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## ASSESSMENT OF MODERN CONTRACEPTIVE UTILIZATION IN HEALTH FACILITIES REPORTING ON DISTRICT HEALTH INFORMATION SYSTEM PLATFORM IN RIVERS STATE

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### **Abstract**

*The study assessed the extent of utilization of modern methods of contraception in health facilities reporting on the electronic District Health Information System version 2.0 (DHIS2) in Rivers State, Nigeria. Awareness of modern methods of contraception in the State was as high as 99.6% but this did not translate to a high contraceptive prevalence rate (CPR); hence the motivation to measure the CPR status/performance in the State over the period 2016 to 2020 against the national FP2020 project target of 27% by 2020. Analytic, descriptive retrospective study design was adopted. A sample of 254 health facilities which constituted about 69.2% of all the public and private health facilities on the State DHIS2 platform were selected using purposive sampling technique. The extent of modern contraceptive utilization by women aged 15-49 years for the different categories of independent variables were measured using modern contraceptive prevalence rate (mCPR). The Chi square statistics was used to test the hypotheses at 0.05 level of significance. The State achieved a mCPR of 4.13% within 2016 to 2020. The year 2020 witnessed the highest mCPR of 7.06%. The Urban areas, Okrika LGA, and the Tertiary health facilities recorded the highest mCPRs of 5.77%, 10.62% and 8.84% respectively in the period. Statistically significant differences ( $p < 0.05$ ) were noted in contraceptive utilization in the different LGAs, the Urban, Suburban and Rural areas, and among the different health facility types in the period. The Tertiary health facilities contributed over 200% to the State mCPR of 4.13% reported within the period. Conclusively, the State achieved over 190% increment in mCPR within 5 years, and over 15% of the national FP2020 target of 27% by 2020 in the same period. Therefore, to further improve on the State mCPR and to meet target levels, the cause(s) of the low contraceptive utilization in 13 LGAs, the Rural areas, and the Secondary and primary health facilities must be investigated and resolved.*

### **Keywords:**

Modern Contraceptives (MC), Modern Contraceptive Utilization (MCU), Modern Contraceptive Methods (MCM), Modern Contraceptive Prevalence Rates (mCPRs), District Health Information System 2 (DHIS2), Health Facilities (HFs), Local Government Areas (LGAs), Rivers State (State).

## 1.1 Introduction

Modern Methods of Family Planning (MMFP) as a popular public health intervention have been adjudged as one of the cost effective and proven ways to reduce the risk of maternal death. Ezire, Idogho, Theophilus, Ikani and Oluigbo (2014) described Modern Methods of Family Planning (MMFP) as very effective, safe, and legal methods used in preventing pregnancy such as the use of contraceptive pills, intra-uterine devices (IUD), injectable contraceptives, use of condoms (male and female), sterilization (tubal ligation and vasectomy), implants, lactational amenorrhea method (LAM), standard days method (SDM) and emergency contraception. The correct and consistent use of various modern contraceptive methods have been found to prevent maternal deaths through the reduction in the total number of child births, high-risk pregnancies, unintended pregnancies, unsafe abortions, and sexually transmitted infections including HIV/AIDS (Starbird, Norton, and Marcus, 2016; Adewale, Fagbamigbe, and Bamgboye, 2011; Arbab, Bener and Adulmalik, 2011).

The maternal mortality ratio (MMR) is a population-based indicator of maternal health and refers to the number of women who die from pregnancy-related complications per 100,000 live births during a given time or period. In 2008 alone, FP interventions worldwide prevented over 272,000 maternal deaths which accounted for 44% reduction in global MMR in the same year (Ahmed, Li, Liu and Tsui, 2012). Of the 24% unintended pregnancies that occurred in Nigeria in 2012, about 56% of it ended up being aborted, which raised the induced abortion figure of 1999 from 23 abortions per 1,000 women to 33 abortions per 1,000 women of aged 15-49 years in 2012 (Adewole, Hussain, Awolude, Singh, and Akinyemi, 2015). Majority of these unintended pregnancies and the subsequent induced abortions could have been prevented through accurate and consistent use of effective contraceptive methods. Thus, optimizing the practice of FP in Nigeria has the potential to further reduce the prevalence of unintended pregnancies, induced abortions, and maternal mortality, and which consequently would lead to improved maternal health.

The Federal Government of Nigeria launched her first national population policy in 1988, reflecting new approval on the part of policymakers and as a national effort to curb the combined effect of the rapid population growth and dwindling revenue due to the falling crude oil prices in the 80s. The policy was aimed at improving the quality of life of an average Nigerian by reducing fertility through the provision of family planning services across the nation. The government's target was to bring down the total fertility rate (the number of children a woman is likely to have during her lifetime) from over six (6) to four (4) live births per woman by escalating the use of contraceptives via women of child bearing age; suggests an optimum marriage age of 18 years for women and 24 years for men, and advocates that pregnancies be restricted to the 18-35-year range and at intervals of 2 years [National Population Commission Nigeria (NPCN) and ICF International (ICFI), 1989].

The revised edition of the Nigeria National Population policy (NNPP) was published in 2004. The policy aimed at addressing new challenges that came up from the 1991 National Population Census, the 1994 International Conference on Population and Development, the 1999 HIV/AIDS summit in Abuja, and the 2000 - 2015 Millennium Development Goals which largely were pointers to a possible significant relationship between population and health (NPCN and ICFI, 2014). According to Monjok, Smesny, Ekabua and Essien (2010) some specific targets of the revised policy included among others a reduction of maternal deaths by 75% in 2015 in accordance with the Millennium Development Goal (MDG) [No.5.51]; a reduction in the total fertility rate of at least 0.6 children every five years, and to increase the modern contraceptive prevalence rate by at least 2 % point per year.

The ultimate goals of the Nigerian Population Policy (NPP) were to achieve a lower population growth rate through voluntary fertility regulation to improve the standard of living of Nigerians, promote health and welfare of the people through the reduction of deaths and disease among women and children. However, an evaluation of the policy and the specific targets of the NPP by Michael and Mayowa (2017) indicated a total failure of all set targets for the year 2000. The population has continued to grow at an annual rate of approximately 3.0%; the contraceptive prevalence rate fluctuating from 11% to 13% extremely far from the estimated 80% expected in 2000; while the total fertility rate was also still far from the targeted four (4) children per woman (Michael and Mayowa, 2017).

Reporting on what led to the failure in achieving the 1988 and 2004 policy objectives, Michael and Mayowa (2017) identified the combined negative roles of several factors like multiculturalism, lack of political will, prolonged political instability with frequent policy changes and inadequate funding among others. While it was known that multiculturalism among the geo-political zones plays a major role in determining the people's fertility behavior, the lack of political will by successive administrations during the period resulted to lack of both financial and administrative support including poor data collection, monitoring and evaluation. Inadequate resources or funding did not only distort the conduct of 2001 population census but also led to postponement of the census to 2006. Besides, the National Population Policy's family planning programs carried out were basically public sector driven, clinic-based and largely controlled by physicians. Thus, the services rendered were grossly scanty and unevenly distributed and could not adequately provide the needed coverage to satisfy the large unmet demand for family planning services (Michael and Mayowa, 2017).

Family Planning (FP) 2020 was the outcome of the July 11, 2012, London Summit on Family Planning. The FP2020 project is a global partnership that works with governments, civil society, multilateral organizations, development partners, the private sector, and the research and development community to enable millions of women to use contraceptives no matter where they live. The objective of FP2020 is to ensure universal access to sexual and reproductive health services and rights by 2030, as laid out in Sustainable Development Goals 3 and 5. The London summit deliberated on the renewal and revitalization of the global commitment to support the rights of an additional 120 million women and girls all over the world's 69 poorest countries to use contraceptive information, services, and supplies without coercion or discrimination by 2020. Doing so would prevent a staggering 100 million unintended pregnancies, 50 million abortions, 200,000 pregnancy/childbirth-related maternal deaths, and 3 million infant deaths globally (Family Planning Summit Metric Group, 2012). Core partners of FP2020 are Bill & Melinda Gates Foundation, the Department for International Development (DFID), United Nation Population Fund (UNFPA) and USAID.

