Reducing Maternal, Child Morbidity & Mortality, Through Improving the Quality of Reproductive, Maternal, Neonatal, Child, and Adolescent Health, Malaria, and Nutrition (RMNCAH+MN) Healthcare Service Delivery: A Data-Driven Approach, case study of Bauchi State, Nigeria

by

Student Name: [ABDULLAHI BALARABE]

Student ID: [IDEAS/24/43506]

Supervisor: [Dr. Akande Noah Oluwatobi]

Department: [Professional Diploma in Data Analytics]

University: [Base University Abuja]

Date: [30h August 2024

Project Overview:

This project aims to enhance the quality of RMNCAH+MN, healthcare services by leveraging on data analytics to identify services gaps, optimize resource allocation, and improve service delivery. The focus areas include antenatal care, intermittent preventive treatment of malaria in pregnancy, haematinics usage, labor and delivery outcomes, live births, CHX4 (chlorhexidine) application for newborn care, skin-to-skin breastfeeding, vitamin A supplementation for children aged 6 to 59 months, and immunization coverage for under-five children.

Objectives:

1. Identify Gaps in Service Delivery: Utilize data analytics to detect inefficiencies, missed opportunities, and gaps in the delivery of RMNCAH, malaria, and nutrition services.
2. Optimize Resource Allocation: Analyze the data to inform resource distribution, ensuring that areas of high need are adequately supported.
3. Improve Service Delivery: Use insights gained from data analysis to implement targeted interventions aimed at improving healthcare outcomes, reduce maternal, child morbidity and mortality in Bauchi state

Data Overview:

Time Frame: October 2021 to April 2022

NB: To be able to make sense of data analytics in the health sector, one need to have a very good understanding of the national health management information system (HMIS/DHIS2) Since one clinical service is associated with two or more services

Key Metrics Analyzed:

Antenatal care visits (ANC):

These refers to the antennal care visit to health facility and corresponding services outcome at each of the clinic visit, such as intermittent preventive malaria treatment of malaria in pregnancy IPT1p, IPT2p, IPT3p, IPT4p and Haematinics received during each antenatal clinic visit, all pregnant women after their first trimester that went to clinic should receive IPTp that correspond to her clinic visit and haematinics.

Intermittent preventive treatment of malaria in pregnancy IPT:

These is antimalaria drug recommended to be given to all the pregnant women at antennal (care ANC) visit is Sulfadoxine-Pyrimethamine (SP), which is has been shown to reduce maternal anaemia, low birth weight and perinatal mortality.

Haematinics distribution and usage: This is an iron supplement used to treat or prevent low blood levels (such as cause by anemia or pregnancy). Iron is an important mineral that the body needs to produce red blood cells and keep humans in good health. All pregnant women that went for ANC visit should receive haematinics.

Labor and delivery outcomes:

This refer to the services a pregnant woman in labour should receive such as, the attention of a skill birth attendant (SBA), Partograph utilization, The partograph is a tool for monitoring maternal and foetal wellbeing during the active phase of labour, and a decision-making aid when abnormalities are detected. It is designed to be used at any level of care. Its central feature is a graph used to record the progress of cervical dilation, as determined by vaginal examination.

Administration of uterotonics at the third stage of labour: Uterotonic agents increase the uterine tone and contractions. These agents intensify uterine muscle contractions at the beginning and during labor, and during the postpartum period. Oxytocin, a hormone produced by the posterior pituitary, is a natural uterotonic. Uterotonic agents are used to induce labor and for elected abortions. They lessen blood loss during childbirth and are extremely important in the prevention and treatment of postpartum hemorrhage

NB. Indicators are plotted on the graph each time they are checked:

Maternal indicators: Vital signs (heart rate, blood pressure and temperature, Time of spontaneous or artificial rupture of the membranes, Uterine contractions (number per 10 minutes and duration, Urine output**,** Drugs administered (oxytocin, antibiotics, etc.)

Foetal indicators: Foetal heart rate, Amniotic fluid (colour, odour and quantity, Descent of the foetal head and head moulding**.**

Number of live births: This refers to the total number of live birth or born alive compared to total deliveries, fresh still birth (FSB) and marcerated still birth (MSB) in a given health clinic aggregated by state

Care for the new born Babies: This refers to the set of care given to new born baby in a health care after delivery such as CHX4 application to newborns to the umbilical cord to prevent infections and quick healing , Immunization against deadly disease such Bacillus Calmette-Guérin (BCG) is the only licensed vaccine against tuberculosis (TB), Hep0 is hepatitis vaccine given to infant at birth, safe and effective tool to help protect you against two forms of viral hepatitis: A and B. Typically, the vaccines are given to children or infants in a two- or three-dose course so that they are protected from a young age and OPV0 is a Polio vaccines given to infant at birth, they are vaccines used to prevent poliomyelitis (polio). Two types are used: an inactivated poliovirus given by injection (IPV) and a weakened poliovirus given by mouth (OPV). The World Health Organization (WHO) recommends all children be fully vaccinated against polio.

Skin-to-skin breastfeeding initiation to the new born: Skin-to-skin contact is a key part of the UNICEF UK Baby Friendly Initiative standards. It helps babies adjust to life outside the womb and supports mothers to initiate breastfeeding and develop close, loving relationships with their baby. It is expected that, it should be initiated within one hour after birth.

Nutritional services Received in a health facility: Such as Vitamin A supplementation for children aged 6 to 59 months among other things. Vitamin A is vital to child health and immune function; hence, in settings where vitamin A deficiency is a public health problem, vitamin A supplementation is recommended in infants and children aged 6-59 months as a public health intervention to reduce child morbidity and mortality.

Data Table.

