HEALTH COMMODITES FORECAST

2021-22 to 2026-27

VERY ESSENTIAL MNCH COMMODITIES

DEPARTMENT OF HEALTH
GOVERNMENT OF BALOCHISTAN

Forecasting Exercise for the Very Essential Maternal, Newborn, and Child Health Commodities for the Government of Balochistan

September 2021

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

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Acronyms

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

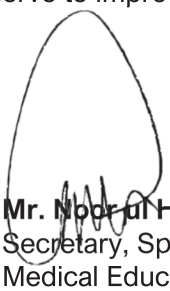
Foreword

Forecasting and supply planning (FASP) lays 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. For improved accuracy and timeliness of forecasting and supply planning for these very Essential Commodities, there was a need for having a structured mechanism for accurate FASP with dedicated trained staff.

This forecasting exercise on complete range of FP products for both departments and MNCH commodities as per Very Essential Medicines List (VEML) is based on logistics, demographic and morbidity indicators and enhancement in service delivery.

We would like to express our gratitude to the United States Agency for International Development (USAID) Pakistan and Global Health Supply Chain Program, Procurement and Supply Management (GHSC-PSM) Project for reviewing and updating province focused forecast through its implementing partner SysReforms International Private Limited.

The technical assistance will help the department in strengthening the provincial planning, procurement processes. Estimation of these maternal, newborn, and child health (MNCH) life-saving commodities will serve to improve the survival and quality of care for millions of women and children in Pakistan.



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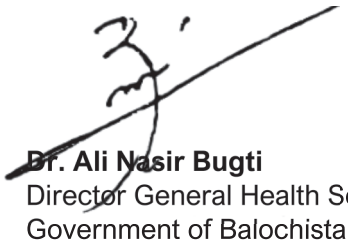
Acknowledgement

In 2017, With the technical support of United States Agency for International Development (USAID), Global Health Supply Chain Program, Procurement and Supply Management (GHSC-PSM) Project, the Department of Health, Government of Balochistan had developed a province-focused forecast for the MNCH commodities listed in the Very Essential Medicines List (VEML) of Balochistan.

As per the mandate of USAID, GHSC-PSM Project continues to lend its technical expertise to support forecasting and supply planning of FP and MNCH commodities in Balochistan. The SysReforms technical experts in coordination with GHSC-PSM and DOH Balochistan reviewed and updated the forecast for next 5 years i.e., 2021-22 to 2026-27. This forecast will not only strengthen the procurement processes but will also become a stepping stone towards the human resource capacity building of of DOH Balochistan. In addition, it is aimed at the successful transition of all forecasting and supply planning activities to provincial government which can lead towards the achievement of global supply planning benchmarks.

The DOH highly appreciates the auspicious and productive support of USAID/Pakistan towards strengthening the health sector of the province. We acknowledge the leadership of Dr. Enilda Martin, Director, Health Office, USAID Pakistan, Mr. Khalid Mahmood, Project Management Specialist, USAID Pakistan, Dr. Muhammad Tariq, Country Director, USAID Global Health Supply Chain Program Procurement and Supply Management (GHSC-PSM) project, Chemonics International and invaluable technical assistance of GHSC-PSM and SysReforms International Private Limited technical teams for their devoted efforts and support provided in in the revision of this 5-year forecast.

I would like to express my deepest appreciation to all the relevant public-sector stakeholders, development partners, experts, and medical professionals for reviewing, contributing, guiding, and supporting the Forecasting of MNCH commodities for Balochistan.



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Director General Health Services
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1. Introduction & Background

Forecasting and Supply Planning (FASP) is the foundational step towards an ultimate product availability for the patients. Emerging disease trends and evolution of disease burden requires constant updating of FASP strategy and approach. Changes in treatment effectiveness over time also entails updating of Essential Medicine List (EML) and subsequent alignment of FASP strategy with EML. There are sometimes newer and effective drugs which need to be included in EML and conversely some drugs may become less effective due to emerging resistance of pathogens or other factors.

Availability of life saving commodities in Pakistan particularly in the remote and impoverished areas like Balochistan requires careful planning and management. Already constraint resources need to be spent on optimal quantities of medicines to maintain uninterrupted supplies on one hand but avoiding wastages and expires on the other. Government of Balochistan in collaboration with the developing partners has incrementally improved supply chain management of health commodities and quality of health care ser vices. However, despite a specific focus and involvement of multiple stakeholders, the health indicators remain far from ideal compared to other provinces of Pakistan (1). Infant and children under five years mortality rates are 66 and 78 deaths per 1,000 live births respectively. Neonatal mortality rate has considerably reduced to 33 deaths per 1,000 live births as compared to 66 deaths per PDHS 2012-13 (2). The average population growth rate is 3.37% per annum (3).

The major causes of maternal death s reported are due postpartum hemorrhage, eclampsia, hypertension, and other indirect obstetric causes. Infant and newborns deaths are primarily due to premature births, asphyxia, and infections. Diarrhea and acute respiratory infections predominately contribute to these mortality rates. Lack or absence of required commodities renders the programs and services ineffective, which results in failure to avoid most of these preventable deaths.

Keeping in view the above facts, there was dire need to have consistent and uninterrupted accessibility of FP and MNCH items in all facilities of the province. Department of Health, Government of Balochistan realized a need of mechanized forecasting tool contrary to conventional factorization approach for the forecast of health commodities used by the department officials. This conventional approach involved estimation of past distribution data to the facilities to calculate the needs for essential commodities which ultimately led to the irregular inventory, stock-outs of some important medicines, and use of emergency orders.

To address this challenge and to have formalized and structured forecast mechanism, DOH Balochistan requested GHSC-PSM Project, Pakistan, implemented by Chemonics International, to improve forecasting and supply planning of MNCH commodities. GHSC-PSM Pakistan since 2017, has been providing technical assistance to Government of Balochistan and relevant stakeholders in improving supply chain indicators in the province. On the request by the department, GHSC-PSM mobilizing its resources conducted a consultation with public health specialists, and as a result DOH Balochistan notified its first ever MNCH very essential medicines list. This list had 25 priority commodities across the Maternal, Newborn, and Child Health (MNCH) health care domain that needs to be available at each health facility, thereby reducing maternal and neonatal deaths. Thereafter, in the same year, based on logistics, demographic, and morbidity indicators, GHSC-PSM technical experts developed 5 years forecast for MNCH VEML for Balochistan i.e., 2017-18 to 2022-23.

In 2021, GHSC-PSM continuing its legacy and on the request of department through its implementing partner SysReforms International Private Limited conducted a consultative meeting where MNCH VEML 2021 was updated. The activity was held on June 15, 2021, at Quetta which involved detailed deliberations and consensus between the technical experts and specialists of DOH Balochistan, GHSC-PSM and SysReforms International. The updated EML for 2021, containing 33 products was approved with inclusion of more drugs and contraceptives, During the meeting, consensus on forecasting methodology was also built on this comprehensive harmonized forecast for all MNCH very essential medicines.

With the goal to optimize a data-driven procurement system and prevent stocks outs and overstocking, the objectives of MNCH VEML forecasting outlined below:

01 Determine the provincial needs and prepare forecast for 33 very essential MNCH commodities for the period 2021-22 to 2026-27.

02 Review the established estimates and reduce gaps to formulate regular forecasting and supply planning approaches and to address those gaps.

03 Assist the department to ensure regular use of a formal MNCH forecasting and pipeline monitoring system within the Department of Health. Help DOH in gauging the performance of forecasting and procurement processes through this system

This activity will help the department to take accurate procurement decisions for the MNCH commodities. This report will facilitate the procurement specialists to procure coveted number of products, thereby optimizing stock levels at facilities ultimately reducing maternal and child deaths.

2. Methodology

Forecasting of essential medicines is complex process that involves the use of appropriate tools for prediction of future consumption of health commodities. This process is influenced by the choices of these methods and related medical conditions and complications associated with these health commodities. Based on various indicators and assumptions, adjustments are also made to develop aggregated forecast. Therefore, forecasting methodology pertains to the quantitative analysis of the estimated requirements for specific products.

The methodology involves reviewing of existing and available data and then applying the algorithms for forecasting of each commodity. This is followed by thorough review by respective experts to finalize the methodology.

Scope:

This forecast includes 33 very essential MNCH commodities. Below table shows the updated MNCH VEML segregated by maternal and child health care products prioritized by the Department of Health, Balochistan in consultations with the technical specialists. It pertains to the estimated requirements of these commodities for health services provided at district and sub-district level public health facilities in the province. Covering the timeframe of five years, this exercise also includes estimates of FP products, which are crucial for the department to provide to couples requiring birth spacing.

Very Essential MNCH List 2021		
#	Generic Drug Name	Indications
Commodities for Maternal Health		
1	misoprostol	prevention of post-partum hemorrhage
2	oxytocin	
3	sodium chloride	
4	sodium lactate	
5	magnesium sulphate	severe pre-eclampsia and eclampsia
6	calcium gluconate	
7	phenobarbital	
8	diazepam*	
9	paracetamol	palliative care and pain
10	labetalol	hypertension
11	hydralazine* (hydrochloride)	
12	methyldopa	
13	metronidazole	maternal sepsis
14	levonorgestrel	emergency contraception
15	Cu-T 380 A	postpartum IUCD insertion
16	depot medroxyprogesterone acetate	Injectable contraceptive
17	norethisterone	progesterone only pill (oral contraceptive)
18	nifedipine*	inhibition of uterine contractions
19	ampicillin (as sodium salt)	maternal sepsis, neonatal pneumonia, neonatal sepsis
20	gentamicin	
Commodities for Neonatal & Child Health		
21	amoxicillin	childhood pneumonia

22	fosfomycin	urinary tract infection
23	cefixime	sexually transmitted infections
		pneumonia, possible serious bacterial infection
24	cefotaxime*	pneumonia, neonatal sepsis, maternal sepsis, possible serious bacterial infection
25	ceftriaxone*	
26	salbutamol sulphate / albuterol*	
27	dexamethasone (disodium phosphate)	improvement of fetal lung maturity
28	zinc sulfate	diarrhea
29	low osmolarity oral rehydration salts	
30	dextrose	
31	vitamin A	treatment of measles complications
32	vitamin K1* (phytonadione)	prevention of coagulation disorders in premature neonates
33	chlorhexidine digluconate	antiseptics for cord care

3. Types of Forecasts

Various predictive models could be used to forecast health products. The goal of forecast is the estimate the future demand. Mapping of actual demand through surveys may not be possible in most settings as they are costly and cannot be frequently conducted. However, there are other feasible alternatives as discussed below.

- **Morbidity based:** Estimates based on morbidity data basically translate the disease burden to products. Disease burden is mostly estimated through population-based surveys.
- **Consumption based:** product consumption data, where well recorded and maintained, provide a useful insight into the future requirements. If product is in full supply with minimal stockouts and facilities are covering most of the population, the product consumption will correlate well with product demand.
- **Services data based:** The services data also provides key insights into the future product requirements. Though, less accurate than morbidity-based data, it can reliably be used as a proxy for demand in settings where health seeking behaviors are optimal and outreach of services are almost universal.

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. Following basic data elements are required for morbidity data-based forecasting

1. Approved medicine list
2. Standard treatment guidelines, inclusive of recommended treatment regimen for all types of illnesses and conditions in which a certain product is planned to be used.
3. Packaging and formulation related information of the product
4. Morbidity/disease burden data, preferably from a reliable and generalizable population-based survey.

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	x	Number of expected treatment episodes of the health problem

Quantity for a specified course of treatment 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.

Collection and compilation of data

Provincial consultation was held to understand the provincial program strategy to procure and supply the MNCH very essential products. Current treatment strategies and guidelines were obtained from health department. Morbidity data was obtained mostly from Pakistan Demographic & Health Survey 2017-18 (1). In case specific data was not available from PDHS 2017-18, other studies were used with the order of preference of large-scale studies in Balochistan to studies in Pakistan, in the region or globally (specific references have been provided in results section for each product forecast). The 2017-18 forecasting exercise was thoroughly review and adaptations and improvements were made based on it wherever applicable and feasible. In situations where no reliable data was available, careful assumptions were made and noted down in the analysis.

Data Analysis

Product specific algorithms were developed initially. These algorithms estimated the number of users. The estimates were based on recent census data (3) , further breaking it down by population age groups and segments and then applying the disease incidence/prevalence rates on it. The number of users were then converted to the required products based on the treatment guidelines. The exercise was done on Excel templates, one Excel sheet per product. The outcome was robust tool which can be used by Balochistan province or districts to adapt/modify their forecasts as per their needs or changing scenarios.