Nigeria was among the first group of countries to commit to the FP2020 global initiative when it was launched in 2012. A major part of this commitment was the development of Nigeria Family Planning Blueprint (Scale-Up Plan) to achieve the national objective of scaling up the contraceptive prevalence rate (CPR) of 15 percent in 2013 to 36 percent by 2018. Nigeria commits to increase CPR by 2% every year to achieve 36% by 2018; with the aim to avert 31,000 maternal deaths, save more than 700,000 mothers from injuries or permanent illness due to childbirth; to avert 1.6 million unintended pregnancies and 400,000 infant deaths and 700,000 child deaths in the country [Federal Ministry of Health (FMoH), 2014]. However, by 2017 it became increasingly clear that the 36 percent target would not be feasible by 2018; and on July 11, 2017, during the FP2020 Summit in London UK, the Government of Nigeria updated its FP2020 commitment in collaboration with its development partners and private sector, and pledged to achieve a modern contraceptive

prevalence rate (mCPR) of 27% among all women by 2020 [Federal Government of Nigeria (FGN) 2019].

According to Ogundipe (2019) the latest report on FP2020 launched on the sidelines of the international conference on population and Development (ICPD) in Nairobi, in November 2019 showed that Nigeria has made steady progress toward increasing the uptake of contraceptives. The report added that over 6.5 million women in Nigeria now use a modern method of contraception which is the highest number on record in the history of the country; and because of modern contraceptive use in the country, it is estimated that over 2.3 million unintended pregnancies have been prevented, and over 800,000 unsafe abortions and 13,000 maternal deaths have been averted in 2018 alone (Ogundipe, 2019). Although Nigeria is Africa's most populous country, the nation is still the second slowest growing country in West Africa after Mali when it comes to the uptake of modern contraception. Nigeria is not among the nine countries like Mozambique, Chad, Cameroon, Kyrgyz Republic, Zimbabwe, Kenya, Ghana, Burkina Faso and Sri Lanka that are on track to surpass the FP2020's goals set for growth in modern contraceptive use despite being part of the first group of countries to commit to the FP2020 partnership when it was launched in 2012. In Nigeria the percentage of women with an unmet need for a modern method of contraception (married/in-union) stood at 23.7% in 2019; despite over 6.5 million women using a modern method of contraception, translating to modern contraceptive prevalence rate of 14.2 % (Ogundipe, 2019).

In Nigeria, a woman gives birth to an average of 5.5 children in her lifetime, and the population of women of reproductive age in Nigeria makes up roughly half of all women of reproductive age in West Africa (Monjoket *et al.* 2010). Although Nigeria's modern contraceptive prevalence rate (mCPR) is growing at roughly the average rate set for FP2020 focused countries as a whole - 0.3 percentage points per year – Nigeria remains the second slowest growing country in West Africa, in terms of contraceptive use due to the growing population of women at reproductive age (Monjoket *et al.* 2010). The Nigerian Demographic and Health Survey (NDHS) 2013 reported that only 15.1% of married women of reproductive age were using any contraceptive (10% using a modern method, and 5% use other methods of contraception); whereas about 16 percent of married women have an unmet need for family planning (Monjoket *et al.* 2010).

The Unmet need for family planning refers to the proportion of fecund women of childbearing age (usually at risk of pregnancy) who are desirous to delay (space) or stop childbearing but are not practicing contraception or having access to contraceptives (Monjoket *et al.* 2010). Singh, Darroch, Ashford and Vlassoff (2010) reported that there are about 215 million women in the developing world who currently have an unmet need for family planning. It is postulated that satisfying the unmet need for FP has the potential to reduce MMR by one-third, and to prevent about 10% of child mortality (Ahmed *et al.*, 2012; Cleland, Conde-Agudelo, Peterson, Ross and Tsui, 2012). Several factors have been cited as drivers of the unmet need for FP, and they include, but are not limited to: - insufficient knowledge about FP methods; limited access to FP services; and perceived social barriers to use of FP methods (Adebowale *et al.* 2011).

The low use of modern methods of family planning (FP) has been identified as one of the factors underlying high maternal mortality ratio (MMR). Gebreselassie (2011) decried the very low use of contraceptives in sub-saharan Africa and other regions despite widespread adoption of family planning in the developing world.

The Rivers State like other states in the country was also involved in the implementation of key national policies of the Federal Government in population control and family planning, including the FP2020 project. Just like other States, Rivers State receives support and funding for family planning from the World Bank through the Federal Ministry of Health. Major development partners currently working with the State and supporting or funding different aspects of FP programmes over the years included: - The Challenge Initiative (TCI), Association for Reproductive and Family Health (ARFH), Clinton Health Access Initiative (CHAI), Marie Stopes International Organization of Nigeria (MSION), Population Service International (PSI) and Planned Parenthood Federation of Nigeria (PPFN).

Although, it is well known fact that an extensive use of contraceptive could significantly reduce the numbers of unintended pregnancies, abortions, and maternal deaths, such knowledge however, had never been sufficiently put into practice (NPCN and ICFI, 2019). Several factors may have contributed to this unmet need: including limited access to services both on the demand and supply sides. Lack of adequate information on FP services, limited-service outlets, poor quality of service, problems associated with transporting supplies to places where they are needed, a weak system of logistics management, including an erratic system of placing orders and erratic storage systems, remain major constraints on supply side. Similarly, barriers to family planning services demand were associated with liberal religious consent to have more children, as well as very strong cultural beliefs that more children mean greater economic benefits for the family (NPCN and ICFI, 2019).

The commonly used indicator for assessing FP practice at the population level is the contraceptive prevalence rate (CPR), defined as the percentage of women aged 15-49 years who are using a contraceptive method at a specified time (NPCN and ICFI, 2019). Among married women in Nigeria, the CPR increased from 6 percent to 14 percent between 1990 and 2013 (FRN and ICFI 2014; Fotso, Ajayi, Idoko, Speizer, Fasiku and Mberu, 2011). However, Darroch and Singh (2013) described the situation as worrisome, the fact that unmet need for FP in Nigeria has remained higher than CPR since the 1990s. It is also a well-known fact that most health indicators in Nigeria have been found to vary substantially according to geographical location (NPCN and ICFI, 2019). It was in the light of the highlighted backdrop that the researcher picked interest in doing an assessment of modern contraceptive utilization in health care facilities in Rivers State, Nigeria.

## **1.2 Statement of the Problem**

Despite the global adoption of modern contraceptives as a pragmatic and very cost-effective means to tackle the issue of high fertility rates, population growth rates and prevention of maternal and infants' deaths; modern contraceptive usage in most West African countries including Nigeria have remained very low (Ogboghodo, Adam and Wabatsoma 2017; Gebreselassie, 2011). Although in Rivers State the awareness of modern methods of contraception among women of childbearing age (15-49 years) was observed to be as high as 99.6%, this did not translate into high contraceptive prevalence rate (CPR) [NPCN and ICFI, 2014]. This implied that modern contraceptive adoption or usage in the State still fell far below expected targets. This was really supported by the fact, in Rivers State, the unmet need for family planning was put at 23 percent, higher than the country's figure of 19 percent in 2018 (NPCN and ICFI, 2019).

In 2017 the Nigerian Government and Partners renewed their commitment to FP2020 Project by setting a new national target of achieving 27% CPR by 2020 following the failure to achieve the previous national target of increasing the CPR from 15% in 2013 to 36% by 2018. However, the projected target year of 2020 set for achieving mCPR of 27% had come and

gone, there has been no evaluation or assessment carried out to determine the extent of the achievement of this target in Rivers State. Again, the extent of unmet needs for modern methods of contraception had also not been quantified within this period in the State. Thus, it is the desire to fill these observed gaps and resolve the issues and concerns raised above that researcher was motivated to assess the extent of modern contraceptive utilization in Rivers State from 2016 to 2020.

