EFFECTS OF FREE INTERVENTIONS ON THE UTILIZATION OF ANTI-MALARIA SERVICES IN NIGER STATE, NIGERIA. 2010-2013

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ผลกระทบของกระบวนการวินิจฉัยรักษาที่ไม่เสียค่าใช้จ่าย ต่อการใช้บริการต้านมาลาเรียในรัฐไนเจอร์ ประเทศไนจีเรีย ค.ศ. 2010-2013

นายโคโล ยาโร ยาคุบุ

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาวิทยาศาสตรมหาบัณฑิต
สาขาวิชาเศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ
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Field of Study	Health Economics and Health Care Management
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โล ยาโร ยาคุบุ : ผลกระทบของกระบวนการวินิจฉัยรักษาที่ไม่เสียค่าใช้จ่ายต่อการใช้บริการต้านมาลาเรียในรัฐไนเจอร์ ประเทศไนจีเรีย ค.ศ. 2010-2013. (EFFECTS OF FREE INTERVENTIONS ON THE UTILIZATION OF ANTI-MALARIA SERVICES IN NIGER STATE, NIGERIA. 2010-2013) อ.ที่ปรึกษาวิทยานิพนธ์หลัก: อ. ดร.นพพล วิทย์วรพงศ์, 67 หน้า.

การศึกษาครั้งนี้เป็นการประเมินประสิทธิภาพของนโยบายสนับสนุนการใช้บริการต่อต้านมาลาเรียโดยไม่เสียค่าใช้จ่าย ในรัฐไนเจอร์ ประเทศไนจีเรีย ปี 2010-2013 โดยใช้ข้อมูลภาคตัดขวางตามช่วงเวลาจากศูนย์รักษาพยาบาล 150 แห่ง ในรัฐบาลท้องถิ่น 7 แห่ง รวมเป็นข้อมูลทั้งสิ้น 5,550 หน่วย ซึ่งข้อมูลแต่ละหน่วยแสดงถึงการให้บริการของศูนย์ รักษาพยาบาลในเดือนที่กำหนด การวิเคราะห์จึงทำในระดับศูนย์ให้บริการทางสุขภาพ

นโยบายสนับสนุนการให้บริการต่อต้านมาลาเรียโดยไม่เสียค่าใช้จ่ายสามารถแบ่งออกเป็น 3 นโยบายย่อย คือ การจัดการโรค มาลาเรีย (Malaria Case Management: MCM) โดยการใช้ Artemisinin based Combination Therapies (ACTs) การ ป้องกันมาลาเรียในช่วงตั้งครรภ์ (Malaria in Pregnancies: MIP) โดยการใช้ Long Lasting Insecticidal bed Nets (LLINs) กับ Sulphadoxine/pyrimethamine (SPs) ซึ่งทั้ง 2 นโยบายข้างต้นเริ่มใช้พร้อมกันในช่วงเดือนสิงหาคม 2010 ถึงเดือนมิถุนายน 2012 และการทดสอบมาลาเรียแบบ Rapid Diagnostic Test kits (RDTs) ซึ่งเริ่มใช้ในเดือนกรกฎาคม 2012 และใช้ร่วมกับ 2 นโยบายแรก

ศูนย์ให้รักษาพยาบาลถูกแบ่งออกเป็น 2 กลุ่ม กลุ่มแรกเป็นกลุ่มที่ได้รับการสนับสนุนการให้บริการต่อต้านมาลาเรียโดยไม่เสีย ค่าใช้จ่ายจากรัฐบาล ซึ่งกำหนดให้เป็นกลุ่มทดลอง (treatment group) และกลุ่มที่สองเป็นศูนย์รักษาพยาบาลที่ไม่ได้รับการสนับสนุนการให้บริการต่อต้านมาลาเรียโดยไม่เสียค่าใช้จ่ายจากรัฐบาล ซึ่งกำหนดให้เป็นกลุ่มควบคุม (control group) ทั้งนี้ วิธีการที่ใช้ในการประเมินคือ difference-in-difference โดยประกอบด้วยตัวแปรตาม 4 ตัวแปร ดังนี้ จำนวนการใช้บริการทางสุขภาพโดยรวม จำนวนการใช้บริการการต่อต้านมาลาเรีย อัตราการใช้บริการทางสุขภาพโดยรวม และอัตราการใช้บริการการ ต่อต้านมาลาเรีย

ผลการศึกษาของทั้งสี่ตัวแปรตามสอดคล้องกัน โดยพบว่า นโยบายสนับสนุนการใช้บริการต่อต้านมาลาเรียโดยไม่เสีย ค่าใช้จ่ายจะเพิ่มอัตราการใช้บริการอย่างมีนัยสำคัญทางสถิติที่ระดับร้อยละ 5 โดยไม่ขึ้นกับประเภทของนโยบาย ผลการศึกษาของ จำนวนการใช้บริการการต่อต้านมาลาเรียเป็นตัวแปรตาม พบว่าเมื่อมีการใช้นโยบายสองนโยบายแรก (MCM และ MIP) จะเพิ่ม จำนวนการใช้บริการ 27.9 ครั้ง ส่วนการใช้นโยบายทดสอบมาลาเรียจะเพิ่มจำนวนการใช้บริการ 12.6 ครั้ง ในขณะที่ ถ้าใช้ทั้งสามนโยบายพร้อมกันจะทำให้จำนวนการใช้บริการเพิ่มขึ้น 35.7 ครั้ง โดยพบแนวโน้มดังกล่าวในตัวแปรตามอื่นๆ เช่นกัน

สาขาวิชา เศรษฐศาสตร์สาธารณสุขและการจัดการบริการสุขภาพ ลายมือชื่อนิสิต .....

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KOLO YARO YAKUBU: EFFECTS OF FREE INTERVENTIONS ON THE UTILIZATION OF ANTI-MALARIA SERVICES IN NIGER STATE, NIGERIA. 2010-2013. ADVISOR: NOPPHOL WITVORAPONG, Ph.D., 67 pp.

This study evaluated the effectiveness of free interventions on utilization of anti-malaria services in Niger State, Nigeria in 2010-2013. Based on 7 Local Government Areas and 150 health facilities, a panel dataset comprising 5,550 observations was put together where each observation represented a facility in a given month. The analysis was done at health facility level.

There were 3 free anti-malaria interventions. Prompt and effective Malaria Case Management (MCM) using quality assured Artemisinin based Combination Therapies (ACTs), prevention of Malaria in Pregnancies (MIP) using Long Lasting Insecticidal bed Nets (LLINs) with Sulphadoxine/pyrimethamine (SPs), both introduced and implemented together between August 2010 and June 2012 and Parasite based Diagnosis of Malaria using Rapid Diagnostic Test kits (RDTs) introduced in July 2012 and implemented together with the first two.

Health facilities were assigned into two groups. One group received free anti-malaria interventions from the Government and they were collectively termed "the treatment" group. Facilities that did not receive free anti-malaria interventions were termed “the control” group. The method of evaluation used was difference-in-difference and it was conducted on four dependent variables, namely, overall utilization of health care services, overall utilization of anti-malaria services, rate of utilization of health care services and rate of utilization of anti-malaria services.

Results across all four dependent variables were consistent. Free interventions regardless of their type were associated with an increase in the utilization rates at the 5% level of significance. For one of the dependent variables "overall utilization of anti-malaria services", the increase in utilization was 27.9 cases for the first two free interventions, it was 12.6 cases for the third intervention alone and went even higher by 35.7 cases for all three free interventions together. This trend is the same for the other three dependent variables.

Field of Study: Health Economics and Health Care Management Student's Signature .....

Advisor's Signature .....