Forecasting Steps

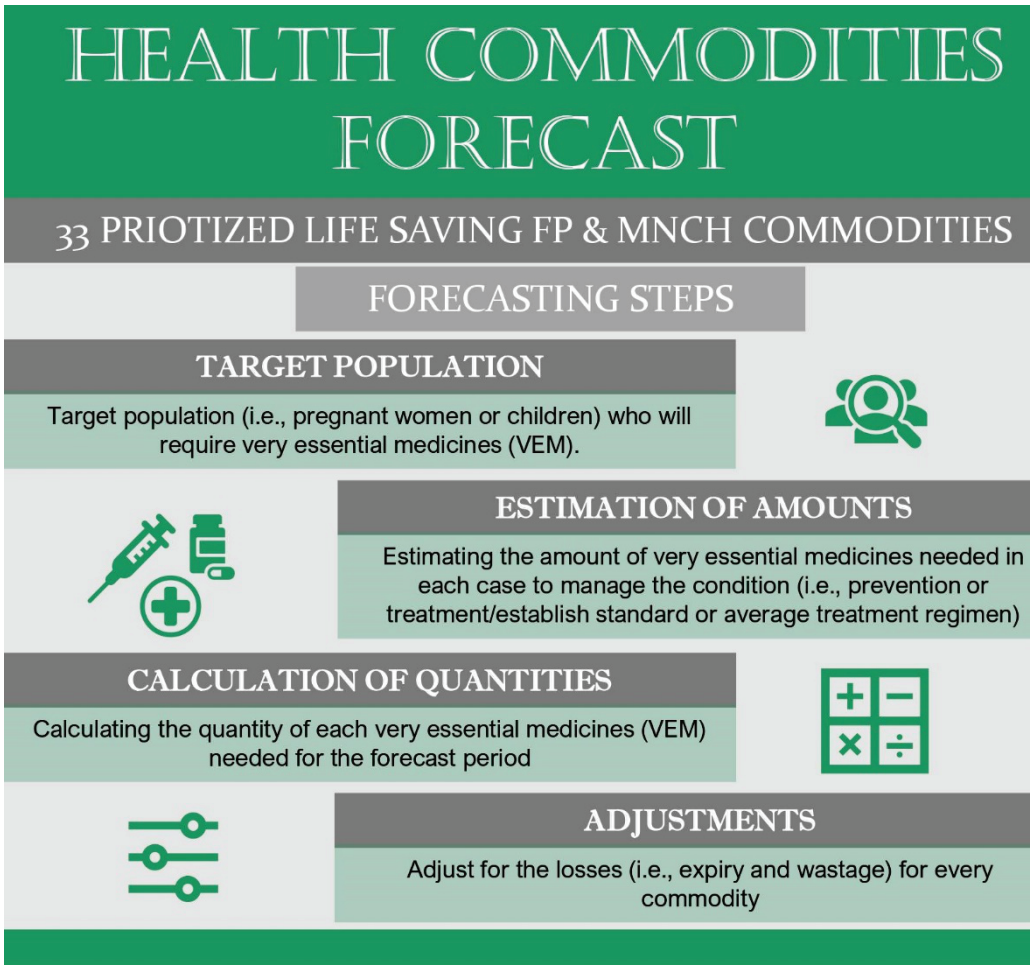
Following are the key forecasting steps of calculations, generally used for all products.

1. Target population (i.e., pregnant women or children) who will require very essential medicines (VEM).
2. Estimating 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. Calculating the quantity of VEM needed for the forecast period
4. Adjusting for losses (i.e., expiry and wastage)

Treatment Protocols

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.

Below infographic depicts the steps involved in forecasting of 33 prioritized health commodities



4. Results

125,058
125,487
124,000
105,450
154,568
56,845
110,000
150,000
35,000
95,054
97,511
99,011
99,216
101,090
101,684
101,962

Misoprostol

For prevention of Post-partum Hemorrhage

Given the injectable route of administration for oxytocin, its use may not be feasible in settings which may have limited human resource or infrastructure. Most trained birth attendants in Pakistan's settings are unlikely to use it home deliveries.

Misoprostol is a good alternative to oxytocin. 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 maybe the only available technology to control PPH. Misoprostol has been proven to act as an effective uterotonic is inexpensive, can be taken orally, does not need refrigeration, and has a long shelf-life.

Recognizing a need for strategies to prevent PPH among women who give birth at home without a skilled provider, the provincial MNCH program provides three 200 mcg tablets of misoprostol to women immediately after delivery under the direct supervision of a community midwife / lady health worker. It should be noted that the current recommendation of the World Health Organization is for three 200 mcg tablets dose. Women are also counseled on the use of misoprostol during antenatal visits.

Summary of Data Needed for Forecasting Misoprostol

- Target population (total number of pregnancies)
- Percent deliveries in public health facilities Balochistan
- Number of public health facility deliveries
- Number of public facility deliveries requiring Misoprostol for prevention of PPH
- Standard or average treatment regimen (i.e., amount of misoprostol needed for each case to prevent risks of PPH (three per woman)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for this calculation of misoprostol is:

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

The associated summary outputs for Misoprostol are shown in Table 1. By applying the different attributes and assumptions the forecasted number of pregnancies for the year 2021-22 and 2026- are estimated at 0.47 million and 0.56 million, respectively. We have estimated that 17% of women will receive public facility delivery service in 2017-18. It is also assumed that 80% of the total number of pregnant women seeking delivery in public sector facility will be given Misoprostol for PPH prevention. Thus, based on these assumptions we estimated that 65,556 and 99,996 pregnant women in 2021-22 and 2026-27, respectively will be administered Misoprostol tablets to prevent PPH. Applying these parameters, we estimate the number of misoprostol tablets (3 x 200ug tablets / pregnant woman) that needs to be procured for public facilities is 206,502 for 2021-22 and 314,987 for 2026-27

Table 1. Forecasted Number of Misoprostol Tablets

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) % of public health facilities deliveries (13.1% PDHS 2017-18) assuming deliveries increases by 1% annually	17%	18%	19%	20%	21%	22%
C) # of health facility deliveries (C = A × B)	81,945	89,660	97,802	106,391	115,448	124,995
D) Prevention of PPH (Assuming 80% of deliveries given Misoprostol) D=Cx80%	65,556	71,728	78,242	85,113	92,359	99,996
E) Requirement of Misoprostol (3 x 200ug tablet) for Prevention of PPH in public health facility deliveries (E = D × 3)	196,668	215,185	234,726	255,340	277,076	299,988
F) 5% Wastage	9,833	10,759	11,736	12,767	13,854	14,999
G) Total Requirement of Misoprostol for PPH prevention including wastage	**206,502**	**225,944**	**246,462**	**268,107**	**290,930**	**314,987**
B) Prevalence of PPH	34%	34%	34%	34%	34%	34%
C) # of PPH cases (C = A × B)	162,932	168,423	174,099	179,966	186,031	192,300
D) % of PUBLIC Health Facilities Deliveries (13.1% PDHS 2017-18) assuming HF Deliveries increases by 1% annually	17%	18%	19%	20%	21%	22%
E) # of PPH Cases seeking treatment from Health Facilities	27,861	30,485	33,253	36,173	39,252	42,498
F) Requirement of Misoprostol (3 tab x 200ug) for Prevention of PPH in PUBLIC HF Deliveries	83,584	91,454	99,758	108,519	117,757	127,495
G) 5% Wastage	4,179	4,573	4,988	5,426	5,888	6,375
H) Total Requirement of Misoprostol for Prevention of PPH in PUBLIC HF Deliveries	87,763	96,026	104,746	113,945	123,645	133,869
I) Requirement of Misoprostol (4-tabs x 200ug) for Treatment of PPH in HF Deliveries	111,445	121,938	133,011	144,692	157,010	169,993
J) 5% Wastage	5,572	6,097	6,651	7,235	7,850	8,500
K) Total Requirement of Misoprostol for PUBLIC HF Deliveries PPH treatment including wastage	**117,018**	**128,035**	**139,662**	**151,927**	**164,860**	**178,493**
L) Total Requirement of Misoprostol for PUBLIC HF Deliveries PPH prevention and treatment including wastage (L=G+K)	**323,520**	**353,979**	**386,124**	**420,034**	**455,790**	**493,480**

Oxytocin

For management of Post-partum Hemorrhage

Postpartum hemorrhage (PPH) is one of the leading causes of maternal mortality in Pakistan. Prevalence of 7% has been reported in some urban settings in Pakistan (4) . However, prevalence as high as 21% has been reported in rural settings of Khyber Agency (5). 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.

All women giving birth should be offered uterotonics during the third stage of labor for the prevention of PPH. Oxytocin is the medicine that is most effective in preventing and treating postpartum hemorrhage. Oxytocin is most often available in 1 ml glass vials, containing 10 IU, and is administered by injection into a woman's vein or muscle.; doses range between 10 IU for prevention of postpartum hemorrhage and up to 40 IU 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 (total pregnancies)
- Prevalence of PPH in Pakistan
- Percent deliveries in public health facilities Balochistan
- 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 treatment)
- 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 facility births**	**x**	**Propo tion of women who require treatment for PPH**	**x**	**Dose per case for 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 2. By applying the different attributes and assumptions the forecasted number of pregnancies for the year 2021-22 and 2026-27 are estimated at 0.47 million and 0.56 million, respectively. We have estimated that 17% of women will receive public facility delivery service in 2021-22. Thus, based on this assumption the total number of estimated PPH cases seeking treatment from facility in the public sector will be 27,861 and 42,498 in 2021-22 and 2026-27, respectively. Applying these parameters, we estimate the number of doses (10 IU) of oxytocin that needs to be procured for public facilities is 117,018 for 2021-22 and 178,493 for 2026-27.

Table 2. Forecasted Oxytocin Requirements

Total Population (projected, based on 2017 census - GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) Prevalence of PPH	34%	34%	34%	34%	34%	34%
C) # of PPH cases (C = A × B)	162,932	168,423	174,099	179,966	186,031	192,300
D) % of public health facilities deliveries (13.1% PDHS 2017-18) assuming deliveries increases by 1% annually	17%	18%	19%	20%	21%	22%
E) # of PPH Cases seeking treatment from public health facilities	27,861	30,485	33,253	36,173	39,252	42,498
F) Requirement of Oxytocin (40 IU= 4 x 10 IU vial) for treatment of PPH	111,445	121,938	133,011	144,692	157,010	169,993
G) 5% wastage	5,572	6,097	6,651	7,235	7,850	8,500
H) Total Requirement of Oxytocin for PPH treatment including wastage	117,018	128,035	139,662	151,927	164,860	178,493

Sodium Chloride

For management of Post-partum Hemorrhage

Intravenous fluid management could be a key lifesaving intervention in complications such as PPH. Intravenous sodium chloride could be vital to averting hypovolemic shock in cases of heavy bleeding. It is also used for correction of electrolyte imbalance.

Summary of Data Needed for Forecasting of Sodium Chloride (NaCl)

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

Formula used for the calculation of Sodium Chloride;

Inj Sodium Chloride Need for PPH Management	**=**	**Total Expected pregnancies**	**x**	**Proportion of public health facility deliveries**	**x**	**Number of PPH cases attending public health facility for treatment**	**x**	**Dose per PPH case for management**

By applying the different attributes and assumptions, the number of pregnancies for the year 2021-22 and 2026-27 are estimated at 0.47million and 0.56 million, respectively. It is estimated that 13.1% of pregnant women with PPH will attend public facility for treatment in 2017-18. Based on these assumptions, the estimated number of PPH cases in the public sector will be27,861 and 42,498 in 2021-22 and 2026-27, respectively. Applying these parameters, the number of doses pertaining to NaCl that needs to be procured for public facilities is 58,509 for 2021-22 and 89,246 for 2026-27. The associated summary outputs for Inj. NaCl are shown in Table 27.

Table 3: Forecasted Sodium Chloride Requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) Prevalence of PPH	34%	34%	34%	34%	34%	34%
C) # of PPH cases (C = A × B)	162,932	168,423	174,099	179,966	186,031	192,300
D) % of public health facilities deliveries (13.1% PDHS 2017-18) assuming HF Deliveries increases by 1% annually	17%	18%	19%	20%	21%	22%
E) # of public health facilities deliveries	27,861	30,485	33,253	36,173	39,252	42,498
F) Requirement of Inj. Sodium Chloride (1000 ml) for Treatment of PPH	55,723	60,969	66,506	72,346	78,505	84,996
G) 5% Wastage	2,786	3,048	3,325	3,617	3,925	4,250
H) Total Requirement of Sodium Chloride for PPH treatment including wastage	**58,509**	**64,017**	**69,831**	**75,964**	**82,430**	**89,246**

Sodium Lactate Compound Solution (Ringer's Lactate)

For treatment of Post-partum Hemorrhage

Ringer's lactate solution (RL) is infused for replacing fluids and electrolytes in those who have low blood volume when treating for PPH. It 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

During PPH patient can go into hypovolemic shock, which can be prevented by infusion of intravenous solutions. IV fluids also help restore the electrolyte balance.

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 Balochistan
- 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**

An estimated number of 27,861 pregnant women will receive public facility delivery service in 2021-22 and 42,498 in 2026-27, respectively. Applying these parameters, total doses of Ringer's Lactate are estimated to be 58,509 for 2021-22 and 89,256 for 2026-27 as shown in Table 4.

The associated summary outputs for Ringer's Lactate are shown in Table 4. By applying the different attributes and assumptions, the forecasted number of pregnancies for the year 2021-22 and 2026-27 are estimated at 0.47 million and 0.56 million, respectively.