### **1.3 Aim and Objectives of the Study**

The aim of the Study is to assess modern contraceptive utilization in health facilities reporting on District Health Information System (DHIS2) platform in Rivers State from 2016 to 2020; and to ascertain the following specific objectives;

1. To determine the yearly modern contraceptive utilization in the State from 2016 to 2020 based on health facilities reporting on DHIS2 platform.
2. To determine the modern contraceptive utilization in the different local government areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform.
3. To determine the modern contraceptive utilization in the urban, suburban, and rural areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform.
4. To determine modern contraceptive utilization in the primary, secondary, and tertiary health facilities from 2016 to 2020 based on health facilities reporting on DHIS2 platform.

### **1.4 Research Questions**

1. What was the yearly modern contraceptive utilization in the State from 2016 to 2020 based on the health facilities reporting on DHIS2 platform?
2. What was the modern contraceptive utilization in the different local government areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform?
3. What was the modern contraceptive utilization in the urban, suburban, and the rural areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform?
4. What was the modern contraceptive utilization in the primary, secondary, and tertiary health facilities from 2016 to 2020 based on health facilities reporting on DHIS2 platform?

### **1.5 Research Hypotheses**

The hypotheses were tested at 0.05 level of statistical significance.

1.  $H_0$ : There were no statistically significant differences in the yearly modern contraceptive utilization in the State from 2016 to 2020 based on health facilities reporting on DHIS2 platform.
2.  $H_0$ : There were no statistically significant differences in modern contraceptive utilization in the different local government areas from 2016 to 2020 based on the health facilities reporting on DHIS2 platform.
3.  $H_0$ : There were no statistically significant differences in modern contraceptive utilization in the urban, suburban and the rural areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform.

4.  $H_0$ : There were no statistically significant differences in modern contraceptive utilization in the primary, secondary, and tertiary health facilities from 2016 to 2020 based on health facilities reporting on DHIS2 platform.

### 1.6 Justification for the Study

The study assessed the impact of FP policies and FP2020 project of the government on the people of Rivers State and also evaluated the extent the set goals and targets over the projected period have been met or implemented. This became expedient since no such evaluation or assessment of the State performance in terms of achievement of F2020 program targets in the State had been conducted before save for this present Study.

The study enabled the simultaneous assessment of contraceptive profiling in three different levels of health facilities namely the primary, secondary and tertiary levels of health care facilities in Rivers State which hitherto has not been done. This is probably novel as few reported studies in the past on contraceptive evaluation and profiling had focused mainly on tertiary health facilities (i.e. teaching hospitals and federal medical centers). Hence this multicentre based study across the three levels of health care facilities in Rivers State was quite revealing, and indeed justifiable.

The study unraveled the trend of contraceptive utilization in health facilities in different settings, locations and situations in Rivers State like the local government areas; urban, suburban and rural areas settings; private and public health facilities; primary, secondary and tertiary health facilities which yielded ample information on the unmet needs for family planning, the impact and extent of programme implementation among others, which are veritable tools for proper planning, re-planning, decision making and advocacy for an efficient, cost-effective and result-oriented FP service and program delivery.

## 2. Methodology

**2.1 Study Area & Research Design:** The study was carried out in Rivers State, located in South-South geopolitical zone of Nigeria. Analytic, descriptive retrospective research design was adopted. Analytic, descriptive design not only describe phenomenon as they exist at any point in time but compared variables for the various identified strata of the sample using hypotheses to arrive at results (Nwankwo (2016). Thus, the study assessed, described, and compared modern contraceptive utilization across various health facilities in Rivers State from 2016 to 2020. The modern contraceptive prevalence rate (mCPR), a known population key performance indicator was utilized in assessing modern contraceptive utilization across health facilities in the State. Study population consisted of all health facilities reporting on the DHIS2 platform and which had provided modern contraceptive services to Women of Child Bearing Age (WCBA) in the period from 2016 to 2020. Thus, health facilities not offering modern contraceptive services and /or not reporting on the DHIS2 platform were excluded from the study.

**2.2 Sample and Sampling Technique:** A sample size of 254 health care facilities was used for the study. From the 367 health care facilities that reported on the DHIS2 platform in the State; all the 254 health facilities [comprising of 229 primary health facilities, 22 secondary health facilities and 3 tertiary health facilities] which provided modern contraceptive services in the period 2016 to 2020 were purposively selected to constitute the Study sample. This Sample size constituted 69.2 percent of all the health facilities reporting on the DHIS2 platform in the period. Ethical approval for the study was duly obtained from the University of Port Harcourt Research Ethics Committee (UNIPORT-REC).

**2.3 Data Collection Method / Procedures:** The State DHIS2 electronic platform is a standardized electronic data collection tool used in this Study. DHIS2 electronic platform is used in the State as part of National Health Information Management System (NHIMS) for capturing all data generated in the health facilities including those of family planning (FMoH, 2015; RSPHCMB, 2014). The DHIS2 is an open source, web-based software package originally developed by the Health Information System Programme (HISP) Centre at the University of Oslo (UiO) in 1998 for the collection, validation, analysis, and presentation of aggregate and patient-based statistical data. All the relevant data required for the Study were extracted from the State DHIS2 platform. Access right to the DHIS2 platform was obtained from the Rivers State Primary Health Care Management Board [RSPHCMB] (See Appendix H). The research assistance was one of the DHIS desk officers of the Board who was properly briefed and trained on the kind of data elements to be collected, sorted, and retrieved from the DHIS2 database. The required data were carefully and technically retrieved from the system for each of the selected health facilities; sorted and disaggregated in line with the specific variables of the study: year by year, local government by local government, urban, suburban and rural areas' strata and into primary, secondary and tertiary health facility types. To reduce possible errors of data collection to the barest minimum, a lot of meticulousness using the bit by bit and stage by stage approach were adopted. The entire process of data collection lasted about six weeks.

**2.4 Method of Data Analysis:** The DHIS2 analytical element; the Microsoft Office Excel Software Spread sheet version 2013 and the Porpo Scientific Calculator model YH-2000 were deployed in processing and analysing the data where appropriate. Descriptive and inferential statistical tools like frequencies, tables, mean, percentages, and the chi squares were used for the various data presentation, analysis, and testing of the study hypotheses. The contraceptive prevalence rates (mCPRs) defined as the percentage of women aged 15-49 years (WCBA) who are using a modern contraceptive method at a specified time (NPCN and ICFI, 2019), was calculated and used to measure the modern contraceptive utilization (MCU) across the selected health facilities. The modern contraceptive utilization (MCU) across the selected health facilities were measured by calculating their contraceptive prevalence rates (mCPRs). The mCPR is defined as the percentage of women aged 15-49 years who are using a modern contraceptive method at a specified time (NPCN and ICFI, 2019). The mCPRs were calculated for all the selected independent variables of the Study thus;

$$\text{mCPR} = \frac{\text{Total number of modern methods acceptors in a given period}}{\text{Total number of WCBA in that Community/Area/Place}} \times \frac{100}{1}$$

The study research hypotheses were tested at 0.05 level of significance.

### 3. Results

**3.1** The data in Table 1 below were analysed to answer Research Question 1: What was the yearly MCU in the State from 2016 to 2020 based on health facilities reporting on DHIS2 platform?

