2019-23

# MNCH VERY ESSENTIAL MEDICINES

# COSTED FORECAST

## DEPARTMENT OF HEALTH
## GOVERNMENT OF PUNJAB

**December 2019**

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

*Updated Forecasting Exercise for the Very Essential Maternal, Newborn, and Child Health Commodities Prioritized by the Department of Health, Govt. of Punjab*

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# ACKNOWLEDGMENTS

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

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 Punjab.

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.

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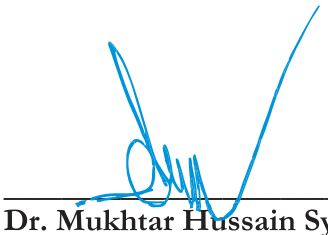

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# ACRONYMS

| | |
|---|---|
| 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, Khyber Pakhtunkhwa 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 government to improve the financing of these FP products but had several limitations. The new forecasting

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

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 108 million for the 20 very essential products, over the 2019-23 period. Breaking down the funding (in millions of USD) by province, 55.61 would be allocated to Punjab, 26.67 to Sindh, 15.87 to Khyber Pakhtunkhwa, and 9.83 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 May 2018, the Integrated Reproductive, Maternal, Newborn & Child Health (IRMNCH) & Nutrition Program, Department of Health, Punjab notified its first ever MNCH very essential medicines list (VEML) for improving access to notified priority commodities across the Maternal, Newborn, and Child Health (MNCH) continuum. As per mandate, the first ever Technical Working Group (TWG) on Forecasting and Supply Planning (FASP) was also notified in May 2018. The terms of reference for TWG focuses on developing institutional FASP capacity for these commodities; strengthening provincial supply chains; and improving data quality and availability. One of the supply chain areas for these commodities that was identified as particularly weak was forecasting and supply planning. For several of these commodities, the data required to estimate needs accurately are unavailable in many countries and national forecasts are based on unsubstantiated assumptions and often on data from past procurements. This is the case for many commodities procured by the IRMNCH & Nutrition Program, Department of Health (DOH) Punjab.

In January 2019, the IRMNCH & Nutrition Program, Department of Health, Government of Punjab revised and re-notified the MNCH VEML for improving access to 20 priority commodities across the Maternal, Newborn, and Child Health (MNCH) continuum. As per its mandate, the UNICEF HLMIS Project, has revised and updated the MNCH forecast in coordination with the IRMNCH & Nutrition Program, Punjab.

# BACKGROUND

Punjab is Pakistan's second largest province by area and its most populous province; with an estimated population of 110,012,442 as of 2017. Among those, an estimated 35% live in rural areas. The population growth rate is 2.13% per annum (PBS) while it accounts for 59% of Pakistan's GDP. http://www.finance.gov.pk/survey/chapters_17/Economic_Indicators.pdf

According to 2017 Population Census and 2017-18 economic survey of Pakistan, Punjab has the highest share of population of 52.9 percent in population pie but its share has declined as compared to 1998. The share of urban population in Punjab has increased from 31.27 percent in 1998 to 36.71 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 20 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

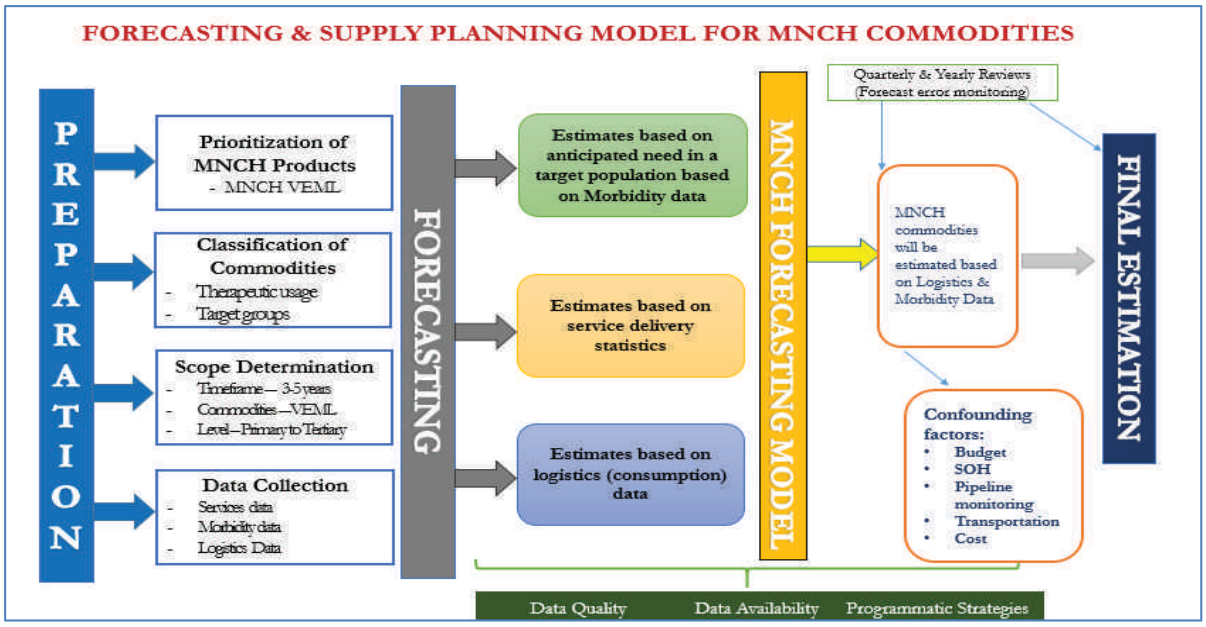


*Figure 1: FASP Model for MNCH VEML*

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)

**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 Punjab 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 Punjab 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 Punjab; 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 Punjab, which will better inform procurement decisions for the MNCH commodities. The exercise will also help DOH Punjab 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 20 very essential MNCH commodities for the period 2019-23

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, Punjab 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, Punjab 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, Punjab 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 2019-23. 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, Punjab**

| Continuum of Care | Commodity | Use |
|---|---|---|
| **Maternal Health** | Misoprostol | Postpartum Hemorrhage |
| | Oxytocin | |
| | Sodium Lactate | |
| | Dinoprostone (prostaglandin E2) Vaginal gel | Induction of Labor |
| | Magnesium Sulphate | Pre-Eclampsia / Eclampsia |
| | Hydralazine (Hydrochloride) | Hypertension |
| | Methyldopa | |
| | Ceftriaxone | Maternal Sepsis |
| | Metronidazole | |
| | Gentamycin | |
| | Ferrous salt + folic acid | Anemia |
| **Child and Newborn Health** | Dexamethasone | Fetal Lung Maturity |
| | Low Osmolarity Oral Rehydration Salts | Diarrhea |
| | Zinc Sulphate | |
| | Amoxicillin | Pneumonia |
| | Chlorhexidine Digluconate | Antiseptics for Cord Care |
| **Maternal & Child and Newborn Health** | Condoms | Birth Spacing |
| | Injectable Contraceptives | |
| | Oral contraceptive Pills | |
| | IUCD with Graduated Inserter | |

**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 2019-23, we used the growth rate of 2017 census. From this, we determined that our estimated total population would be 110.01 million, 3.1 million births, 3.7 million pregnant women and just under 16 million under 5 children in 2017. (Table 2).

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

| Year | Population (GR 2.13%) | Births (2.9%) | Pregnant Women (3.4%) | U5 Children (14.24%) |
|---|---|---|---|---|
| 2017 | 110,012,442 | 3,190,361 | 3,740,423 | 15,665,772 |
| 2018 | 112,355,707 | 3,258,316 | 3,820,094 | 15,999,453 |
| 2019 | 114,748,884 | 3,327,718 | 3,901,462 | 16,340,241 |
| 2020 | 117,193,035 | 3,398,598 | 3,984,563 | 16,688,288 |
| 2021 | 119,689,246 | 3,470,988 | 4,069,434 | 17,043,749 |
| 2022 | 122,238,627 | 3,544,920 | 4,156,113 | 17,406,781 |
| 2023 | 124,842,310 | 3,620,427 | 4,244,639 | 17,777,545 |

### 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, Punjab including DOH, IRMNCH program and development partners i.e. WHO, UNFPA, TRF 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 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 and where cold chain facilities are lacking. 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 Punjab
- 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 3 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 0.95 million and in 2023-24 is 1.2 million. The estimated number of misoprostol tablets required for prevention of PPH is 2.2 million during the forecast period 2019-20 and 2.8 million during 2023-24, while it is assumed that eighty percent pregnant women will receive three 200 μg misoprostol tablets for prevention of PPH. Table 3.1 shows forecast modeling for estimated year-wise requirement of Misoprostol tablet for treatment of PPH.

**Table 3. Forecasted Number of Misoprostol Tablets Required for Prevention of PPH**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| (B) % of Public Health Facilities Deliveries (22.4% PDHS 2017-18 Punjab) assuming HF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| C) # of Health Facility Births (C = A × B) | 837,855 | 893,902 | 951,957 | 1,012,079 | 1,074,331 | 1,138,775 | 1,205,477 |
| D) Prevention of PPH (Assuming 80% of HF deliveries given Misoprostol) D=C x 80% | 670,284 | 715,122 | 761,565 | 809,663 | 859,465 | 911,020 | 964,382 |
| E) Requirement of Misoprostol (3tab x 200ug) for Prevention of PPH in HF Deliveries (E = D × 3) | 2,010,851 | 2,145,365 | 2,284,696 | 2,428,990 | 2,578,394 | 2,733,060 | 2,893,146 |
| F) 0.05% Wastage* | 201 | 215 | 228 | 243 | 258 | 273 | 289 |
| G) Total Requirement of Misoprostol for HF Deliveries PPH prevention including wastage | 2,011,053 | 2,145,579 | 2,284,925 | 2,429,233 | 2,578,651 | 2,733,333 | 2,893,435 |

**Please use stakeholder specific rate*

**Table 3.1. Forecasted Number of Misoprostol Tablets Required for Treatment of PPH**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 72,950 | 77,687 | 82,594 | 87,674 | 92,933 | 98,377 |
| B) Prevalence of PPH | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% |
| (C) # of PPH cases (C = A × B) | 243,127 | 248,306 | 253,595 | 258,997 | 264,513 | 270,147 | 275,902 |
| D) % of Public Health Facilities Deliveries (22.4.1% PDHS 2017-18 Punjab) assuming HF Deliveries increase by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) # of PPH Cases seeking treatment from Health Facilities | 54,461 | 58,104 | 61,877 | 65,785 | 69,831 | 74,020 | 78,356 |
| F) Requirement of Misoprostol (4tab x 200ug) for Treatment of PPH in HF Deliveries | 217,842 | 232,415 | 247,509 | 263,141 | 279,326 | 296,082 | 313,424 |
| G)0.0 5% Wastage* | 109 | 116 | 124 | 132 | 140 | 148 | 157 |
| H) Net Requirement of Misoprostol for HF Deliveries treatment including wastage | 217,951 | 232,531 | 247,633 | 263,272 | 279,466 | 296,230 | 313,581 |

**Please use stakeholder specific rate*

## 2. 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 Punjab
- 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 4. By applying the different attributes and assumptions the forecasted number of pregnancies for the year 2019-20 and 2023-24 are estimated at 3.9 and 4.2 million, respectively. We have estimated (by trend analysis) that 24.4% 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 61,877 and 78,356 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 247,633 for 2019-20 and 313,581 for 2023-24.