Data Element	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	Apr 22
ANC Attendance	36813	42443	36633	33906	33413	39695	28958
ANC 1st Visit GA < 20wks	7631	8579	6469	5799	6027	7952	5915
ANC 1st Visit GA ≥ 20wks	10898	12119	9380	8572	7851	9922	6811
ANC 4th visit	4266	4771	4532	4079	4515	5361	3680
IPT1p	12840	13194	11061	10300	10189	12135	8892
IPT2p	8258	8401	7703	6574	6474	7025	5500
IPT3p	2761	3498	3588	3123	3033	3670	2973
PW who received Haematinics	35255	41822	35321	32634	33481	38362	28036
Deliveries Assisted	6	3	73	14	6	3	0
Deliveries Caeserean Section	165	175	179	161	226	230	192
Deliveries Spontaneous Vaginal Delivery (SVD)	7235	7674	7573	7539	7025	7588	7591
Deliveries by Skilled Birth Attendants (SBA)	7060	7294	7303	7231	6944	7369	7551
Deliveries monitored using a partograph	6152	6653	6784	6795	6448	6854	7127
Women given Uterotonics in the 3rd stage of labour Oxytocin	7121	7518	7131	7310	6801	7376	7398
Live Births Female, <2.5kg	214	221	180	106	111	127	194
Live Births Female, >2.5kg	3354	3474	3555	3675	3346	3541	3577
Live Births Male, <2.5kg	170	178	189	124	88	176	154
Live Births Male, >2.5kg	3544	3702	3689	3711	3408	3798	3780
Still birth Fresh Still Births (FSB)	104	136	90	127	107	99	104
Still birth Macerated (MSB)	161	152	120	140	122	129	128
4% Chlorhexidine (CHX) gel is applied to cord at birth Female	3368	3597	3569	3435	3327	3585	3694
4% Chlorhexidine (CHX) gel is applied to cord at birth Male	3459	3721	3734	3642	3382	3876	3872
Babies put to breast within 1hr with skin-to-skin to keep warm Female	3437	3605	3544	3558	3327	3567	3673
Babies put to breast within 1hr with skin-to-skin to keep warm Male	3534	3732	3728	3745	3482	3859	3836
Children 0-59 months that received Nutrition/GMPS	39021	92713	19231	16510	16880	20698	19345
Children 6-59 months given Vitamin A Female, 12-59m	38312	279851	3043	2581	2379	3843	2599
Children 6-59 months given Vitamin A Female, 6-11m	8405	72680	3039	2690	2595	3509	2570
Children 6-59 months given Vitamin A Male, 12-59m	33419	254219	2815	2217	2089	3380	2372
Children 6-59 months given Vitamin A Male, 6-11m	6376	58846	2704	2548	2691	2745	2290
Fully Immunized < 1 year	4296	4866	5095	4928	5219	5666	5005
OPV 0 birth	6162	7118	6669	6794	6360	6935	6888
BCG given	6986	8061	7531	7353	7246	7990	7857
Hep. B 0 birth	5914	7028	6611	6526	6305	6801	6725

Data source: *National Health Management Information system (DHIS2, Version 2019).*

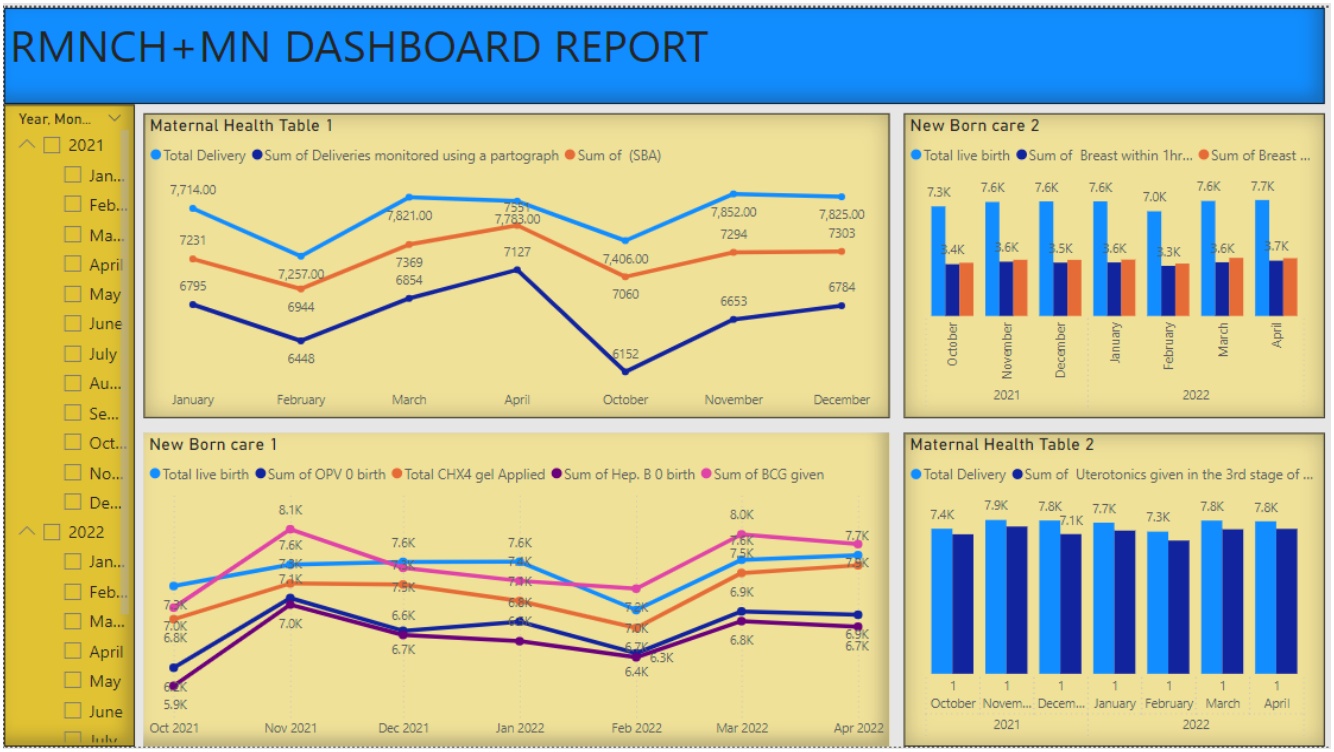
Tools and Techniques:

The data has been transform using Microsoft power query editor and Microsoft power BI data analysis expression (DAX Functions)

Microsoft Power BI: Used for data visualization and dashboard creation. Power BI enabled the exploration of trends, identification of gaps, and presentation of actionable insights to stakeholders.

