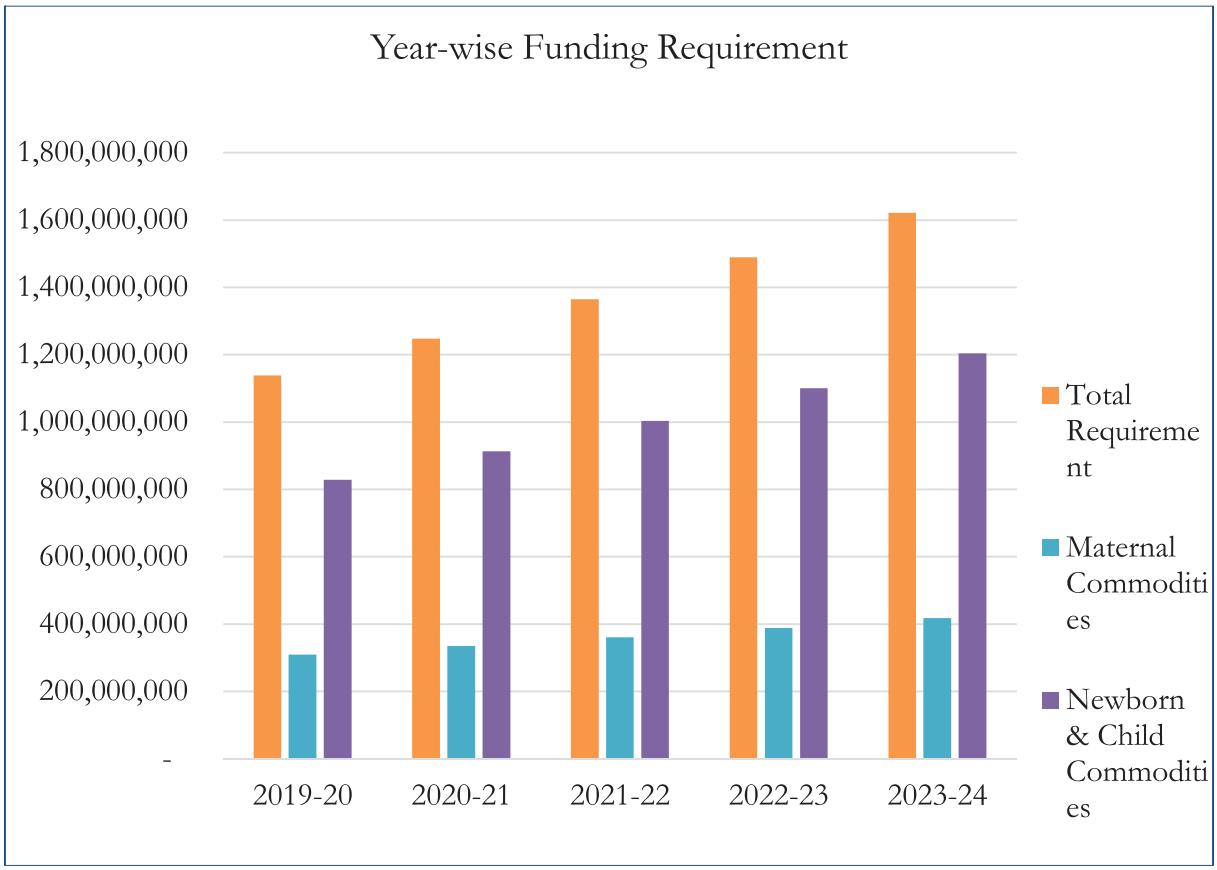
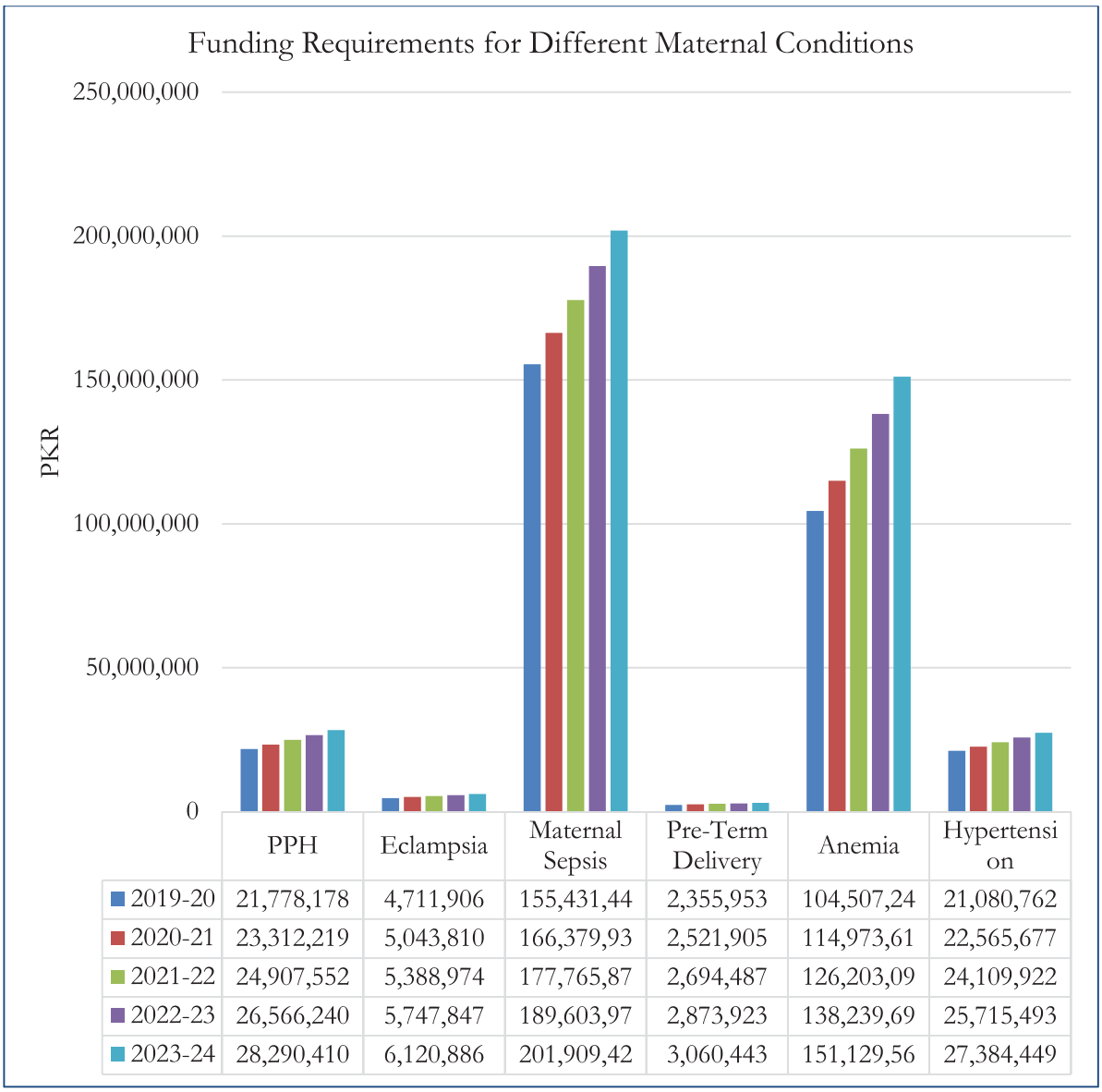