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ABBREVIATIONS AND ACRONYMS

&	And
%	Percentage
ANC	Antenatal Clinic
ACT	Artemisinin based Combination Therapy
CPS	Current Population Survey
LCU5	Local Government Children Under Five Years Population
DID	Difference-in-Difference
DFID	Department for International Development of the UK
DHF	Distance to Health Facility
DOT	Directly Observed Therapy
EIR	Entomological Inoculation Rate
F & F	Facilities & Free
F & NF	Facilities & Not Free
FSS	Facility Support Staff
GSS	Government Subsidy Support
HFT	Health Facility Type
IP	Inpatient
IPT	Intermittent Preventive Treatment
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Net
LGA	Local Government Area
LGAMCP	Local Government Area Malaria Control Program

LLIN	Long Lasting Insecticide treated Nets
LPI	Local Government
LPOP	Local Government Population
LPW	Local Government Pregnant Women Population
MCH	Maternal and Child Health
MCM	Malaria Case Management
MICS	Malaria Indictor Cluster Survey
MIP	Malaria in Pregnancy
MOLG &CA	Ministry of Local Government & Chieftaincy Affairs
NC/inh/year	New Cases per inhabitant per year
NGO	Non- Governmental Organizations
NSPHCDA	Niger State Primary Health Care Development Agency
OP	Out Patients
PCC	Proximity to Coast Line
PCF	Polio Cases treated by health Facility
PHC	Primary Healthcare Centre
RDT	Rapid Diagnostic Test
RH	Reproductive Health
SHP	Skilled Health Personnel
SMCP	State Malaria Control Program
SMOH	State Ministry of Health
SP	Sulphadoxine/Pyrimethamine
STATA	Statistical Package
WHO	World Health Organization
USD	United States Dollars

Chapter 1
Introduction

1.1 Problems and Significance

Malaria is one of the most serious problems facing the world today. An estimated 3.4 billion people were at risk of malaria in 2012, of this, 1.2 billion (47%) were at high risk (> 1 case per 1000 population) living mostly in Africa Region. While 80% of cases in 2012 were recorded in just 18 countries of the world, 80% of estimated malaria deaths occurred in 17 countries with Democratic Republic of Congo and Nigeria accounting for 40% of estimated global total deaths WHO (2013). In the same document, reported data suggest that global domestic financing for malaria increased over the period 2005 -2012, from USD 436 million in 2005 to USD 522 million in 2012.

In Nigeria, 97% of the population are at risk of Malaria and it is estimated that about 50% of the adult population experience at least one episode yearly, while the under five children have up to 2 - 4 attacks of malaria annually. The yearly economic loss due to malaria in Nigeria has been put at 480 Billion Naira due to costs of treatment, transportation to sources of treatment, loss of man-hours, absenteeism from schools and other indirect costs. Thus malaria imposes a heavy cost, not only on a country's income, but also on its rate of economic growth and invariably, on its level of economic development NMEP (2013).

Breman (2006) explained that malaria is caused by the bite of a female anopheles mosquito which deposits Plasmodium into the blood stream. They further described that there are four causes of malarial infections in humans; Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale, and Plasmodium malariae and assert that almost all malaria deaths are caused by falciparum malaria. The spread of Malaria depends on the lifecycle of the mosquito; adult mosquitoes lay their eggs on water, the eggs hatch to become larvae, and then pupa before turning to adults. The malaria infection starts when a female anopheles mosquito -the vector, injects plasmodial sporozoites from its salivary gland into humans during a blood meal. These sporozoites then mature in the liver and are released into the bloodstream as merozoites. These invade red blood cells, causing malaria febrile illnesses. Some forms of the parasites (gametocytes) are ingested by anopheles mosquitoes during feeding and develop into sporozoites, restarting the cycle. Jamison (2006) stated that while more than 40 anophelines can transmit malaria, the most effective are those such as Anopheles gambiae, which are long-lived, occur in high densities in tropical climates, breed readily, and bite humans in preference to other animals.

Describing in further and in details, Breman (2006) argued that the entomological inoculation rate (EIR)—that is, the number of sporozoite-positive mosquito bites per person per year—is the most useful measure of malarial transmission and varies from less than 1 in some parts of Latin America and Southeast Asia to more than 300 in parts of tropical Africa. In Malaria endemic countries, several human bites per infected mosquito can occur per day and people are infected repeatedly throughout their lives with plasmodium falciparum. In such areas, morbidity and mortality during early childhood are quite significant. By adult age, some immunity against disease develops in these areas for survivors, and, most malarial infections are asymptomatic. This situation, with frequent, intense, year-round transmission, is termed stable malaria. In areas where transmission is low, erratic, or focal, full protective immunity is not acquired and symptomatic disease may occur at all ages. This situation is termed unstable malaria.

According to Chanda (2013) in their shared in their article that the WHO recommends a multi-pronged strategy to control and eliminate malaria, which includes integrated vector control interventions (Indoor residual spraying IRS, environmental management and use of long lasting insecticide treated bed Nets LLINs), preventive therapies (Use of Sulphadoxine-pyrimethamine for prevention of Malaria in Pregnancy MIP), parasite based diagnostic testing of malaria (Using Rapid Diagnostic Test Kits for Malaria and Microscopy), treatment with quality-assured Artemisinin based combination therapies ACTs and strong malaria surveillance. Nigeria has adopted all of these strategies and concerted efforts to control malaria have been in place since the year 2000.

Niger State is located in North Central Nigeria with a population of 4,991,927 in 2013 (projected from the 2006 Nigerian National Population Census) and land mass of 76,363 square kilometers equivalent to about 9 percent of Nigeria's total land area, it is considered the state with the largest land area in Nigeria. The state has 25 Local Government Areas (LGAs), 275 political wards, 8 emirate councils, 143 districts, 1066 villages and village heads. The languages mostly spoken are Nupe, Gbagyi and Hausa. The urban population is 30% and the rural population is 70% MOH (2011).

Malaria accounts for 65 % of outpatient hospital attendance Niger state. It is one of the leading causes of childhood and maternal morbidity and mortality. According to the NDHS (2008), all cause infant mortality rate was 103/1000 live births, under five mortality rate was 165/1000 live births, while maternal mortality rate was 1,132/100,000 live births. All age groups are affected and transmission of malaria occurs all year round with seasonal

peaks (July to early November). The main malaria vectors are – Anopheles gambiae (in the wet season); Anopheles funestus (dry season).

Uptake/utilization of anti-malaria services had been very low prior to 2010. According Nigeria's multiple indicator cluster survey MICS (2007), uptake of services for the prevention of malaria in pregnancies in Niger state was 12%, uptake for treatment with Artemisinin Based Combination Therapies (ACTs) for children under the age of 5 year was 3.4% and the percentage of households with at least one Insecticide Treated Bed Net (ITN) was 2.1%. In the first of its kind, in 2009, the Niger State Government distributed 1,741,476 free Long Lasting Insecticidal treated bed Nets (LLINs) as a measure to scale up coverage of bed Nets for better impacts on Malaria control and prevention in the state.

1.1.1 Free Interventions

In August 2010, with support from Development partners; the Global fund for AIDS, Tuberculosis and Malaria (GFATM), The British Department for International Development (DFID), and other project implementing partners, the state introduced the first set of free health facility based interventions for the control of Malaria. These free anti-malaria interventions were (1) Prompt and effective malaria case management (MCM) using quality assured Artemisinin based Combination Therapies (ACTs), (2) Prevention of Malaria in Pregnancies using Long Lasting Insecticidal bed Nets (LLINs) and Intermittent Preventive treatment of Malaria (IPT) with Sulphadoxine/pyrimethamine (SPs), and (3) Parasite based diagnosis of malaria using Rapid Diagnostic Test kits (RDTs) for Malaria. These 3 interventions were introduced at two different times; Prompt and effective malaria case management (MCM) and Prevention of Malaria in Pregnancies were started in September 2010 and the third free intervention Parasite based diagnosis of malaria using Rapid Diagnostic Test kits for Malaria was introduced in July 2012. All 3 interventions were implemented together thereafter MOH (2011).

1.1.2 Three Free Interventions

Essentially, Malaria Case Management (i.e. the first intervention)- treats all febrile illnesses as malaria by providing ACTs to patients of all ages who visit a supported health facility to ensure prompt and effective treatment of malaria within 24 hours of onset of symptoms. There are four types of ACTs in use for this intervention; ACT 1 for ages 6months to 3years, ACT 2 for 4 to 8years, ACT 3 for 9-14years and ACT 4 for ages above 14. Patients who report to the health facilities and are diagnosed to be having febrile illnesses are given these ACTs appropriate to their ages and instructed on how to use them and also advised to

return after medication to confirm if the Malaria has been treated by the drug. Upon returning after medication the health provider examines if the condition of the patient has improved, remained the same or worsened. They record the patients' health status and refer if case remained the same or worsened

Prevention of Malaria in Pregnancy- Prevention of malaria in pregnancies is implemented using two commodities types; LLINs and SPs (i.e. the second intervention) both aimed at preventing Malaria in pregnancies. The LLINs are issued to pregnant women during their first visit to the ante-natal clinics and counseled on appropriate and consistent use of the net for the benefits to be realized. The SPs are administered to pregnant women as prophylaxis for malaria to prevent malaria in pregnancies as directly observed therapy (DOTs) in the health facility. These two doses are to be administered to every pregnant woman who attends ANCs. The first dose is administered at sixteen weeks of pregnancy or 4 months and it is referred to as intermittent preventive therapy 1 (IPT1). The same woman receives the second dose at twenty weeks or 5 months of pregnancy and this is referred to as IPT 2. It is expected that a pregnant woman and her fetus that use the LLINs consistently and appropriately and receive the two doses of IPT 1 and 2, will be protected against malaria throughout the period of pregnancy.