Table 4: Forecasted Ringer's Lactate requirements

Total Population (projected, based on 2017 census -GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) Prevalence of PPH	34%	34%	34%	34%	34%	34%
C) # of PPH cases (C = A × B)	162,932	168,423	174,099	179,966	186,031	192,300
D) % of public health facilities deliveries (13.1 PDHS 2017-18)	17%	18%	19%	20%	21%	22%
E) # of PPH cases attending public facility	27,861	30,485	33,253	36,173	39,252	42,498
F) Requirement of Inj. Ringers Lactate (1000 ml) for treatment of PPH	55,723	60,969	66,506	72,346	78,505	84,996
G) 5% Wastage	2,786	3,048	3,325	3,617	3,925	4,250
H) Total requirement of Ringers Lactate for PPH treatment including wastage	**58,509**	**64,017**	**69,831**	**75,964**	**82,430**	**89,246**

Magnesium Sulfate

For management of Eclampsia

The incidence of pregnancy related hypertension or pregnancy induced is reported to be 9.3% in Pakistan (6). A small-scale hospital-based study has reported a lower prevalence of 5.6% (7). There are many adverse maternal and fetal outcomes of PIH. The most common consequence of PIH are pre-eclampsia and eclampsia with a further possibility of placental abruption and postpartum hemorrhage as an outcome. 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 tonic–clonic seizures are not attributable to other causes (e.g., epilepsy).

Magnesium sulfate recommended for the prevention and treatment of pre- and eclampsia in preference to other anticonvulsants (8) . It is a lifesaving drug and should be available in all health-care facilities throughout the health system. 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.

Summary of Data Needed for Forecasting Magnesium Sulfate

- Target population (expected number of pregnancies)
- Percent deliveries in public health facilities of Balochistan
- Number of public health facility deliveries
- Number of pregnancies in facility 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 $MgSO_4$)

The pregnancy complications were estimated to be 3%. This figure was used to estimate the number of women requiring magnesium sulfate during pregnancy. Out of total of 12,591 pregnancies complicated with pre-/eclampsia, 2,458 pregnant women are estimated to visit public facility for prevention /treatment of PE/E during the forecasting period of 2021/22. A total of 113,576 gm (2 ml Ampoule) magnesium sulfate is required for 2021/22 while a total of 22,715 gm (10 ml Ampoule) is required for the same year, which is to be administered using Pritchard Regime. Table 5 shows the complete factorization for the forecast of Magnesium sulfate.

Table 5. Forecasted Number of Magnesium Sulfate

Total Population (projected, based on 2017 Census - GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of Pregnancies estimated to be complicated with PE/E (3%)	14,376	14,861	15,362	15,879	16,414	16,968
(C) % of women seeking care from public health facilities (13.1% PDHS 2017-18) assuming 1% annual increase	17%	18%	19%	20%	21%	22%
(D) # of health facility deliveries (D = B × C)	2,458	2,690	2,934	3,192	3,463	3,750
(E) Requirement of MgSO4 (in GMs) for treatment of Eclampsia (Pritchard Regime= 44gm/case of eclampsia)	108,168	118,352	129,099	140,437	152,392	164,993
(F) 5% Wastage -in GMs	5,408	5,918	6,455	7,022	7,620	8,250
(G) Net Requirement of MgSO4 (in GMs) for Eclampsia treatment (including wastage) G= E+F	113,576	124,269	135,554	147,459	160,011	173,243
(H) Requirement of Inj. MgSO4 (2 ml Ampoule --500 mg/ml) H=G	113,576	124,269	135,554	147,459	160,011	173,243
(I) Requirement of Inj. MgSO4 (10 ml Ampoule --500 mg/ml) I = G / 5 gm	**22,715**	**24,854**	**27,111**	**29,492**	**32,002**	**34,649**

Calcium Gluconate

For management of Pre-Eclampsia/Eclampsia

Calcium Gluconate is used to treat Pre-eclampsia and Eclampsia which is one the leading cause of maternal death. Pre-eclampsia and eclampsia also pose a serious fatality risk to the babies as well. The blood pressure in eclampsia is managed by taking Calcium Gluconate which is injected intravenously. In populations with low dietary calcium intake, daily calcium supplementation (1.5 g - 2.0 g oral elemental calcium) is recommended by WHO for pregnant women to reduce the risk of pre-eclampsia (9).

Summary of Data Needed for Forecasting Calcium Gluconate

- Target population (total expected pregnancies)
- Number of pregnancies complicated by PE/E
- Percent deliveries in public health facilities of Balochistan
- Number of public facility deliveries requiring Calcium Gluconate for treatment of PE/E
- Standard or average treatment regimen (i.e., amount of calcium Gluconate needed for each case to prevent PE/E (Calcium Gluconate: injection 100 mg/ml in 10-ml ampoule
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of calcium Gluconate is:

Calcium Gluconate Need for PE/E cases	**=**	**Expected pregnancies**	**x**	**Proportion of public facility deliveries**	**x**	**Proportion of PE/E cases consulting public facilities**	**x**	**Dose per PE/E case**

A total of 14,376 women are estimated to require calcium gluconate for the year 2021-22. Out of these, 2,458 pregnant women will seek treatment from public health facilities. A total of 2,581 ampoules of Calcium Gluconate are required for 2021/22 which is to be administered intravenously. Table 6 shows the complete factorization for the forecast of Calcium Gluconate.

Table 6: Forecasted Number of Ampoules of Ca+ Gluconate for Pre-Eclampsia/Eclampsia

Total Population (projected, based on 2017 census-GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of pregnancies estimated to develop PE/E (3%)	14,376	14,861	15,362	15,879	16,414	16,968
C) % of pregnant women seeking care from public health facilities (13.1% PDHS 2012-13) assuming 1% increase / year	17%	18%	19%	20%	21%	22%
D) # of pregnant women with PE/ E seeking care from public health facilities	2,458	2,690	2,934	3,192	3,463	3,750
E) Requirement of Ca+ gluconate (1 Ampoule of 10 ml contains 1000 mg Ca+ gluconate) for management of PE/E (C= B x 1)	2,458	2,690	2,934	3,192	3,463	3,750
F) 5% Wastage -in Ampoules	123	134	147	160	173	187
G) Total Requirement of Ca+ Gluconate (in Ampoules) for management of PE/E G= E+F	2,581	2,824	3,081	3,351	3,637	3,937

Labetalol

For management of severe Hypertension

Labetalol can be used as an alternative to methyldopa for the management of Pregnancy Induced Hypertension (PIH). Labetalol is better tolerated than methyldopa and provides more efficient control of blood pressure (10). Labetalol is generally safe to administer in pregnancy, like methyldopa and nifedipine (11).

Summary of Data Needed for Forecasting Labetalol

- Target population (total expected pregnancies)
- Number of pregnancies estimated to develop Hypertensive disorders of pregnancy
- Percent deliveries in public health facilities of Balochistan
- Number of public facility deliveries requiring labetalol
- Proportion of women who require labetalol for management of hypertension Expected projected changes in consumption (potential loss or scale-up in use)
- Dose per case of hypertension

The formula used for this calculation of labetalol is:

labetalol needed for management of hypertension	**=**	**Expected pregnancies**	**x**	**Proportion of facility deliveries**	**x**	**Proportion of women who require labetalol for management of hypertension**	**x**	**Dose per case of hypertension**

A total of 4,097 pregnant women are estimated to require labetalol for the treatment of hypertension during the forecasting period (2021/22). A total of 25,813 of ampoules of labetalol would be required for 2021/22 which is to be administered intravenously. Table 7 shows the complete factorization for hydralazine forecast. An estimated 5% pregnancies are expected to be complicated by hypertensive disorders.

Table 7: Forecasting requirements for Labetalol

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total Pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies)	23,961	24,768	25,603	26,466	27,357	28,279
(C) % of Pregnant Women seeking care from Public Health Facilities (13.1%% PDHS 2017-18) assuming 1% increase / year	17%	18%	19%	20%	21%	22%
(D) # of Pregnant Women with HDP seeking care from Health Facilities	4,097	4,483	4,890	5,320	5,772	6,250
(D1) # of women treated with labetalol	50%	50%	50%	50%	50%	50%
(E) Requirement of labetalol HCl **(6 Ampoule of 50 mg each)** for Prevention / Treatment of HDP (E= B x 6 Ampoule)	24,584	26,898	29,341	31,917	34,635	37,498
(D) 5% Wastage **-in Ampoules**	1,229	1,345	1,467	1,596	1,732	1,875
(E) Total Requirement of labetalol HCl (1 Ampoule of 50 mg) for Treatment of HDP G= E+F	**25,813**	**28,243**	**30,808**	**33,513**	**36,366**	**39,373**

Hydralazine

For management of severe Hypertension

Hydralazine and labetalol are both used to treat pregnancy induced hypertension (PIH). Intravenous labetalol has been demonstrated to reduces the mean arterial blood pressure more than hydralazine (12). However, both drugs remain effective and safe antihypertensive agents for the management of PIH (13), and can be used interchangeably based on patient profile, healthcare settings and availability.

Hydralazine works by relaxing blood vessels (vasodilator) so blood can flow through the body more easily. Antihypertensive 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 Balochistan
- Number of public facility deliveries requiring Hydralazine for management HDP
- Standard or average treatment regimen i.e., amount of hydralazine needed for each case to manage hypertension (hydralazine injection 20 mg powder or 25 mg and 50 mg tablets.
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Hydralazine is:

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

A total of 4,097 pregnant women are estimated to require hydralazine for the treatment of hypertension during the forecasting period (2021/22). A total of 8,604 injections of hydralazine would be required for 2021/22 which is to be administered intravenously. Table 8 shows the complete factorization for hydralazine forecast. An estimated 5% pregnancies are expected to be complicated by hypertensive disorders.

Table 8: Forecasted Number of Injection Hydralazine Required to Manage Hypertension

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies)	23,961	24,768	25,603	26,466	27,357	28,279
C) % of pregnant women seeking care from public health facilities (13.1%% PDHS 2017-18) assuming 1% increase / year	17%	18%	19%	20%	21%	22%
D) # of pregnant women with HDP seeking care from public health facilities	4,097	4,483	4,890	5,320	5,772	6,250
E) Requirement of Hydralazine HCl **(1 Ampoule of 20 mg)** for prevention / treatment of HDP (E= B x 1 Ampoule)	8,195	8,966	9,780	10,639	11,545	12,499
F) 5% Wastage	410	448	489	532	577	625
G) Total requirement of Hydralazine HCl (1 Ampoule of 20 mg) for prevention / treatment of HDP G= E+F	8,604	9,414	10,269	11,171	12,122	13,124

Methyldopa

For management of severe Hypertension

Pregnancy-induced hypertension (PIH) is the development of new hypertension in a pregnant woman after 20 week's gestations without the presence of protein in the urine or other signs of pre-eclampsia. PIH complicates 6-10% of pregnancies (14).

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. 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

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 Balochistan
- 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 tablet Methyldopa yearly. A total of 1,548,764 Methyldopa tablet is forecasted for the period (2017/18).

Table 9: Forecasted Number of Methyldopa Tablets

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total expected pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of Pregnancies estimated to develop Hypertensive Disorders of Pregnancy (HDP= 5% of total pregnancies)	23,961	24,768	25,603	26,466	27,357	28,279
C) % of Pregnant Women seeking care from Public Health Facilities (13.1 PDHS 2017-18 - assuming 1% increase / year)	17%	18%	19%	20%	21%	22%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
D) # of pregnant women with HDP seeking care from public health facilities	4,097	4,483	4,890	5,320	5,772	6,250
E) Requirement of Methyldopa tablets (2 x 250 mg tablets per day per case x 180 days) (E= B x 360 Tablets)	1,475,013	1,613,886	1,760,444	1,915,047	2,078,070	2,249,907
F) 5% Wastage -(Tablets)	73,751	80,694	88,022	95,752	103,904	112,495
G) Total Requirement of Methyldopa 250mg tablet for prevention/treatment of HDP G= E+F	1,548,764	1,694,580	1,848,466	2,010,799	2,181,974	2,362,403

Metronidazole

For management of maternal sepsis

Metronidazole is also recommended to be used in combination with other antibiotics for the prevention and management of maternal sepsis.

Summary of Data Needed for Forecasting Metronidazole

- Target population (total live births)
- Number of pregnancies complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Balochistan
- 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 Live Births** x **Proportion of facility births** x **Proportion of women requiring Metronidazole for Maternal Sepsis treatment** x **Dose per Maternal Sepsis case for treatment**

A total of 6,989 pregnant women are estimated to require Metronidazole for the treatment of maternal sepsis during the forecasting period (2021/22). A total of 106,938 injections of Metronidazole are required for 2021/22 which are to be administered intravenously. Table 10 shows the complete factorization for the forecast of Metronidazole.

Table 10: Forecasted Number of Doses of Metronidazole Required for Management of Maternal Sepsis

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Maternal Sepsis (average preg+postpartum sepsis) according to WHO definition	10%	10%	10%	10%	10%	10%
C) number of Maternal Sepsis cases (C= BxA)	40,874	42,251	43,675	45,147	46,669	48,241

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (13.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	6,989	7,647	8,342	9,075	9,847	10,661
F) Number of Metronidazole 500mg Injections required for M/Sepsis patients (F= E x 15 (3x5days) Injs. /patient)	104,842	114,712	125,130	136,119	147,706	159,920
G) 2% Wastage	2,097	2,294	2,503	2,722	2,954	3,198
H) Total Requirement of Metronidazole 500mg Injections for Maternal Sepsis patients H= F+G	**106,938**	**117,007**	**127,632**	**138,841**	**150,660**	**163,118**

Ampicillin

For treatment of Maternal Sepsis

Almost 2.4% of women reported postpartum infection or sepsis as per Pakistan Maternal Mortality Survey 2019 (15). 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.