**Table 4. Forecasted Oxytocin Requirements**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) Prevalence of PPH | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% |
| (C) # of PPH cases (C = A × B) | 243,127 | 248,306 | 253,595 | 258,997 | 264,513 | 270,147 | 275,902 |
| (D) % of Public Health Facilities Deliveries (22.4% PDHS 2017-18 Punjab) assuming Public Health Facility (PHF) Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) # of PPH Cases seeking treatment from Public Health Facilities | 54,461 | 58,104 | 61,877 | 65,785 | 69,831 | 74,020 | 78,356 |
| F) Requirement of Oxytocin (40 IU= 4 x 10 IU vial) for Treatment of PPH in Public HF Deliveries | 217,842 | 232,415 | 247,509 | 263,141 | 279,326 | 296,082 | 313,424 |
| G) 0.05% Wastage* | 109 | 116 | 124 | 132 | 140 | 148 | 157 |
| H) Total Requirement of Oxytocin for Public HF Deliveries (PPH treatment including wastage) | 217,951 | 232,531 | 247,633 | 263,272 | 279,466 | 296,230 | 313,581 |

**Please use stakeholder specific rate*

## 3. 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 Punjab
- 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 5. By applying the different attributes and assumptions, the estimated number of pregnancies for the year 2019-20 and 2023-24 are estimated at 3.9 million and 4.2 million, respectively. The total number of public health facility deliveries estimated as 61,877 in 2019-20 and 78,356 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 123,816 for 2019-20 and 156,795 for 2023-24 as shown in the table below.

**Table 5: Forecasted Injection Ringer's Lactate Requirement**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) Prevalence of PPH | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% | 6.5% |
| (C) # of PPH cases (C = A × B) | 243,127 | 248,306 | 253,595 | 258,997 | 264,513 | 270,147 | 275,902 |
| D) % of Public Health Facilities (PHF) Deliveries (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) # of PPH Cases seeking treatment from Public Health Facilities | 54,461 | 58,104 | 61,877 | 65,785 | 69,831 | 74,020 | 78,356 |
| (E) Requirement of Inj. Ringer's Lactate for Treatment of PPH in PHF Deliveries (2 per PPH case) | 108,921 | 116,207 | 123,754 | 131,570 | 139,663 | 148,041 | 156,712 |
| (F) 0.05% Wastage* | 54 | 58 | 62 | 66 | 70 | 74 | 78 |
| (G) Net Requirement of Ringer's Lactate for PHF Deliveries PPH treatment including wastage | 108,976 | 116,265 | 123,816 | 131,636 | 139,733 | 148,115 | 156,790 |

**Please use stakeholder specific rate*

## 4. Forecasted Need for Dinoprostone (Prostaglandin E2) – Induction of Labor

Induction of labor (IOL) is a commonly performed obstetric procedure. It is indicated in cases where waiting for spontaneous onset of labor can jeopardize the maternal or fetal health. Over recent decades, more and more pregnant women around the world have undergone induction of labor (artificially initiated labor) to deliver their babies. In developed countries, up to 25% of all deliveries at term now involve induction of labor. In developing countries, the rates are generally lower, but in some settings, they can be as high as those observed in developed countries.[6]

**Induction of labor**: Induction of labor is defined as the process of artificially stimulating the uterus to start labor [28]. It is usually performed by administering oxytocin or prostaglandins to the pregnant woman or by manually rupturing the amniotic membranes. Over the past several decades, the incidence of labor induction for shortening the duration of pregnancy has continued to rise. In developed countries, the proportion of infants delivered at term following induction of labor can be as high as one in four i.e. 25% deliveries. [29-30]
Induction of labor is not risk-free and many women find it to be uncomfortable. Induction of labor should be performed only when there is a clear medical indication for it and the expected benefits outweigh its potential harms. Induction of labor is recommended for women with pre-labor rupture of membranes at term. Low doses of vaginal prostaglandins are recommended for induction of labor.

Increase in rate of Induction of labor is related to a rise in the number of medically and obstetrically indicated inductions, however, it appears that marginally indicated and elective inductions account for a large proportion of IOL. One of the other contributing factors for increasing rate of IOL is the concern of the patients and healthcare providers about the possible risk of fetal demise at term or post term with the expectant management.

**Summary of Data Needed for Forecasting Dinoprostone Gel**

- Target population (Expected pregnancies)
- Incidence of labor induction in pregnant women
- Number of pregnant women who will require Dinoprostone gel
- Standard or average treatment regimen (i.e., amount of gel needed for induction of labor)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of Dinoprostone Gel is:

$$\text{Forecasted Need for Dinoprostone 2 mg Gel} = \text{Expected Pregnancies} \times \text{Proportion of pregnancies that need induction of labor} \times \text{Number of pregnant women at risk given Dinoprostone gel} \times \text{Dose required per case}$$

By applying the related information provided above, we estimated that approximately 238,013 Dinoprostone gel would be required for induction of labor in approximately 237,989 pregnant women visiting public health facilities during the forecast period of 2019-20.

**Table 6: Forecasted Number of Dinoprostone Gel**

| **Total Population (2017 Census - GR 2.13%)** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Number of Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) Rate of Induction of Labor in pregnant women (WHO recommendations for Induction of labor) | 25% | 25% | 25% | 25% | 25% | 25% | 25% |
| C) # of pregnant women that may require induction of labor (C = A × B) | 935,106 | 955,024 | 975,366 | 996,141 | 1,017,359 | 1,039,028 | 1,061,160 |
| D) % of Public Health Facilities Deliveries (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) # of pregnant women attending public facility that may require induction of labor and will be administered Dinoprostone gel (E = C × D) | 209,464 | 223,476 | 237,989 | 253,020 | 268,583 | 284,694 | 301,369 |
| F) Requirement of Dinoprostone Vaginal Gel/tablets/pessary (2/3mg) for public health facility (F = E x 1 /pregnant women) | 209,464 | 223,476 | 237,989 | 253,020 | 268,583 | 284,694 | 301,369 |
| G)0.01% Wastage* | 21 | 22 | 24 | 25 | 27 | 28 | 30 |
| H) Total Requirement of Dinoprostone Gel/ tablets / pessary for induction of labor in public health facilities H= G+F | 209,485 | 223,498 | 238,013 | 253,045 | 268,610 | 284,722 | 301,399 |

**Please use stakeholder specific rate*

## 5. 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 Punjab
- 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 3.90 million pregnancies, 0.11 million will complicated with pre/post eclampsia and of these 28,559 pregnant women are estimated to visit public facility for prevention /treatment of PE/E during the forecasting period of 2019-20. A total of
1.25 million 2 ml ampoules of inj. magnesium sulfate are required for 2019-20, which is to be administered using Pritchard Regime. Table 7 shows the complete factorization for the forecast of Magnesium sulfate.

**Table 7. Forecasted Doses of Magnesium Sulfate Required for Treatment of Pre-Eclampsia / Eclampsia**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) # of Pregnancies estimated to be complicated with PE/E (3%) | 112,213 | 114,603 | 117,044 | 119,537 | 122,083 | 124,683 | 127,339 |
| C) % of Public Health Facilities (PHF) Deliveries (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| (D) # of PHF Births (D = B × C) | 25,136 | 26,817 | 28,559 | 30,362 | 32,230 | 34,163 | 36,164 |
| (E) Requirement of MgSO4 (in GMs) for Treatment of Eclampsia in HF Deliveries (E= 44 x D) (Pritchard Regime = 44 gm /case of Eclampsia) | 1,105,968 | 1,179,951 | 1,256,583 | 1,335,944 | 1,418,116 | 1,503,183 | 1,591,230 |
| (F) 0.01% Wastage* -in GMs | 111 | 118 | 126 | 134 | 142 | 150 | 159 |
| (G) Net Requirement of MgSO4 (in GMs) for Eclampsia treatment in PHF Deliveries (including wastage) G= E+F | 1,106,079 | 1,180,069 | 1,256,709 | 1,336,078 | 1,418,258 | 1,503,333 | 1,591,389 |
| (H) Requirement of Inj. MgSO4 (2 ml Ampoule --500 mg /ml) H=G | 1,106,079 | 1,180,069 | 1,256,709 | 1,336,078 | 1,418,258 | 1,503,333 | 1,591,389 |

**Please use stakeholder specific rate*

## 6. 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 Punjab
- 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).
- 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 47,598 pregnant women are estimated to require hydralazine for the treatment of hypertension from public facilities during the forecasting period (2019-20). A total of 47,622 injections of hydralazine would be required for the year 2019-20. Table 8 shows the complete factorization for hydralazine forecast.

**Table 8: Forecasted Hydralazine Injections to manage Hypertensive Disorders of Pregnancy (HDP)**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies) | 187,021 | 191,005 | 195,073 | 199,228 | 203,472 | 207,806 | 212,232 |
| C) % of Public Health Facilities (PHF) Deliveries (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| (D) # of Pregnant Women with HDP seeking care from Public Health Facilities | 41,893 | 44,695 | 47,598 | 50,604 | 53,717 | 56,939 | 60,274 |
| (E) Requirement of Hydralazine HCl (1 Ampoule of 20 mg) for Treatment of HDP (E= B x 1 Ampoule) | 41,893 | 44,695 | 47,598 | 50,604 | 53,717 | 56,939 | 60,274 |
| (F) 0.05% Wastage* -in Ampoules | 21 | 22 | 24 | 25 | 27 | 28 | 30 |
| (G) Total Requirement of Hydralazine HCl (1 Ampoule of 20 mg) for Treatment of HDP G= E+F | 41,914 | 44,717 | 47,622 | 50,629 | 53,743 | 56,967 | 60,304 |

**Please use stakeholder specific rate*

## 7. 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 Punjab
- 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 9 shows the forecasted amount of Methyldopa yearly. A total of 17.1 million 250/500 mg tablets of Methyldopa are forecasted for the period (2019-20).