Data Analysis Techniques: Descriptive statistics, trend analysis, and comparative analysis were employed to understand service delivery patterns over the specified period

Dashboard sheet: 1



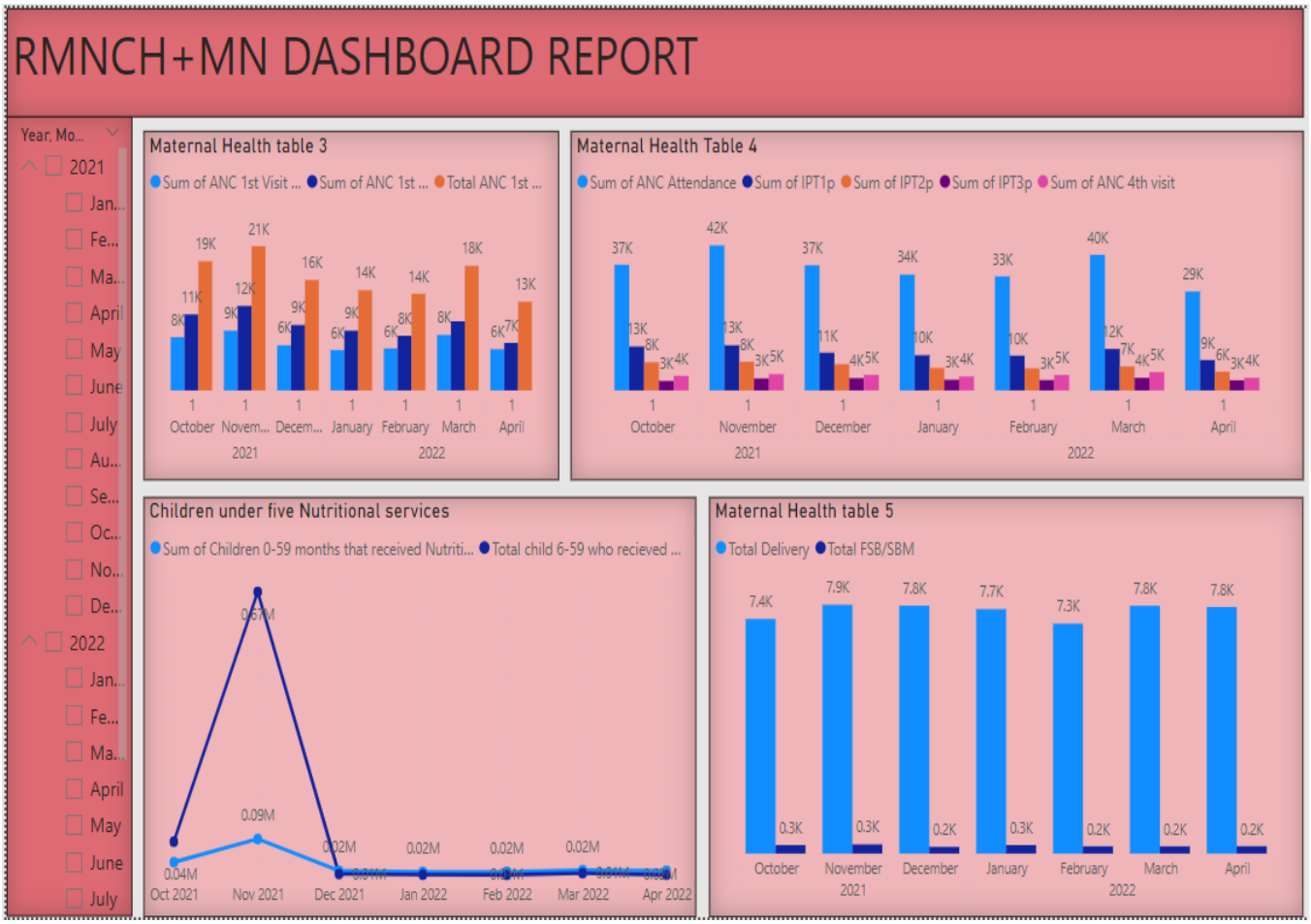
From the dashboard sheet 1, above, it can be observed that, in the maternal health table one, that partograph utilization and skill birth attendant are below the total number of deliveries taken across all the months, this implies that, a significant number of pregnant women that deliver their babies in the health clinic where not attended by a skill birth attendant nor monitor for danger signs during the progress of their labour. While in maternal health table two, from the dashboard, it can be clearly seen that, uterotonics was not administered during the third stage of labour to a quite number of deliveries across all the period under study. These may lead increase in the incidence delivery complications such as postpartum hemorrhage and untimely death of significant number of women during delivery.

Newborn care: It can be clearly observed that, a significant number of live birth where not immunize against deadly disease at birth, such OPV0, Hep0, while for BCG that is higher than the live birth in November 2021, February, march, and April 2022, it could be that, some outreaches were taken to immunize children in their communities and not the clinics.

It could be seen that CHX4 gel applied to the umbilical cord is below the live birth. This services gap itemized above

has contributed to a significant increase in maternal morbidity, mortality and child death in Bauchi state.

Dashboard Sheet: 2



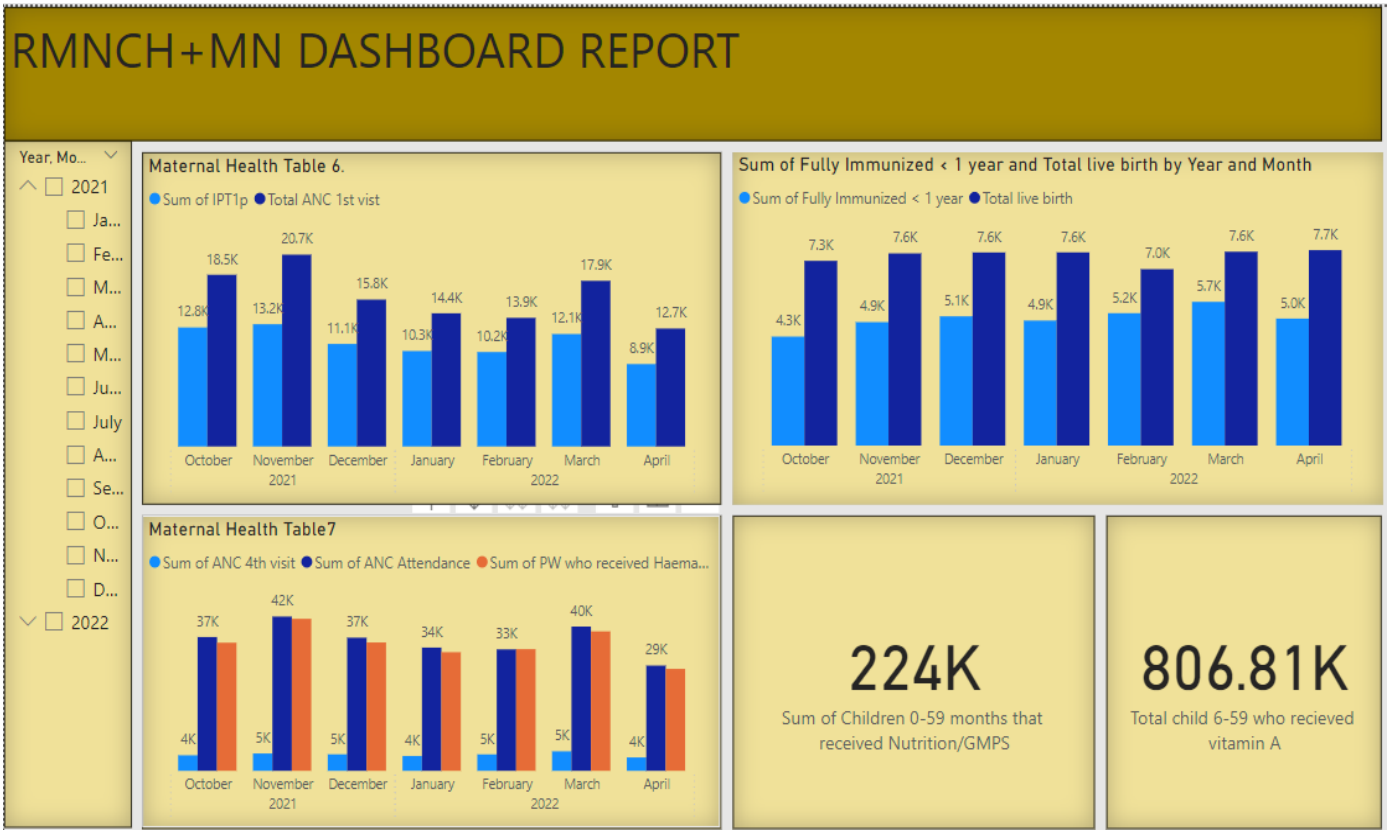
From the dashboard sheet 2, It can clearly be seen from the maternal health table three that, antennal care of pregnancy of gestational age greater than 20weeks is higher that of antennal care attendance of gestational age less 2oweeks across all months under study, this implies that,