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)(16).

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

Summary of Data Needed for Forecasting Ampicillin

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

The formula used for this calculation of Ampicillin is:

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

A total of 6,989 pregnant women with maternal sepsis seeking treatment from public facility, are estimated to require injection Ampicillin for the treatment of maternal sepsis during the forecasting period (2021/22). A total of 142,585 injections of Ampicillin doses are required for 2021/22 which are to be administered intravenously. Table 11a shows the complete factorization for the estimated forecast of Ampicillin. The estimate for deliveries complicated with infection is kept at 10%.

Table 11a: Forecasted Number of Doses of Ampicillin Required for the Treatment of Maternal Sepsis

Total population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27
A) Total pregnancies (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Maternal Sepsis (average preg. + postpartum sepsis) according to WHO definition	10%	10%	10%	10%	10%	10%
C) number of Maternal Sepsis cases (C= B x A)	40,874	42,251	43,675	45,147	46,669	48,241
D) Percentage Maternal Sepsis cases referred to Public Health Facility for treatment (13.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Maternal Sepsis patients visiting Public Health Facilities	6,989	7,647	8,342	9,075	9,847	10,661
F) Number of Ampicillin 500mg Injections required for M/Sepsis patients (F= E x 20 (4x5days) Injs. /patient)	139,789	152,950	166,839	181,491	196,941	213,227
G) 2% Wastage	2,796	3,059	3,337	3,630	3,939	4,265
H) Total Requirement of Ampicillin 500mg Injections for Maternal Sepsis cases H= F+G	142,585	156,009	170,176	185,121	200,880	217,491

Injectable Ampicillin

For management of Neonatal Pneumonia

One in 16 children die before reaching their first birthday, and one in 14 die before reaching their fifth birthday (1). The infant mortality in Pakistan, although has shown decline in the past decade or so (2), is still high compared to other regional countries. In 2019, 47% of all under-5 deaths occurred in the newborn period with about one third dying on the day of birth and close to three quarters dying within the first week of life (17).

Lack of skilled care and proper treatment immediately after birth contributes towards lower neonatal mortality. Focused programs on improving antenatal, postnatal, and neonatal care have considerably reduced neonatal morbidity and mortality.

Summary of Data Needed for Forecasting Injectable Ampicillin

- Target population (total live births)
- Number of newborns at risk of neonatal Pneumonia
- Number of newborns who will be given ampicillin
- Standard or average treatment regimen (i.e., amount of ampicillin needed for each case to prevent risks of neonatal pneumonia (ampicillin: 50mg/kg per dose: IM/IV every 6 hours for at least 5 days]
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of ampicillin is:

Total need ampicillin (ampoule of 500 mg)	=	Total Live births	x	Proportion of newborn at risk of neonatal pneumonia	x	Dose Per case of neonatal pneumonia

An estimated 135,455 ampoules of ampicillin were estimated by using the factors given above for year 2021-22. Details of computations are given in Table 11b.

Table 11b: Forecasted Number of Injectable Ampicillin

Total Population (projected, based on 2017 census) (GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Pneumonia in Neonates 0-28 days (episodes/child year)	38%	38%	38%	38%	38%	38%
C) number of Pneumonia episodes in neonates (0-28 days) (C= BxA)	155,321	160,555	165,966	171,559	177,341	183,317
D) Percent neonates taken to public health facility for treatment (13.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of neonatal pneumonia patients visiting health facilities	26,560	29,060	31,699	34,483	37,419	40,513
F) % receiving antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
G) Number of neonatal pneumonia patients requiring Ampicillin for treatment	26,560	29,060	31,699	34,483	37,419	40,513
H) Number of Ampicillin 500mg Injections required for patients (H= G x 15 Inj/episode)	132,799	145,302	158,497	172,417	187,094	202,565
I) 2% Wastage	2,656	2,906	3,170	3,448	3,742	4,051
J) Total Requirement of Ampicillin 500mg Injections for neonatal pneumonia patients K= I+J	**135,455**	**148,209**	**161,667**	**175,865**	**190,836**	**206,616**

Gentamycin

For treatment of Maternal Sepsis

Refer to the earlier review of maternal sepsis, its etiology, and complications. Gentamycin is recommended as first line antibiotic for prevention and treatment of peripartum infections.

Summary of Data Needed for Forecasting Gentamycin

- Target population (expected live births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Balochistan
- 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 Inj.=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 Live Births**	**x**	**Proportion of public facility deliveries**	**x**	**Proportion of deliveries complicated with maternal sepsis and requires Gentamycin**	**x**	**Dose per case for treatment**

A total of 69,89 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 (2021/22). A total of 35,646 injections of Gentamycin are required for 2021/22 which are to be administered intravenously. Table 12a shows the complete factorization for the forecast of Gentamycin.

Table 12a: Forecasted Number of Doses of Gentamycin Required for Treatment of Maternal Sepsis

Total Population (projected, based on 2017 census - GR 3.37%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Maternal Sepsis (average preg + postpartum sepsis) WHO definition	10%	10%	10%	10%	10%	10%
C) Number of Maternal Sepsis cases (C= B x A)	40,874	42,251	43,675	45,147	46,669	48,241
D) Percent deliveries in public health facility (13.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Maternal Sepsis patients visiting public health facilities	6,989	7,647	8,342	9,075	9,847	10,661
F) Number of Gentamicin 40mg Injections required for M/Sepsis patients (F= E x 5 -3mg/kg/dayx5days = 3x70kg=210mg/40mg Inj.=5 inj approx. /patient)	34,947	38,237	41,710	45,373	49,235	53,307
G) 2% Wastage	699	765	834	907	985	1,066
H) Total Requirement of Gentamicin 40mg Injections for Maternal Sepsis Patients H= F+G	**35,646**	**39,002**	**42,544**	**46,280**	**50,220**	**54,373**

Injectable Gentamicin

For management of Neonatal Pneumonia

The overall incidence of pneumonia is reported to be 0.26 episodes per child-year in Pakistan (18). As mentioned earlier, the neonatal mortality in Pakistan is high, mainly contributed by high burden of infections in the neonatal period.

Summary of Data Needed for Forecasting Gentamycin

- Target population (expected live births)
- Number of deliveries complicated by Maternal Sepsis
- Percent deliveries in public health facilities of Balochistan
- 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 Inj.=5 injs. Approx.)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula for calculation of gentamicin is:

Total need of gentamicin (ampoule of 50 mg) = **Total Live births** × **Proportion of newborns at risk of neonatal pneumonia** × **Dose Per case of neonatal pneumonia**

A total of 81,237 ampoules of gentamicin are estimated by applying the information given above, for the period 2021-22. An yearly forecast for next five years is also provided as given in Table 12b.

Table 12b: Forecasted Number of Injectable Gentamicin

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Pneumonia in Neonates 0-28 days (episode/child year)	38%	38%	38%	38%	38%	38%
C) number of Pneumonia episodes in neonates (C= BxA)	155,321	160,555	165,966	171,559	177,341	183,317
D) Percentage attending public	17%	18%	19%	20%	21%	22%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
health facility for treatment (13.1% PDHS 2017-18) assuming 1% increase annually						
E) Number of neonatal pneumonia patients visiting health facilities	26,560	29,060	31,699	34,483	37,419	40,513
F) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
G) Number neonatal pneumonia patients requiring Gentamicin for treatment	26,560	29,060	31,699	34,483	37,419	40,513
H) Number of Gentamicin 40mg Injections required (H= G x 3 Injs. /episode)	79,680	87,181	95,098	103,450	112,257	121,539
I) 2% Wastage	1,594	1,744	1,902	2,069	2,245	2,431
J) Total requirement of Gentamicin 40mg Injections for management of neonatal pneumonia J=H+I	81,273	88,925	97,000	105,519	114,502	123,970

Gentamicin

For management of Neonatal Sepsis

Gentamicin is effectively used in the treatment of neonatal sepsis. WHO recommends use of gentamicin in combination with other antibiotics for the management of neonatal sepsis (19).

Summary of Data Needed for Forecasting Injectable Gentamicin

- Target population (total live births)
- Number of newborns at risk of neonatal sepsis
- Number of newborns who will be given gentamicin
- Standard or average treatment regimen (i.e., amount of gentamicin needed for each case to prevent risks of neonatal pneumonia (gentamicin: 40mg per dose: IM/IV every 24 hours for at least 5 days]

The formula for calculation of gentamicin is:

Total need of gentamicin (ampoule of 40 mg) = **Total Live births** × **Proportion of newborns at risk of neonatal sepsis** × **Dose Per case of neonatal sepsis**

A total of 3,565 ampoules of gentamicin are estimated by applying the information given above, for the period 2021-22. Yearly forecast for next five years is also provided as given in Table 12b.

Table 12c: Forecasting needs of Gentamycin for management of neonatal sepsis

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Neonatal Sepsis in Neonates 0-28 days (10 per 1000 live births)	1%	1%	1%	1%	1%	1%
C) number of Neonatal Sepsis	4,087	4,225	4,368	4,515	4,667	4,824

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
Episodes in Neonates (0-28 days) (C= BxA)						
D) Percentage Neonates taken to PUBLIC Health Facility for treatment (13.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Neonatal Sepsis patients visiting Health Facilities	699	765	834	907	985	1,066
F) Percentage receiving Antibiotics	100%	100%	100%	100%	100%	100%
G) Number of Neonatal Sepsis patients requiring treatment from Health Facilities	699	765	834	907	985	1,066
H) Number of Inj. Gentamicin 40mg required for patients (H= G x 1 vial /day x 5days /episode) (5 Inj.)	3,495	3,824	4,171	4,537	4,924	5,331
I) 2% Wastage	70	76	83	91	98	107
J) Total Requirement of Inj. Gentamicin 40 mg for Neonatal Sepsis patients	**3,565**	**3,900**	**4,254**	**4,628**	**5,022**	**5,437**

Amoxicillin

For treatment of Childhood Pneumonia

High-dose amoxicillin is used as a first line agent for the treatment of community acquired childhood pneumonia. WHO recommends use of amoxicillin for treatment of childhood pneumonia (20).

Summary of Data Needed for Forecasting Injectable Gentamicin

- Target population (total live births)
- Number of newborns at risk of neonatal pneumonia
- Number of newborns who will be given amoxicillin
- Standard or average treatment regimen (i.e., syrup amoxicillin 125/250mg per 5ml)
- Amount of amoxicillin needed for each case to treat childhood pneumonia (80mg/kg/day for five days)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of gentamicin is:

Total need of amoxicillin (syrup 125/250mg per 5ml) = **Total Live births** × **Proportion of newborns at risk of childhood pneumonia** × **Dose Per case of childhood pneumonia**

A total of 92,041 syrup bottles of amoxicillin are estimated by applying the information given above, for the period 2021-22. Yearly forecast for next five years is also provided as given in Table 13.

Table 13

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) 0-59 months population (18%)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
B) Incidence of Pneumonia in 0-59 months (episodes/child year)	26%	26%	26%	26%	26%	26%
C) number of Pneumonia Episodes in 0-59 months (C= BxA)	659,621	681,850	704,828	728,581	753,134	778,515

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
D) Percentage Neonates taken to PUBLIC Health Facility for treatment (13.1% PDHS 2012-13) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Pneumonia patients visiting Health Facilities	112,795	123,415	134,622	146,445	158,911	172,052
F) Percentage receiving Antibiotics (46.2% PDHS 2017-18). Assuming 80% of those visiting facility will receive antibiotic	80%	80%	80%	80%	80%	80%
G) Number of Pneumonia patients requiring treatment from Health Facilities	90,236	98,732	107,698	117,156	127,129	137,641
H) Number of amoxicillin Syrup (125mg/250mg/5ml) required for patients (H= G x ONE Syrup /episode)	90,236	98,732	107,698	117,156	127,129	137,641
I) 2% Wastage	1,805	1,975	2,154	2,343	2,543	2,753
J) Total Requirement of Amoxicillin Syrup 125mg/250mg/5ml for Pneumonia patients	**92,041**	**100,706**	**109,852**	**119,499**	**129,672**	**140,394**

Fosfomycin

For treatment of Urinary Tract Infections

Oral fosfomycin is effective against multi-drug resistant pathogens causing Urinary Tract Infections (UTI) (21). UTIs are a common problem during pregnancy and should be effectively treated to avoid adverse maternal and neonatal outcomes (22). The incidence of UTIs among pregnant mothers in Pakistan is reported to 28.5% (23).