Figure 3: Year-wise Financing Requirement for Very Essential MNCH Commodities.

Year-wise Funding Requirement for Different Maternal Conditions

Figure 4 shows the year wise financing requirement for the Department of Health, Govt. of Sindh. It reflects the year wise financing requirement for different maternal health conditions. Of this year wise requirement, maternal sepsis and anemia has the maximum contribution over the years.



	PPH	Eclampsia	Maternal Sepsis	Pre-Term Delivery	Anemia	Hypertension
2019-20	21,778,178	4,711,906	155,431,44	2,355,953	104,507,24	21,080,762
2020-21	23,312,219	5,043,810	166,379,93	2,521,905	114,973,61	22,565,677
2021-22	24,907,552	5,388,974	177,765,87	2,694,487	126,203,09	24,109,922
2022-23	26,566,240	5,747,847	189,603,97	2,873,923	138,239,69	25,715,493
2023-24	28,290,410	6,120,886	201,909,42	3,060,443	151,129,56	27,384,449

Figure 4: Year-wise Financing Requirement for Different Maternal Conditions

Year-wise Funding Requirement for Different Newborn and Child Conditions

Table 31 shows the year wise financing requirement for the Department of Health, Govt. of Sindh. It reflects the year wise financing requirement for different newborn and child health conditions. Of this year wise requirement, pneumonia, diarrhea and allergic conditions have the maximum contribution over the years.