a considerable number of pregnant women do not come to heath facilities for antennal care until they start perceiving a danger sign.

While for maternal health table four, it can clearly be seen that a considerable number of pregnant women who started coming for antennal care do not reach the WHO recommendations of at least four ANC visit before delivery when compared the total ANC attendance. Likewise in the maternal health table five it can be clearly seen that, the proportion of fresh still and macerated still birth are greater than 10% of the total delivery, this is considered to be high especially in in October, November 2021 and January 2022. This could be do to delay in seeking medical attention in less 24 hours after the initiation of labour, this has resulted to a significant increase in maternal and infant mortality in the state.

Children Under the age of five Nutritional services: It could be seen from under five nutritional services table that there is upshoot in the total number children who received vitamin A in the month of November 22021, it could be due child health week activity during the month. It can also be observed that, there is a significant disparity between number of children between 6 to 59 month who received vitamin A and total number of children zero to 59 month of age who received nutritional services in the health facilities, this implies that, a lot of vitamin A given is not well documented in the national health management information system, this may lead to a significant crowding out of foreign interventions of nutritional services into the state.

Dashboard sheet: 3.



From the dashboard sheet 3, Above It can be seen in the maternal health table six, that, IPT1p received is less that the total number of antennal first visit across all the months under study, this has the potentials of increasing the risk of severe malaria in pregnancy thereby posing a significant danger to the mothers, fetus and their infants. Looking at the maternal health table from the dashboard, it can be observed that haematinics was not serve for a considerable number of pregnant women during their ANC visit, this may increase the risk of postpartum Hemorrhage and lost lives. While it can be observed that, total live birth is higher than the total number of fully immunized children less than one year age, this implies that a quite number of children do not complete their immunization cycle before the reach the age of one. This has resulted to a proliferation of incidence of preventable disease and death of children below the age of one.

The differentials between total number of vitamin A received by children 6 to 59 month and the sum of children 0 to 59 month of age, it could be as a result of poor data documentations of outreach activities during during child health week.

Key Findings:

Antenatal Care: It has been Identified that, antenatal first visits of gestational age greater than 20 weeks is higher than that of gestational less than 20 weeks, haematinics given is less than the total antennal visits across all months under study, this implies that a significant number of pregnant women do not come to the health facilities for antennal care until they start perceiving a danger sign. This may result to a significant increase in maternal complications and death.

Malaria Prevention: Data revealed gaps in the distribution and uptake of intermittent preventive treatment in pregnancy, this may cause a significant increase in severe malaria incidence in pregnancy, thereby posing a significant danger to the mothers, fetus and their infants.

Labour & Delivery, there is a significance services gap ranging from partograph utilization in monitoring the progress of labour, skill birth attendant during labour, administration of uterotonics in the third stage of labour, these has resulted to a significant incidence of labour complications, postpartum hemorrhage, thereby leading to increase in maternal death.

Newborn Care: A significant services gap has been identified between live birth, CHX4 usage and skin-to-skin breastfeeding, zero dose antigens such as OPV, Hep0, BCG were below optimal levels across all the months under study, these has increased the incidence of preventable disease, burden to the health system, leading to significant increase in death of children

Child Nutrition: Disparities in vitamin A supplementation and the total number of children 0 to 59 month that were documented to have received nutritional services into the national health management information system data tools in the state with later been higher. This will lead to crowding out essential nutrition interventions by international communities in to the state

Recommendations:

There is need to strengthen community advocacy and awareness on the need for all pregnant women to go for antenatal care as early as possible, specifically earlier than 13^{th} weeks of pregnancy and not when danger sign is perceived and immunized their children against deadly diseases

The health facilities management committees and community development committees should come together and raised fund to institute a local drug revolving fund for essential drugs to avoid consistent stock out of drugs

Enhanced Training: Improve training for healthcare providers on the importance of CHX4 usage and skin-to-skin breastfeeding, partograph utilization, administration of uterotonics at the third stage of labour

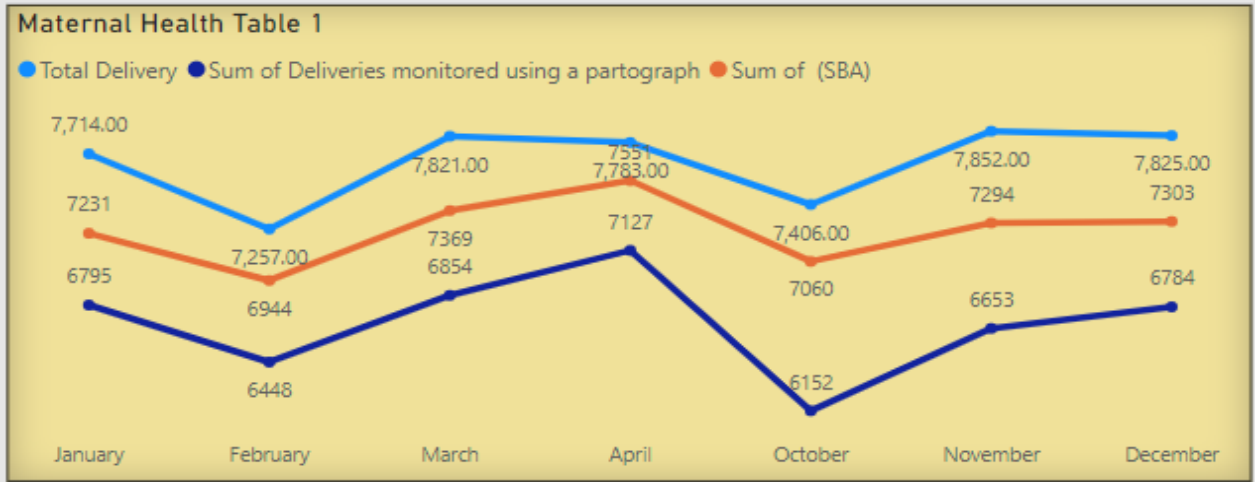
Community Engagement: Increase community outreach efforts to boost antenatal care visits, malaria prevention in pregnancy, and child immunization, infant and young child feeding and nutritional supplements.