**Table 1: Yearly Modern Contraceptive Utilization in the State from 2016 to 2020.**

|                    | Modern Contraceptive Utilization |           |           |           |           |            |
|--------------------|----------------------------------|-----------|-----------|-----------|-----------|------------|
|                    | 2016                             | 2017      | 2018      | 2019      | 2020      | 2016 –2020 |
| <b>MCM CLIENTS</b> | 38,566                           | 38,559    | 55,190    | 91,557    | 128,648   | 352,520    |
| <b>WCBA</b>        | 1,593,714                        | 1,647,900 | 1,703,929 | 1,761,862 | 1,821,766 | 8,529,171  |
| <b>mCPR</b>        | 2.42%                            | 2.34%     | 3.24%     | 5.20%     | 7.06%     | 4.13%      |

The yearly modern contraceptive utilization in the State health facilities from 2016 to 2020 is as shown in Table 1. Notice an upward trend or relative increases in the number of modern contraceptive (MC) clients and the yearly mCPRs from 2016 to 2020 apart from the slight drop in 2017. The highest modern contraceptive utilization (MCU) or mCPR of 7.06% was reported in 2020. The State recorded an overall mCPR of 4.13% in the five-year period. Notice that the highest modern contraceptive utilization (MCU) or mCPR was reported in 2020. Similarly, observe the increase in mCPR of 2.42% in 2016 to mCPR of 7.06% in 2020 which represented over 190% increment in the mCPR above the 2016 value. The Chi-square ( $X^2$ ) analyses (see Appendix A, Table 3) showed that the calculated value of 86505.60 was far greater than the critical table value of 9.49 at 4 degrees of freedom and 0.05 level of significance. Therefore, the null hypothesis which stated that there were no statistically significant differences in the mCPRs in the State from 2016 to 2020 based on health facilities reporting on DHIS-2 platform was rejected, while the alternate hypothesis was accepted. This implied that the observed differences in the yearly mCPR in the State from 2016 to 2020 based on health facilities reporting on DHIS2 platform were statistically significant and were not due to chance occurrences.

3.2 The data in Figure1 below were analyzed to answer Research Question 2: What was the MCU in the different local government areas from 2016 to 2020.

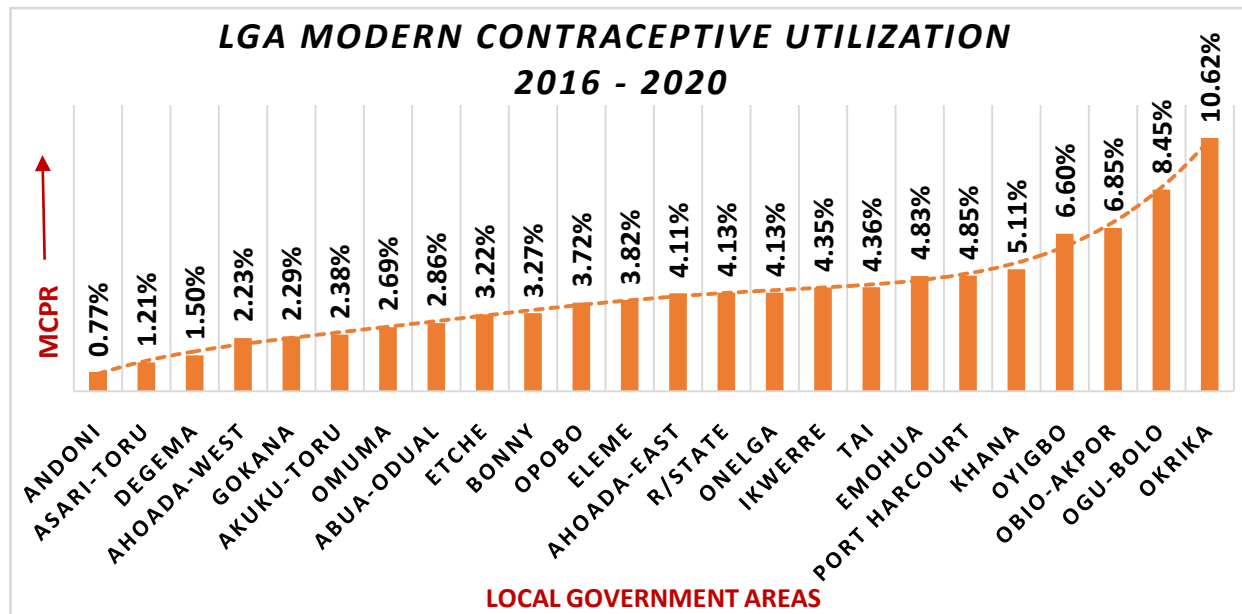


Figure 1: Local Government Areas' Modern Contraceptive Utilization, 2016 – 2020.

Figure 1 shows the modern contraceptive utilization in the different LGAs' health facilities from 2016 to 2021. The mCPRs for the different LGAs and that of the State in the period were rearranged in ascending order as follows: Andoni (0.77%), Asari-toru (1.21%), Ahoada-West (2.23%), Gokana (2.29%), Degema (1.50%), Akuku-Toru (2.38%), Omuma (2.69%), Abua-Odual (2.86%), Etche (3.22%), Bonny (3.27%), Opobo-Nkoro (3.72%), Eleme (3.82%), Ahoada-East (4.11%), Rivers State (4.13%), Onelga (4.13%), Ikwerre (4.35%), Tai (4.36%), Emohua (4.83%), Port Harcourt (4.85%), Khana (5.11%), Oyigbo (6.60%), Obio/Akpor (6.85%), Ogbolob (8.45%), and Okrika (10.62%). Observe that Okrika and Andoni LGAs recorded the highest and the least mCPRs of 10.62% and 0.77% respectively in the period. Notice that ten (10) LGAs namely Okrika (10.62%), Ogbolob (8.45%), Obio/Akpor (6.85%), Oyigbo (6.60%), Khana (5.11%), Port Harcourt (4.85%), Emohua (4.83%), Tai (4.36%), Ikwerre (4.35%), and Onelga (4.13%) had mCPRs of above or equal to that the State mCPR of 4.13%; whereas the rest thirteen (13) LGAs namely Ahoada-East (4.11%), Eleme (3.82%), Opobo-Nkoro (3.72%), Bonny (3.27%), Etche (3.22%), Abua-Odual (2.86%), Omuma (2.69%), Akuku-Toru (2.38%), Gokana (2.29%), Ahoada-West (2.23%), Degema (1.50%), Asari-toru (1.21%), and Andoni (0.77%) had mCPRs below the State figure of 4.13%. The performance of these thirteen LGAs which constituted about 57 percent of the LGAs as identified above were low in terms of modern contraceptive utilization in the period when compared to the other ten LGAs (43 percent) with impressive performance in modern contraceptive utilization. The Chi-square ( $\chi^2$ ) analyses (see Appendix B, Table 4) showed that the calculated value of 235872.17 was far greater than the critical table value of 33.92 at 22 degrees of freedom and 0.05 level of significance. The null hypotheses which stated that there were no significant differences in modern contraceptive utilization in the different Local Government Areas from 2016 to 2020 based on the health facilities reporting on DHIS-2 platform was therefore rejected, while the alternate hypothesis was upheld. This implied that there were statistically significant differences ( $p < 0.05$ ) in modern contraceptive

utilization (contraceptive prevalence rates) in the different local government areas from 2016 to 2020 which were not due to chance events.

**3.3** The data in Table 2 were analysed to answer the research question 3: What was the MCU in the Urban, Suburban, and the Rural areas from 2016 to 2020 based on health facilities reporting on DHIS2 platform?