Parasite based Diagnosis of Malaria (i.e. the second intervention) - is parasite based diagnosis to screen febrile illnesses and confirm malaria before treatment using rapid diagnostic test kits that detect malaria in few a minutes. This confirms the need for treatment and ensures rational use of drugs.

Earlier in 2010, the state malaria control programme (SMCP) in the State Ministry of Health (SMOH) working with the Ministry for Local Government (SMLG) came up with a set of inclusion criteria to identify public/Government health facilities cutting across the three levels of health care; primary, secondary and tertiary within each of the 25 local government areas of the state to be supported with the free facility based interventions. Some of these criteria include all facilities operating ante-natal clinic services, high disease burden, Malaria transmission pattern - seasonal or perennial, health facilities procurement and supply chain management system, storage systems, commodity security, Infrastructure and availability of skilled health personnel and absence of prior free health interventions. Of 1585 public/Government health facilities, 375 were selected for the support for free anti-malaria interventions across the 25 LGAs DPRS (2010) .

Also, at the start of the free interventions, 359,880 doses of Artemisinin based combination therapies were supplied in the state for case management of Malaria with

160,000 Long Lasting Insecticide Treated Nets (LLINs) and 390,000 doses of Sulphadoxine / Pyrimethamines (SPs) for prevention of Malaria in pregnancy (MIP). All commodities were distributed through the selected routine health facilities. In 2011, 397,418 doses of ACTs, 143,000 LLINs, and 160,000 doses of SPs were again supplied and distributed through same health facilities. In July 2012, upon introducing the third intervention (parasite based diagnosis of malaria) alongside case management of Malaria and prevention of Malaria in pregnancy, 439,586 doses of ACTs, 86,000 LLINs, 260,000 doses of SPs and 1,381,650 units of Rapid Diagnostic Test (RDTs) kits for parasite based diagnosis of malaria, were supplied and distributed for services through the health facilities in the state for the free interventions MOH (2011).

Since the inception of these interventions, there has not been any study to evaluate the programme. Therefore, this research will investigate the influence of free intervention as it affects the utilization of anti-malaria services, and to provide its relevance in the strengthening of health systems in Niger State, Nigeria.

1.2 Research Questions

1.2.1 Primary question

Did free interventions lead to an increase in the utilization of anti-malaria services in Niger state?

1.2.2 Secondary Question

What are the combined and differential effects of the 3 free interventions on the utilization of anti-malaria services in Niger state?

1.3 Research Objectives

1.3.1 Main Objective

This is a quantitative study to evaluate the effectiveness of free interventions as to whether they led to an increase in utilization of anti-malaria services in Niger State, Nigeria.

1.3.2 Specific Objective

To determine the how 3 free interventions; Case Management of Malaria, Prevention of Malaria in pregnancy and Parasite based diagnosis of malaria affected the change in the utilization of anti-malaria services in Niger State Nigeria

1.4 Hypothesis

Free interventions increased the utilization of anti-malaria services in Niger state, Nigeria

1.5 Scope of the study

This study is conducted with data from Government/public health facilities located within geopolitical wards which are subunits of the 25 Local government areas in Niger state. The study area is the entire state. The government/public health facilities comprise tertiary, secondary and primary level facilities that are owned and operated by Federal, State and Local Governments. The facilities have in-patient and out-patient services. Most of the primary level facilities are out-patient centers.

The study analyses changes in utilization rates retrospectively in treatment and control groups of facilities before the introduction of 3 free anti-malaria interventions in 2010 and a cut-off period as after the free interventions in 2013.

1.6 Possible Benefits

This study hopes to provide information on facility level factors that are associated with increases in utilization of anti-malaria services in Niger state and the efficacy or otherwise of the free anti-malaria interventions which will be useful for future decision making by state malaria control program in Niger state.

It will provide a basis for a further scale up of free interventions even beyond malaria control to other disease initiatives aiming to improve utilization of their services.

The outcome of this study will provide lessons for other disease programme initiatives that aim to instigate changes in utilization and population outcomes. The study will also provide Information on the free intervention that increased utilization the most. This is useful in reprogramming to increase efficiency of malaria control programme in the state.

It will provide baseline results for the state government so they can better understand barriers to uptake of certain key anti-malaria services. It will also provide a methodological basis on which future studies on evaluating policy interventions may be built.

Chapter 2

Literature Review

Malaria continues to constitute a major public health problem despite the curable nature of the disease. The disease overburdens the already overstretched health system especially in tropical Africa. Strategic approaches on malaria control towards elimination vary from country to country and within settings, and depend greatly on political commitment and financial potentials. Prompt access to effective malaria treatment, defined as having access within 24hours of onset of symptoms, is central to the success of malaria control worldwide. The last two decades have witnessed a sharp increase of initiatives to improve utilization and access to effective malaria treatment in many parts of sub-Saharan Africa.

Utilization of health services is defined as the outcome of interaction between health professionals and patients Donabedian (1973). Measures associated with health service utilization have often been expressed by outcomes and volume of services. Yet, utilization is a multidimensional process Donabedian (1973), Starfield (1998). Over the years, there has been a number of works conducted by various organizations that looked at utilization to go beyond just using services and the outcomes from using such services. In a 2008 report, the World Health Organization defined utilization of health services to broadly include such concepts as access and continuity of care.

Conceptually, the demand for health care is the quantity of health services that will be purchased/or required, if free (assuming their availability) by consumers. Such demand is determined by a number of factors. Such factors include the prices charged for health services, the consumers' incomes, health services quality (as perceived by consumers), the distance that consumers travel to obtain the services available to them, waiting time, and service time. Other factors are demographic, biological, socio-cultural and institutional factors.

A more general and working definition of health care service utilization is the measure of the population's use of health care services available to them. This includes the utilization of hospital resources and providers' resources. Health care utilization and health status are used to examine how efficiently a health care system produces health in a population Anyawu (2007). This definition clearly incorporates the concept of access which cannot be isolated from utilization when it comes to health care services.

Inadequate access to health care is a complex, multidimensional problem Mamdani (2004). On the supply-side, availability of appropriate interventions such as drugs or vaccines, quality of services, and affordability all affect the uptake of health interventions. Demand-side factors such as acceptability of interventions, health education, and treatment seeking behavior can also affect access Krause (2000), Ensor (2004). Physical accessibility plays an important role in the use of health services Noor (2006). The investment and effort required to access health services including distance or time required to travel, loss of productivity due to time away from work, and availability and cost of transportation are crucial factors in the decision about whether and when to seek treatment.

As documented by Chuma (2010), there is some evidence to suggest that there is a lower chance of the lowest segment of the population demanding prompt and effective malaria treatment which, when coupled with many other variables such as affordability, acceptability and availability affect their access to prompt and effective treatment. This study about considers the barriers to prompt and effective malaria treatment among the poorest population in Kenya, a number of focused group discussions reveal that costs of treatment as a barrier to access was predominant. Importantly, their study showed that knowledge abound that treatment of malaria should be with an appropriate anti-malarial, notwithstanding, costs were recorded to have inhibited people from seeking effective treatment.

Similarly, Wilkinson (2001) in rural South Africa, investigated changes on attendance for health care services when user fees were taken away. In 1994, the government waved user fees for children aged less than 6 years and pregnant women and this was followed in 1997 by the removal of all user fees at all primary health care clinics. Using data from 1992 to 1998, the group analyzed the average quarterly new registrations and total attendances for preventive services at a mobile primary health care unit.

They ran regression analysis to assess whether trends were statistically significant. There was a sustained increase in new registrations (P = 0.0001) and total attendances (P = 0.0001) for curative services, and a fall in new registrations (P = 0.01) and total attendances for immunization and growth monitoring (P = 0.0002) over the study period. The upturn in demand for curative services started at the time of the first policy change. The decreases in antenatal registrations (P = 0.07) and attendances (P = 0.09) were not statistically significant. The number of new registrations for immunization and growth monitoring increased following the first policy change but declined thereafter. The important finding from this study is the correlation between the removal of user fees and the rise in demand for curatives services as they found that there was a sustained increase in new registrations and

total attendances for curative services, and a fall in new registrations and total attendances for immunization over the study period.

They inferred from the study that the rise in demand for curative services coincided with the time of the first policy change. The removal of user fees improved access to curative services but this may have happened at the expense of some preventive services. The result of this study further lends credence to the hypothesis that free interventions lead to increases in utilization rates of health care services which this research work is seeking to demonstrate.