Primary health facilities should create and initiate effective referral communications and emergency means of transportations to the to the secondary facilities.

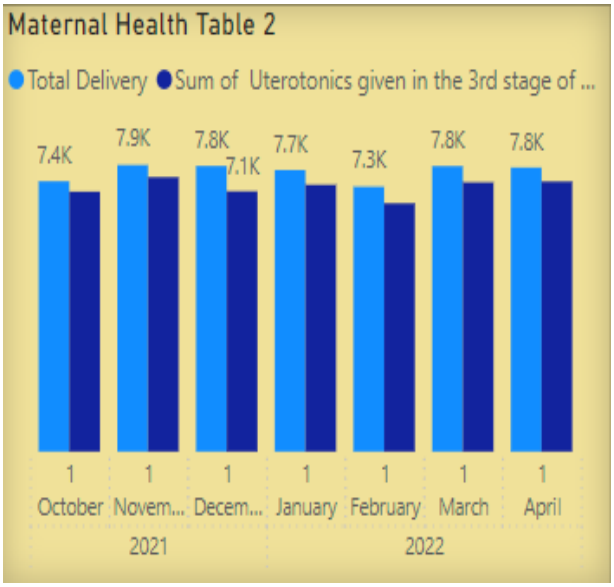
APPENDIX SECTION 1

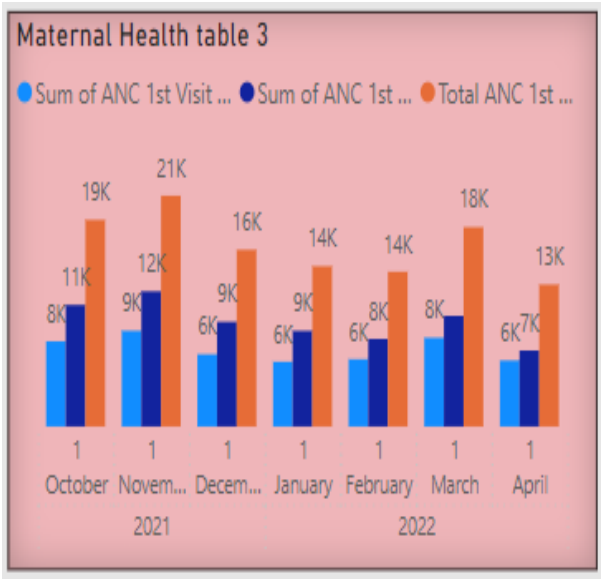
Analysis Tables:1

Table:1



Tabble:2 &3





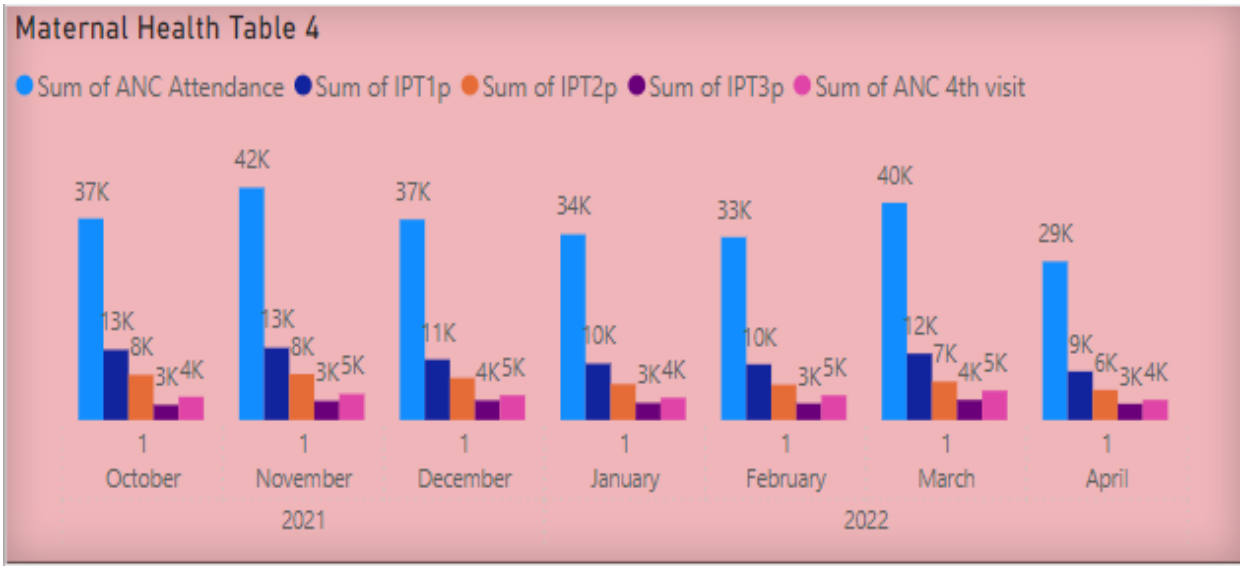


Table: 4

Table: 5

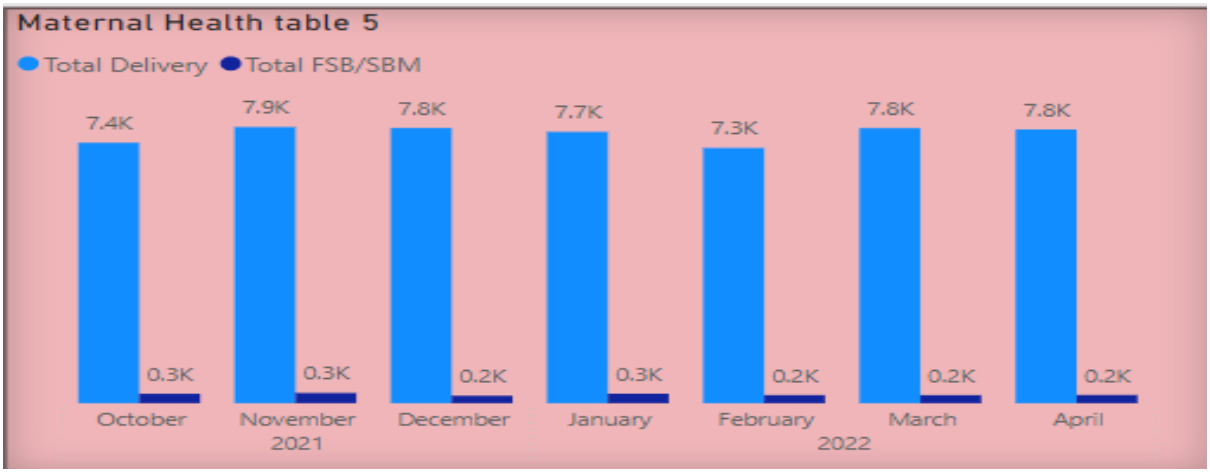


Table :6

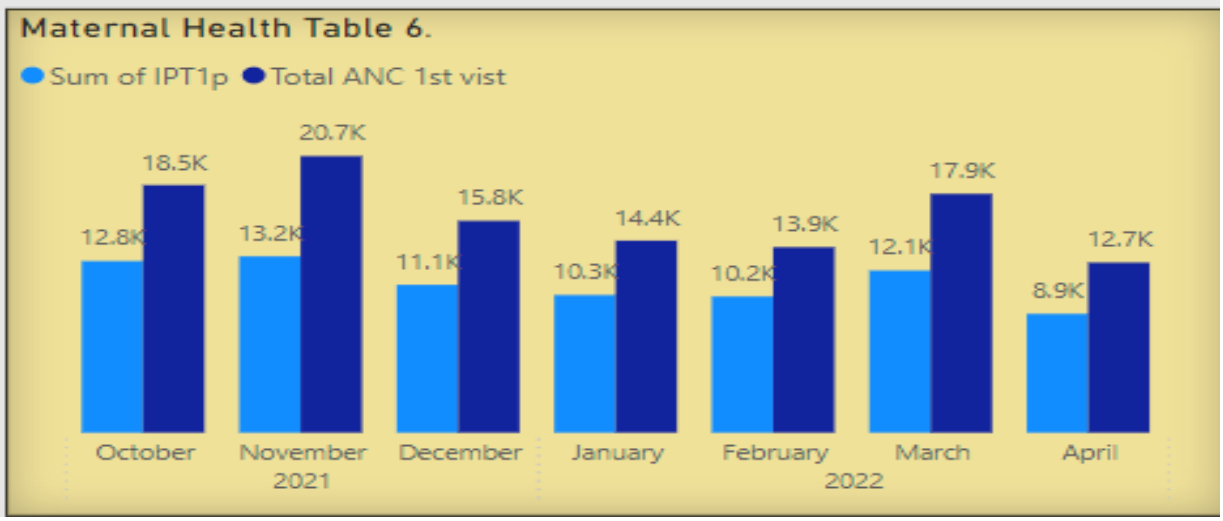


Table:7

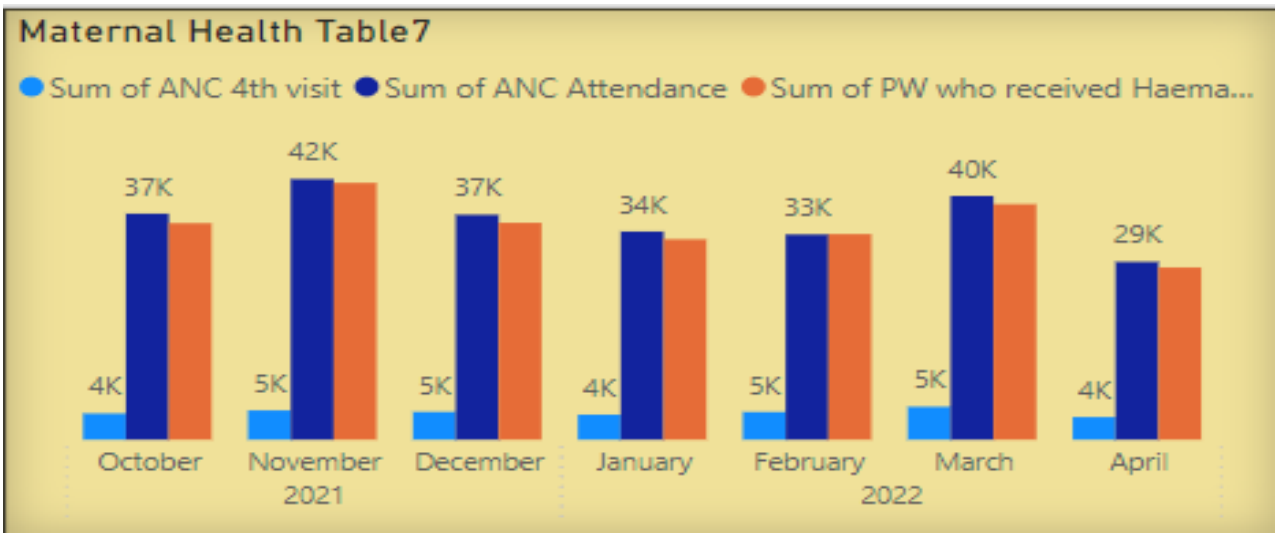


Table: 8

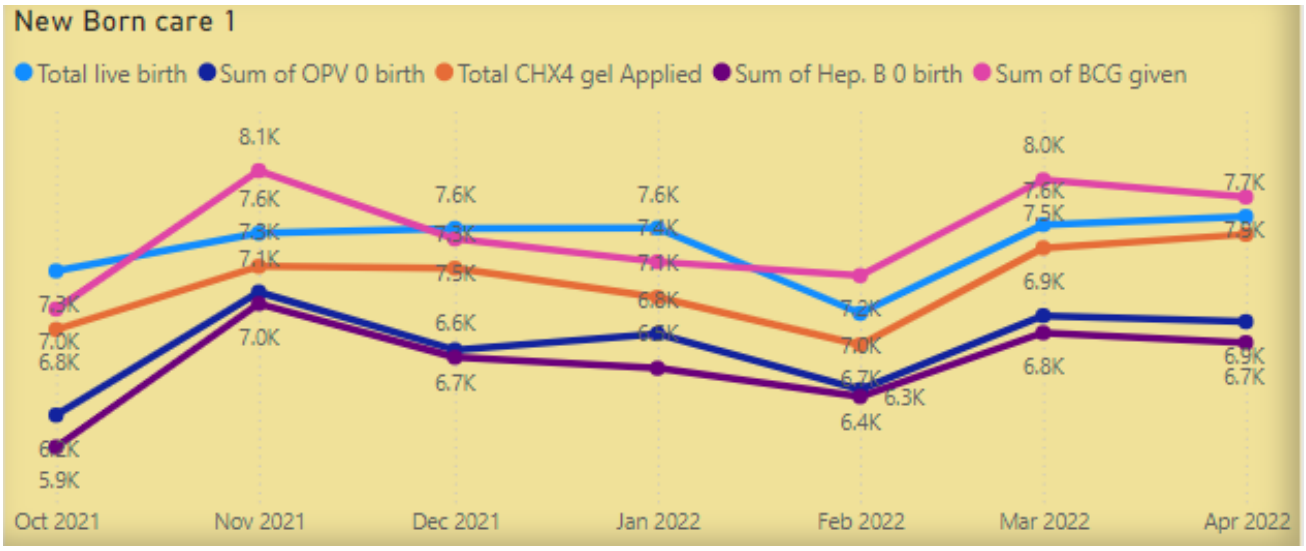


Table: 9

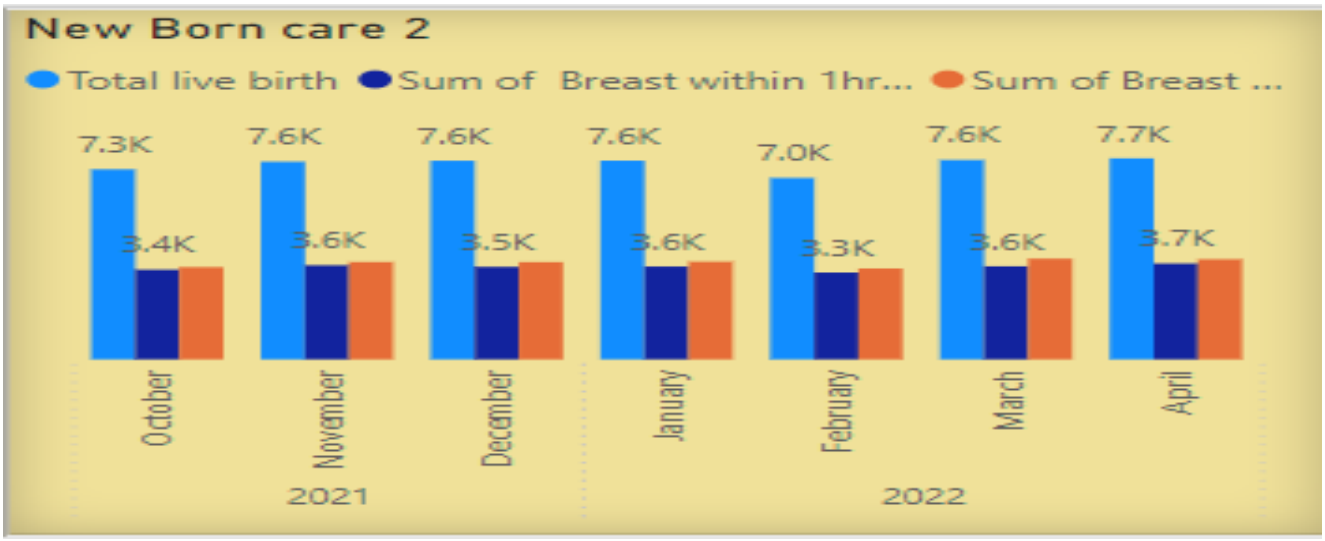


Table: 10

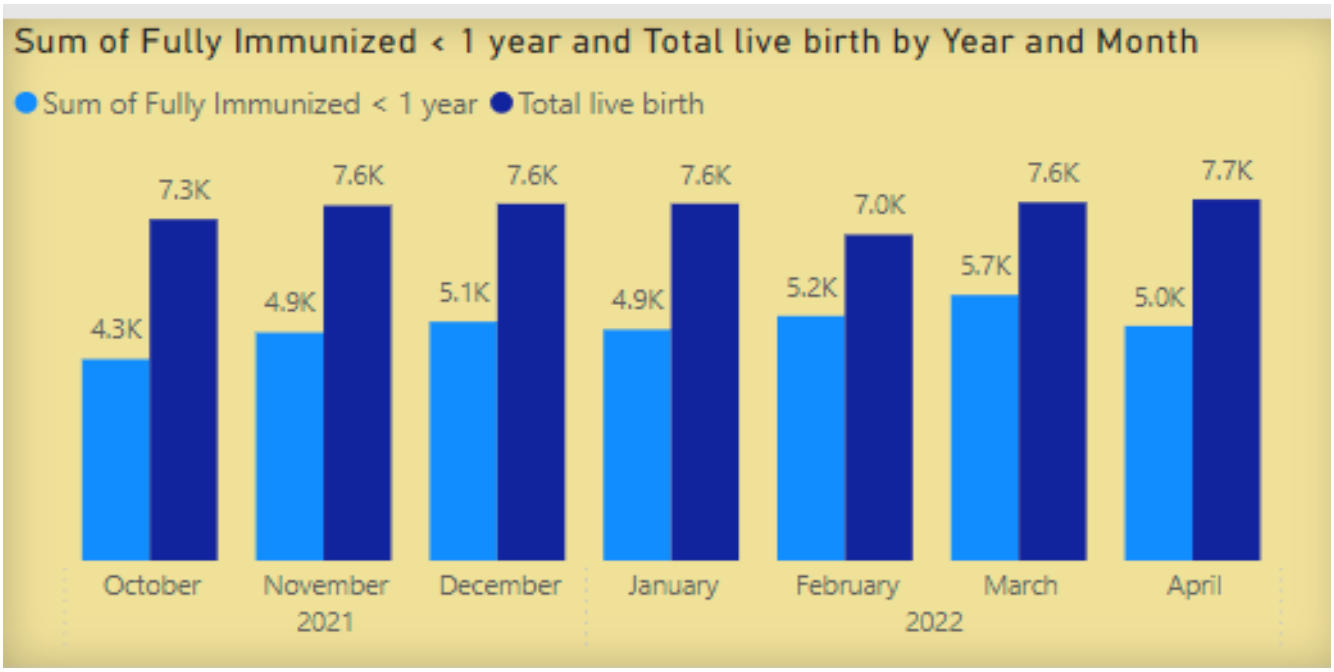


Table:11

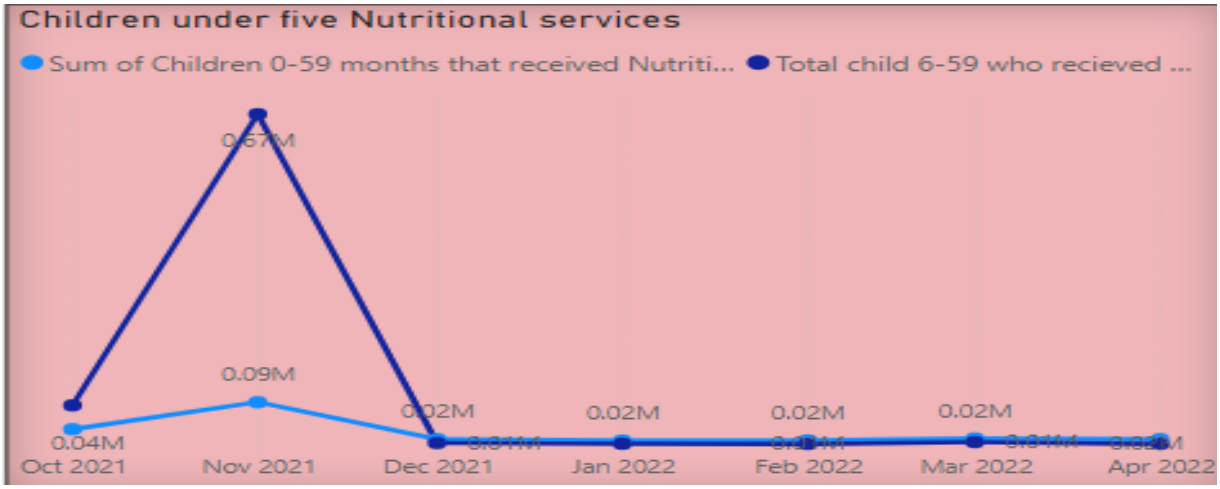


Table: 12

Appendix section 2a.

Data Cleaning and Transformation Tables

Maternal Health table 1

Year	Month	Sum of Deliveries Assisted	Sum of (SBA)	Sum of Deliveries Caeserean Section	Sum of Deliveries monitored using a partograph	Total Delivery	Total live birth
2021	October	6	7060	165	6152	7,406.00	7,282.00