Table 31: Year-wise Financing Requirement for Different Newborn and Child Conditions

Newborn & Child Conditions	2019-20	2020-21	2021-22	2022-23	2023-24
Pneumonia	692,127,688	764,681,102	842,787,829	926,779,091	1,017,002,513
Diarrhea	27,725,924	31,281,561	35,134,576	39,300,664	43,796,183
Cord Care	14,698,735	15,734,104	16,810,841	17,930,339	19,094,032
VKDB	1,199,297	1,283,775	1,371,628	1,462,970	1,557,918
Dysentery	8,735,719	9,351,058	9,990,982	10,656,319	11,347,923
Worm Infestation	3,990,543	4,487,709	5,025,680	5,606,595	6,232,684
Vitamin A Supplementation	22,790,688	24,396,050	26,065,553	27,801,357	29,605,687
Allergies	47,266,765	50,596,205	54,058,672	57,658,644	61,400,735
Pain & Fever	7,214,996	7,812,295	8,442,092	9,105,797	9,804,873
Asthma	3,267,861	3,498,047	3,737,430	3,986,320	4,245,035

Adjust for Losses and Programmatic Changes

The proportion of patients likely to be treated with the product depends on programmatic factors. This adjustment is made either before or after converting the number of episodes to products. For example, if the number of episodes of diarrhea is expected to change, these adjustments are made when estimating the number of episodes. For forecasting and budgetary purposes, we are adding a percentage for uncertainties in demand to avoid stock-outs. It is also important to stress, that in these forecasts, the whole target population was considered, without taking into account the existing programmatic status (rate of scale up). When actual procurement of these commodities is being planned, DOH, Sindh will need to assess the status of implementation, particularly of new commodities such as Misoprostol and Chlorhexidine, and adjust the target population as relevant.

Forecast Limitations

Producing accurate forecasts of these MNCH commodities remains a challenge in Sindh because of the non-availability of services, consumption and stock-on-hand data. Some of the other challenges or limitations faced in producing this forecast include the following:

- To conduct the forecasting exercise, 2017 census data is used for projections of the target population (births and pregnancies), while under 5 children percentages are of either PDHS 2012-13 or PBS website, leaving a chance of error regarding the actual number of the target population. Obtaining information on the different treatment regimens was a challenge in carrying out the exercise since standardized national treatment protocols do not currently exist for most of the conditions.
- The lack of a coordinated/unified provincial procurement and supply chain management system within DOH and MNCH Program for a specific MNCH commodity is a challenge. For example, both entities are procuring Misoprostol to distribute at the community level using their own field network, which opens a window of targeting same women.
- Information on the number of days of stock-outs of products at the district and sub-district levels is not available.
- Information on the minimum and maximum stock levels at different levels of supply chain and buffer stock for MNCH commodities is not available.
- The official unit cost for different MNCH commodities is not available for costing purposes.
- The accuracy of this exercise fully depends on the full implementation of MNCH program strategies and policies.
- In some cases, the recommended product is not yet available in the market or is produced by a very small number of manufacturers.

RECOMMENDATIONS

- Because there is lack of availability of quality information or data on the actual consumption of essential medicines, MNCH program, DOH, Sindh should develop a mechanism for collecting logistics data on a routine basis from the health facilities to enable expeditious determination of provincial requirements of very essential medicines.
- DOH and MNCH program should include these very essential MNCH commodities in their logistics reporting forms and take necessary steps to make the logistics data available in their existing MIS and ensure the ultimate availability of the necessary data in web-based Pakistan LMIS.
- The Directorate General of Health (DOH) of Sindh need to establish mechanisms to undertake the forecasting exercise of MNCH commodities through a Forecasting and Supply Planning Technical Group (FASP-TWG) comprised of technical experts and FASP champions. This approach helps to improve the forecasting and supply planning functions.
- The technical capacity of the DOH staff for conceptualizing the forecasting methodology, assumptions data validation process, and for undertaking the overall forecasting and supply planning exercise, must be strengthened. Quantification can be institutionalized in DOH by establishing a unit of relevant technical personnel across the entities that can sensitize and transfer skills to the lower levels.
- A Technical Working Group (TWG) on Forecasting and Supply Planning may be constituted and notified with Terms of Reference.
- Coordination among the stakeholders is essential before MNCH commodities are procured.
- DOH can consider disseminating the forecasting report to the drug manufacturers to inform them of the quantity of commodities needed for the whole province so they too can plan accordingly.
- This forecasting exercise should be reviewed biannually by the entities and adjusted to account for changes in the assumptions or data in accordance with strategic plans and new data.
- District Managers can use the forecasting algorithms for each commodity presented in this document for their local procurement planning using their own routine health information systems and population data.
- Different stakeholders should maintain an effective coordination mechanism during procurement planning, particularly for items procured at provincial and district levels. This effort will minimize the over stocking and potential wastage of commodities.