**Table 9: Forecasted Number of Methyldopa Tablets**

| **Total Population (GR 2.13%) 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%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies) | 187,021 | 191,005 | 195,073 | 199,228 | 203,472 | 207,806 | 212,232 |
| C) % of PUBLIC Health Facilities Deliveries (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| D) # of Pregnant Women with HDP seeking care from Health Facilities | 41,893 | 44,695 | 47,598 | 50,604 | 53,717 | 56,939 | 60,274 |
| (E) Requirement of Methyldopa (360 tablets per case i.e. 2 x day for 180 days) for management of HDP (E= B x 360 Tablets) | 15,081,386 | 16,090,236 | 17,135,221 | 18,217,423 | 19,337,952 | 20,497,951 | 21,698,592 |
| (F) 0.01% Wastage* -(Tablets) | 1,508 | 1,609 | 1,714 | 1,822 | 1,934 | 2,050 | 2,170 |
| (G) Total Requirement of Methyldopa 250 mg tablet for the management of HDP<br>G= E+F | 15,082,894 | 16,091,845 | 17,136,935 | 18,219,245 | 19,339,886 | 20,500,001 | 21,700,762 |
| (H) Total Requirement of Methyldopa 500 mg tablet for the management of HDP<br>G= E+F | 15,082,894 | 16,091,845 | 17,136,935 | 18,219,245 | 19,339,886 | 20,500,001 | 21,700,762 |

**Please use stakeholder specific rate*

## 8. 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 Punjab
- 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 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 232,940 pregnant women are estimated to require Ceftriaxone for the treatment of maternal sepsis during the forecasting period (2019-20). Out of these, 56,837 pregnant women are estimated to seek treatment from public health facility.

A total of 852,647 injections of Ceftriaxone 250/500 mg are required for 2019-20.

Table 10 shows the complete factorization for the estimated forecast for ampicillin.

**Table 10: Forecasted Number of Doses of Ceftriaxone Required for the Treatment of Maternal Sepsis**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total births (2.9%) | 3,190,361 | 3,258,316 | 3,327,718 | 3,398,598 | 3,470,988 | 3,544,920 | 3,620,427 |
| B) Incidence of Maternal Sepsis (average pregnancy, child birth & postpartum sepsis) according to WHO definition | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| C) Number of Maternal Sepsis cases (C= B x A) | 223,325 | 228,082 | 232,940 | 237,902 | 242,969 | 248,144 | 253,430 |
| D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (22.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) Number of Maternal Sepsis patients visiting Public Health Facilities | 50,025 | 53,371 | 56,837 | 60,427 | 64,144 | 67,992 | 71,974 |
| F) Number of Ceftriaxone Injection 250/500mg / 1 gm. required for M/Sepsis patients (F= E x 15 Inj. /patient) | 750,373 | 800,568 | 852,561 | 906,406 | 962,158 | 1,019,874 | 1,079,611 |
| G) 0.01% Wastage* | 75 | 80 | 85 | 91 | 96 | 102 | 108 |
| H) Total Requirement of Ceftriaxone 250/500 mg Injections for Maternal Sepsis patients H= F+G | 750,448 | 800,648 | 852,647 | 906,497 | 962,254 | 1,019,976 | 1,079,719 |

**please use stakeholder specific rate*

## 9. 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 Punjab
- 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 232,940 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 1.42 million injections of Gentamycin are required for 2019-20 which are to be administered intravenously. Table 11 shows the complete factorization for the forecast of Gentamycin.

Table 11: **Forecasted Number of Doses of Gentamycin Required for Treatment of Maternal Sepsis**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total births (2.9%) | 3,190,361 | 3,258,316 | 3,327,718 | 3,398,598 | 3,470,988 | 3,544,920 | 3,620,427 |
| B) Incidence of Maternal Sepsis (pregnancy, child birth & postpartum) according to WHO definition | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| C) number of Maternal Sepsis cases (C= B x A) | 223,325 | 228,082 | 232,940 | 237,902 | 242,969 | 248,144 | 253,430 |
| D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (22.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) Number of Maternal Sepsis patients visiting Public Health Facilities | 50,025 | 53,371 | 56,837 | 60,427 | 64,144 | 67,992 | 71,974 |
| F) Number of Gentamicin 40mg Injections required for M/Sepsis patients (F= E x 5x5) 3mg/ kg/ day x5 days = 3 x70kg= 210 mg /40mg Inj.= 5 Injs. approx. /patient) Inj. 80 mg = 2.5 inj. / patient | 1,250,621 | 1,334,280 | 1,420,935 | 1,510,677 | 1,603,597 | 1,699,789 | 1,799,352 |
| G) 0.01% Wastage* | 125 | 133 | 142 | 151 | 160 | 170 | 180 |
| H) Total Requirement of Gentamicin 40mg Injections for Maternal Sepsis patients H= F+G | 1,250,747 | 1,334,414 | 1,421,078 | 1,510,828 | 1,603,757 | 1,699,959 | 1,799,532 |

**Please use stakeholder specific rate*

## 10. Forecasted Need for Metronidazole – 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.

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 Punjab
- 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 232,940 pregnant women are estimated to require Metronidazole for the treatment of maternal sepsis during the forecasting period (2019-20). Out of these, 56,837 pregnant women are estimated to seek treatment from public health facility. A total of 1.13 million injections of Metronidazole are required for 2019-20 which are to be administered intravenously. Table 12 shows the complete factorization for the forecast of Metronidazole.

**Table 12: Forecasted Number of Doses of Metronidazole Required for Management of Maternal Sepsis**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **14,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total births (2.9%) DHIS 2016 Annual Report Punjab | 3,190,361 | 3,258,316 | 3,327,718 | 3,398,598 | 3,470,988 | 3,544,920 | 3,620,427 |
| B) Incidence of Maternal Sepsis (average pregnancy, child birth & postpartum) according to WHO definition | 7% | 7% | 7% | 7% | 7% | 7% | 7% |
| C) number of Maternal Sepsis cases (C= B x A) | 223,325 | 228,082 | 232,940 | 237,902 | 242,969 | 248,144 | 253,430 |
| D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (22.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) Number of Maternal Sepsis patients visiting Public Health Facilities | 50,025 | 53,371 | 56,837 | 60,427 | 64,144 | 67,992 | 71,974 |
| F) Number of Metronidazole 500mg Injections required for M/Sepsis patients (F= E x 15 (4x5days) Injs. /patient) | 1,000,497 | 1,067,424 | 1,136,748 | 1,208,541 | 1,282,877 | 1,359,831 | 1,439,482 |
| G) 0.01% Wastage* | 100 | 107 | 114 | 121 | 128 | 136 | 144 |
| H) Total Requirement of Metronidazole 500mg Injections for Maternal Sepsis patients H= F+G | 1,000,597 | 1,067,531 | 1,136,862 | 1,208,662 | 1,283,006 | 1,359,967 | 1,439,626 |

**Please use stakeholder specific rate*

## 11. 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-hour time 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 13 that approximately 624,234 pregnant women are at risk of preterm birth during the forecast period, 2019-20 and 679,142 in year 2023-24. Further, to prevent the risk of preterm delivery a total of 913,970 ampoules for 2019-20 and 1,157,374 ampoules of dexamethasone (1 ml each) for 2023-24 need to be procured during the forecast periods, as depicted in Table 13.

**Table 13. Forecasted Need for Dexamethasone**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Number of Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| B) Percentage of pregnant women at risk of preterm delivery (Meta-Analysis 2017 /Every Preemie Scale-Pakistan Profile / WHO 2015 Updated Recommendations | 16% | 16% | 16% | 16% | 16% | 16% | 16% |
| C) # of pregnant women at risk of preterm delivery (C = A × B) | 598,468 | 611,215 | 624,234 | 637,530 | 651,110 | 664,978 | 679,142 |
| D) Percentage Maternal Sepsis cases referred to Public Health Facility (PHF) for treatment (22.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| E) # of pregnant women at risk administered dexamethasone (E = C × D) | 134,057 | 143,024 | 152,313 | 161,933 | 171,893 | 182,204 | 192,876 |
| F) Number of dexamethasone ampoules (4mg in 1-ml amp) required (F = E x 6 amp) WHO recommend total 24 mg in divided doses | 804,341 | 858,146 | 913,878 | 971,596 | 1,031,357 | 1,093,224 | 1,157,258 |
| G) 0.01% Wastage* | 80 | 86 | 91 | 97 | 103 | 109 | 116 |
| H) Total Requirement of Dexamethasone Ampoules for PHF Deliveries for Preterm Births/deliveries H= G+F | 804,421 | 858,232 | 913,970 | 971,693 | 1,031,461 | 1,093,333 | 1,157,374 |

**Please use stakeholder specific rate*

## 12. 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/prevalence of ARI/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 pneumonia in under five children | × | Percent ARI/pneumonia patients attending public health facility | × | Dose per episode |
|---|---|---|---|---|---|---|---|---|

Table 14 and 14.1 shows the forecasted number of Amoxicillin required for the management of childhood ARI/pneumonia. An estimated total of 2.9/5.9 million dispersible tablets, 0.39/0.789 million bottles of syrup (125 mg; 250 mg) and 2.9/5.9 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 14. Forecasted Number of Amoxicillin for Management of ARI in 0-59 Months Children**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 125,184,578 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) % 0-59 months children in Punjab -- PBS 2012-13 | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% |
| B) Estimated Number / Population of 0-59 months children (2017 Pop x A) | 15,665,772 | 15,999,453 | 16,340,241 | 16,688,288 | 17,043,749 | 17,406,781 | 17,777,545 |
| C) Prevalence of ARI in 0-59 months Children (PDHS 2017-18 Punjab) | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% | 13.0% |
| D) number of 0-59 months children with ARI Symptoms (D= B x C) | 2,030,830 | 2,074,086 | 2,118,264 | 2,163,383 | 2,209,463 | 2,256,525 | 2,310,907 |
| E) Percentage of children with ARI symptoms for whom advice/treatment sought (86.1% PDHS 2017-18 Punjab) assuming 1% increase annually | 86.1% | 87.1% | 88.1% | 89.1% | 90.1% | 91.1% | 92.1% |
| F) Number of children with ARI symptoms for whom advice/treatment sought | 1,748,544 | 1,806,529 | 1,866,191 | 1,927,575 | 1,990,727 | 2,055,694 | 2,128,346 |
| G) Percentage of children with ARI symptoms for whom advice or treatment was sought from Public Health Facility (22.4% 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 patients visiting Public Health Facilities | 346,212 | 375,758 | 406,830 | 439,487 | 473,793 | 509,812 | 549,113 |
| I) Percentage receiving Antibiotics (46.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 46.4% | 47.4% | 48.4% | 49.4% | 50.4% | 51.4% | 52.4% |
| J) Number of 0-59 months patients requiring Amoxicillin for treatment from Public Health Facilities | 160,642 | 178,109 | 196,906 | 217,107 | 238,792 | 262,043 | 287,735 |
| K) Number of Amoxicillin 250/500 mg tablets required for 0-59 months patients (= J x 15 tablets /episode) | 2,409,634 | 2,671,640 | 2,953,583 | 3,256,599 | 3,581,875 | 3,930,652 | 4,316,030 |
| L) 0.01% Wastage* | 241 | 267 | 295 | 326 | 358 | 393 | 432 |
| M) Total Requirement of Amoxicillin 250/500 mg tablets for 0-59 months patients K= K+L | 2,409,875 | 2,671,907 | 2,953,878 | 3,256,924 | 3,582,233 | 3,931,045 | 4,316,461 |
| N) Number of Amoxicillin Syrup 125/250mg required for 0-59 months patients (= J x 2 bottle /episode) (125mg=25% & 250 = 75%) | 321,285 | 356,219 | 393,811 | 434,213 | 477,583 | 524,087 | 575,471 |
| O) 0.01% Wastage* | 32 | 36 | 39 | 43 | 48 | 52 | 58 |
| P) Total Requirement of Amoxicillin Syrup | 321,317 | 356,254 | 393,850 | 434,257 | 477,631 | 524,139 | 575,528 |