Summary of Data Needed for Forecasting fosfomycin

- Target population
- Total number of pregnancies
- Number of pregnancies estimated to develop UTIs
- Number of women requiring fosfomycin
- Standard or average treatment regimen (3 sachet, 3g/sachet) for Treatment of UTI)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula for calculation of gentamicin is:

Total need of fosfomycin (1 sachet, 3g/sachet) = Total pregnancies × Incidence of UTIs in pregnancy × Dose Per case of UTI (3 sachet)

A total of 73,566 sachet of fosfomycin are estimated by applying the information given above, for the period 2021-22. Yearly forecast for next five years is also provided as given in Table 14

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total Pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of Pregnancies estimated to develop Urinary Tract Infection (UTI= 28.5% of total pregnancies)	136,575	141,178	145,936	150,854	155,937	161,192
(C) % of Pregnant Women seeking care from Public Health Facilities (13.1%% PDHS 2017-18) assuming 1% increase / year	17%	18%	19%	20%	21%	22%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
(D) # of Pregnant Women with UTI seeking care from Health Facilities	23,354	25,553	27,874	30,322	32,903	35,624
(D1) # of women treated with fosfomycin	75%	75%	75%	75%	75%	75%
(E) Requirement of fosfomycin (3 sachet, 3g/sachet) for Treatment of UTI (E= B x 3 sachet)	70,063	76,660	83,621	90,965	98,708	106,871
(D) 5% Wastage -in sachet	3,503	3,833	4,181	4,548	4,935	5,344
(E) Total Requirement of fosfomycin (1 sachet, 3g/sachet) for Treatment of UTI G= E+F	**73,566**	**80,493**	**87,802**	**95,513**	**103,644**	**112,214**

Cefixime

For treatment of Pneumonia in children

Childhood pneumonia accounts for 15% of deaths of under five children worldwide. Bacterial pneumonia can be effectively treated with antibiotics and is a lifesaving intervention. However, only one third of those children requiring antibiotics are able to get them (24). With an estimated 10 million cases occurring each year, childhood pneumonia is also a primary cause of under-five mortality in Pakistan (25).

Cefixime is mostly used in combination with other antibiotics for the management of childhood pneumonia (26). The current forecast provides the requirements of cefixime only for childhood pneumonia.

Summary of Data Needed for Forecasting of Cefixime for Pneumonia in Children

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

The formula for calculation of Cefixime is:

Total Need for Cefixime = **Estimated number of under five children** × **Incidence of pneumonia U5 children (case/child/year)** × **% of patients seeking Cefixime from public facility** × **Dose per episode**

Table 15a shows the forecasted number of Cefixime syrup required for the management of childhood pneumonia. A total of 115,051 syrup bottles (100 / 200 mg) of Cefixime are required to treat childhood pneumonia during the period (2021-2022). Pakistan Bureau of Statistics and PDHS 2017-18 data were used to estimate this drug.

Table15a: Forecasted Cefixime Requirements for Management of Pneumonia 0-59 Months Children

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) % 0-**59** months children in Balochistan -- PBS 2012-13	18%	18%	18%	18%	18%	18%
B) Estimated Population of 0-59 months children (2017 Pop x A)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Incidence of Pneumonia in 0-59 months	26%	26%	26%	26%	26%	26%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
(episodes/child year)						
D) Number of Pneumonia episodes in 0-59 months (C=B x A)	659,621	681,850	704,828	728,581	753,134	778,515
E) Percent visiting public health facility for treatment (17.1% PDHS 2017-18) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
F) Number of Pneumonia patients visiting public health facilities	112,795	123,415	134,622	146,445	158,911	172,052
G) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
H) Number of Pneumonia patients requiring treatment from public health facilities	112,795	123,415	134,622	146,445	158,911	172,052
I) Number of Cefixime Syrup (100mg/200mg/5ml) required for patients (H= G x ONE Syrup /episode)	112,795	123,415	134,622	146,445	158,911	172,052
J) 2% Wastage	2,256	2,468	2,692	2,929	3,178	3,441
K) Total Requirement of Cefixime Syrup 100mg/ 200mg/5ml for Pneumonia patients	**115,051**	**125,883**	**137,315**	**149,374**	**162,089**	**175,493**

Cefixime –

For treatment of Sexually Transmitted Infections (STI's)

Sexually Transmitted Infections (STIs) during pregnancy can complicate pregnancy and delivery. STIs can also cause adverse outcomes in neonates (e.g., ophthalmia neonatorum). Cefixime is effectively used for the treatment of uncomplicated gonorrhea which is common STI (27).

Summary of Data Needed for Forecasting of Cefixime

- Total population
- Prevalence of STI's
- Percent of public health facility consultations
- Number of public health facility consultations
- Number of public facility consultations requiring Cefixime
- Standard or average treatment regimen
- Expected projected changes in consumption (potential losses or scale-up in use

Formula used for the calculation of Cefixime;

Total Need for Cap Cefixime = Total Population × Prevalence of STIs × Proportion of STI cases seeking treatment from public health facility × Dose per STI Case

The associated summary outputs for Cefixime are shown in Table 15b .

Table 15b: Forecasted Cefixime Requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	6,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Prevalence of STIs in Balochistan	4%	4%	4%	4%	4%	4%
B) # of STI cases (B = A × 2017 Pop)	620,156	641,055	662,659	684,991	708,075	731,937
C) % of health facilities consultations (7.7% PDHS 2012-13) assuming HF consultations increases by 1% annually	17%	18%	19%	20%	21%	22%
E) # of STI Cases seeking treatment at public health facilities (C = A × B)	106,047	116,031	126,568	137,683	149,404	161,758
F) Requirement of Cap Cefixime 400 mg for	106,047	116,031	126,568	137,683	149,404	161,758

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	6,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
treatment of STIs (single dose-WHO)						
G) 5% Wastage	5,302	5,802	6,328	6,884	7,470	8,088
H) Total requirement of Cap. Cefixime 400mg for STI cases treatment including wastage G= E+F	111,349	121,833	132,896	144,567	156,874	169,846

Cefotaxime

For treatment of Neonatal Sepsis

Neonatal sepsis is one of the major contributors towards neonatal mortality. Low birth weight, prematurity and prolonged and difficult deliveries are the common cited reasons for sepsis. The mortality from sepsis is reported to be close to 50% (28). Delays in illness recognition and care seeking, a dearth of primary health care providers, and limited access to facility care also contribute to these deaths. Therapy with appropriate antibiotics and supportive management in neonatal nurseries is the cornerstone of management of these causes.

Summary of Data Needed for Forecasting Cefotaxime

- Target population (total live births)
- Incidence of neonatal sepsis
- Percent births in public health facilities of Balochistan
- Number of public facility births requiring Cefotaxime for treatment of neonatal Sepsis
- Standard or average treatment regimen (i.e., amount of Cefotaxime needed for each case to treat neonatal sepsis)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Cefotaxime is:

Cefotaxime Need for Treatment of Neonatal Sepsis = **Total births** x **Proportion of facility births** x **Proportion of births who require Cefotaxime for treatment of neonatal sepsis** x **Dose per case**

The estimated number of neonates who require Cefotaxime for the treatment of neonatal sepsis at public health facility is 699 during the forecasting period 2021/22. A total of 3,565 injections of Cefotaxime are required for 2021/22. Table 16a shows the complete factorization for the forecast of Cefotaxime.

Table 16a: Forecasted Number of Doses of Cefotaxime Required for Treatment of Neonatal Sepsis

Total population Census 2017 GR 3.37%	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total Births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of Neonatal Sepsis in Neonates 0-28 days (episodes/child year)	1%	1%	1%	1%	1%	1%
C) number of Neonatal Sepsis Episodes in Neonates (0-28 days) (C= BxA)	4,087	4,225	4,368	4,515	4,667	4,824

Total population Census 2017 GR 3.37%	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
D) Percentage Neonates taken to PUBLIC Health Facility for treatment (7.7% PDHS 2012-13) assuming 1% increase annually	17%	18%	19%	20%	21%	22%
E) Number of Neonatal Sepsis patients visiting public health facilities	699	765	834	907	985	1,066
F) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
G) Number of Neonatal Sepsis patients requiring treatment from Health Facilities	699	765	834	907	985	1,066
H) Number of Inj. Cefotaxime 500 mg required for patients (H= G x15 Inj. /day x 5days /episode) (5 Inj.)	3,495	3,824	4,171	4,537	4,924	5,331
I) 2% Wastage	70	76	83	91	98	107
J) Total Requirement of Inj. Cefotaxime 500 mg for Neonatal Sepsis patients	**3,565**	**3,900**	**4,254**	**4,628**	**5,022**	**5,437**

Cefotaxime

For treatment of Pneumonia in children

Cefotaxime is a third-generation cephalosporin with broad spectrum antibacterial activity. Cefotaxime is mostly used in combination with other antibiotics for the management of severe pneumonia

Summary of Data Needed for Forecasting of Cefixime for Pneumonia in Children

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

The formula for calculation of Ceftriaxone is:

Total Need for cefotaxime = **Estimated number of under five children** × **Incidence of pneumonia U5 children (case/child/year)** × **% Of patients seeking cefotaxime from public facility** × **Dose per episode**

A total of 1,776,523 doses of cefotaxime injections are required to treat pneumonia during the period (2021-2022). Table 16b shows the details of calculations for forecasting cefotaxime

Total Population Census 2017	**14,094,456**	**14,569,440**	**12,344,409**	**12,760,416**	**13,190,442**	**13,634,959**
Parameters	**2021-22**	**2022-23**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
A) % 0-**59** months children in Balochistan -- PBS 2012-13	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
B) Estimated Number / Population of 0-59 months children (2017 Pop x A)	2,537,002	2,622,499	2,221,994	2,296,875	2,374,279	2,454,293
C) Incidence of Pneumonia in 0-59 months Children (# episodes/child/year)	26%	26%	26%	26%	26%	26%
D) number of Pneumonia Episodes in 0-59 months children (D= BxC)	659,621	681,850	577,718	597,187	617,313	638,116
E) Percentage 0-59 months taken to **Public Health Facility** for treatment (13.1% PDHS 2017-18) assuming 1% increase annually	17.10%	18.10%	19.10%	20.10%	21.10%	22.10%

Total Population Census 2017	14,094,456	14,569,440	12,344,409	12,760,416	13,190,442	13,634,959
Parameters	**2021-22**	**2022-23**	**2022-23**	**2023-24**	**2024-25**	**2025-26**
F) Number of 0-59 months patients visiting Health Facilities	112,795	123,415	110,344	120,035	130,253	141,024
G) Percentage receiving Antibiotics	100%	100%	100%	100%	100%	100%
H) Number of 0-59 months patients requiring treatment from Health Facilities	112,795	123,415	110,344	120,035	130,253	141,024
I) Number of Inj. Cefotaxime 500 mg required for 0-59 months patients (I = H x 3 vial x 5 days /episode) = 15 Inj. (WHO 50-75mg/kg every 8 hrs)	1,691,927	1,851,222	1,655,163	1,800,520	1,953,795	2,115,355
J) 5% Wastage	84,596	92,561	82,758	90,026	97,690	105,768
K) Total Requirement of Inj. Cefotaxime 500 mg for 0-59 months pneumonia patients K= I+J	1,776,523	1,943,783	1,737,921	1,890,546	2,051,484	2,221,123

Ceftriaxone

For treatment of Neonatal Sepsis

Refer to earlier given review of neonatal sepsis in Pakistan. Ceftriaxone is one of the most effective antibiotics used alone or in combination for the management of neonatal sepsis.

Summary of Data Needed for Forecasting Ceftriaxone

- Target population (total live births)
- Incidence of neonatal sepsis
- Percent births in public health facilities of Balochistan
- Number of public facility births requiring Ceftriaxone for treatment of neonatal Sepsis
- Standard or average treatment regimen (i.e., amount of Ceftriaxone needed for each case to treat neonatal sepsis)
- Expected projected changes in consumption (potential loss or scale-up in use)
- Target population (total live births)
- Incidence of neonatal sepsis
- Percent births in public health facilities of Balochistan
- Number of public facility births requiring Cefixime for treatment of neonatal Sepsis
- Standard or average treatment regimen (i.e., amount of Cefixime needed for each case to treat neonatal sepsis)

The formula used for this calculation of Ceftriaxone is:

Ceftriaxone Need for Treatment of Neonatal Sepsis = **Total live births** x **Proportion of public health facility births** x **Proportion of births requiring Ceftriaxone for treatment of neonatal sepsis** x **Dose per neonatal sepsis case**

A total of 3.565 injections of Ceftriaxone are required for 2017/18. Table 17a shows the complete factorization for the forecast of Ceftriaxone.

Table 17a: Forecasted Ceftriaxone Requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) Incidence of neonatal sepsis in neonates 0-28 days (episodes/child year)	1%	1%	1%	1%	1%	1%
C) Number of neonatal sepsis episodes in neonates (0-28 days) (C= BxA)	4,087	4,225	4,368	4,515	4,667	4,824
D) Percentage neonates taken to public health facility for treatment (7.7% PDHS 2012-13) assuming 1% increase	17%	18%	19%	20%	21%	22%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
annually						
E) Number of neonatal sepsis patients visiting public health facilities	699	765	834	907	985	1,066
F) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
G) Number of neonatal sepsis patients requiring treatment from health facilities	699	765	834	907	985	1,066
H) Number of Inj. Ceftriaxone 250 mg) required for patients (H= G x 1 vial /day x 5days /episode) (5 Inj.)	3,495	3,824	4,171	4,537	4,924	5,331
I) 2% Wastage	70	76	83	91	98	107
J) Total Requirement of Inj. Ceftriaxone 250 mg for Neonatal Sepsis patients	3,565	3,900	4,254	4,628	5,022	5,437

Ceftriaxone

Childhood Pneumonia in 0-59 Months Children

Refer to earlier review of childhood pneumonia in Pakistan. Ceftriaxone is a third-generation cephalosporin with a broad-spectrum activity used alone or in combination for the treatment of childhood pneumonia (29).