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ANNEX – A

Revised MNCH Very Essential Medicines List
Department of Health, Government of Sindh 2019

Sr. #	Generic Drug Name	Form	Strength	Primary Health Care Facilities					Secondary Health Care Facilities	
				LHW	CMW	CD	BHU	RHC	THQ	DHQ
	Oxytocic									
1	Misoprostol	tablets	200 mcg		√		√	√	√	√
2	Oxytocin	injection	10 IU in 1 -ml		√		√	√	√	√
	Parental Solution Correcting Water, Electrolyte and Acid Base Balance									
3	Sodium chloride	infusion	0.9 %			√	√	√	√	√
4	Sodium lactate	ringer's lactate infusion	infusion,1000ml contains calcium chloride 0.2gm; potassium chloride 0.3gm; sodium chloride 6 gm.; sodium lactate 3.1gm; sterile water for injection			√	√	√	√	√
5	Dextrose	infusion	5 and 10%			√	√	√	√	√
	Anticonvulsants									
6	Magnesium sulphate	injection	500mg/ml (*Eclampsia only*)		√	√	√	√	√	√
7	Diazepam*	rectal gel/solution	5 mg/ml in 0.5 ml, 2 ml, 4 ml tubes				√	√	√	√
		injection	10 mg				√	√	√	√
	Antihypertensive									
8	Hydralazine* (hydrochloride)	injection	powder for injection 20 mg			X	X	X	√	√
		tablets	25 and 50 mg			X	X	X	√	√
9	Methyldopa	tablet	250 mg; 500 mg			√	√	√	√	√
	Medicines Used in Diarrhea									
10	Low osmolarity oral rehydration salts	dry mixture (low osmolarity formula) in sachet for 1 liter of solution	each sachet contains glucose anhydrous 13.5 gm. trisodium citrate dihydrate 2.9 gm. potassium chloride 1.5gm, sodium chloride 2.6gm B.P.	√	√	√	√	√	√	√
11	Zinc sulphate	scored dispersible tablets/syrup	20 mg	√	√	√	√	√	√	√
	Fat-soluble vitamins									
12	Vitamin A	capsules	500,000; 100,000IU; 200,000IU		√	√	√	√	√	√
13	Vitamin K1* (phytonadione)	injection	10 mg			X	X	√	√	√

	Pain and Palliative Care									
14	Paracetamol	syrup	120 mg / 5 ml	√	√	√	√	√	√	√
		tablets	500 mg	√	√	√	√	√	√	√
		Injection	150 mg / ml			X	X	√	√	√
		suppository	100 mg			X	√	√	√	√
	Antiseptic									
15	Chlorhexidine gluconate (7.1%)	gel	equivalent to 4 % Chlorhexidine	√	√	√	√	√	√	√
	Anti-anemia									
16	Ferrous salt + folic acid	tablets	equivalent to 60 mg iron + 400 mcg folic acid	√	√	√	√	√	√	√
	Anthelminthic									
17	Mebendazole	tablets chewable	100 mg *(Adults only)*	√	√	√	√	√	√	√
		syrup	100 mg per 5 ml	√	√	X	√	X	√	√
	Anti-asthmatic / Bronchodilator									
18	Salbutamol	tablets	2 and 4 mg			√	√	√	√	√
		syrup	2 mg per 5 ml			√	√	√	√	√
		solution	5 mg / ml			X	√	√	√	√
	Anti-Allergic and Anaphylactic									
19	Chlorpheniramine maleate	tablets	4 mg			√	√	√	√	√
		syrup	2 mg per 5 ml			√	√	√	√	√
		injection	10 mg /ml			X	√	√	√	√
20	Dexamethasone (disodium phosphate)	injection	4 mg (as disodium salt) in 1 -ml			√	√	√	√	√
		tablet	0.5 mg			X	√	√	√	√
	Antibacterial									
21	Ampicillin (as sodium salt)	injection	250 mg			X	√	√	√	√
		syrup	125 and 250 mg / 5 ml			X	X	√	√	√
		capsules	250; 500 mg			X	X	√	√	√
22	Ceftriaxone	injection	250 mg; 500; 1 gm			X	X	X	√	√
23	Metronidazole	infusion	5 mg / ml in 100 -ml			X	X	√	√	√
		tablet	200; 400 mg		√	√	√	√	√	√
		syrup	200 mg / 5 ml		√	√	√	√	√	√
24	Gentamycin	injection	40 mg; 80 mg			X	X	√	√	√
25	Amoxicillin	injection	250 mg; 500 mg			X	√	√	√	√
		Dispersible tablet / capsule	500 mg; 250 mg	√	√	√	√	√	√	√
		syrup	125 mg; 250 mg / 5 ml	√	√	√	√	√	√	√

** Restricted items; will only be provided to trained staff*


unicef
Chemonics
Development works here.