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 125,184,578 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| 250/125 mg bottles for 0-59 months ARI patients = N+O | | | | | | | |
| Q) Number of Amoxicillin Inj. 250/500 mg required for 0-59 months patients (= J x 15 Injs. /episode) (50% each) | 2,409,634 | 2,671,640 | 2,953,583 | 3,256,599 | 3,581,875 | 3,930,652 | 4,316,030 |
| R) 0.01% Wastage* | 241 | 267 | 295 | 326 | 358 | 393 | 432 |
| S) Total Requirement of Amoxicillin Inj. 250/500 mg for 0-59 months pneumonia patients = Q + R | 2,409,875 | 2,671,907 | 2,953,878 | 3,256,924 | 3,582,233 | 3,931,045 | 4,316,461 |

**Please use stakeholder specific rate*

**Table 14.1 Forecasted Number of Amoxicillin for Management of Pneumonia in 0-59 Months Children**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 125,184,578 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) % 0-59 months children in Punjab -- PBS 2012-13 | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% |
| B) Estimated Number / Population of 0-59 months children (2017 Pop x A) | 15,665,772 | 15,999,453 | 16,340,241 | 16,688,288 | 17,043,749 | 17,406,781 | 17,777,545 |
| C) 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 |
| D) number of Pneumonia Episodes in 0-59 months children (D= B x C) | 4,073,101 | 4,159,858 | 4,248,463 | 4,338,955 | 4,431,375 | 4,525,763 | 4,622,162 |
| E) Percentage of children with ARI symptoms for whom advice/treatment sought (86.1% PDHS 2017-18 Punjab) assuming 1% increase annually | 86.1% | 87.1% | 88.1% | 89.1% | 90.1% | 91.1% | 92.1% |
| F) Number of children with ARI symptoms for whom advice/treatment sought | 3,506,940 | 3,623,236 | 3,742,896 | 3,866,009 | 3,992,669 | 4,122,970 | 4,257,011 |
| 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 | 694,374 | 753,633 | 815,951 | 881,450 | 950,255 | 1,022,497 | 1,098,309 |
| I) Percentage receiving Antibiotics (46.4% PDHS 2017-18 Punjab) assuming 1% increase annually | 46.4% | 47.4% | 48.4% | 49.4% | 50.4% | 51.4% | 52.4% |
| J) Number of 0-59 months patients requiring Amoxicillin for treatment from Public Health Facilities | 322,190 | 357,222 | 394,920 | 435,436 | 478,929 | 525,563 | 575,514 |
| K) Number of Amoxicillin 250/500 mg tablets required for 0-59 months patients (= J x 15 tablets | 4,832,843 | 5,358,331 | 5,923,806 | 6,531,545 | 7,183,929 | 7,883,449 | 8,632,707 |

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 125,184,578 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| /episode) | | | | | | | |
| L) 0.01% Wastage* | 483 | 536 | 592 | 653 | 718 | 788 | 863 |
| M) Total Requirement of Amoxicillin 250/500 mg tablets for 0-59 months pneumonia patients K+L | 4,833,327 | 5,358,867 | 5,924,398 | 6,532,198 | 7,184,647 | 7,884,237 | 8,633,571 |
| N) Number of Amoxicillin Syrup 125/250mg required for 0-59 months patients (= J x 2 bottle /episode) (125mg=25% & 250 = 75%) | 644,379 | 714,444 | 789,841 | 870,873 | 957,857 | 1,051,126 | 1,151,028 |
| O) 0.01% Wastage* | 64 | 71 | 79 | 87 | 96 | 105 | 115 |
| P) Total Requirement of Amoxicillin Syrup 250/125 mg bottles for 0-59 months pneumonia patients N+O | 644,444 | 714,516 | 789,920 | 870,960 | 957,953 | 1,051,232 | 1,151,143 |
| Q) Number of Amoxicillin Inj. 250/500 mg required for 0-59 months patients (= J x 15 Injs. /episode) (50% each) | 4,832,843 | 5,358,331 | 5,923,806 | 6,531,545 | 7,183,929 | 7,883,449 | 8,632,707 |
| R) 0.01% Wastage* | 483 | 536 | 592 | 653 | 718 | 788 | 863 |
| S) Total Requirement of Amoxicillin Inj. 250/500 mg for 0-59 months pneumonia patients S+R | 4,833,327 | 5,358,867 | 5,924,398 | 6,532,198 | 7,184,647 | 7,884,237 | 8,633,571 |

**Please use stakeholder specific rate*

## 13. 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 Punjab 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 15 shows that there will be 10.02 million estimated number of diarrhea episodes in 2019-20 and out of these 3.62 million will be treated with ORS. Out of these, 0.88 million will seek ORS from public health facilities of Punjab Health Department. This means that a total of 1.77 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 15. Forecasted Number of ORS for 0-59 Months Children**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) % under 5 children in Punjab -- PBS 2012-13 | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% |
| B) Number / Population of < 5 children (2017 Pop x A) | 15,621,767 | 15,954,510 | 16,294,341 | 16,641,411 | 16,995,873 | 17,357,885 | 17,727,608 |
| C) Prevalence of Diarrhea in < 5 Children in Punjab-- PDHS 2017-18 | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% |
| D) Total number of U5 children with Diarrhea (B x C) | 3,202,462 | 3,270,675 | 3,340,340 | 3,411,489 | 3,484,154 | 3,558,366 | 3,634,160 |
| E) Incidence of Diarrhea in < 5 Children (# episodes/ child /year) study in Lahore18 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| F) Total number of Diarrhea Episodes (D x E) | 9,607,387 | 9,812,024 | 10,021,020 | 10,234,468 | 10,452,462 | 10,675,099 | 10,902,479 |
| G) Percentage who received ORS (34.2% PDHS 2017-18 Punjab) assuming 1% increase annually | 34.2% | 35.2% | 36.2% | 37.2% | 38.2% | 39.2% | 40.2% |
| H) Number of diarrhea episodes / patients treated with ORS | 3,285,726 | 3,453,832 | 3,627,609 | 3,807,222 | 3,992,840 | 4,184,639 | 4,382,797 |
| I) % of patients seeking ORS from Public Health Facilities (22.4% PDHS 2017-18 Punjab) assuming Public HF utilization increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| J) Number of patients seeking ORS from Public Health Facilities (H x I) | 736,003 | 808,197 | 885,137 | 967,034 | 1,054,110 | 1,146,591 | 1,244,714 |
| K) Number of ORS packet required (J x 2 packet / episode) | 1,472,005 | 1,616,394 | 1,770,273 | 1,934,069 | 2,108,220 | 2,293,182 | 2,489,428 |
| L) 0.01% Wastage* | 147 | 162 | 177 | 193 | 211 | 229 | 249 |
| M) Total Requirement of ORS packets = K+L | 1,472,153 | 1,616,555 | 1,770,450 | 1,934,262 | 2,108,431 | 2,293,411 | 2,489,677 |

**Please use stakeholder specific rate*

## 14. 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 3.4 million, while for the year
2023-24 it is 5.6 million, as shown in (Table 16).

**Table 16. Forecasted Number of Zinc Sulphate Tablets**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **17,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| Parameters | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
| A)% under 5 children in Punjab -- PBS 2012-13 | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% | 14.2% |
| B) Number / Population of < 5 children (2017 Pop x A) | 15,621,767 | 15,954,510 | 16,294,341 | 16,641,411 | 16,995,873 | 17,357,885 | 17,727,608 |
| C) Number of 0-5 months children (1.35% - Operational Guidance on Infant Feeding in Emergencies (OG-IFE) version 3.0) | 1,485,168 | 1,516,802 | 1,549,110 | 1,582,106 | 1,615,805 | 1,650,221 | 1,685,371 |
| D) Number / Population of 6-59 months children (B-C) | 14,136,599 | 14,437,708 | 14,745,232 | 15,059,305 | 15,380,068 | 15,707,664 | 16,042,237 |
| E) Prevalence of Diarrhea in < 5 Children in Punjab-- PDHS 2017-18 | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% | 20.5% |
| F) Total number of 0-5 months children with Diarrhea (E x C) | 304,459 | 310,944 | 317,568 | 324,332 | 331,240 | 338,295 | 345,501 |
| G) Total number of 6-59 months children with Diarrhea (E x B) | 2,898,003 | 2,959,730 | 3,022,772 | 3,087,158 | 3,152,914 | 3,220,071 | 3,288,659 |
| H) Incidence of Diarrhea in 0-59m Children (# episodes/child/year) -- study in Lahore18 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| I) Total Number of diarrhea episodes in 0-5 months children | 913,378 | 932,833 | 952,703 | 972,995 | 993,720 | 1,014,886 | 1,036,503 |
| J) Total Number of diarrhea episodes in 6-59 months children | 8,694,008 | 8,879,191 | 9,068,317 | 9,261,473 | 9,458,742 | 9,660,213 | 9,865,976 |
| K) % of patients seeking Zinc SO4 from Public Health Facilities (22.4% PDHS 2017-18 Punjab) assuming PHF utilization increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| L) Number of 0-5 months patients seeking treatment from Public Health Facilities (PHF) | 204,597 | 218,283 | 232,459 | 247,141 | 262,342 | 278,079 | 294,367 |
| M) Number of 6-59 months patients seeking treatment from PHF | 1,947,458 | 2,077,731 | 2,212,669 | 2,352,414 | 2,497,108 | 2,646,898 | 2,801,937 |
| N) Percentage who received Zinc (13% PDHS 2017-18) assuming 1% increase annually | 13% | 14% | 15% | 16% | 17% | 18% | 19% |
| O) Number of 0-6 months diarrhea patients who received Zinc | 26,598 | 30,560 | 34,869 | 39,543 | 44,598 | 50,054 | 55,930 |
| P) Number of 6-59 months diarrhea patients who received Zinc | 253,170 | 290,882 | 331,900 | 376,386 | 424,508 | 476,442 | 532,368 |
| Q) Number of Zinc Sulphate 20 mg tablet requirement for 0-6 months children (10mg/day x 10 days = 10mg x 10 days = 100 mg = 5 tablets | 79,793 | 152,798 | 174,345 | 197,713 | 222,991 | 250,271 | 279,649 |
| R) Number of Zinc Sulphate 20 mg tablet requirement for 6-59 months children (I= H x 20 mg tabletx10 days=20x10=200=10tablets) | 2,531,695 | 2,908,823 | 3,319,004 | 3,763,862 | 4,245,083 | 4,764,417 | 5,323,680 |
| S) 0.01% Wastage* (Q+R) | 261 | 306 | 349 | 396 | 447 | 501 | 560 |
| T) Total Requirement of Zinc Sulphate 20 mg tablets for 0-59 months children with diarrhea (Q+R+S) | 2,611,749 | 3,061,927 | 3,493,698 | 3,961,971 | 4,468,521 | 5,015,190 | 5,603,889 |