There is also evidence that provision of free of charge health services allowed significant increases in utilization rates of services which in turn allowed efficiency gains through better use of existing resources. This much was demonstrated by Ponsar (2011) in their work that looks at how abolishing user fees for children and pregnant women step wisely increased utilization of malaria-related interventions in Kangaba, Mali. In many sub Saharan countries, user fees are the reasons essential services are underused. As enumerated in their studies, the government had tried out a number of strategies to improve uptake and utilization of health services, including subsidizing diagnostics and drugs alone for a prevalent disease such as malaria, but this did not work because even with subsidies health care remains unaffordable to the rural poor. With the abolition of user fees, utilization of health services in Kangaba, rural Mali rose revealing the huge unmet demands existing before the removal of user fees among pregnant women and children under 5 years of age. Looking closely, their findings reveal that, in 2004, before the intervention, health service utilization was 0.17 new cases per inhabitant per year (NC/inh/Year). However, during the first phase of the intervention, the utilization rate rose to 0.22 in 2005 and 0.29 in 2006. During the second phase of the project in 2007 after abolishing the user fees for the pregnant women and children under 5 years of age, utilization increased to 0.84 NC/inh/year corresponding to a three times increase compared to 2006 when it was subsidies for test and malaria drugs only. This is further validated because in non-intervention areas utilization of services did not vary greatly between 2004 and 2007. In intervention area, free care implementation led to increases in utilization in 2007. Again, this is in line with the hypothesis of this study.

Rosenstock (2005) reviewing previous data available on the utilization of diagnostic and treatment services, found that most studies of utilization do not throw any light on why people use health services and he consequently, came up with the suggestion that efforts should be made to understand health and illness behavior as a function of personal

characteristics. This supports the need for this study to explore one factor that greatly affects utilization, which is waiving away user fees or provision of free interventions.

To illustrate this further, an experimental study conducted in Sinnar state, one of Sudan's highly endemic malaria regions on the impact of user fee exemption on service utilization and treatment seeking behavior, Abdu (2004) argued that "exemption from user fees increased health services utilization, improved treatment-seeking behavior and promoted early diagnosis". The experimental study assessed the effect of different levels of exemption, 25%, 50% and 75%, from health center user fees on utilization of health services and treatment seeking behavior for malaria by a high risk group of pregnant under 5 years children and pregnant women.

Other than cost and user fees alone, some other important factors are associated with low rate of utilization of services from the health facilities. Girma (2011) argued that by improving predictors of health care use we can greatly improve health care utilization especially at facility levels. In addition to other variables, they went ahead to investigate the effects of perceived transport cost and distance to the nearest health center as they affect utilization of health facility services. In their study to assess the utilization of health services and associated factors in Jimma zone, south west Ethiopia, household as well as facility level characteristics affect utilization rates of health care services were analyzed. They found that services related factors like perceived transportation cost and distance to the nearest health facility and perceived treatment cost were seen to predict the use of health facility services. So was physical access which was found to be a significant factor that influences outpatient visits. They inferred that, those is a 2.9 times higher chance of using the health services by those who live less than or equal to 10 kilometers from the nearest health center or hospital than those who are farther away. Besides, there was a 0.05% chance of service utilization as compared to those who perceive transportation cost to be expensive. In concluding they stated that improving physical accessibility of health services will possibly result in better utilization of health care services.

In another study, the average population per health facility was found to be an important district level factor in the utilization of health services. Singh (2013) explain that studies have often ignored examining the role of community- and district-level factors in the utilization of maternity healthcare services, particularly in the Indian context. They did this by analyzing factors that are associated with maternal healthcare utilization in nine high focus states in India. Their results show among other things that community and district-level factors influence the pattern of utilization of maternal healthcare services significantly. They showed that average population coverage of primary health centers (PHCs), among

other factors influence the use of maternity care services. In conclusion, they highlighted the role of strengthening public health infrastructure at district level in the utilization of services.

Another very important aspect of this study is the techniques employed for the estimation and analysis of the increases and effects of the free interventions on the utilizations rates of anti-malaria services: Ordinary least squares regression and difference-in-difference estimation techniques. These are techniques in econometrics used to measure the effects of a treatment at given period of time. The difference-in-difference estimator assumes that considering two comparable groups; treatment and control over a period of time, the two groups will show different trends in outcome. The use of this methodology is clearly demonstrated by the work of Card (1993) . They estimated the impacts of a law that increased minimum wage in fast food industry in New Jersey compared to Pennsylvania where there was no increase within the period of study. They sought to find out the impact of a law that increased New Jersey's minimum wage on April 1st, 1992 from $4.25 to $5.05 per hour. They compared the changes in wages, employment and prices at stores in New Jersey relative to stores in Pennsylvania (where the minimum wage remained fixed at $4.25 per hour). They used the Difference-in-Difference estimation techniques with New Jersey and treatment and Pennsylvania as control. They found that no evidence that the rise in New Jersey minimum wage reduced employment at fast food restaurants in the state. They also found that prices of fast food meals increased in New Jersey relative to Pennsylvania suggesting that much of the burden of minimum wage rise was passed to the consumers. Within New Jersey, however, they found no evidence that prices increased more in stores that were most affected by the minimum wage rise. This methodology is applicable to estimate the changes in utilization rates over time with the free interventions in this study.

A similar study was conducted by Hamermesh (2000). They studied the effects of a change in California's overtime law. At one point in time, the law required that women received an overtime premium for hours of work beyond eight in a given day. In 1989, this daily overtime penalty was extended to cover men as well. They asserted that the estimator assumes that, were it not for the expanded coverage of California's overtime law, outcome changes for men would have been similar across regions. Using current population survey (CPS) data from 1973, 1985 and 1991 that provided information on daily hours of work, they estimated the impact on work schedules of California extending its overtime law to cover men. Their basic strategy was to track outcomes for California men before and after they were subject to the daily overtime penalty, and then compared them with changes with the corresponding changes for men in Non- western states who were never subject to daily overtime pay regulations. After California's daily overtime penalty was extended to men, overtime hours and the incidence of overtime workdays declined substantially for male

workers in California relative to men in other states and the prevalence of eight-hour workdays rose by roughly the same amount that overtime incidence fell. This implied elasticity of demand for daily overtime hours is at least -0.5. Their estimates represent the response to an exogenous price change. They found strong evidence that the distribution of daily work hours responded to the California's overtime law exactly as the theory of labor demand predicts.

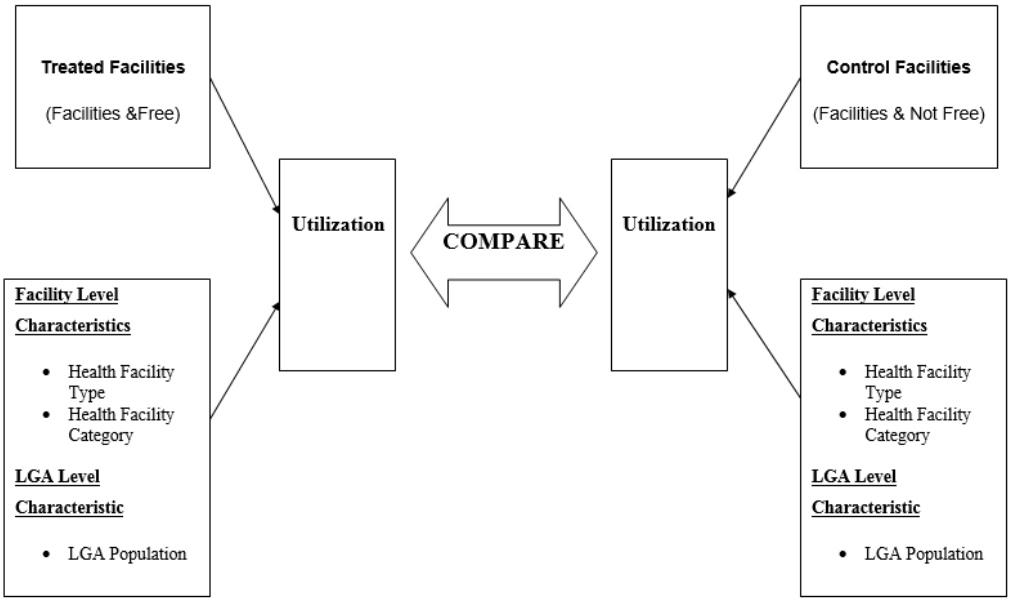
This literature review contributes to this research work by way of characterizing the definition of utilization of healthcare services and other key concepts associated with it. Most literature reviewed here define utilization of healthcare services to be when patients who need health services visit services delivery points and use the available services. This agrees with the concept of utilization for this study, which describes utilization of anti-malaria service as visiting a health facility and receiving an appropriate anti-malaria service. Also, the literature review was very useful with the identification of relevant key factors which are associated with healthcare utilizations for inclusion in the analysis of this research.