Summary of Data Needed for Forecasting of Cefixime for Pneumonia in Children

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

The formula for calculation of Ceftriaxone is:

Total Need for Ceftriaxone = **Estimated number of under five children** × **Incidence of pneumonia U5 children (case/child/year)** × **% of patients seeking Ceftriaxone from public facility** × **Dose per episode**

A total of 2,368,697 (250 mg) of Ceftriaxone injections / tablets are required to treat pneumonia during the period (2021-2022). Pakistan Bureau of Statistics and PDHS data were used to estimate this drug. Table 17b shows the estimated number of patients requiring Ceftriaxone.

Table 17b: Forecasted Ceftriaxone Requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) % 0-59 months children in Balochistan -- Census 2017	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
B) Estimated Population of 0-59 months children (2017 Pop x A)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Incidence of Pneumonia in 0-59 months (episodes/child/year)	26%	26%	26%	26%	26%	26%
D) Number of Pneumonia episodes in 0-59 months children (D= BxC)	659,621	681,850	704,828	728,581	753,134	778,515
E) Percentage 0-59 months taken to public health facility for treatment (7.7% PDHS 2012-13) assuming 1% increase annually	17.10%	18.10%	19.10%	20.10%	21.10%	22.10%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
F) Number of 0-59 months patients visiting health facilities	112,795	123,415	134,622	146,445	158,911	172,052
G) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
H) Number of 0-59 months patients requiring treatment from health facilities	112,795	123,415	134,622	146,445	158,911	172,052
I) Number of Inj. Ceftriaxone 250 mg required for 0-59 months patients (I = H x 1 gm. x 5 days /episode WHO) I gm. Injections= 1x5days=5 Inj.	2,255,902	2,468,296	2,692,443	2,928,895	3,178,225	3,441,035
J) 5% Wastage	112,795	123,415	134,622	146,445	158,911	172,052
K) Total Requirement of Inj. Ceftriaxone 250 mg 250 mg tablets for 0-59 months pneumonia patients K= I+J	**2,368,697**	**2,591,711**	**2,827,066**	**3,075,340**	**3,337,137**	**3,613,086**

Salbutamol Sulphate/Albuterol

For Pneumonia Management

Salbutamol, also known as albuterol and marketed as Ventolin among other names, is a medication that opens up the medium and large airways in the lungs. It is used to treat asthma including asthma attacks, exercise-induced bronchoconstriction, and chronic obstructive pulmonary disease (COPD) (30). The forecast below includes only the Salbutamol Sulphate required for treatment of bronchospasm associated with pneumonia in children under five.

Summary of Data Needed for Forecasting of Salbutamol Sulphate for Pneumonia

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

The formula for calculation of Salbutamol Sulphate e is:

Need for Salbutamol Sulphate = **Under five children** × **Incidence of pneumonia in children U5 years (case/child/year)** × **% of patients seeking Salbutamol Sulphate in public facility** × **Dose per episode**

A total of 118,437 syrup / solution bottles of Salbutamol Sulphate are required to treat pneumonia during the period (2021-2022). Pakistan Bureau of Statistics and PDHS data was used to estimate this drug. Table 18 shows the forecasted number of patients requiring Salbutamol Sulphate.

Table 18: Forecasted Salbutamol Sulphate Requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) % 0-**59** months children in Balochistan -- Census 2017	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
B) Estimated Population of 0-59 months children (2017 Pop x A)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Incidence of Pneumonia in 0-59 months children (episodes/child/year)	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)	659,621	681,850	704,828	728,581	753,134	778,515
E) Percentage 0-59 months taken to public health facility for treatment (13.1% PDHS 2017-	17.10%	18.10%	19.10%	20.10%	21.10%	22.10%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
18) assuming 1% increase annually						
F) Number of 0-59 months patients visiting health facilities	112,795	123,415	134,622	146,445	158,911	172,052
G) Percentage receiving Antibiotics (42% PDHS 2012-13) assuming 1% increase annually	100%	100%	100%	100%	100%	100%
H) Number of 0-59 months patients requiring treatment from health facilities	112,795	123,415	134,622	146,445	158,911	172,052
I) Number of Syrup Salbutamol required for 0-59 months patients (I = H x 1 bottle x 5 days /episode	112,795	123,415	134,622	146,445	158,911	172,052
J) 5% Wastage	5,640	6,171	6,731	7,322	7,946	8,603
K) Total Requirement of Syrup Salbutamol for 0-59 months pneumonia patients K= I+J	118,435	129,586	141,353	153,767	166,857	180,654
L) Number of Solution Salbutamol required for 0-59 months patients (L= H x 1 bottle x 5 days /episode	112,795	123,415	134,622	146,445	158,911	172,052
M) 5% Wastage	5,640	6,171	6,731	7,322	7,946	8,603
N) Total Requirement of Solution Salbutamol for 0-59 months pneumonia patients K= L+M	118,435	129,586	141,353	153,767	166,857	180,654

Nifedipine

For the Inhibition of Uterine Contractions

Tocolytic agents are intended to arrest uterine contractions during an episode of preterm labor (acute tocolysis) or maintain uterine quiescence after an acute episode (maintenance tocolysis). Since uterine contractions are the most frequently recognized symptom and sign of preterm birth, inhibition of uterine contractions with tocolytic agents to prolong pregnancy and reduce neonatal complications has been and continues to be the focus of treatment of preterm labor.

Nifedipine is a calcium channel blocker and the drug of choice for inhibiting preterm labor and subsequently improving neonatal outcomes. Nifedipine can reduce the number and frequency of contractions, but its effect and how long it lasts varies from one woman to another (31). Like all tocolytic medications, Calcium Channel Blockers don't prevent or delay preterm delivery for a significant period.

Summary of Data Needed for Forecasting Nifedipine

- Target population (total expected pregnancies)
- Number of pregnancies complicated by preterm labor contractions
- Percent deliveries in public health facilities of Balochistan
- Number of pregnant women requiring Nifedipine for treatment of preterm labor
- Standard or average treatment regimen (i.e., amount of Nifedipine needed for each case to treat preterm labor)
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of Nifedipine is:

Nifedipine Need to inhibit uterine contractions = **Total expected pregnancies** x **Proportion of facility deliveries** x **Proportion of women at risk of preterm contractions** x **Dose per case to inhibit preterm uterine contractions**

Table 21 shows the forecasted amount of Nifedipine by year. By applying the information on pregnancy complication (16% pregnancies are complicated), the estimated number of women who require Nifedipine for the treatment of preterm labor is given as 76,674 pregnant women for the period 2021/22. Out of total 13,111 at risk pregnant women will seek treatment from public health facilities and will require 440,537 capsules (10 mg immediate release capsules) during the forecast year 2021/22. Table 19 shows the complete factorization for the forecast of Nifedipine.

Table 19: Forecasted Number of Nifedipine Capsules Required for the Inhibition of Uterine Contractions

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Number of Pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) Percentage of pregnant women at risk of preterm delivery (Meta-Analysis 2017 /Every Preemie Scale-Pakistan	16%	16%	16%	16%	16%	16%

Profile / WHO 2015 Updated Recommendations						
C) # of pregnant women at risk of preterm delivery (C = A × B)	76,674	79,258	81,929	84,690	87,544	90,494
D) % of Public Health Facilities Births (17.1%) assuming HF Deliveries increases by 1% annually	17.10%	18.10%	19.10%	20.10%	21.10%	22.10%
E) # of pregnant women at risk administered **Nifedipine 10 mg Capsules** (E = C × D)	13,111	14,346	15,648	17,023	18,472	19,999
F) Number of **Nifedipine Capsule (10mg / capsule) required** (F = E x 16 cap x 2 days) recommend total dose is 160 mg in divided doses / day for 48-72 hrs	419,559	459,061	500,748	544,724	591,096	639,974
G) 5% Wastage	20,978	22,953	25,037	27,236	29,555	31,999
H) Total Requirement of Nifedipine Capsule (10mg) for Public HF Deliveries for Inhibition of Uterine Contractions to prevent Preterm Births/deliveries H= G+F	440,537	482,014	525,786	571,961	620,650	671,972

Antenatal Corticosteroids

To improve Fetal Lung Maturity

A systematic review and meta-analysis reported the prevalence of pre-term births to be almost 19% in Pakistan (32). Preterm birth is a leading cause of perinatal death and disability and is an important global public health problem. It is also the leading cause of neonatal mortality both in developed and developing countries, accounting for an estimated 24% of neonatal deaths.

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 a24-48-hourtime span between the first dose and birth.

An injection of4 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 injection 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**

A total of 76,674 women are estimated to be at risk of Pre-term birth in 2021-22 and 90,494 in 2026-27. Out of these, approximately 13,111pregnant women are at risk of preterm birth during the forecast period, 2021-22 and 19,999 in 2026-27, which will seek treatment from public health facility. To prevent the risks of preterm delivery a total of 82,601 ampoules for 2021-22 and 125,995 ampoules of dexamethasone (1 ml each) for 2026-27 should be procured during the forecast period, as depicted in Table 20.

Table 20. Forecasted Amount of Dexamethasone

Total Population Projected based on Census 2017 GR 3.37%	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
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%
C) # of pregnant women at risk of preterm delivery (C = A × B)	76,674	79,258	81,929	84,690	87,544	90,494
(D) % of Pregnant Women seeking care from public health facilities (13.1%% PDHS 2017-18) assuming 1% increase / year	17%	18%	19%	20%	21%	22%
E) # of pregnant women at risk seeking care from public health facilities (E = C × D)	13,111	14,346	15,648	17,023	18,472	19,999
F) Number of dexamethasone ampoules (4mg in 1-ml amp) required (F = E x 6 amp) WHO recommend total 24 mg in divided doses	78,667	86,074	93,890	102,136	110,830	119,995
G) 5% Wastage	3,933	4,304	4,695	5,107	5,542	6,000
H) Total requirement of dexamethasone ampoules for deliveries in public sector for preterm births/deliveries H= G+F	82,601	90,378	98,585	107,243	116,372	125,995

Zinc Sulphate

For treatment of Diarrhea

Zinc supplementation is known to reduce duration and severity of diarrhea (33,34) WHO recommends giving children 20 mg per day of zinc supplementation for 10-14 days (10 mg per day for infants under the age of six months) (35). 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

- Target population -- estimated number of children 0-59 months
- Incidence of diarrhea -- episodes of diarrhea per child per year
- 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 the calculation of Zinc Sulphate need is;

Total Need for Zinc Sulphate tablets	**=**	**Estimated number of 0-59 months children**	**x**	**Incidence 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**

An estimated total zinc sulphate 20 mg tablet requirement for 2021-22 is 227,759 for 0-6 months and 14.5 million for 6-59 months children, respectively (Table 21), considering the number of diarrhea episodes per child per year are 3.

Table 21. Forecasted Number of Zinc Sulphate Needed During the Period (2017/18-2022/23)

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) % of 0-6 Month children	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
B) Population (0-6 months)	84,567	87,417	90,363	93,408	96,556	99,810
C) Incidence of Diarrhea	3	3	3	3	3	3
D) Total diarrhea episodes	253,700	262,250	271,088	280,223	289,667	299,429
E) % public health facilities (13.1% PDHS 2012-13)	17%	18%	19%	20%	21%	22%
F) Number of patients seeking Zinc Sulphate from public health facilities	43,383	47,467	51,778	56,325	61,120	66,174
G) Zinc Sulphate tablets required (I = H x 5 tablets/episode)	216,914	237,336	258,889	281,625	305,599	330,869

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
H) 5% Wastage	10,846	11,867	12,944	14,081	15,280	16,543
I) Total Requirement (0-6m)	227,759	249,203	271,833	295,706	320,879	347,412
A) % 6-**59** months children in Balochistan -- PBS 2012-13	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
B) Population 6-59 months children	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Incidence of diarrhea	3	3	3	3	3	3
D) Total diarrhea episodes (BxC)	7,611,006	7,867,497	8,132,632	8,406,702	8,690,008	8,982,861
E) % seeking care at public health facilities (13.1% PDHS 2017-18)	17%	18%	19%	20%	21%	22%
F) Number of patients seeking Zinc Sulphate from Public Health Facilities	1,301,482	1,424,017	1,553,333	1,689,747	1,833,592	1,985,212
G) Requirement of Zinc Sulphate 20 mg tablet (I = H x 10 tabs/episode)	13,014,821	14,240,170	15,533,327	16,897,471	18,335,916	19,852,123
H) 5% Wastage	650,741	712,009	776,666	844,874	916,796	992,606
I) Total Requirement of (6-59 months) Zinc Sulphate tablets	13,893,322	15,201,382	16,581,827	18,038,050	19,573,590	21,192,141
J) Combined Requirement of Zinc Sulphate tablets =I+I	**14,544,063**	**15,913,391**	**17,358,493**	**18,882,924**	**20,490,386**	**22,184,747**

Oral Rehydration Salts

For treatment of Diarrhea

After respiratory tract infections, diarrheal disease are the second leading cause of deaths due to infections in under five year children in Pakistan. 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. Oral Rehydration Therapy (ORT) has become a high impact public health intervention in reducing the child mortality related to diarrhea, despite the prevalence of diarrhea remaining high (36).