**Table 2: Modern Contraceptive Utilization in Urban, Suburban and Rural Health Facilities 2016 – 2020.**

| Modern Contraceptive Utilization |                  |                     |                  |
|----------------------------------|------------------|---------------------|------------------|
|                                  | Urban Facilities | Suburban Facilities | Rural Facilities |
| <b>MCM</b>                       |                  |                     |                  |
| <b>CLIENTS</b>                   | 95,511           | 120,116             | 136,893          |
| <b>WCBA</b>                      | 1,654,554        | 2,288,698           | 4,585,918        |
| <b>mCPR</b>                      | 5.77%            | 5.25%               | 2.99%            |

The modern contraceptive utilization in Urban, Suburban and Rural health facilities in the period from 2016 to 2021 is as shown in Table 2. Notice the decrement in mCPRs as you moved from the Urban facilities (5.77%) to the Suburban facilities (5.25%) and then to Rural health facilities (2.99%). Thus, there was a general downward trend in the consumption pattern of modern contraceptives as one moved from the urban to suburban and down to the rural health facilities in the period. The Urban health facilities recorded the highest mCPR of 5.77%; while the Rural health facilities had the least mCPR of 2.99% over the five-year period. The Urban health facilities contributed over 130% to the State mCPR of 4.13% reported in the period. The Chi-square ( $\chi^2$ ) analyses (see Appendix C, Table 5) showed that the calculated  $\chi^2$  value of 17,372.73 was far greater than the critical table value of 15.51 at 8 degrees of freedom and at 0.05 level of significance. Thus, the null hypotheses which stated that there were no statistically significant differences in modern contraceptive utilization in urban, suburban, and rural health facilities reporting on DHIS2 platform in the State from 2016 to 2020 was therefore rejected; and the alternate hypothesis was upheld. This implied that there were statistically significant differences ( $p < 0.05$ ) in the pattern of modern contraceptive utilization among the urban, suburban, and rural health facilities in the state within period which could not be attributed to chance events.

**3.4** The data in Figure 2 below was analysed to answer Research Question 4: What was the MCU in the primary, secondary and tertiary health facilities from 2016 to 2020 based on health facilities reporting on DHIS2 platform?

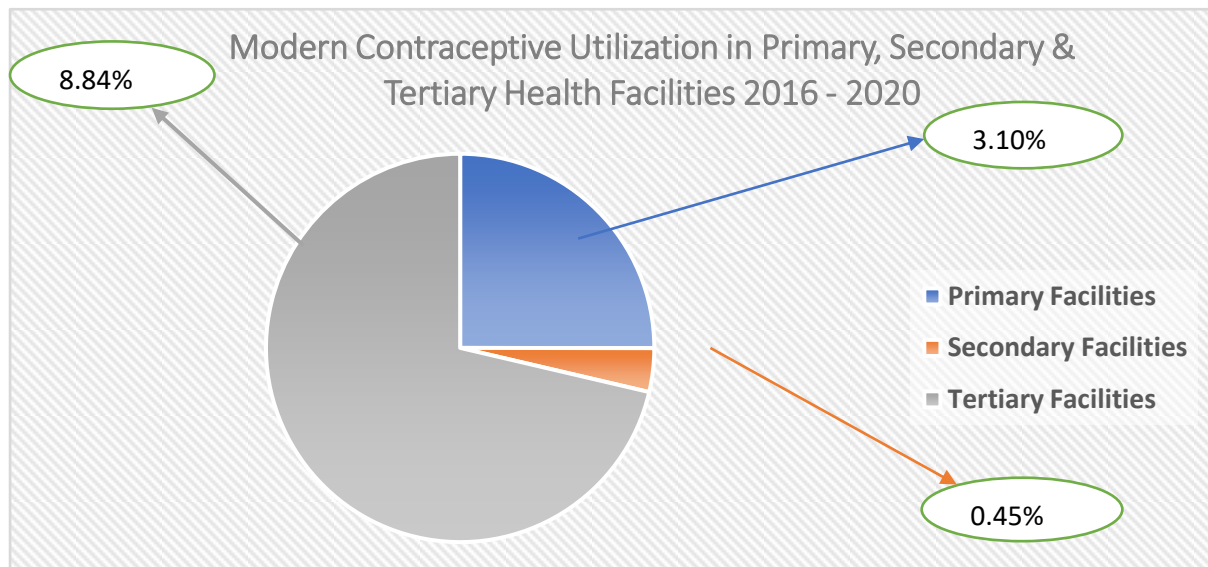


**Figure 2: Modern Contraceptive Utilization in Primary, Secondary & Tertiary Health Facilities 2016 – 2020.**

Figure 2 showed the modern contraceptive utilization in primary, secondary and tertiary health facilities in the State in the period. Notice that the tertiary health facilities had a mCPR of 8.84% which was quite higher than those of the primary health facilities (mCPR, 3.10%) and even far higher than those of secondary health facilities (mCPR, 0.45%) respectively. When compared with the primary health facilities mCPR of 3.10% in the period, the observed trend represented mCPR increment of 185% for the tertiary health facilities and mCPR decrement of 85% for the secondary health facilities. Notice that the mCPR of 8.84% recorded for the tertiary health facilities doubled the mCPR values obtained for the primary (mCPR, 3.10%) and secondary health facilities (mCPR, 0.45%) put together. Observe that the Tertiary health facilities contributed over 200% to the State mCPR of 4.13% reported in the period. The Chi-square ( $\chi^2$ ) analyses (see Appendix D, Table 6) showed that the calculated value of 4724.82 was far greater than the critical table value of 15.51 at 8 degrees of freedom and 0.05 level of significance. The null hypothesis which stated that there were no statistically significant differences in modern contraceptive utilization in the primary, secondary, and tertiary health facilities from 2016 to 2020 was therefore rejected, and the alternate hypothesis was upheld. This implied that there were statistically significant differences ( $p < 0.05$ ) in modern contraceptive utilization among the three health facility types (primary, secondary and tertiary) in the State from 2016 to 2020. In other words, the observed differences in the modern contraceptive utilization among the three levels of health care facilities in the state within the period under consideration were real and could not be attributed to chance events.

## 4. Discussions

### 4.1 Modern Contraceptive Utilization in the State / LGAs, 2016-2020.

This study showed that average mCPR in the State over the period from 2016 to 2020 was about 4.13%, with the highest MCU in all health facilities was reported in 2020 [mCPR of 7.06%] (see Table 1). Over the five-year period, the mCPR in all the DHIS2 health facilities in the State, increased from 2.42% in 2016 to 7.06% in 2020 which represented mCPR increment of over 190%. Similarly, the number of MC Clients visits had risen from 38566 in 2016 to 128614 in 2020, which accounted for over 230% increment in client flow over the same period (see Table 1). This result was quite an impressive improvement in contraceptive utilization in the State especially when compared with mCPR increment from 6% in 1990 to 14% in 2013 which represented only 133% increment over a 23-year period reported among married women in Nigeria (FRN and ICFI, 2014; Fotso *et al.*, 2011). Again, when you compare this study result increment of over 190% in mCPR from 2.42% in 2016 to 7.06% in 2020 with the national 14% increment in mCPR among married women from 11.1% in 2013 to 12.7% in 2018 (NPCN and ICFI, 2018); over the same period then it would be glaringly obvious to all that the State had a massive improvement in modern contraceptive utilization in the period under review.

With a mCPR record of 4.13% in the period it implied that the State have achieved over 15% of the National FP2020 target of 27% intended to be achieved by year 2020. Indeed, achieving a mCPR of 7.06% alone in 2020 was a great feat in view of the prevailing circumstances then, the adverse realities of COVID-19 pandemic, the global economic meltdown, and the unprecedented lockdowns. Although, the mCPR dropped slightly to 2.34% in 2017; there were statistically significant differences ( $p < 0.05$ ) in the yearly MCU in the State from 2016 to 2020 based on health facilities reporting on DHIS-2 platform (see Appendix A, Table3). Evidence suggests that the presence of national FP programs and/or policies with strong government commitment could increase access and the use of modern contraceptives methods and decrease the level of unmet need for FP (Bongaarts *et al.*, 2014); and these well-known altruistic facts were seemingly what played out in the State that had a good number of committed FP program partners and some level of government commitment in MC service delivery in the State.