Because this interventions have not been evaluated by any group or government body, the contribution of this research work to the body of knowledge is the outcome of the evaluation of the effectiveness of the free interventions that will translate into policies to inform future programme design. Also, the use of diiference-in-difference approach to estimate the effects of free intervention on utilization of anti-malaria services is a technique that has not been used by any other researchers previously in the analysis of facility based utilization of anti-malaria services.

Chapter 3
Conceptual Framework

Facility and LGA level characteristics for two groups of facilities termed as 'treatment' (for those that received free interventions) and 'control' (for those that did not receive free interventions will be analyzed across 37 months (March 2010 to March 2013). This consist of period of no free interventions, period of introduction of first set of free interventions and a second period of introduction of additional free intervention. There will then be comparison of the increases in utilization and rates of utilization of anti-malaria service between these two groups of facilities and inferences will be made.

Figure 1: Conceptual Framework



This conceptual framework also shows the approach that will be used for the analysis. The analysis will be done using the diiference-in-difference estimation technique, which will measure the difference in utilization between period of before the commencement of free intervention and the post interventions periods both for the treatment group and the control group, and then measure the difference of that difference between the treatment and control groups.

There are sets of explanatory variables that included in the analysis to explain the utilization of anti-malaria services, these are Intervention variables, facility and LGA level variables.

Intervention variables include health facility type which is either treatment facility (free) or not, there is the first period of free intervention (p01) which refers to when the first sets of two free intervention were introduced, also another second period of free interventions (p02) referring to period when the third intervention was introduce and made free, there are also interaction (terms free*p01) and (free*p02) for the free facilities and the two free time periods of the interventions. These are all dummy variables that carry the values of 0 or 1.

Facility level variables include health facility level which is further categorized into primary (pri), secondary (sec) or tertiary level (ter) facilities and captured as dummy variables in the analysis. Other facility level explanatory variables that are continuous variables are the number febrile illnesses cases of the outpatient department (fopd), number of febrile illnesses cases of the inpatients department (fipd), total number of febrile illnesses cases (futil), number of malaria cases of the outpatient department (mopd), number of malaria cases of the inpatients department (mipd), total number of malaria cases (mutil). There are also facility variables like number of beds (bed), number of skilled health personnel (shp), number of female skilled health personnel (fshp), number of facility support staff (fss), distance from health facility to the farthest community they serve (dhf), proximity of health facility to coast line/riverine areas (pcl), and the number of polio cases treated by each facility (pcf).

Local Government explanatory variables include total population of people in the LGA (lpop), population of pregnant women in the LGA (lpw), population of children under five years of age (lcu5), the local government fertility rate per annum (lfr), Local Government average per capita income (lpi) and number of acute febrile illness cases (afi).

Chapter 4
Methodology

4.1. Study Design

This is a quantitative study using panel data from health facilities in 25 Local Government Areas to retrospectively determine the effects of 3 free interventions on the utilization of anti-malaria services between the years 2010 to 2013. The analysis is performed at the health facility level, and the observation unit is facility-month. Data are sourced from two groups of facilities that were assigned by the state Government in the state. These are groups of facilities that received free anti-malaria interventions termed as “facilities and free” (F & F) and those that did not receive treatment termed as “facilities and not free” (F & NF). The first group is the treatment group and the second group is the control group.

4.2 Data Analysis Methods

There will be two types of regression for this study:

The first being linear regression estimates of four dependent variables obtained using facility- month data from March 2010 to March 2013 (37 months) for health facilities in both the F & F treatment group and the F & NF control group. There are 5550 observations from 150 Health facilities in 7 LGAs.

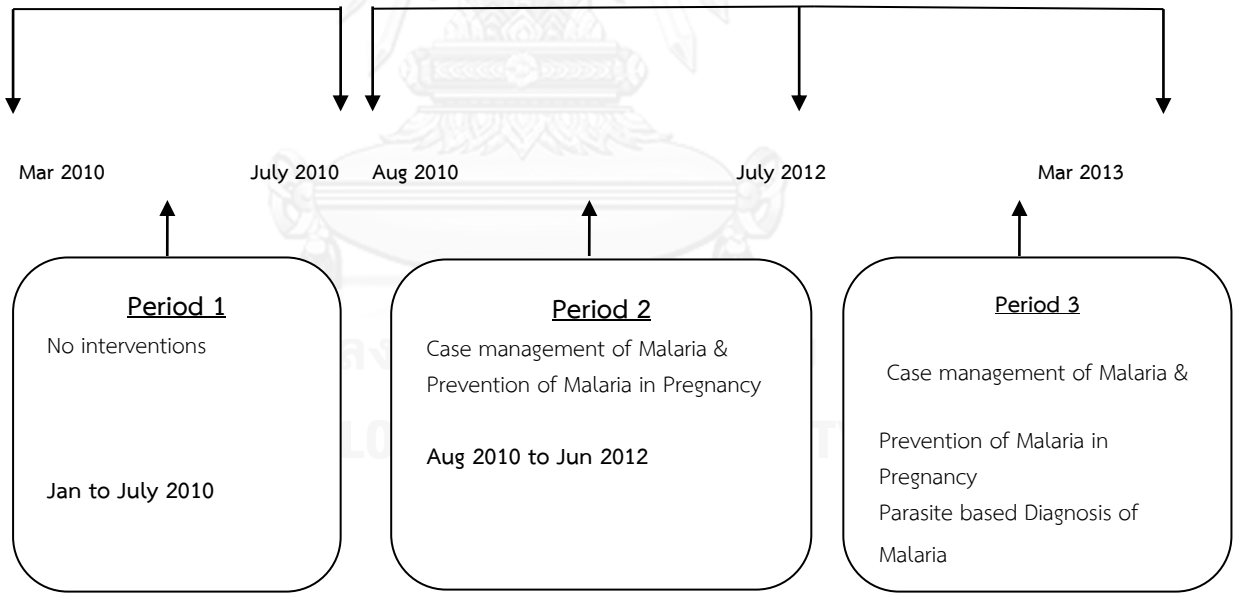
The second is Difference-in-Difference regression is used to estimate the effects of the free interventions on the rates of utilization of the anti-malaria services. For the treated facilities, March to July 2010 was a period of no free interventions; this was followed by the introduction of the first two free interventions which were implemented from August 2010 to June 2012. The third free intervention was then introduced in July 2012 and all three implemented together to March 2013. As such the combined effects of the first two free interventions together, all three free interventions together and the third free intervention alone are estimated using the Difference-in-Difference (DID) estimation technique.

Before the introduction of the 3 free interventions, all public health facilities across the 25 LGAs in Niger state were providing health care services according to the National system of cost recovery (drug revolving fund) which Niger state has adopted and was being supported by government. Patients paid some amounts to cover

services and drugs. In August of 2010, the state Government with support from its partners introduced and made free the provision of anti-malaria services and commodities in 250 health facilities across all 25 LGAS; 10 health facilities per LGAs. In 2011 the free intervention were scaled up to additional 125 health facilities bringing the total facilities to 375. The 3 free interventions were Case Management of Malaria with Artemisinin based combination therapies ACTs; Prevention of Malaria in pregnancy with Sulphadoxine/pyrimethamine for intermittent preventive treatment and Long Lasting Insecticidal Bed Nets and Parasite based diagnosis using Rapid Diagnostic Test Kits for Malaria.

The first two free interventions; case management of malaria and prevention of Malaria in Pregnancy were introduced at the same time in August of 2010 and implemented together, then parasite based diagnosis being the third free intervention was introduced as an additional free intervention to all 375 implementing health facilities in July of 2012 and all three interventions continue to be implemented together.

Figure 2: Periods of free interventions



The Difference-in-Difference (DID) estimator of the effects of free interventions can be represented by the assumption that, if there were no free interventions, the changes in utilization rates of the treated group will be comparable to the control; as such any differences in the trends of the two groups could be attributed to the free interventions. That is,

DD = $[Y_t^{\text{Post free}} --- Y_t^{\text{Pre free}}] -- [Y_c^{\text{Post free}} --- Y_c^{\text{Pre free}}]$

Where,
Y is outcome variable,
t = treatment group (F & F)
c = Control group (F & NF)

Table 1: Periods of Free Interventions

Intervention (Period)	Comparison (Period)	Effects
2	1	**First two Interventions together** ● Case management of Malaria ● Prevention of Malaria in Pregnancy
3	1	**All three Interventions together** ● Case management of Malaria ● Prevention of Malaria in Pregnancy ● Parasite based diagnosis of Malaria
3	2	**Third Interventions Alone** ● Parasite based diagnosis of Malaria

The 37 months study period covers a period of no free intervention (period 1- March 2010 to July 2010) and two periods of free interventions; period 2 being when the first two free interventions (case management of malaria and prevention of Malaria in Pregnancy) were implemented (August 2010 to June 2012). Period 3 was when the third free intervention (parasite based diagnosis of malaria) was added and implemented together with the first two (July 2012 to March 2013). To estimate the effects of these free interventions, the regressions compared periods of interventions with periods when there were no interventions and also compared periods between different interventions taking cognizance of treatment and control facilities.