**Please use stakeholder specific rate*

## 15. 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 / 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 live births × Dose (5 ml) Gel per birth

According to the current provincial guidelines, Chlorhexidine will be used for all births. Table 17 shows year-wise forecasted amount of Chlorhexidine gel. A total of 0.756 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 17: Forecasted Number of Chlorhexidine Gel Required for Cord Care**

| **Total Population (GR 2.13%) Census 2017** | **110,012,442** | **112,355,707** | **114,748,884** | **117,193,035** | **119,689,246** | **122,238,627** | **124,842,310** |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Total live births (2.7%) DHIS 2016 Annual Report Punjab | 2,970,336 | 3,033,604 | 3,098,220 | 3,164,212 | 3,231,610 | 3,300,443 | 3,370,742 |
| (B) % of Public Health Facilities Births (22.4% PDHS 2017-18 Punjab) assuming HF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| (C) # of HF Births (C = A × B) | 665,355 | 709,863 | 755,966 | 803,710 | 853,145 | 904,321 | 957,291 |
| (D) Prevention of Cord Infection (Assuming 100% of PHF Births given Chlorhexidine) D= C x 100% | 665,355 | 709,863 | 755,966 | 803,710 | 853,145 | 904,321 | 957,291 |
| (E) Requirement of Chlorhexidine digluconate Enzichlor 7.1% Gel (One 5ml Gel / birth) for Prevention of cord infection in PHF Births (E = D × 1) | 665,355 | 709,863 | 755,966 | 803,710 | 853,145 | 904,321 | 957,291 |
| (F) 0.01% Wastage* | 67 | 71 | 76 | 80 | 85 | 90 | 96 |
| (G) Total Requirement of Chlorhexidine Gel for Prevention of cord infection in PHF Births G= E+F | 665,422 | 709,934 | 756,041 | 803,790 | 853,230 | 904,412 | 957,387 |

**Please use stakeholder specific rate*

## 16. Forecasted Need for Ferrous Salt + Folic Acid Tablets – Anemia

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 as follows;

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 Punjab
- 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 18 shows the forecasted quantities of ferrous salt + folic acid tablet for the period 2019-20 to 2023-24. A total of 521,901 pregnant women are estimated to visit public health facilities during 2019-20, and 93.95 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 18 shows the complete factorization for the forecast of ferrous salt + folic acid tablet.

**Table 18: Forecasted Number of Ferrous Salt + Folic Acid Tablets**

| Total Population (GR 2.13%) Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
|---|---|---|---|---|---|---|---|
| **Parameters** | **2017-18** | **2018-19** | **2019-20** | **2020-21** | **2021-22** | **2022-23** | **2023-24** |
| A) Number of Pregnancies (3.4%) DHIS 2016 Annual Report Punjab | 3,740,423 | 3,820,094 | 3,901,462 | 3,984,563 | 4,069,434 | 4,156,113 | 4,244,639 |
| 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 | 3,216,764 | 3,323,482 | 3,433,287 | 3,546,261 | 3,662,491 | 3,782,063 | 3,905,067 |
| D) Percentage who received ANC and took Iron (60.3 PDHS 2017-18 Punjab) assuming 1% increase annually | 60.3% | 61.3% | 62.3% | 63.3% | 64.3% | 65.3% | 66.3% |
| E) Number of pregnant women who received ANC and took Iron | 1,939,709 | 2,037,294 | 2,138,938 | 2,244,783 | 2,354,982 | 2,469,687 | 2,589,060 |
| F) % of Public Health Facilities (PHF) Births (22.4% PDHS 2017-18 Punjab) assuming PHF Deliveries increases by 1% annually | 22.4% | 23.4% | 24.4% | 25.4% | 26.4% | 27.4% | 28.4% |
| G) # of pregnant women who will receive Ferrous Salt + Folic Acid Tablets during ANC visit from PHF (G = E × F) | 434,495 | 476,727 | 521,901 | 570,175 | 621,715 | 676,694 | 735,293 |
| 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) | 78,209,050 | 85,810,838 | 93,942,137 | 102,631,495 | 111,908,729 | 121,804,974 | 132,352,733 |
| I) 0.01% Wastage* | 7,821 | 8,581 | 9,394 | 10,263 | 11,191 | 12,180 | 13,235 |
| J) Total Requirement of Ferrous Salt + Folic Acid Tablets for PHF ANC Visits J= H+I | 78,216,871 | 85,819,419 | 93,951,531 | 102,641,758 | 111,919,920 | 121,817,154 | 132,365,969 |

**Please use stakeholder specific rate*

## 17. Forecasted Need for Contraceptives – Birth Spacing

The use of family planning helps married couples avoid unintended and untimely pregnancies, and reduces risks of unsafe abortions. Contraceptives help mothers space the births of their children, which directly benefits the health of the mother and infants. Pakistan pledged to enhance its contraceptive prevalence rate (CPR) to 50% to contribute towards Family Planning 2020 commitments. This means reaching out and ensuring an additional 4.2 million married women become users of family planning methods by 2022.

It is possible to prepare a forecast using demographic or population data by setting a goal for the total fertility rate (TFR) or contraceptive prevalence rate (CPR) for the ending year of the forecast and determining how many contraceptive users are required to reach this goal. Numbers of contraceptive users are then converted into estimates of consumption using the *couple-years of protection* (CYP) conversion factors, which are simply the estimated quantities of contraceptives required to protect a couple from unwanted pregnancy for one year.

The quality of the forecast depends on the accuracy of the TFR or CPR goal used. Setting an appropriate goal requires familiarity with the individual program and country, and an understanding of historical precedents regarding rates of TFR or CPR change.

### Summary of Data Needed for Forecasting of Contraceptives

The key demographic and program data required for contraceptive forecasting are;

- Number of women of reproductive age (WRA).
- Percentage of WRA married (MWRA).
- Contraceptive prevalence rate (CPR).
- Method mix.
- Total fertility rate (TFR).
- Source mix.
- Brand Mix
- Population growth rate.
- CYP conversion factors
- Annual CPR increase (percentage)

**Steps in Preparing a Population Data-Based Forecast:**

A population data-based forecast requires conversion of population data into estimates of commodities needed for the various time periods covered by the forecast. Following steps are followed;

1. Gather necessary demographic and programmatic data (WRA, percent MWRA, method mix, brand mix, source mix, and CPR) for the beginning year of the forecast.

2. Forecast changes in these variables over the time period of the forecast. Interpolate between beginning- and ending-year values, and calculate the numbers of users of each method for each year of the forecast.

3. Convert numbers of contraceptive users to quantities of contraceptives required using couple-years of protection (CYP) factors.

**Choosing the Base Year for the Projection:** Two common challenges with population data-based forecasting are: no single source contains all the necessary data for the forecast, and the data from different sources are likely to be from different time periods. Adjusting old data to obtain current estimates of population parameters is time-consuming and problematic, potentially requiring the forecaster to make assumptions about trends in many of the variables. Such additional assumptions may introduce significant error into the forecast. To minimize the number of such adjustments, the date of the survey used as the major data source for the projection should be chosen as the base or starting year of the forecast.

**Estimating Married Women of Reproductive Age for the Base Year:** It is possible to adjust older census enumerations of WRA, using an annual population growth rate to obtain an estimate for the beginning year of the projection.

| | | | | | | |
|---|---|---|---|---|---|---|
| Estimated MWRA for Year n + 1 | = | Estimated MWRA for Year n | + | (Estimated MWRA for Year n | x | Annual Rate of Population Increase) |

**Estimating the Actual Population at Risk of Pregnancy:** All married women of reproductive age can be considered at risk, and the CPR for currently married women, is used for the projection. Because it is never true that all women are at risk of pregnancy, this assumption is obviously illogical. Mathematically, however, using the CPR for all WRA currently married, compensates for the assumption that 100 percent of women are at risk, allowing the forecaster to complete the projection without making a potentially incorrect guess about the number actually at risk.

**Choosing the Appropriate Contraceptive Prevalence Rate for the Base Year:** The initial CPR estimate is best obtained from the most recent PDHS. The forecaster must be certain that the base population for MWRA and the base population for CPR are the same.

**Calculating the Method Mix:** The PDHS and other similar surveys present data for each method as a percentage of all WRA currently married, including women who are not contracepting. For projection purposes, the forecaster needs the method mix expressed as percentages relative to all WRA currently married *who are using any method of contraception*. This percentage can be obtained by dividing the PDHS figure for women using each method by the percentage of women using any method—

Method Mix for a Method = Percentage using method / Percentage using any method

For example, if all currently married women are being used for the projection, and the survey reveals that 8 percent use the oral pills and 30 percent use any method, then—

Method mix for a Method = 8% / 30% = 26.6% orals

In other words, orals represent 26.6 percent of overall contraceptive use. This calculation is repeated for all other methods.

**Source Mix:** To prepare sector / program-specific estimates, the forecaster must estimate the *source mix*—the proportion of contraceptive use attributable to the particular sector / program for which the forecast is being prepared. This proportion may be very different for different methods. For

example, LHW program may contribute a significant portion of the national condom CPR, but nothing at all for other contraceptive methods like implants. Thus, the source mix will likely have to be estimated separately for each method. PDHS include a table called "Source of supply for modern contraceptive methods." In many cases, this table can be used to estimate the source mix.