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.

Summary of Data Needed for Forecasting of ORS

- Target Population -- estimated number of children less than 5 years of age
- Incidence of diarrhea -- episodes of diarrhea per child per year
- 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**	**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 22 shows that there will be 7.61 million estimated number of diarrhea episodes in 2021-22 and out of these 4.81 million will be treated with ORS. Out of 2.1 million, 0.71million will seek ORS from public health facility. This means that a total of 1.5 million ORS packets are required for the year 2021-22 to treat diarrhea episodes in public health facility. Pakistan Bureau of Statistics and PDHS data were used to estimate the need for ORS.

Table 22. Forecasted Number of ORS Needed During the Period (2017/18-2022/23)

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A)% 0-**59** months children in Balochistan -- PBS 2012-13	18.0%	18.0%	18.0%	18.0%	18.0%	18.0%
B) Number / Population of < 5 children (2017 Pop x A)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Incidence of Diarrhea in < 5 Children (# episodes/child/year)--study in Lahore	3	3	3	3	3	3
D) Total number of Diarrhea Episodes (BxC)	7,611,006	7,867,497	8,132,632	8,406,702	8,690,008	8,982,861
E) Percentage who received ORS (51% PDHS 2017-18) assuming 1% increase annually	55.00%	56.00%	57.00%	58.00%	59.00%	60.00%
F) Number of diarrhea patients treated with ORS	4,186,054	4,405,799	4,635,600	4,875,887	5,127,104	5,389,717
G) % of patients seeking ORS from Public Health Facilities (13.1% PDHS 2017-18) assuming Public HF utilization increases by 1% annually	17%	18%	19%	20%	21%	22%
H) Number of patients seeking ORS from Public Health Facilities (H=FxG)	715,815	797,450	885,400	980,053	1,081,819	1,191,127
I) Number of ORS packet required (I = H x 2 packet/episode)	1,431,630	1,594,899	1,770,799	1,960,107	2,163,638	2,382,255
J) 5% Wastage	71,582	79,745	88,540	98,005	108,182	119,113
K) Total Requirement of ORS packets K= I+J	1,503,212	1,674,644	1,859,339	2,058,112	2,271,820	2,501,367

Dextrose

For treatment of Diarrhea

Water loss without electrolyte loss may occur in fever, hyperthyroidism, high blood calcium, or diabetes insipidus. Intravenous sugar solution, also known as dextrose solution, is a mixture of dextrose (glucose) and water. It is used to treat low blood sugar or water loss without electrolyte loss. It is also used in the treatment of high blood potassium, diabetic ketoacidosis, and as part of parenteral nutrition. It is given via an injection into a vein.

Summary of data needed for forecasting of Dextrose

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

The Formula used for the calculation of Dextrose.

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

The associated summary outputs for Dextrose are shown in Table 23. An estimated number of 81,945 pregnant women will receive public facility delivery service in 2021-22 and 124,995 in 2022-23, respectively. Applying these parameters, we estimate the number of injection Dextrose that needs to be procured for public facilities is 17,.085 for 2021-22 and 262,489 for 2026-27

Table 23: Forecasted Dextrose requirements

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
D) % of public health facilities deliveries (13.1% PDHS 2017-18)	17%	18%	19%	20%	21%	22%
E) # of public health facilities deliveries (C = A × B)	81,945	89,660	97,802	106,391	115,448	124,995
F) Requirement of Inj. Dextrose 10% 500 ml for deliveries (2/delivery)	163,890	179,321	195,605	212,783	230,897	249,990
G) 5% Wastage	8,195	8,966	9,780	10,639	11,545	12,499
H) Total Requirement of Dextrose for deliveries including wastage G= E+F	**172,085**	**188,287**	**205,385**	**223,422**	**242,442**	**262,489**

Vitamin A

For reducing childhood mortality due to infectious diseases

Vitamin A plays a crucial role in development of immune system. Vitamin A plays a regulatory role in cellular and humoral immune responses (37). Thus, it is essential to normal development in children and provides important immunity to respiratory and intestinal pathogens. Vitamin A supplementation is an important component of the strategies aiming to reduce childhood mortality due to infectious diseases.

Vitamin A supplementation program in Pakistan is reaching out to 0 to 59 months aged children with recommended doses (capsules) to alleviate deficiency (38).

Summary of Data Needed for Forecasting Vitamin A

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

Forecasted Need for Vitamin A	**=**	**6-59 months children population**	**x**	**Recommended dose of Vitamin A capsule for 6-59 months children**

Formula used for the Calculation of Vitamin A

The estimated number of 6-59 months children requiring Vitamin A from public health facility for the year 2021-22 is 164,905. Applying these parameters, the number of Vitamin A capsules for children 6-59 months to be acquired for public health facility is estimated to be 667,062 for the forecast year 2021-22. The associated summary outputs for Vitamin A are shown in Table 24

Table 24: Forecasted Vitamin A Capsules Requirement

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Percent Infants (1.17%) (PBS 12-13)	1.17%	1.17%	1.17%	1.17%	1.17%	1.17%
B) Number of Infants requiring Vitamin A 100,000 IUs for prevention/treatment of Measles	164,905	170,462	176,207	182,145	188,283	194,629

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
C) Requirement of Cap. Vitamin A 100,000 IUs for Infants (1x2 days= 2 Capsule)	329,810	340,925	352,414	364,290	376,567	389,257
D) 2% Wastage	6,596	6,818	7,048	7,286	7,531	7,785
E) Total Requirement of Cap. Vitamin A 100,000 IUs for Infants (1x2 days= 2 Capsule)	336,406	347,743	359,462	371,576	384,098	397,042
A) Percent children between 1 and 2 years (2.32%) (PBS 12-13)	2.32%	2.32%	2.32%	2.32%	2.32%	2.32%
D) Number of Children requiring Vitamin A 200,000 IUs for prevention/treatment of Measles	326,991	338,011	349,402	361,177	373,348	385,930
C) Requirement of Cap. Vitamin A 200,000 IUs for Infants (1x2 days= 2 Capsule)	653,983	676,022	698,804	722,354	746,697	771,861
E) 2% Wastage	13,080	13,520	13,976	14,447	14,934	15,437
F) Total Requirement of Capsule. Vitamin A 200,000 IUs	**667,062**	**689,542**	**712,780**	**736,801**	**761,631**	**787,298**

Vitamin K Injection.

For treating hemorrhagic disease of the newborn

Vitamin K injection is required to prevent or treat Vitamin K deficiency bleeding (VKDB), formerly known as hemorrhagic disease of the newborn. VKDB is a life-threatening condition but can be easily prevented by giving 1mg IM of vitamin K within one hour of birth (39). WHO recommends that all newborns should be given 1 mg of vitamin K intramuscularly (IM) after birth to prevent Vitamin K deficiency bleeding (VKDB).

Summary of Data Needed for Forecasting Vitamin K1

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

The formula used for this calculation of Vitamin K1 is:

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

Table 25 shows the forecasted amount of Vitamin K1 by year. A total of 7,339 injections (10mg) are forecasted for the period (2021/22).

Table 25: Forecasted Number of Vitamin K1 Injections Required for Prevention of Hemorrhagic Disease of Newborn

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
B) % of public health facilities births (13.1%) assuming an increase by 1% annually	17%	18%	19%	20%	21%	22%
C) # of births seeking Vitamin K1 1 mg Injection from public facility (C = A × B)	69,894	76,475	83,420	90,746	98,471	106,613
D) Number of Vitamin K1 Injection (10mg / Injection)	6,989	7,647	8,342	9,075	9,847	10,661

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
required (D = C x 1/10) recommended dose is 1 mg / newborn						
E) 5% Wastage	349	382	417	454	492	533
F) Total requirement of Vitamin K1 Injection (10mg) for Prevention/ treatment of Hemorrhagic Disease of Newborn H= G+F	**7,339**	**8,030**	**8,759**	**9,528**	**10,339**	**11,194**

Paracetamol

For treatment of pain

Paracetamol is pain reliver and fever reducer. Paracetamol is commonly available over the counter drug for the treatment of pain at multiple sites in the body (head, muscles, tooth etc.)(40).

Summary of Data Needed for Forecasting Paracetamol

- Target population (0-59 months children)
- Number of children suffering from pain / fever
- Percent deliveries in public health facilities of Balochistan
- Number 0-59 months children requiring Paracetamol for treatment of pain and fever.
- Standard or average treatment regimen (i.e., amount of Paracetamol (syrup / suppository) needed for each case to treat pain / fever).

Formula used for the calculation of Paracetamol is;

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

Estimated number of under 5 children visiting public sector health facility for the year 2021-22 is 164,854. Applying these parameters, the number of estimated doses pertaining to Paracetamol for children (<5 yrs.) for forecasted year 2021-22 is 173,097 syrups/suppository. The associated summary outputs for Paracetamol are shown in Table 26.

Table 26: Forecasted Paracetamol Requirements

Total Population (projected, based on 2017 census - GR 3.379%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**
A) % under 5 children -- Census 2017	18.00%	18.00%	18.00%	18.00%	18.00%	18.00%
B) Estimated Population of 0-59 months children (2017 Pop x A)	2,537,002	2,622,499	2,710,877	2,802,234	2,896,669	2,994,287
C) Percent 0-59 months children at risk of fever/pain (PDHS 2012-13)	38%	38%	38%	38%	38%	38%
D) Estimated number of 0-59 months children with fever/pain	964,061	996,550	1,030,133	1,064,849	1,100,734	1,137,829
E) Percent under 5 years visiting public health facility for treatment (13.1% PDHS 2017-18)	17%	18%	19%	20%	21%	22%
F) Estimated number of 0-59 months children visiting public health facility	164,854	180,375	196,755	214,035	232,255	251,460
G) Requirement of Paracetamol Syrup/Suppository for the treatment of fever/pain (1	164,854	180,375	196,755	214,035	232,255	251,460

Total Population (projected, based on 2017 census - GR 3.379%)	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021/22**	**2022/23**	**2023/24**	**2024/25**	**2025/26**	**2026/27**
bottle /episode)						
H) 5% Wastage	8,243	9,019	9,838	10,702	11,613	12,573
I) Total Requirement of Syrup / Suppository Paracetamol for under 5 children	**173,097**	**189,394**	**206,593**	**224,736**	**243,868**	**264,033**

Diazepam

For the Management of Pre-Eclampsia/Eclampsia

Eclampsia is, complication of pre-eclampsia, is characterized by seizures or coma during pregnancy or postpartum. Several different anticonvulsants are used to control eclamptic fits and to prevent further fits. The drug of choice for both the prevention and treatment of eclampsia is magnesium sulphate. If magnesium sulphate is not available, diazepam may be given. Fits or convulsions which are prolonged or recurrent may be controlled by intravenous diazepam (41).

Summary of Data Needed for Forecasting Diazepam

- Target population (total expected pregnancies)
- Number of pregnancies complicated by PE/E
- Percent deliveries in public health facilities of Balochistan
- Number of public facility deliveries requiring diazepam for treatment of PE/E
- Standard or average treatment regimen i.e. amount of diazepam needed for each case to prevent PE/E (diazepam rectal gel)

The formula used for this calculation of diazepam is:

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

It is estimated that 14,376 pregnancies will be complicated with pre-eclampsia/eclampsia and will require diazepam for the treatment of PE/E during the forecasting year (2021/22). Out of these, 2,458 pregnant women will seek treatment from public health facilities. Approximately, 5,136 ampoules of diazepam are estimated to be required for the same year. Table 27 shows the complete factorization for the forecast of diazepam gel.

Table 27: Forecasted Number of Diazepam Gel Required

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928	17,195,525
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**	**2027-28**
A) Total Pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588	584,648
B) # of Pregnancies estimated to be complicated with PE/E (3%)	14,376	14,861	15,362	15,879	16,414	16,968	17,539
(C) % of Health Facilities Births (13.1%) assuming PUBLIC HF Deliveries	17%	18%	19%	20%	21%	22%	23%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928	17,195,525
increases by 1% annually							
(D) # of HF Births (D = B × C)	2,458	2,690	2,934	3,192	3,463	3,750	4,052
(E) Requirement of Diazepam Rectal Gel 5 mg for Control / Treatment of Seizures in Eclampsia (Dose 10 mg = E= 2 x D)	4,917	5,380	5,868	6,383	6,927	7,500	8,103
(F) 5% Wastage - **in Gel**	246	269	293	319	346	375	405
(G) Net Requirement of **Diazepam Rectal Gel** for Control of Seizures in Eclampsia in PUBLIC HF Deliveries (including wastage) G= E+F	5,163	5,649	6,162	6,703	7,273	7,875	8,508

Phenobarbital

For the Treatment of Seizures

Phenobarbital belongs to the class of drugs called anticonvulsants. Although, the mainstay of treatment for eclampsia remains magnesium sulphate, phenobarbital may be used to control seizures.