As shown by the table above, to estimate the effects of the first two interventions (case management of malaria and prevention of Malaria in Pregnancy), the regressions compared period 2 to period 1 (period of first two free interventions

compared with no free intervention period). To estimate the effects of all three interventions together (case management of malaria, prevention of Malaria in Pregnancy and parasite based diagnosis of malaria), the regressions compared period 3 with period 1 (period when all there free interventions were implemented together compared with period of no free interventions). And lastly, to estimate the effect of the third intervention alone (parasite based diagnosis of malaria), the regressions compared period 3 to period 2 (period when all three free interventions were implemented together compared to period when two interventions were implemented together).

The difference-in-difference equation for the effects of the free interventions on the utilization of anti-malaria services can be written generally as:-

$$Y_{it} = \beta_0 + \beta_1 treat_i + \beta_2 post_{it} + \beta_3 treat_i * post_{it} + \beta_4 HFT_{it} + \beta_5 HFL_{it} + \beta_6 IP_{it} + \beta_7 OP_{it} + \beta_8 BED_{it} + \beta_9 SHP_{it} + \beta_{10} FSHP_{it} + \beta_{11} FSS_{it} + \beta_{12} DHF_{it} + \beta_{13} PCL_{it} + \beta_{14} PCF_{it} + \beta_{15} LPOP_{it} + \beta_{16} LCU5_{it} + \beta_{17} LPW_{it} + \beta_{18} LFR_{it} + \beta_{19} LPI_{it} + \beta_{20} AFI_{it} + e_{it}$$

Where, i=facility
t=month

The DD effects to be estimated include:

1. **Effects of the *first 2 free interventions together***

(Period 2 Vs Period 1)
Case Management of Malaria
Prevention of Malaria in pregnancy
Months included in the analysis: March 2010 to June 2012
Where,
Y_i = Effect of the first 2 free interventions together
treat = 1 if facility is free
= 0 if facility if Not free
post = 1 if August 2010 to June 2012
= 0 if March 2010 to July 2010
X = facility and LGA characteristics

2. **Effects of the all 3 free interventions together**

(Period 3 Vs Period 1)
Case Management of Malaria

Prevention of Malaria in pregnancy
Parasite based diagnosis of Malaria
Months included in the analysis: March 2010 to March 2013
Where,
Y_i = Effect of all 3 free interventions together
treat = 1 if facility is free
= 0 if facility if Not free
post = 1 if July 2012 to March 2013
= 0 if March 2010 to July 2010
X = facility and LGA characteristics

3. Effects of the third free interventions alone

(Period 3 Vs Period 2)
Parasite based diagnosis of Malaria
Months included in the analysis: August 2010 to March 2013
Where,
Y_i = Utilization effect of the third free intervention alone
treat = 1 if facility is free
= 0 if facility if Not free
post = 1 if July 2012 to March 2013
= 0 if August 2010 to July 2012
X = facility and LGA characteristics

The DD effect for all of the above comparisons is measured by β_3 (i.e. the coefficient of the interaction term between "treat" and "post"

To define the dependent variables, we first define utilization as the extent to which a given group uses a particular available healthcare service in a specified period. Usually expressed as the number of services used per stated period of time per 100 or per 1000 persons.

Because there are different services targeted at particular vulnerable groups of persons for malaria prevention and control, utilization of anti-malaria services in this study is defined as use of a service by specific groups of persons who need the services. Need here include those who need and use the services as well as those

who need the services but do not use. This therefore forms the basis for how overall utilization of anti-malaria services and other healthcare services are defined in this study.

Utilization rates are defined as the extent to which the members of a population use a healthcare service over a stated time and usually expressed as a percentage. For this study, rates of utilization of anti-malaria services and other healthcare services are measured as a percentage determined by dividing the number of individuals who need and used the services by the total population of individuals who are vulnerable in the specified geographical study area.

The definitions of the four **dependent variables** in this study therefore are as below:

1. **FUTIL** = *Overall Utilization of Healthcare Services* is the number of available services used by persons who need and presented at a health facility per month.

2. **MUTIL=** *Overall Utilization of Anti- Malaria Services*
    a. **Prevention** = Overall Utilization of Anti-Malaria *Prevention Services* is the number of available preventives services used by pregnant women and caregivers of children under five years of age (vulnerable groups for malaria) in a health facility per month.
    b. **Treatment =** Overall Utilization of Anti-Malaria *Treatment Services* is the number of available Treatment Services used by persons diagnosed with Malaria in a health facility per month
    c. **Diagnosis =** Overall Utilization of Anti-Malaria *Diagnostic Services* is the number of available Diagnostic Services used by persons with acute febrile illnesses who do not know they have malaria in a health facility per month

3. **FUTIL/AFI_MTH** = *Rate of Utilization of Healthcare Services* is the number of available services used by persons who presented at a health facility per month out of the population of those who need the health care services per Local Government Areas.
4. **MUTIL/AFI_MTH** = *Rate of Utilization of Anti-malaria Services*

a. **Prevention** = Rate of Utilization of Anti-Malaria *Prevention Services* is the number of available preventives services used by pregnant women and caregivers of children under five years of age (vulnerable groups for malaria) in a health facility per month out of the population of the two vulnerable groups in a Local Government Area.
b. **Treatment =** Overall Utilization of Anti-Malaria *Treatment Services* is the number of available Treatment Services used by persons diagnosed with Malaria in a health facility per month out of the population that were diagnosed with malaria per Local Government Area
c. **Diagnosis =** Overall Utilization of Anti-Malaria *Diagnostic Services* is the number of available Diagnostic Services used by persons with acute febrile illnesses who do not know they have malaria in a health facility per month out of the population of all those with acute febrile illness who do not know they have malaria in a Local Government Area

For the second and fourth dependent variables, even though it would be desirable to be able to distinguish between preventive services, treatment services and diagnosis, the data do not permit such distinctions, in which case the regression analysis assumes that the two dependent variables represent utilizations -at least in the loose sense.

The Independent variables (X) include

Treat: Health facility that had free anti-malaria services

Post: Period that intervention was free

HFT: Health Facility Type

HFL: Health Facility Level

IP: In patients in the earlier period

OP: Outpatients in the earlier period

BED: Beds

SHP: Skilled Health Personnel

FSHP: Female Skilled Health Personnel

FSS: Facility Support Staff

DHF: Distance of Health Facility to farthest population it serves

PCL: Proximity of facility to Coast Line

PCF: Polio Cases treated by Facility

LPOP LGA Population

LCU5: LGA Children under Five years of age population

LPW: LGA Pregnant Women Population

LFR: LGA Fertility Rate

LPI: LGA average per Capita Income

AFI: Acute Febrile Illness

Table 2: Definition of Explanatory variables

S/NO	VARIABLE	VARIABLE TYPE	EXPECTED SIGNS	DESCRIPTION	SOURCE OF DATA	VARIATION
Facility Level Characteristics						
1	Health Facility Type	Dummy	+	1 = if health facility is Free 0 = if health facility is Not Free	Niger State Primary Health Care Development Agency (NSPHCDA)	Monthly
2	Health Facility Category	Dummy	+	1 = if health facility is primary 0 = if health facility is Not	NSPHCDA	Unchanged
3	In patients	Continuous	+	Number of in-patients per facility per month (in the earlier period)	State Malaria Control Programme (SMCP) data base	Monthly
4	Outpatients	Continuous	+	Number of out-patients per facility per month (in the earlier period)	(SMCP) data base	Monthly
5	Beds	Continuous	+	Number of beds per facility (determinant of size of health facility)	(SMCP) data base	Yearly
6	Skilled Health Personnel	Continuous	+	• Number of skilled health personnel per health facility • Ratio of female skilled health per facility. Defined as: No. of female skilled personnel _____	NSPHCDA	Yearly

				Total No. of Skilled health personnel Skilled Health Personnel include: ● Doctors, nurses & others in secondary facilities ● Community Health Extension workers (CHEWS) or Community Health officers (CHOs) for most primary facilities		
7	Facility Support Staff	Continuous	+	Number of support staff per facility (unskilled staff)	NSPHCDA	Yearly
8	Health Facility Distance	Continuous	+	Distance in kilometers from health facility to the farthest community of population it covers	LGAMCP	Unchanged
9	Proximity to coast Line	Dummy	+	1 = if Health facility distance is 5km or less from the coast line 0 = if Health facility distance is 5km or more from the coast line	LGAMCP	Unchanged
10	Polio cases treated by Facility	Continuous	+	Number of polio cases treated by facility. This is an outreach based intervention by each health facility	LGAMCP	Monthly
LGA Level Characteristics						