**Estimating MWRA, CPR, Method Mix, and Source Mix for the Final Forecast Year:** The above formulas and procedures provide the necessary population parameters for a single year—the base year of the projection. Before consumption estimates can be made, it is necessary to project how these parameters will change over the forecast period. The three population parameters most likely to change significantly over the course of a short- or medium-term forecast are MWRA, method mix, and CPR. Consequently, at least these parameters require estimates for the future years of the forecast. The most common technique is to estimate values for these data items for the last year of the projection and then calculate intermediate values.

**Estimating CPR for the Final Forecast Year:** The CPR estimate for the final forecast year is *the* crucial assumption in a population data-based forecast. A challenge derives from the fact that programs and governments often set national targets for increases in CPR that are very optimistic. The forecaster is likely to come under pressure to use these in the population data-based forecast. Except for the UN's *World Contraceptive Use* wall chart and *Levels and Trends of Contraceptive Use* there are few generally recognized data sources for historical rates of change in CPR that can be used to confirm realistic goals or refute unrealistic ones.

Given the relatively short time period of forecasts made for immediate procurement purposes, major CPR increases or decreases during the forecast period are unlikely. The most successful family planning programs in the world have increased contraceptive prevalence by only one or two percentage points per year. In countries with lower levels of prevalence and less commitment to family planning, the change is closer to one-half of one percentage point growth per year, ranging all the way down to negative growth.

**Estimating Method Mix for the Final Forecast Year:** It is best to be conservative when estimating change in method mix over a four- or five-year period. Although method mix can be affected immediately by stockouts of a method, major shifts in the overall method mix have usually progressed more slowly. Without an aggressive program to introduce or expand the use of specific methods (backed by training for service providers and an IEC campaign to orient clients), it is unlikely that there will be significant changes in the method mix during the forecast period. The forecaster should review all program plans to launch or expand the use of particular methods, as well as program budgets for IEC, service delivery training, procurement, and distribution.

**Estimating the Proportion of Contraceptive Use Attributable to the Sector / Program (Source Mix) for the Final Forecast Year:** In the rare cases where two or more successive PDHSs are available, and the DHS table "Source of supply for modern contraceptive methods" is sufficiently detailed, the extrapolation techniques can be used to estimate changes in the source mix. Frequently, however, no hard data are available, and the forecaster and program managers will have to use their best judgment in estimating changes in the source mix. As with the other parameters, it is best to be conservative. Unless specific program interventions aimed at changing the market share of individual programs are planned, these percentages are likely to remain relatively constant over the time period of a short-term forecast.

## Calculating Commodity Consumption for the Forecast Period:

The general formula for calculation of population data forecasts is—

| Estimated Consumption of a Method in Year N | = | Estimated MWRA for Year N | x | CPR for year N | x | Method Mix for this method for Year N | x | Source Mix for this method for Year N | x | CYP conversion factor |
|---|---|---|---|---|---|---|---|---|---|---|

Multiplying estimated MWRA with the CPR, the first two factors, simply gives the total number of women at risk of pregnancy who are estimated to be contracepting. Multiplying this result by the method mix percentages, the third factors, gives the number of users being protected by a particular commodity. Multiplying further by the source mix, the fourth factor, provides an estimate of the number of those users being protected by the sector/program. With this figure in hand, it is necessary to estimate the quantity of commodities needed to protect those married women throughout each time period. This is done using the last factor in the equation, the CYP conversion factor. All these steps to estimate the yearly consumption for different methods have been demonstrated in table 19 below.

**Table 19: Forecasted Number of Contraceptives for Birth Spacing with Year wise and Total Costs**

| Data Item | Base Year | Intermediate Year | Forecast Years | | | | |
|---|---|---|---|---|---|---|---|
| Year | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
| Population Census 2017 | 110,012,442 | 112,355,707 | 114,748,884 | 117,193,035 | 119,689,246 | 122,238,627 | 124,842,310 |
| Percentage of Females in Punjab Population Census 2017 | 49.13% | 49.13% | 49.13% | 49.13% | 49.13% | 49.13% | 49.13% |
| Female Population | 54,049,113 | 55,200,359 | 56,376,126 | 57,576,938 | 58,803,327 | 60,055,838 | 61,335,027 |
| Women of reproductive age (WRA) 15-49 yrs. WHO | 24% | 24% | 24% | 24% | 24% | 24% | 24% |
| Number of WRA | 26,402,986 | 26,965,370 | 27,539,732 | 28,126,328 | 28,725,419 | 29,337,271 | 29,962,154 |
| Percentage of married women of reproductive age (MWRA ...15-49 yrs.) PDHS 2017-18 | 62% | 62% | 62% | 62% | 62% | 62% | 62% |
| Annual rate of population increase | 2.13% | 2.13% | 2.13% | 2.13% | 2.13% | 2.13% | 2.13% |
| Married WRA | 16,369,851 | 16,718,529 | 17,074,634 | 17,438,324 | 17,809,760 | 18,189,108 | 18,576,536 |
| Contraceptive prevalence rate (CPR) all methods @ 1% increase annually | 38.3% | 39.3% | 40.3% | 41.3% | 42.3% | 43.3% | 44.3% |

| CPR PDHS 2017-18 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Condom | 10.6% | 10.8% | 11.0% | 11.2% | 11.4% | 11.6% | 11.8% |
| COC | 1.0% | 1.1% | 1.1% | 1.2% | 1.2% | 1.3% | 1.3% |
| POP | 0.25% | 0.24% | 0.23% | 0.22% | 0.21% | 0.20% | 0.20% |
| DMPA | 1.6% | 1.7% | 1.8% | 2.0% | 2.1% | 2.2% | 2.3% |
| IUCD | 2.9% | 3.1% | 3.2% | 3.3% | 3.5% | 3.6% | 3.8% |
| **Method Mix** | | | | | | | |
| Condom | 27.7% | 27.5% | 27.3% | 27.1% | 27.0% | 26.8% | 26.6% |
| COC | 2.6% | 2.8% | 2.7% | 2.9% | 2.8% | 3.0% | 2.9% |
| POP | 0.7% | 0.6% | 0.6% | 0.5% | 0.5% | 0.5% | 0.5% |
| DMPA | 4.2% | 4.3% | 4.5% | 4.8% | 5.0% | 5.1% | 5.2% |
| IUCD | 7.6% | 7.9% | 7.9% | 8.0% | 8.3% | 8.3% | 8.6% |
| **Source Mix** | | | | | | | |
| Public sector | 44% | 45% | 46% | 47% | 48% | 49% | 50% |
| Private sector | 43% | 43% | 43% | 43% | 43% | 43% | 43% |
| Others | 13% | 13% | 13% | 13% | 13% | 13% | 13% |
| **CYP conversion Factors** | | | | | | | |
| Condom | 120 | 120 | 120 | 120 | 120 | 120 | 120 |
| COC | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| POP | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| DMPA | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| IUCD | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| **Estimated Consumption of Method for the Year** | | | | | | | |
| Condom | 91,618,784 | 97,502,462 | 103,677,177 | 110,154,402 | 116,946,007 | 124,064,266 | 131,521,873 |
| COC | 1,080,410 | 1,241,351 | 1,295,965 | 1,475,282 | 1,538,763 | 1,737,969 | 1,811,212 |
| POP | 270,103 | 270,840 | 270,974 | 270,468 | 269,284 | 267,380 | 278,648 |
| DMPA | 460,975 | 511,587 | 565,512 | 655,681 | 718,090 | 784,314 | 854,521 |
| IUCD | 208,879 | 233,223 | 251,339 | 270,468 | 299,204 | 320,856 | 352,954 |
| **Estimated Cost of Method for the Year –PKR** | | | | | | | |
| Condom | 183,237,568 | 195,004,925 | 207,354,354 | 220,308,805 | 233,892,014 | 248,128,532 | 263,043,746 |
| COC | 21,608,204 | 24,827,016 | 25,919,294 | 29,505,643 | 30,775,265 | 34,759,385 | 36,224,245 |
| POP | 5,402,051 | 5,416,803 | 5,419,489 | 5,409,368 | 5,385,671 | 5,347,598 | 5,572,961 |
| DMPA | 17,056,076 | 18,928,719 | 20,923,939 | 24,260,196 | 26,569,312 | 29,019,630 | 31,617,264 |
| IUCD | 15,039,310 | 16,792,091 | 18,096,380 | 19,473,725 | 21,542,686 | 23,101,622 | 25,412,701 |
| **Yearly Total Cost - PKR** | 242,343,208 | 260,969,553 | 277,713,456 | 298,957,737 | 318,164,949 | 340,356,767 | 361,870,916 |
| **Five Years Total Cost (2019-23) -- PKR** | **1,597,063,825** | | | | | | |

## 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 Punjab. We estimated a total requirement of PKR. 8,341,320,851. Of this requirement, 61 percent is for maternal commodities, 19 percent for Contraceptives and 20 percent is for
the newborn and children less than 5 years of age.

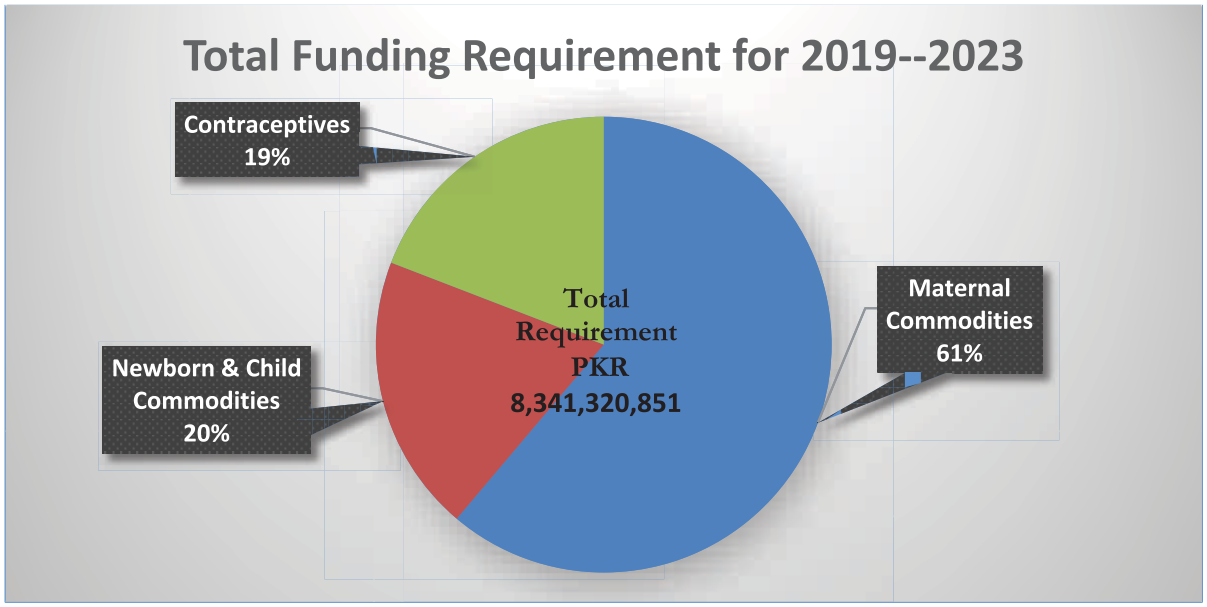


Figure 2: Overall Provincial Financing Requirement of Very Essential MNCH Commodities for Department of Health, Punjab.