2021	November	3	7294	175	6653	7,852.00	7,575.00
2021	December	73	7303	179	6784	7,825.00	7,613.00
2022	January	14	7231	161	6795	7,714.00	7,616.00
2022	February	6	6944	226	6448	7,257.00	6,953.00
2022	March	3	7369	230	6854	7,821.00	7,642.00
2022	April	0	7551	192	7127	7,783.00	7,705.00
Total		**105**	**50752**	**1328**	**46813**	**53,658.00**	**52,386.00**

Maternal Health table 2

Year	Month	Sum of Delivery (SVD)	Sum of IPT1p	Sum of IPT2p	Sum of IPT3p	Sum of ANC Attendance	Sum of ANC 4th visit	Sum of ANC 1st Visit GA ≥ 20wks	Sum of ANC 1st Visit GA < 20wks
2021	October	7235	12840	8,258.00	2761	36813	4,266.00	10898	7631
2021	November	7674	13194	8,401.00	3498	42443	4,771.00	12119	8579
2021	December	7573	11061	7,703.00	3588	36633	4,532.00	9380	6469
2022	January	7539	10300	6,574.00	3123	33906	4,079.00	8572	5799
2022	February	7025	10189	6,474.00	3033	33413	4,515.00	7851	6027
2022	March	7588	12135	7,025.00	3670	39695	5,361.00	9922	7952
2022	April	7591	8892	5,500.00	2973	28958	3,680.00	6811	5915