11	Population	Continuous	+	LGA Average population	Individual Local Government Malaria Control units (LGAMCP)	Yearly
12	Children Under Five	Continuous	+	LGA Population of children under five	LGAMCP	Yearly
13	Pregnant women	Continuous	+	LGA Population of pregnant women	LGAMCP	Yearly
14	Fertility Rate	Continuous	+	LGA number of live births per 1000 women between the ages of 15 and 44 years	LGAMCH/RH Unit	Yearly
15	Average Per Capita Income in Local Government Area	Continuous	+	LGA Average per Capita Income of population in the each LGA	MOLG & CA	Yearly

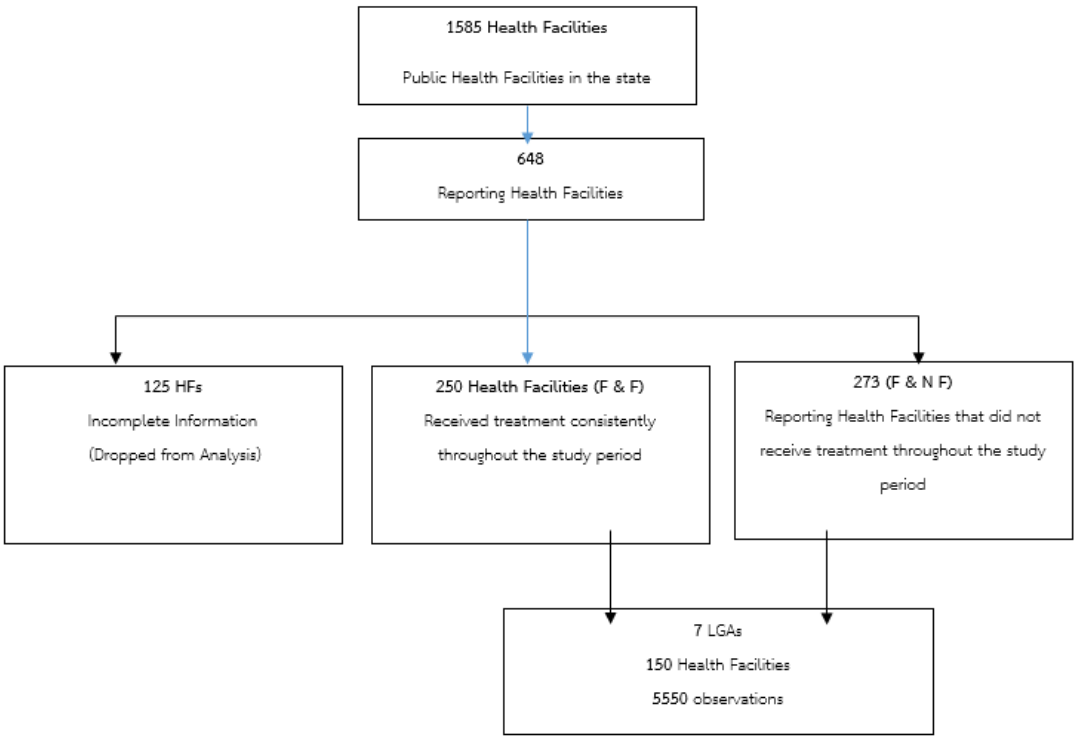
4.3 Data

4.3.1 Sample Selection criteria

There are 1585 public health facilities across the 25 LGAs in Niger the state. The state government was using a set of inclusion criteria to select facilities that received support for the free intervention (treated facilities). These criteria include population of vulnerable group served by health facility (Children under five and Pregnant women), number of malaria cases seen by health facilities, number of skilled health workers and absence of support activities of Government or Non-Governmental Organizations (NGOs). 648 of the 1585 health facilities in the state are reporting malaria data on monthly basis. Of these reporting facilities, a total of 375 received support for the free intervention at one point during the study period. Out of these, 250 health facilities received the free support (treatment) consistently from inception throughout the study period. These will constitute the treated group (F &F) in this analysis. The remaining 273 reporting health facilities will constitute the control group (F & NF).

The discussion above is illustrated in figure 3 below.

Figure 3: Selection of Health Facilities



Because all data entries had to be manually inputted, considering the time and the fact that one lGA could possibly represent another, it is necessary to further narrow down the sample (in addition to the criterion of whether or not a given facility reported its data consistently).

The 25 Local Government Areas in the state were classified into three categories according to the burden of febrile illnesses; defined as the temperature greater than 37.8^0C multiplied by the number of days with the temperature per year per LGA. The burden is categorized into low, medium and high burdens. There were four LGAs in the low category which consists of LGAs with 0-10% febrile illnesses burden, 18 LGAs in the medium category with 11-20% febrile illnesses burden and three LGAs in the high category with above 20% febrile illnesses burden.

Table 3: Classification of Febrile illnesses Burden in Niger state

Classification of Febrile Burden	**Zone**	**LGA**	**Percentage**
Low	A	Bida	8.4%
0-10%	A	Edati	10.8%
	A	Gbako	10.2%
	B	Shiroro	9,5%
	A	Agaie	15.7%
	C	Borgu	18.4%
	B	Bosso	19.7%
	B	Gurara	15.9%
	C	Kontagora	14.4%
	A	Lapai	18.7%
	C	Mariga	15.6%
	C	Mashegu	15.6%

Medium **11-20%**	B	Tafa	17.6%
	B	Rafi	14.1%
	B	Chanchaga	12.8%
	A	Katcha	11.0%
	A	Lavun	13.1%
	C	Magama	11.7%
	C	Rijau	11.7%
	B	Suleja	13.2%
	C	Mokwa	19.2%
	C	Wushishi	19.2%
High **Above 20%**	B	Munya	20.1%
	B	Paikoro	22.7%
	C	Awagara	40.0%

Two LGAs are selected from the low febrile illnesses burden category, three from the medium and another two from the high category, making a total of 7 LGAs. There are three geopolitical zones in the state, for each febrile illnesses burden category, the selection of LGAs was done to ensure that LGAs represent different geographical zones.

Table 4: Selected LGAs by febrile illnesses burden

Burden of Febrile illnesses	**Zone**	**LGA**	**No. of HFs**
Low	A	Bida	11
0-10%	B	Shiroro	28
Medium	B	Bosso	11
11-20%	C	kontagora	25

	A	Lapai	20
High	B	Paikoro	24
Above 20%	C	Agwara	24
Number of Health Facilities			**150**
Number of Observations			**5550**

Other considerations in the selection of the 7 LGAs include percentage of reporting. Only LGAs with 100% reporting of complete data were considered across the three categories of Low, Medium and High febrile illnesses burden. The number of health facility cadre in each LGA was another key consideration in the selection. LGAs that have as much as possible the three or at least two of the health facility cadre; (Primary, Secondary and Tertiary) were selected. This is to ensure similarity of observations across the three types of cadre. There are a few LGAs that had only Primary Health care facilities, such were not given priority. First consideration was given to the 3 cadres and where that was not possible 2 LGA were selected. All the 7 selected LGAs have primary health and secondary level facilities. One of the LGAs; Bida LGA has a tertiary facility in addition to primary and secondary health facilities.

A further consideration in the selection of the 7 LGAs includes the presence of socio-economic activities. In the 7 LGAs, agriculture remains the basic occupation. However, common to all of them and absent in the others, is that they are also major industrial or economic hubs in the state and therefore prompting some form of reasons for inward or outward migration. Malaria Transmission season was another important consideration in LGA selection. Though these selected LGAs have only a small portion of riverine communities with preponderant upland communities in comparison to others, the malaria transmission season in all of them is perennial.

Finally, Language and culture spread in each febrile illnesses burden category was considered. In each of the low, medium and high febrile illnesses category, one LGA differs from the next in terms of Language, cultural and way of life, allowing us to see the variation in the febrile illnesses categories. An example, is the Medium febrile illnesses category where Bosso LGA has predominantly Gbagyis speaking population, while Kontagora has the Hausas and Lapai has the Nupes speaking population representing the three major tribes in the state. No two LGAs within the same febrile illnesses category are similar in language, culture and way of life.

The data collection and entry was done by desktop review of secondary data collected over time by the state malaria elimination program (SMEP), which is stored in archives in their data bank. Missing data identified were retrieved from the health facilities directly by the help of the Local Government malaria focal persons concerned. Data for facility variables were collected and entered into a template, separate from the LGA level variable data. The two were later merged for the analysis.

In total, 5550 observations from 150 health facilities of 7 Local Government Areas across 37 months (March 2010 to March 2013) comprising both the treatment and control groups are analyzed in this study. The list of health facilities included in this study is shown in appendix 1.