### 4.2 Modern contraceptive utilization in the 23 local government areas:

The MCU in the period was highest in Okrika LGA and the least was from Andoni LGA (see Figure 2). Ten LGAs, Okrika (10.62%), Ogubolo (8.45%), Obioakpor (6.85%), Oyigbo (6.60%), Khana (5.11%), Port Harcourt (4.85%), Emohua (4.83%), Tai (4.36%), Ikwerre (4.35%), Onelga (4.13%), had mCPRs above the State value of 4.13% over the period; whereas 13 LGAs, Ahoada-East (4.11%), Eleme (3.82%), Opobo-Nkoro (3.72%), Bonny (3.27%), Etche (3.22%), Abua-Odual (2.86%), Omuma (2.69%), Akuku-Toru (2.38%), Gokana (2.29%), AhoaWest (2.23%), Degema (1.50%), Asari-toru (1.21%), and Andoni (0.77%) had mCPRs less than the State average value (see Figure 2). Rivers State (4.13%). There was a huge disparity or difference in mCPR of 9.85% between the highest performing Okrika LGA (10.62%) and the least performing Andoni LGA (0.77%) in the period. The finding in this study was similar to that of a comparative study on the patterns and trend in modern contraceptive use in South-South and North-Western zones of Nigeria that showed a very wide difference in use of modern methods of FP between the South-South (18.1%) and the North-Western zones (3.5%) (Ezire *et al.*, 2014). In fact, the study recorded statistically significant differences ( $p < 0.05$ ) in modern contraceptive utilization in the different local

government areas in the State from 2016 to 2020 (see Appendix B, Table 4). This implied that despite the apparent improvement in the modern contraceptive utilization in the State during the period, a lot need to be done to close the gap in those 13 LGAs with mCPRs below the State value of 4.13% recorded within the period. It has been reported by Akinyemi *et al.* (2015) that persistence of regional disparities in the uptake of modern contraceptives in several comparative studies carried out had not been given sufficient attention in the past; and such negligence would not allow for proper planning in addressing the unmet needs for family planning, logistic problems, and commodity distributions across critical geographical locations and hard to reach settlements. Thus, local comparative study of this sort is quite informative as it helped to locate areas or LGAs that needed serious interventions and possible deployment of training and logistic needs by the State Government and FP development partners.

#### **4.3 Modern Contraceptive Utilization in Urban, Suburban and Rural Health Facilities**

This study recorded statistically significant differences ( $p < 0.05$ ) among the urban, suburban, and rural health facilities in the State in terms of MCU from 2016 to 2020; with the Urban health facilities having the highest mCPR of 5.77%, followed by the suburban facilities with mCPR of 5.25% and then the rural health facilities with mCPR of 2.99% respectively within the five-year period (see Appendix C, Table 5). In other words, the period witnessed and downward trend in the consumption pattern of modern contraceptives from the Urban areas (5.77%) to the Rural areas (2.99%) of the State (see Table 2). This study was in conformity with a similar study by Ezire *et al.* (2014) which also reported a higher usage of modern contraceptives among urban residents (14.2%) than among rural residents (7.1%) in a study on the patterns and trend on MCU among South-South and North-Western zones of Nigeria between 2003 and 2011. In a different Study in far Democratic Republic of Congo (DRC), it had also been found that modern contraceptive use was three times higher among urban than rural women (Muanda *et al.*, 2017). In two different studies by Ola-Olorun and Hindin, (2014), and Gordon *et al.* (2011) had separately discovered that rural women had lower probability of modern contraceptive methods use compared to their urban counterparts. The Study result was also in line with the National Demographic Health Survey report of 2013 which showed that the use of modern contraceptives in rural Nigeria was actually low with only about 6.5% of married rural women using modern methods of contraception compared to about 16.7 % of married urban women (NPCN and ICFI, 2014).

However, this study result was a variation with the work of Maxwell and Bob-Manuel (2018) who actually reported a significant difference in the reproductive health needs of rural and urban women, with the rural women having a higher mean score. However, a recent study in Nigeria that estimated community influences on modern method use found no statistically significant differences between urban and rural residents in their odds of using modern methods of contraception (Ejembi *et al.*, 2015). Thus, the result of this study is rather pointing to the need for a greater push of focus on the escalation of FP services and adequate demand creation on modern contraceptives in the rural and suburban populations to close the gaps in the unmet need for family planning in the State.

#### **4.4 Modern Contraceptive Utilization in Primary, Secondary and Tertiary Health Facilities**

The study also reported statistically significant differences ( $p < 0.05$ ) among the different facility types in term of MCU within the period, with the Tertiary health facilities which recorded the highest mCPR of 8.84% that far double those of the primary health facilities with mCPR of 3.10% and the secondary health facilities with mCPR of 0.45% put together

(see Figure 2; Appendix D. Table 6). These findings invariably implied that the volume of modern contraceptive services offered in the period under consideration were more in the tertiary health facility types than in the primary and secondary facility types put together. This unexpected trend happened even though the tertiary health facilities in the State were far fewer in number and scantily located in the city and its suburb; when compared with the numerous primary and secondary health facilities spread across the 23 local government areas of the State.

The finding came as a big departure from what should be the general expectation in the pattern of utilization of FP services and other health services for that matter among the three levels of the health facilities. The Primary and Secondary health facilities which are far greater in number than the tertiary health facilities (in a ratio of 76:7:1 in this Study) and fairly distributed across the State and also being the nearest systems of health care delivery closest to the grassroots were expected to have ranked first in patronage and utilization of FP services and even other health related services by the members of the public, but this was never the case here. Although the type of study design used and the scope of this study delimited giving further account on such observed trend, several factors have been alluded to explain the occurrence of such in several qualitative studies. For instance, in two separate qualitative research studies one on a comparative assessment of contraception uses among secondary school students in Edo State, Nigeria and the other on the quest for quality of healthcare among people of Chad Republic it was both found that women prefer to bypass the closest facility to acquire their desired method of modern contraception or obstetric care from a farther facility (Obi and Ofili, 2018; Gauthier and Wane, 2011). Several factors were alluded to have contributed to such behaviours and included: - the lack of confidence in the availability and quality of service in nearest facilities; need to avoid family members and friends' discouragement or interference with personal / private life, and/or their confidentiality; also to escape cultural / religious beliefs and influences, and the desire to be attended to by experts or professionals who they believe could only be seen in tertiary health facilities (Obi and Ofili, 2018; Gauthier and Wane, 2011). In fact, Ahmed *et al.* (2012) and Monjok *et al.* (2010) had in their different studies similarly found that women were more likely to use a modern method of contraception if they perceived approval from others such as their mothers-in-laws, relations, or closest friends. Stated in different words, it can be said that a woman's likelihood of using a modern method of FP and the type of facility they visit can be influenced by the FP attitudes of those with whom she has close contacts or relationship.

## 5. Conclusion

The State witnessed an impressive improvement in modern contraceptive utilization between 2016 and 2020 as the yearly mCPRs in the State rose from 2.42% to 7.06% which represented over 190% increment in the mCPR above the 2016 value (see Table 1). There were yearly statistically significant differences ( $p < 0.05$ ) in the MCU in the State from 2016 to 2020, with the highest record of 7.06% reported in 2020; while the State average mCPR over the 5-year period of assessment was 4.13%. The seemingly low performances of 13 LGAs out of 23 [namely Ahoada-East (4.11%), Eleme (3.82%), Opobo-Nkoro (3.72%), Bonny (3.27%), Etche (3.22%), Abua-Odual (2.86%), Omuma (2.69%), Akuku-Toru (2.38%), Gokana (2.29%), Ahoada-West (2.23%), Degema (1.50%), Asari-toru (1.21%), and Andoni (0.77%)] had actually limited the overall performance of the State within the period. The ten LGAs [namely Okrika (10.62%), Ogubolo (8.45%), Obioakpor (6.85%), Oyigbo (6.60%), Khana (5.11%), Port Harcourt (4.85%), Emohua (4.83%), Tai (4.36%), Ikwerre (4.35%), and Onelga (4.13%)] which had mCPRs above/equal to the State average value of

4.13% were largely responsible for the impressive performance in MCU recorded by the State in the period.