Total		**52225**	**78611**	**49,935.00**	**22646**	**251861**	**31,204.00**	**65553**	**48372**

Nutrition services

Year	Month	Total child 6-59 who recieved vitamin A	Sum of Children 0-59 months that received Nutrition/GMPS
2021	October	86,512.00	39021
2021	November	665,596.00	92713
2021	December	11,601.00	19231
2022	January	10,036.00	16510
2022	February	9,754.00	16880
2022	March	13,477.00	20698
Total		**806,807.00**	**224398**

Appendix section 2b.

New Born care Table 1

Year	Month	Total live birth	Sum of OPV 0 birth	Sum of Hep. B 0 birth	Sum of BCG given	Total CHX4 gel Applied	Total FSB/SBM	Sum of Fully Immunized < 1 year
2021	October	7,282.00	6162	5914	6986	6,827.00	265.00	4296
2021	November	7,575.00	7118	7028	8061	7,318.00	288.00	4866
2021	December	7,613.00	6669	6611	7531	7,303.00	210.00	5095
2022	January	7,616.00	6794	6526	7353	7,077.00	267.00	4928
2022	February	6,953.00	6360	6305	7246	6,709.00	229.00	5219
2022	March	7,642.00	6935	6801	7990	7,461.00	228.00	5666
2022	April	7,705.00	6888	6725	7857	7,566.00	232.00	5005