## 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 Punjab. It also reflects the year wise financing requirement for maternal and newborn and child health commodities. Of this year wise requirement, generally over the years, approximately 80 percent is for the maternal commodities and 20 percent for newborn and children (less than 5 years of age) commodities.

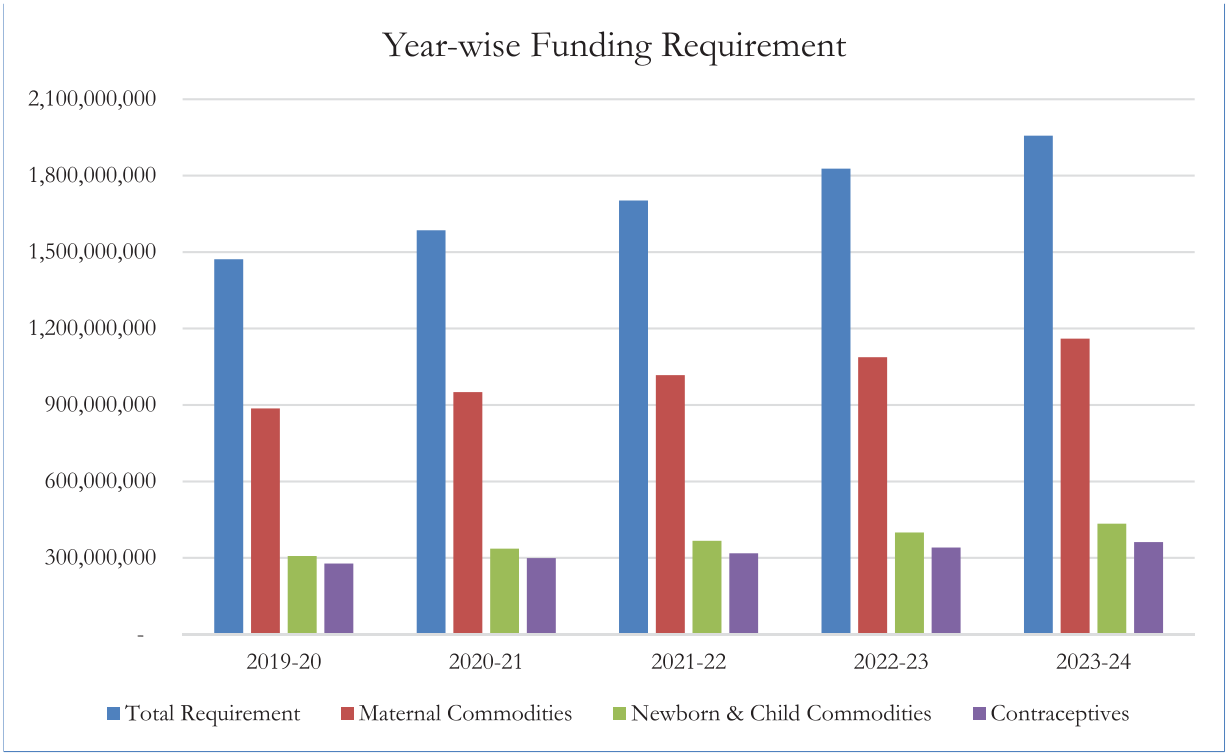


Figure 3: Year-wise Financing Requirement for Very Essential MNCH Commodities.

## Year-wise Funding Requirement for Different Maternal Conditions

Figure 4 shows the year wise financing requirement for the Department of Health, Govt. of Punjab. 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.

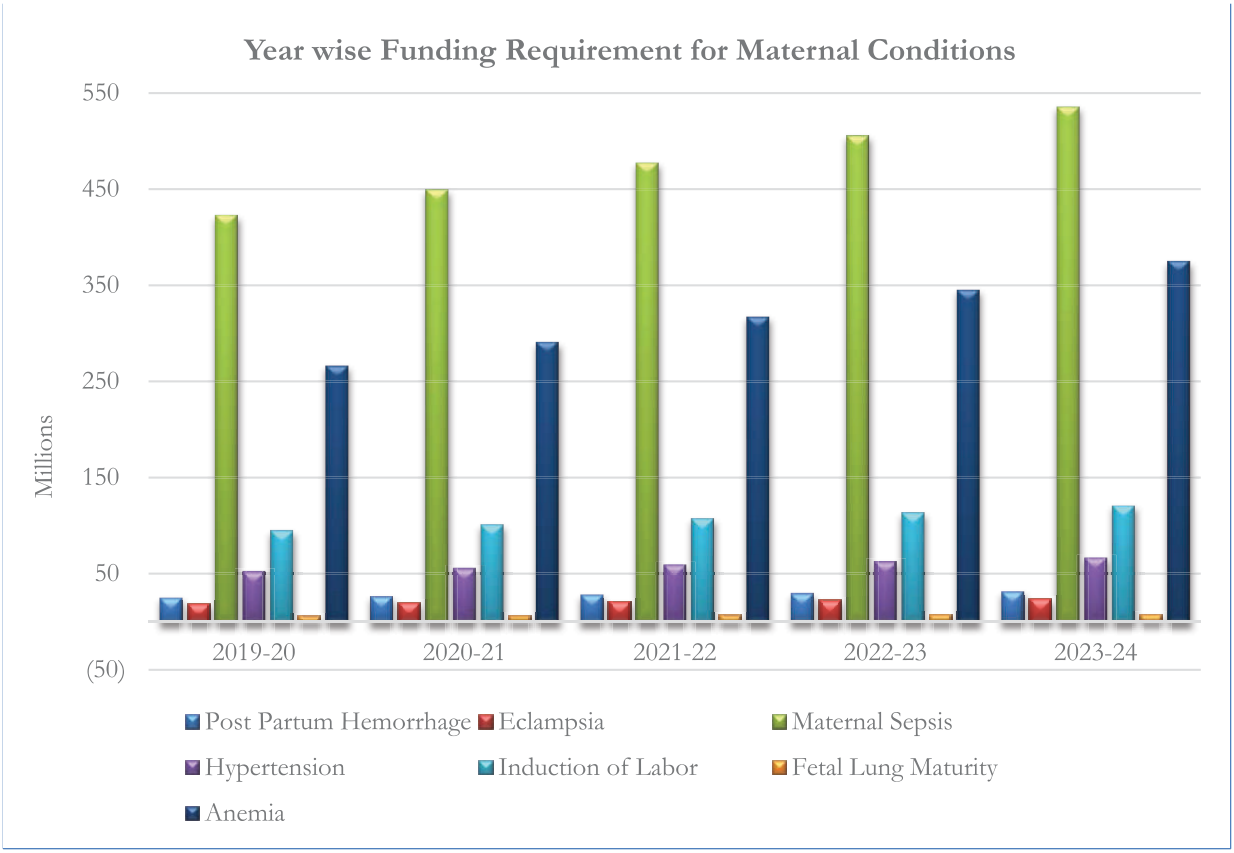


Figure 4: Year-wise Financing Requirement for Different Maternal Conditions

## Year-wise Funding Requirement for Contraceptives

Figure 5 shows the year wise financing requirement for the Department of Health, Govt. of Punjab. It
reflects the year wise financing requirement for different birth spacing methods. Of this year wise requirement, condom and combined oral pills have the maximum contribution over the years, followed by 3-month injection and copper-T.