The Urban health facilities contributed up to 140% to the State mCPR of 4.13% achieved in the period (see Appendix D, Table 6 & Table 2). There were statistically significant differences ( $p < 0.05$ ) in the pattern of MCU among the urban, suburban, and rural health facilities in the period with a clearly defined decline in MCU from the Urban health facilities (mCPR, 5.77%), down to the Rural health facilities (mCPR, 2.99) [see Table 2]. The observed low performance of the Rural health facilities might have largely limited the achievement of a higher mCPR in the State during the period. It would be imperative therefore that the FP programs in the Rural areas should be reappraised to uncover the real cause(s) of low utilization of modern contraceptives especially in the rural areas of the State. In addition, more effort should be channeled to increase modern contraceptive access and demand creation, and to reach out more to the unreached massive women populations in the underserved Rural areas of the State. Taking such measures will not only help reverse the present trend of low MCU and to cut down on the high level of unmet need for FP in the State but would also raise the current level of mCPR.

The Tertiary health facilities recorded the highest mCPR, of 8.84% more than those of the Primary health facilities (mCPR, 3.10%) and the Secondary health facilities (mCPR, 0.45%); and this achievement largely accounted for over 200% contribution to the State average mCPR of 4.13% observed in the period (Figure 2). There were statistically significant differences ( $p < 0.05$ ) in MCU among the different facilities types with the primary and secondary health facilities' performances falling far below the State average mCPR of 4.13% recorded in the period.

## **6. Recommendations**

It would be nice to investigate and quickly address the cause(s) of poor performance of the 13 LGAs in the State in terms of MCU as this will greatly help to improve on the State mCPR record and speedily close the wide gap of unmet need for FP in the State.

It is important also that the entire Family Planning programs in the State be reappraised to uncover the real cause(s) of low utilization of modern contraceptives especially in the rural areas of the State. In addition, more effort should be channeled to increase modern contraceptive access and demand creation, and to reach out more to the unreached massive women populations in the underserved rural areas of the State. Taking such measures will not only help reverse the present trend of low MCU or to cut down on the high level of unmet need for FP in the State but would also raise the current level of mCPR.

The present contributions of both the secondary and primary health facilities in terms of MCU in the State can only be halted, reversed or improved if the cause(s) of the poor performances are investigated, identified, and corrected. It is expected that when these grassroots facilities (primary and secondary health care facilities) in the State are provided adequately with the right environment and equipment to fully deliver the MC services, it would yield the synergistic effects required to improve on the State mCPR. Again, such measures will not only remove the challenges of poor patronage of MC services at both levels, but will significantly help to close the existing gap between the mCPR and the unmet need for FP in the State.

Finally, it is also recommended that the FP Program and FP partners in the State should actually scale up their activities and services in order to sustain or surpass the gains of the present achievement of mCPR of 4.13% in the State within the 5 year period of the assessment. This will also the State to speedily meet up or even surpass the revised National FP 2020-2024 new target of achieving 27% mCPR by the year 2024. Such efforts may include to continually monitor, track, identify and resolve real-time issues and challenges on commodity stocks, storage, logistics and distribution to ensure all round the clock access, availability and utilization of modern contraceptive products or servicers in all parts of the Rural and Suburban areas of the State especially in the difficult terrains, hard-to-reach areas and urban slums with large underserved and unreached populations.

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## Appendix A

**Table 3: Chi Square Calculations for Yearly Modern Contraceptive Utilization in the State 2016- 2020.**

| Parameters                     | State Modern Contraceptive Utilization |            |             |            |             |
|--------------------------------|----------------------------------------|------------|-------------|------------|-------------|
|                                | 2016                                   | 2017       | 2018        | 2019       | 2020        |
| $f_o$                          | 38566                                  | 38559      | 55190       | 91557      | 128648      |
| $f_e$                          | 70504                                  | 70504      | 70504       | 70504      | 70504       |
| $f_o - f_e$                    | -31938                                 | -31945     | -15314      | 21053      | 58144       |
| $(f_o - f_e)^2$                | 1020035844                             | 1020483025 | 234518596   | 443228809  | 3380724736  |
| $\chi^2 = (f_o - f_e)^2 / f_e$ | 14467.77267                            | 14474.1153 | 3326.316181 | 6286.57678 | 47950.82174 |
| $\Sigma \chi^2$                | <b>86505.60266</b>                     |            |             |            |             |

Note that the calculation of the expected frequencies was based on Hypothesis 1 ( $H_0$ ) that there were no significant differences in the yearly modern contraceptive utilization from 2016 to 2020 in the State based on health facilities reporting on DHIS-2 platform. Thus, if  $H_{01}$  is assumed to be true and we had 352520 modern FP clients from 2016 to 2020; then 352520/5 of them ie 70504 clients would be expected for each of the five years.

Degrees of freedom (df) = number of categories (k) minus one; that is  $df = k - 1 = 5 - 1 = 4$ .  $\chi^2_{cri} = 9.49$ ;  $\alpha = 0.05$ . Decision rule if  $\chi^2_{cal.} < \chi^2_{cri}$  accept the  $H_0$ ; but if  $\chi^2_{cal.} > \chi^2_{cri}$  reject the  $H_0$ ; and accept  $H_1$ . Note above that  $\chi^2_{cal.} > \chi^2_{cri}$ ; that is  $86505.60 > 9.49$ ; thus,  $H_0$  was rejected and  $H_1$  accepted. Thus, it was found that there were statistically significant

differences in the yearly modern contraceptive utilization the State from 2016 to 2020 based on health facilities reporting on DHIS-2 platform.

## Appendix B

**Table 4: Chi Square calculations for LGAs Modern Contraceptive Utilization 2016 – 2020.**

|                                      | LGA Facilities Modern Contraceptive Utilization |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |         |          |          |
|--------------------------------------|-------------------------------------------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|---------|----------|----------|
|                                      | Abolga                                          | Aelga    | Awelga   | Akulga   | Andoni   | Asalga   | Bolga    | Delga    | Eleme    | Emolga   | Etche    | Golga    | Ikwerre  | Khana    | Obilga   | Onelga   | Ogubolo  | Okrika   | Omuma    | Opobo    | Oyilga  | Phalga   | Tai      |
| $f_o$                                | 13320                                           | 11576    | 9137     | 6117     | 2663     | 4386     | 11570    | 6152     | 11993    | 16050    | 13204    | 8620     | 13590    | 24711    | 52378    | 19276    | 10384    | 38795    | 4442     | 9257     | 13316   | 43133    | 8450     |
| $f_e$                                | 15327                                           | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327    | 15327   | 15327    | 15327    |
| $f_o - f_e$                          | -2007                                           | -3751    | -6190    | -9210    | -12664   | -10941   | -3757    | -9175    | -3334    | 723      | -2123    | -6707    | -1737    | 9384     | 37051    | 3949     | -4943    | 23468    | -10885   | -6070    | -2011   | 27806    | -6877    |
| $(f_o - f_e)^2$                      | 4028049                                         | 14070001 | 38316100 | 84824100 | 1.6E+08  | 1.2E+08  | 14115049 | 84180625 | 11115556 | 522729   | 4507129  | 44983849 | 3017169  | 88059456 | 1.37E+09 | 15594601 | 24433249 | 5.51E+08 | 1.18E+08 | 36844900 | 4044121 | 7.73E+08 | 47293129 |
| $\chi^2 = \frac{(f_o - f_e)^2}{f_e}$ | 262.8074                                        | 917.9879 | 2499.909 | 5534.292 | 10463.68 | 7810.105 | 920.9271 | 5492.309 | 725.2271 | 34.10511 | 294.0647 | 2934.942 | 196.8532 | 5745.381 | 89565.9  | 1017.459 | 1594.131 | 35933.13 | 7730.36  | 2403.921 | 263.856 | 50445.2  | 3085.609 |
| $\sum \chi^2$                        | 235872.1651                                     |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |          |         |          |          |

Note that the calculation of the expected frequencies was based on Hypothesis 1 ( $H_0$ ) that there were no significant differences in modern contraceptive utilization among the different local government areas from 2016 to 2020 based on the health facilities reporting on DHIS-2 platform. Thus, if  $H_0$  is assumed to be true and we had 352520 modern FP clients from the 23 LGAs; then 352520/23 of them ie 15327 clients would be expected for each of the LGAs in the period. Degrees of freedom (df) = number of categories (k) minus one; that is  $df = k - 1 = 23 - 1 = 22$ .