Summary of Data Needed for Forecasting phenobarbital

- Target population (expected number of pregnancies)
- Percent deliveries in public health facilities of Balochistan
- Number of public health facility deliveries
- Number of pregnancies in facility complicated by PE/E
- Standard or average prevention/treatment regimen (4x 100mg injections of phenobarbital)
- Expected projected changes in consumption (potential losses or scale-up in use)

The formula used for this calculation of magnesium sulfate is:

Phenobarbital for Eclampsia treatment (4x100mg injections) = **Total expected pregnancies** x **Proportion of public facility deliveries** x **Treatment dose per eclampsia case (4x100mg injections)**

A total 10,325 injections are estimated to be required for year 2021-2022, as shown in Table 28 below

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total Pregnancies (3.4%) NIPS	479,212	495,361	512,055	529,311	547,149	565,588
B) # of Pregnancies estimated to be complicated with Eclampsia (3%)	14,376	14,861	15,362	15,879	16,414	16,968
(C) % of Pregnant Women seeking care from Public Health Facilities (13.1%% PDHS 2017-18) assuming 1% increase / year	17%	18%	19%	20%	21%	22%
(D) # of HF Births (D = B × C)	2,458	2,690	2,934	3,192	3,463	3,750
(E) Requirement of Phenobarbital for Treatment of Eclampsia in **HF Deliveries** (E= 4 x D) (4 X 100mg injections for treatment of eclampsia)	9,833	10,759	11,736	12,767	13,854	14,999
(F) 5% Wastage -injections	492	538	587	638	693	750
(G) Net Requirement of phenobarbital for Eclampsia treatment in HF Deliveries (including wastage) G= E+F	**10,325**	**11,297**	**12,323**	**13,405**	**14,546**	**15,749**

Chlorhexidine

For the treatment of umbilical cord infections

Infections constitute the major etiology of newborn mortality in Pakistan. The under-five mortality in Pakistan has declined from 2012-13 to 2017-18 but is still one of the highest in the South Asian region (1).

Local unsafe practices, such as cutting the birth cord with un-sterilized instruments is one of key source of infection in the neonatal period. 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 has retained 4% chlorhexidine in its Model List of Essential Medicines for Children, published 2019 (42). WHO recommends daily application of chlorhexidine (7.1% chlorhexidine digluconate aqueous solution or gel, delivering 4% chlorhexidine) application to the umbilical cord stump during the first week of life for newborns who are born at home in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births).

Summary of Data Needed for CHX Forecasting

- Target population (total live births)
- Standard or average treatment regimen (i.e. of CHX needed per newborn) (single dose5 ml)
- 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 × One Gel (5 ml) per birth

According to the current provincial guidelines, Chlorhexidine will be used for all births. Table 14 shows the forecasted amount of Chlorhexidine by year. A total of 73,389 gels of 5 ml (7.1% CHX digluconate) will be procured for public health facilities to implement the provincial policy guidelines during the forecast period (2021-22) (Table29).

Table 29: Forecasted Number of Chlorhexidine Gel Required for Cord Care

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) total births (2.9%) NIPS	408,739	422,514	436,752	451,471	466,686	482,413
(B) % of Public Health Facilities Births (13.1%) assuming HF Deliveries increases by 1% annually	17%	18%	19%	20%	21%	22%
(C) # of HF Births (C = A × B)	69,894	76,475	83,420	90,746	98,471	106,613

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
(D) Prevention of Cord Infection (Assuming 100% of **PHF Births** given Chlorhexidine) D= Cx100%	69,894	76,475	83,420	90,746	98,471	106,613
(E) Requirement of Chlorhexidine digluconate Enzichlor 7.1% Gel (One 5ml Gel / birth) for Prevention of cord infection in **PHF Births** (E = D × 1)	69,894	76,475	83,420	90,746	98,471	106,613
(F) 5% Wastage	3,495	3,824	4,171	4,537	4,924	5,331
(G) Total Requirement of Chlorhexidine Gel for Prevention of cord infection in PHF Births G= E+F	**73,389**	**80,299**	**87,591**	**95,283**	**103,394**	**111,944**

Emergency Contraceptive Pill (ECP)

Pakistan's Contraceptive Prevalence rate has remained stagnant over the past decade (1,2). Lack of availability of contraceptives has not only increased the unmet need but also systematically affected the contraceptive demand by inducing a lack of trust in clients of uninterrupted supplies. Contraceptives were added to Balochistan EML 2021 for improving availability at health facilities and at CMW level.

Levonorgestrel 0.75 (two tablets) are used for emergency contraception. The pill provides protection against pregnancy if taken within 72 hours of conception (43). For the current forecast, 10% of all the pill use is assumed to be ECP use.

Summary of Data Needed for Forecasting ECP

- Total population
- Number of married women of reproductive age group (MWRA)
- Target users for the respective contraceptive based on method wise contraceptive prevalence rate (CPR)
- Proportion of women receiving contraceptives from public health facilities
- Converting users to products required based on Couple Years of Protection (CYP) conversion factors
- Expected projected changes in consumption (potential loss or scale-up in use)

The formula used for this calculation of ECP is

ECP (Levonorgestrel 0.75mg, two tablets) = (MWRA x Proportion of contraceptive users x Proportion of users visiting public sector facilities) x CYP Conversion factor

A total of 110,096 ECP will be required for year 2020-21 as per computations given in Table 30 below.

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of ECP users, 0.27% (PDHS 2017-18). Projected 7% increase in users each year	6,990	7,480	8,003	8,563	9,163	9,804
(C) % of women receiving contraceptives from public health facilities (PWD & DOH)	100%	100%	100%	100%	100%	100%

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
(D) # of women receiving contraceptives from public health facilities (PWD & DOH)	6,990	7,480	8,003	8,563	9,163	9,804
(E) Requirement of ECP, 15 cycles per user	104,853	112,193	120,046	128,449	137,441	147,062
(F) 5% Wastage **-in cycles**	5,243	5,610	6,002	6,422	6,872	7,353
(G) Total Requirement of ECP	**110,096**	**117,802**	**126,048**	**134,872**	**144,313**	**154,415**

Intrauterine Contraceptive Device (IUCD)

Cu-T 380A is the most used IUCD in Pakistan. Among the contraceptive users, the most population methods in Pakistan are condoms. The use of long-term reversible contraceptives (LARCS) is very low. The method specific CPR of IUCDs is only 0.6% in Balochistan (1).

The current forecast uses the demographic data to estimate the number of users and then coverts it to users.

Summary of Data Needed for Forecasting IUCD

- Total population
- Number of married women of reproductive age group (MWRA)
- Target users for the respective contraceptive based on method wise contraceptive prevalence rate (CPR)
- Proportion of women receiving contraceptives from public health facilities
- Converting users to products required based on Couple Years of Protection (CYP) conversion factors

The formula used for this calculation of ECP is

IUCD = (MWRA x Proportion of contraceptive users x Proportion of users visiting public sector facilities) x CYP Conversion factor

Total of almost 20,000 ECP are required for year 2020-21 as per computations given in Table 31 below

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of IUCD users, 0.6% (PDHS 2017-18). Projected 5% increase in users each year	14,405	15,125	15,881	16,675	17,509	18,384
(C) % of women receiving contraceptives from public health facilities (PWD & DOH)	100%	100%	100%	100%	100%	100%
(D) # of women receiving contraceptives from public health facilities (PWD & DOH)	14,405	15,125	15,881	16,675	17,509	18,384
(E) Requirement of IUCD, one per user	18,726	19,662	20,645	21,678	22,761	23,899

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
(30% added to adjust for discontinuation rate)						
(F) 5% Wastage **-in vials**	936	983	1,032	1,084	1,138	1,195
(G) Total Requirement of IUCD	19,662	20,645	21,678	22,761	23,899	25,094

Depot medroxyprogesterone acetate (DMPA)

The use rate for DMPA is relatively low in Pakistan, compared to condoms. However, it is still better than LARC. Only 2.3% of MWRA are users of DMPA in Balochistan (1). A total of four injections per year are required to provide complete protection from pregnancy for one couple.

The current forecast uses the demographic forecast to estimate the number of users and then converts these into number of required DMPA based on CYP conversion factors.

Summary of Data Needed for Forecasting DMPA

- Total population
- Number of married women of reproductive age group (MWRA)
- Target users for the respective contraceptive based on method wise contraceptive prevalence rate (CPR)
- Proportion of women receiving contraceptives from public health facilities
- Converting users to products required based on Couple Years of Protection (CYP) conversion factors

The formula used for this calculation of ECP is

DMPA = (MWRA x Proportion of contraceptive users x Proportion of users visiting public sector facilities) x CYP Conversion factor

For the estimated total 55,217 users of DMPA, total quantities of 231,913 would be required for the year 2020-21. Details are provided in Table 32

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of DMPA users, 2.3% (PDHS 2017-18). Projected 5% increase in users each year	55,217	57,978	60,877	63,921	67,117	70,473
(C) % of women receiving contraceptives from public health facilites (PWD & DOH)	100%	100%	100%	100%	100%	100%
(D) # of women receiving contraceptives from public health facilites (PWD & DOH)	55,217	57,978	60,877	63,921	67,117	70,473
(E) Requirement of DMPA, four injections per year for each user	220,869	231,913	243,508	255,684	268,468	281,891
(F) 5% Wastage **-in vials**	11,043	11,596	12,175	12,784	13,423	14,095
(G) Total Requirement of DMPA	**231,913**	**243,508**	**255,684**	**268,468**	**281,891**	**295,986**

Norethisterone

Progesterone Only Pill, commonly called POP (norethisterone 5mg) is the oral pill used for contraception among lactating women. POP has been reported to be generally safe to lactating mothers and breastfed babies (44).

The availability of POP in Pakistan has remained generally low and erratic. Pakistan Demographic & Health Survey (PDHS) also does not specifically measure the method-wise usage of POP separate from other oral pills (1).

The current forecast assumes the total consumption of POP to be 10% (0.27%) of all the pill use (2.7%) in Balochistan

Summary of Data Needed for Forecasting POP

- Total population
- Number of married women of reproductive age group (MWRA)
- Target users for the respective contraceptive based on method wise contraceptive prevalence rate (CPR)
- Proportion of women receiving contraceptives from public health facilities
- Converting users to products required based on Couple Years of Protection (CYP) conversion factors

The formula used for this calculation of ECP is

POP = (MWRA x Proportion of contraceptive users x Proportion of users visiting public sector facilities) x CYP Conversion factor

Almost 110,000 pills are required for the year 2021-22 as per details provided in Table 33

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of POP users, 0.27% (PDHS 2017-18). Projected 7% increase in users each year	6,990	7,480	8,003	8,563	9,163	9,804
(C) % of women receiving contraceptives from public health facilites (PWD & DOH)	100%	100%	100%	100%	100%	100%
(D) # of women receiving contraceptives from public health facilites (PWD & DOH)	6,990	7,480	8,003	8,563	9,163	9,804
(E) Requirement of COP, 15 cycles per user	104,853	112,193	120,046	128,449	137,441	147,062
(F) 5% Wastage -**in cycles**	5,243	5,610	6,002	6,422	6,872	7,353
(G) Total Requirement of POP	**110,096**	**117,802**	**126,048**	**134,872**	**144,313**	**154,415**

COC

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of COC users, 2.7% (PDHS 2017-18). Projected 7% increase in users each year	69,902	74,795	80,031	85,633	91,627	98,041
(C) % of women receiving contraceptives from public health facilites (PWD & DOH)	100%	100%	100%	100%	100%	100%
(D) # of women receiving contraceptives from public health facilites (PWD & DOH)	69,902	74,795	80,031	85,633	91,627	98,041
(E) Requirement of COC, 15 cycles per user	1,048,529	1,121,926	1,200,461	1,284,493	1,374,407	1,470,616
(D) 5% Wastage **-in cycles**	52,426	56,096	60,023	64,225	68,720	73,531
(E) Total Requirement of IUCD	**1,100,955**	**1,178,022**	**1,260,484**	**1,348,718**	**1,443,128**	**1,544,147**

Male Condom

Total Population Census 2017	14,094,456	14,569,440	15,060,430	15,567,966	16,092,607	16,634,928
Parameters	**2021-22**	**2022-23**	**2023-24**	**2024-25**	**2025-26**	**2026-27**
A) Married Women of Reproductive age (16%)	2,255,113	2,331,110	2,409,669	2,490,875	2,574,817	2,661,588
B) # of Condom users, 5.4% (PDHS 2017-18). Projected 7% increase in users each year	139,804	149,590	160,061	171,266	183,254	196,082
(C) % of women receiving contraceptives from public health facilites (PWD & DOH)	100%	100%	100%	100%	100%	100%
(D) # of women receiving contraceptives from public health facilites (PWD & DOH)	139,804	149,590	160,061	171,266	183,254	196,082
(E) Requirement of Condoms, 120 units per user per year	16,776,462	17,950,814	19,207,371	20,551,887	21,990,519	23,529,855
(D) 5% Wastage - in cycles	838,823	897,541	960,369	1,027,594	1,099,526	1,176,493
(E) Total Requirement of IUCD	**17,615,285**	**18,848,355**	**20,167,739**	**21,579,481**	**23,090,045**	**24,706,348**

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