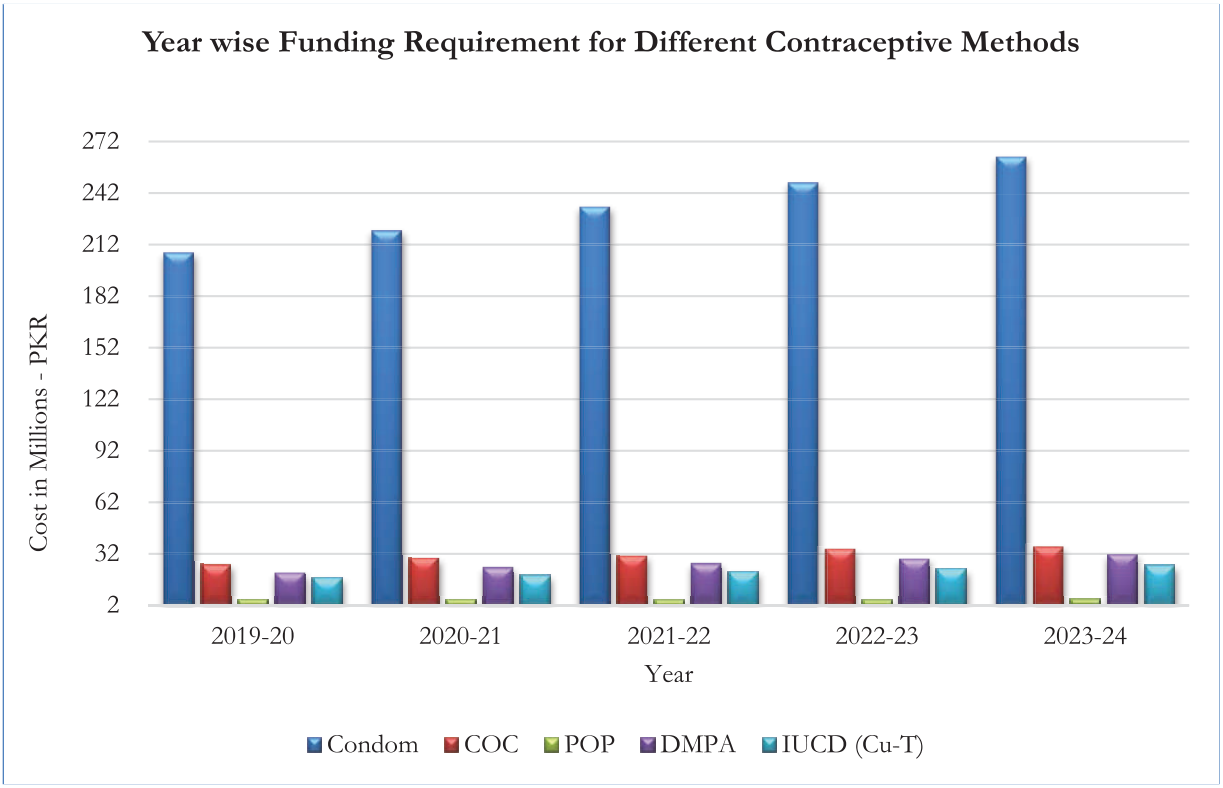


Figure 5: Year-wise Financing Requirement for Different Family Planning Methods

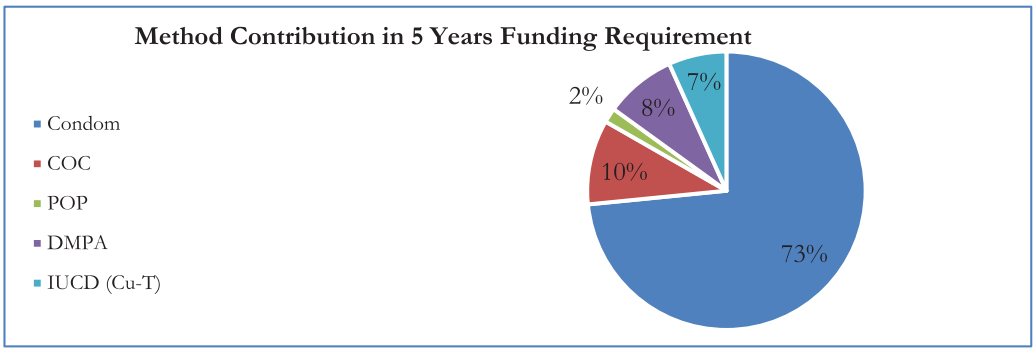


Figure 6: Method Contribution in 5 Years Financing Requirement for Family Planning Methods

## Year-wise Funding Requirement for Different Newborn and Child Conditions

Table 20 and figure 7 below shows the year wise financing requirement for the Department of Health, Govt. of Punjab. It reflects the total and year wise financing requirement for different newborn and child health conditions. Over the years, the yearly requirements for pneumonia, diarrhea and cord care conditions are reflected in table 20.

| Newborn & Child Conditions | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|---|---|---|---|---|---|
| Pneumonia | 145,509,807 | 160,438,035 | 176,462,916 | 193,645,618 | 212,050,086 |
| Diarrhea | 85,660,003 | 96,451,273 | 108,096,137 | 120,635,278 | 134,110,925 |
| Cord Care | 37,046,021 | 39,385,720 | 41,808,283 | 44,316,178 | 46,911,942 |
| Year Total PKR | 145,509,807 | 160,438,035 | 176,462,916 | 193,645,618 | 212,050,086 |

Table 20: Year-wise Financing Requirement for Different Newborn and Child Conditions

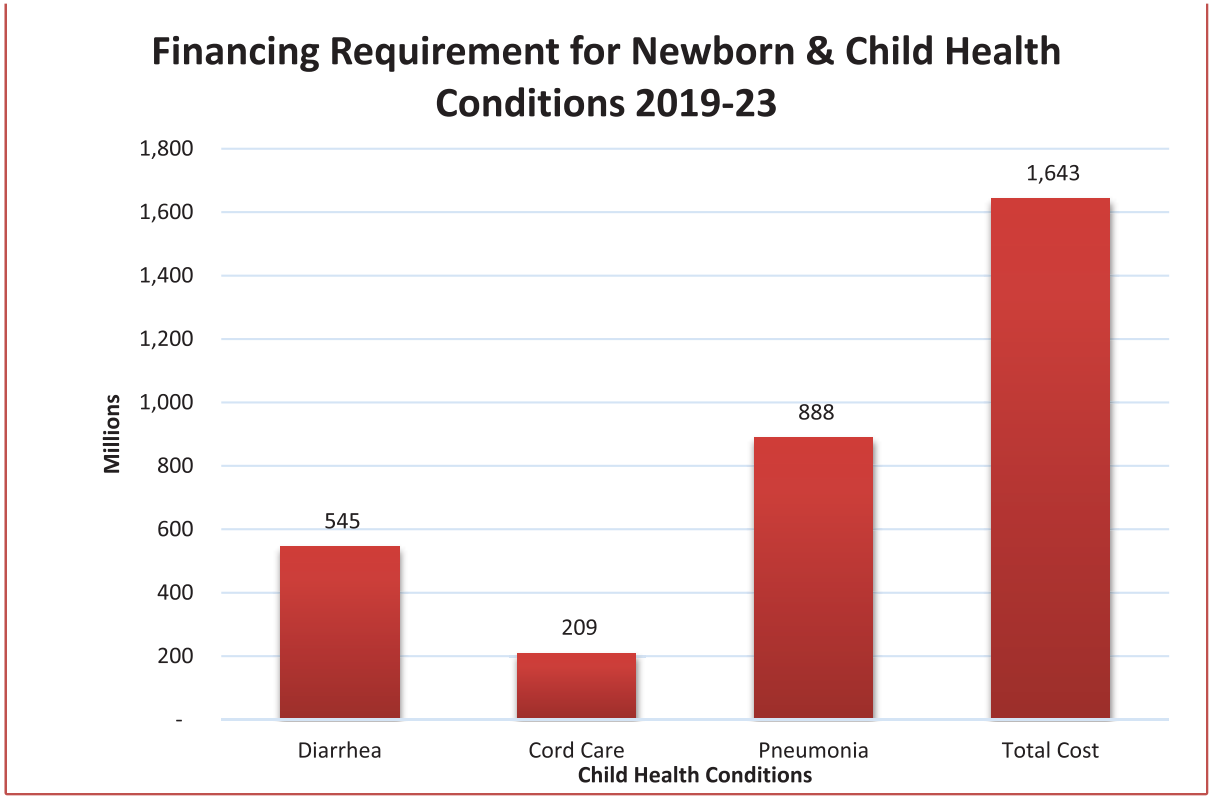


Figure 7: Five Years Financing Requirement for Newborn and Child Health Conditions

## 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, Punjab 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

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 20 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.

Producing accurate forecasts of these MNCH commodities remains a challenge in Punjab 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.

## Future Roadmap and Implementation plan:

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

- **Functional Forecasting and Quantification Technical Working Group (TWG) at Provincial Level**
  The health department need to hold regular meetings of notified 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.

## RECOMMENDATIONS

- Because there is lack of availability of quality information or data on the actual consumption of essential medicines, MNCH program, DOH, Punjab 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 Punjab 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 IRMNCH & Nutrition Program, Department of Health, Govt. of Punjab January 2019


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**NOTIFICATION**

Following "Very Essential Medicines List (VEML)" for Maternal New Born & Child Health (MNCH) is hereby notified with immediate effect to ensure the stocks availability at primary & secondary level health facilities across the province

| Sr. # | Generic Drug Name | Form | Strength | Indication |
|---|---|---|---|---|
| 1 | misoprostol | tablets | 200 mcg | prevention of post-partum hemorrhage |
| 2 | oxytocin | injection | *10 IU in 1-ml | treatment of post-partum hemorrhage |
| 3 | sodium lactate | ringer's lactate infusion | infusion,1000ml contains calcium chloride 0.2gm U.S.P.; potassium chloride 0.3gm U.S.P.; sodium chloride 6 gm U.S.P.; sodium lactate 3.1gm U.S.P.; sterile water for injection | |
| 4 | dinoprostone (prostaglandin E2) *[c]* | vaginal gel/tablets /pessary | 2/3 mg | induction of labor |
| 5 | magnesium sulphate | injection | 500mg/ml | severe pre-eclampsia and eclampsia |
| 6 | hydralazine (hydrochloride) | injection | 20 mg | management of severe hypertension |
| 7 | methyldopa | tablets | 250mg, 500 mg | |
| 8 | Ceftriaxone | injection | 250mg, 500 mg and 1 g | maternal sepsis |
| 9 | gentamicin (sulfate) | injection | 40mg, 80 mg | |
| 10 | metronidazole | injection | 500 mg in 100-ml | |
| 11 | dexamethasone (disodium phosphate) | injection | 4 mg / ml | improvement of fetal lung maturity |
| 12 | Amoxicillin | syrup | 125mg & 250mg /5ml | pneumonia |
| | | Injection | 250mg, 500 mg | |
| | | Dispersible Tablets | 250 mg, 500mg | |

| Sr. # | Generic Drug Name | Form | Strength | Indication |
|---|---|---|---|---|
| 13 | ORS (low osmolarity) | dry mixture (low osmolarity formula) in sachet for 1 liter of solution | each sachet contains glucose anhydrous 13.5gm B.P. , trisodium citrate dihydrate 2.9 gm B.P , potassium chloride1.5gm B.P. , sodium chloride 2.6gm B.P. | diarrhea |
| 14 | zinc sulphate | Syrup / scored dispersible tablets | 20 mg | |
| 15 | chlorhexidine digluconate (7.1%) | gel | equivalent to 4 % chlorhexidine | *antiseptics for cord care* |
| 16 | Ferrous Salt / Folic Acid / Ferrous Sulphate + Folic Acid | tablets | tablet, equivalent to 60 mg iron + 400 mcg folic acid | anemia |
| 17 | Condoms | piece | non-colored, silicone lubricated latex | Birth spacing |
| 18 | Injectable contraceptives | injection | Medroxyprogesterone acetate – 150 mg/ml in 1 ml vial | Birth spacing |
| 19 | Oral contraceptive pills (COC) | Cycle | 0.15 mg levonorgestrel + 0.03 mg ethinyl estradiol, 75 mg ferrous fumarate | Birth spacing |
| | Oral contraceptive pills (POP) | Tablets | Lynestrenol 500mcg | |
| 20 | IUCD with graduated inserter | piece | Copper-containing device (TCu380A) | Birth spacing |

*Where the [c] symbol is placed next to the complementary list it signifies that the medicine(s) require(s) specialist diagnostic or monitoring facilities, and/ or specialist medical care, and/ or specialist training for their use.*

** In Pakistan 5 IU in 1-ml is available*

**Program Director**
IRMNCH & Nutrition Program, Punjab

No. 258-333 /IRMNCH Dated Lahore the 4th Jan, 2019

A copy is forwarded for information and necessary action to

1. The Secretary, Primary & Secondary Healthcare, Govt. of the Punjab
2. The Director General Health Services, Punjab Lahore
3. All Chief Executive Officers, District Health Authorities in Punjab
4. Procurement Specialist, P&SHC Department, Govt. of the Punjab
5. All District Coordinators, IRMNCH & Nutrition Program in Punjab

**Program Director**
IRMNCH & Nutrition Program, Punjab


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