$\chi^2_{cri} = 33.92$ ;  $\alpha = 0.05$ . Decision rule if  $\chi^2_{cal.} < \chi^2_{cri}$  accept the  $H_0$ ; but if  $\chi^2_{cal.} > \chi^2_{cri}$  reject the  $H_0$ ; and accept  $H_1$ . Note that  $\chi^2_{cal.} > \chi^2_{cri}$ ; that is  $235872.17 > 9.49$ ; thus,  $H_0$  was rejected and  $H_1$  accepted. Thus, it was seen that there were statistically significant differences in modern contraceptive utilization among the different local government areas from 2016 to 2020 based on the health facilities reporting on DHIS-2 platform.

## Appendix C

**Table 5: Chi Square Calculations for Urban, Suburban and Rural Modern Contraceptive Utilization.**

|                                                  | Urban, Suburban and Rural Modern Contraceptive Utilization |              |              |              |               | TOTAL         |
|--------------------------------------------------|------------------------------------------------------------|--------------|--------------|--------------|---------------|---------------|
|                                                  | 2016                                                       | 2017         | 2018         | 2019         | 2020          |               |
| <b>Urbanfo</b>                                   | 13125                                                      | 12962        | 18811        | 28190        | 22423         | <b>95511</b>  |
| <b>fe</b>                                        | 10449                                                      | 10423        | 14883        | 24827        | 34929         |               |
| <b>Suburban fo</b>                               | 15122                                                      | 16305        | 18457        | 28611        | 41621         | <b>120116</b> |
| <b>fe</b>                                        | 13141                                                      | 13109        | 18717        | 31223        | 43926         |               |
| <b>Ruralfo</b>                                   | 10319                                                      | 9205         | 17663        | 34833        | 64873         | <b>136893</b> |
| <b>fe</b>                                        | 14976                                                      | 14940        | 21331        | 35584        | 50062         |               |
| <b>TOTAL</b>                                     | <b>38566</b>                                               | <b>38472</b> | <b>54931</b> | <b>91634</b> | <b>128917</b> | <b>352520</b> |
| <b>f<sub>o</sub>-f<sub>e</sub></b>               | 2676                                                       | 2539         | 3928         | 3363         | -12506        |               |
|                                                  | 1981                                                       | 3196         | -260         | -2612        | -2305         |               |
|                                                  | -4657                                                      | -5735        | -3668        | -751         | 14811         |               |
| <b>(f<sub>o</sub>-f<sub>e</sub>)<sup>2</sup></b> | 7160976                                                    | 6446521      | 15429184     | 11309769     | 156400036     |               |
|                                                  | 3924361                                                    | 10214416     | 67600        | 6822544      | 5313025       |               |
|                                                  | 21687649                                                   | 32890225     | 13454224     | 564001       | 219365721     |               |
| <b><math>\chi^2 = (f_o - f_e)^2 / f_e</math></b> | 685.326442                                                 | 618.489971   | 1036.69851   | 455.543118   | 4477.6557     |               |
|                                                  | 298.634883                                                 | 779.191090   | 3.61168998   | 218.510208   | 120.95399     |               |
|                                                  | 1448.16033                                                 | 2201.48767   | 630.735737   | 15.8498485   | 4381.88089    |               |
| <b><math>\Sigma \chi^2</math></b>                | <b>17372.73002</b>                                         |              |              |              |               |               |

Degrees of freedom (df) = (C - 1) (R - 1) = (5 - 1) (3 - 1) = (4) (2) = 8.  $\chi^2_{cri} = 15.51$ ;  $\alpha = 0.05$ . Decision rule if  $\chi^2_{cal.} < \chi^2_{cri}$  accept the  $H_0$ ; but if  $\chi^2_{cal.} > \chi^2_{cri}$  reject the  $H_0$ ; and accept  $H_1$ . Note that  $\chi^2_{cal.} > \chi^2_{cri}$ ; that is  $17372.73 > 15.51$ ; thus,  $H_0$  was rejected and  $H_1$  accepted. Thus, there were statistically significant differences in modern contraceptive utilization in urban, suburban, and rural health facilities reporting on DHIS-2 platform in the State from 2016 to 2020.

## Appendix D

**Table 6: Chi Square Calculations for Primary, Secondary and Tertiary Health Facilities MCU.**

| Primary, Sec. and Tertiary Facilities Modern Contraceptive Utilization |                    |              |              |              |               |              |
|------------------------------------------------------------------------|--------------------|--------------|--------------|--------------|---------------|--------------|
|                                                                        | 2016               | 2017         | 2018         | 2019         | 2020          | TOTAL        |
| Primaryfo                                                              | 7659               | 8001         | 16147        | 24460        | 31851         | <b>88118</b> |
| fe                                                                     | 9640               | 9638         | 13796        | 22886        | 32158         |              |
| Secondary fo                                                           | 2448               | 2704         | 2512         | 2783         | 2487          | <b>12934</b> |
| Fe                                                                     | 1415               | 1415         | 2025         | 3359         | 4720          |              |
| Tertiaryfo                                                             | 28459              | 27854        | 36531        | 64314        | 94310         | <b>25146</b> |
| Fe                                                                     | 27511              | 27506        | 39369        | 65312        | 91770         | <b>8</b>     |
|                                                                        |                    |              |              |              |               | <b>35252</b> |
| <b>TOTAL</b>                                                           | <b>38566</b>       | <b>38559</b> | <b>55190</b> | <b>91557</b> | <b>128648</b> | <b>0</b>     |
| $f_o - f_e$                                                            | -1981              | -1637        | 2351         | 1574         | -307          |              |
|                                                                        | 1033               | 1289         | 487          | -576         | -2233         |              |
|                                                                        | 948                | 348          | -2838        | -998         | 2540          |              |
| $(f_o - f_e)^2$                                                        | 3924361            | 2679769      | 5527201      | 2477476      | 94249         |              |
|                                                                        | 1067089            | 1661521      | 237169       | 331776       | 4986289       |              |
|                                                                        | 898704             | 121104       | 8054244      | 996004       | 6451600       |              |
| $\chi^2 = (f_o - f_e)^2 / f_e$                                         | 407.09139          | 278.042021   | 400.63793    | 108.252905   | 2.930810      |              |
|                                                                        | 754.12650          |              |              |              |               |              |
|                                                                        | 1                  | 1174.21978   | 117.12049    | 98.7722536   | 1056.4171     |              |
|                                                                        | 32.667078          | 4.40282120   | 204.58340    | 15.2499387   | 70.301841     |              |
|                                                                        | 6                  | 3            | 3            | 6            | 6             |              |
| <b><math>\Sigma \chi^2</math></b>                                      | <b>4724.816347</b> |              |              |              |               |              |

Degrees of freedom (df) = (C - 1) (R - 1) = (5 - 1) (3 - 1) = (4) (2) = 8.  $\chi^2_{cri} = 15.51$ ;  $\alpha = 0.05$ .

Decision rule if  $\chi^2_{cal.} < \chi^2_{cri}$  accept the  $H_0$ ; but if  $\chi^2_{cal.} > \chi^2_{cri}$  reject the  $H_0$ ; and accept  $H_1$ . Note that  $\chi^2_{cal.} > \chi^2_{cri}$ ; that is  $4724.82 > 15.51$ ; thus,  $H_0$  was rejected and  $H_1$  accepted. It was therefore proven that there were statistically significant differences in modern contraceptive utilization in primary, secondary and tertiary health facilities reporting on DHIS2 platform in the State from 2016 to 2020.