Total		**52,386.00**	**46926**	**45910**	**53024**	**50,261.00**	**1,719.00**	**35075**

New born care Table 2

Year	Month	Total live birth	Sum of Breast within 1hr with skin-to-skin to keep warm Female	Sum of Breast within 1hr with skin-to-skin to keep warm Male
2021	October	7,282.00	3437	3534
2021	November	7,575.00	3605	3732
2021	December	7,613.00	3544	3728
2022	January	7,616.00	3558	3745
2022	February	6,953.00	3327	3482
2022	March	7,642.00	3567	3859
Total		**52,386.00**	**24711**	**25916**

Maternal Health 3

Year	Month	Total Delivery	Sum of PW who received Haematinics	Sum of Uterotonics given in the 3rd stage of labour Oxytocin	Sum of ANC Attendance	Total live birth
2021	October	7,406.00	35255	7121	36813	7,282.00
2021	November	7,852.00	41822	7518	42443	7,575.00
2021	December	7,825.00	35321	7131	36633	7,613.00
2022	January	7,714.00	32634	7310	33906	7,616.00
2022	February	7,257.00	33481	6801	33413	6,953.00
2022	March	7,821.00	38362	7376	39695	7,642.00
Total		**53,658.00**	**244911**	**50655**	**251861**	**52,386.00**