4.4 Summary Statistics

Following Analysis using Ordinary least squares regression method for five dependent variables on utilization and difference-in-difference estimation analysis methods, results were obtained.

Table 5: Summary Statistics of Dependent Variables

Variable	Definition	Mean	Standard Deviation	Observations
FUTIL: Overall Utilization of Healthcare Services	defined as the change in utilization of all services by people who visited a health facility with a febrile illnesses	100.551	126.681	5550
MUTIL: Overall Utilization of anti-Malaria Services	defined as the change in utilization of anti-malaria services by people who visited a health facility with a febrile illnesses, were diagnosed with malaria and received appropriate anti-malaria services	75.755	96.456	5550
FUTIL/AFI_MTH: Rate of Utilization	The third dependent variable is the *rate of utilization of healthcare services* defined as change in utilization of all services by people who visited a health facility with a	0.043	0.057	5550

of Healthcare Services	febrile illnesses out of the population of people with febrile illnesses in the Local Government Areas.			
MUTIL/AFI_MTH: Rate of Utilization of anti-Malaria Services	The fourth dependent variable is *rate of utilization of anti-malaria services* defined as defined as the change in utilization of anti-malaria services by people who visited a health facility with a febrile illnesses, were diagnosed with malaria and received appropriate anti-malaria services out of the population of people with febrile illnesses in the Local Government Areas	0.033	0.043	5550

The changes in utilization is determined by explaining four dependent variables in this study. The first dependent variable is the overall utilization of healthcare services defined as the change in utilization of all services by people who visited a health facility with a febrile illnesses. The second dependent variable is the overall utilization of anti-Malaria Services defined as the change in utilization of anti-malaria services by people who visited a health facility with a febrile illnesses, were diagnosed with malaria and received appropriate anti-malaria services. The third dependent variable is the rate of utilization of healthcare services defined as change in utilization of all services by people who visited a health facility with a febrile illnesses out of the population of people with febrile illnesses in the Local Government Areas. The fourth dependent variable is rate of utilization of anti-malaria services defined as defined as the change in utilization of anti-malaria services by people who visited a health facility with a febrile illnesses, were diagnosed with malaria and received appropriate anti-malaria services out of the population of people with febrile illnesses in the Local Government Areas.

Table 6: Summary Statistics of Independent Variables

Variable	**Regression Code**	**Mean**	**Standard Deviation**	**Type of Variable**
Facilities with free anti-malaria Services	Free	0.659	0.474	Dummy
First period of free anti-malaria services	p01	0.265	0.441	Dummy
Second period of free anti-malaria services	p02	0.162	0.368	Dummy

Outpatient febrile illnesses cases	Fopd	98.382	122.830	Continuous
Inpatient febrile illnesses cases	Fipd	2.554	12.779	Continuous
Total febrile illnesses cases	Futil	100.551	126.681	Continuous
Outpatient malaria cases	Mopd	77.063	99.375	Continuous
Inpatient malaria cases	Mipd	1.480	8.188	Continuous
Total malaria cases	Mutil	75.755	96.456	Continuous
Primary level health care facilities	Pri	0.967	0.180	Dummy
Secondary level health care facilities	Sec	0.033	0.180	Dummy
Tertiary level health care facilities	Ter	0.000	0.000	Dummy
Beds	Bed	4.155	8.579	Continuous
Skilled Health personnel	Shp	5.542	10.021	Continuous
Female Skilled Health Personnel	Fshp	3.146	4.629	Continuous
Facility Support Staff	Fss	4.336	13.939	Continuous
Distance from health Facility to the farthest community they serve	Dhf	7.529	5.875	Continuous
Proximity of health facility to coastline (Rivers, lakes etc.)	Pcl	3.980	4.247	Continuous
Polio cases treated by health facilities	Pcf	41.169	53.741	Continuous
Population of pregnant women in LGA	Lpw	9041.573	3344.995	Continuous
Population of Children Under 5 in LGA	luc5	36166.450	13379.980	Continuous
Local Government Area fertility rate	Lfr	5.197	0.146	Continuous
Local Government Area per capita Income	Lpi	660.054	244.342	Continuous
Total population in Local Government Area	Lpop	180832.300	66899.320	Continuous
Acute febrile illness in Local Government Area per year	**Afi**	**26992.580**	11294.920	Continuous
Total Observations			**5550**	

Intervention variables include

1. Health facility type -which explains if a health facility did received treatment and hence termed (free) or if it did not receive any treatment.
2. The first period of free intervention (p01) -which refers to when the first sets of two free intervention were introduced
3. Second period of free interventions (p02) -referring to period when the third intervention was introduce and made free.
4. Interaction (terms free*p01) and (free*p02) -is the interaction term that explain how the free facilities and the two free time periods interacted during the interventions.
5. All intervention variables are dummy variables that carry the values of 0 or 1.

Facility level variables include

1. Health facility level -which is further categorized into primary (pri), secondary (sec) or tertiary level (ter) facilities and captured as dummy variables in the analysis. They describe the level and ownership of a health facility.
2. Number febrile illnesses cases of the outpatient department (fopd) -represents the number of cases of febrile illnesses recorded by health facility in the outpatient department of the facility
3. number of febrile illnesses cases of the inpatients department (fipd) -describes the number of cases of febrile illnesses recorded by health facility in the inpatient department of the facility
4. Total number of febrile illnesses cases (futil) -this the sum of the number of febrile illnesses case in both the outpatient and inpatient department of a health facility.
5. Number of malaria cases of the outpatient department (mopd) -represents the number of cases of malaria recorded by health facility in the outpatient department of the facility.
6. number of malaria cases of the inpatients department (mipd) -describes the number of cases of malaria recorded by health facility in the inpatient department of the facility
7. Total number of malaria cases (mutil) -this the sum of the number of febrile illnesses case in both the outpatient and inpatient department of a health facility.
8. Beds (bed) -is the number of beds in each facility

9. Number of skilled health personnel (shp –is the number of skilled health personnel defined as those working in the health facility who have received formal training on any area of healthcare and are certificated
10. Number of female skilled health personnel (fshp) -is the number of female skilled health personnel defined as those female service providers working in the health facility who have received formal training on any area healthcare and are certificated
11. Number of facility support staff (fss) – defined as all other staff working in the health facility that do not have formal training on healthcare, termed as support staff in the health facility
12. Distance from health facility to the farthest community they serve (dhf) – describes the longest distance in kilometers from the health facility to the place they serve
13. Proximity of health facility to coast line/riverine areas (pcl) – describes the distance in kilometers from the health facility to the nearest free flowing water points like rivers, lakes etc.
14. Number of polio cases treated by each facility (pcf)- this is the number of polio cases that each health facility treats per months

Local Government explanatory variables include

1. Total population of people in the LGA (lpop)- this is the total population of the LGAs per year
2. Population of pregnant women in the LGA (lpw) –this represents the number of pregnant women in the population of an LGA per year
3. population of children under five years of age (lcu5) - this represents the number of children that are under the age of 5 in the population of an LGA per year
4. The local government fertility rate per annum (lfr) -this describes the fertility rate of a local Government per year
5. Local Government average per capita income (lpi) –This tell the average per capita income of an individual in the LGA defined as GDP by population of the LGA
6. Number of acute febrile illness cases (afi) –This is defined as the number febrile illnesses cases recorded in an LGA per year

Chapter 5
Analysis and Results

The predicted value of Y is represented by the equation below:

$Y_{it} = \beta_0 + \beta_1 treat_i + \beta_2 post_{it} + \beta_3 treat_i * post_{it} + \beta_4 HFT_{it} + \beta_5 HFL_{it} + \beta_6 IP_{it} + \beta_7 OP_{it} + \beta_8 BED_{it} + \beta_9 SHP_{it} + \beta_{10} FSHP_{it} + \beta_{11} FSS_{it} + \beta_{12} DHF_{it} + \beta_{13} PCL_{it} + \beta_{14} PCF_{it} + \beta_{15} LPOP_{it} + \beta_{16} LCU5_{it} + \beta_{17} LPW_{it} + \beta_{18} LFR_{it} + \beta_{19} LPI_{it} + \beta_{20} AFI_{it} + e_{it}$

An example of how the value of the diiference-in-difference estimate could be teased out is provided here. Considering only the comparison between the periods of the first two interventions (period 1) with the period when there were no free interventions and using a facility that was free from the regression results, this equation can be written as:

$Y_{it} = \beta_0 + \beta_1 treat_i + \beta_2 post_{p01} + \beta_3 treat_i * post_{p01} + \beta_4 HFT_{it} + \beta_5 HFL_{it} + \beta_6 IP_{it} + \beta_7 OP_{it} + \beta_8 BED_{it} + \beta_9 SHP_{it} + \beta_{10} FSHP_{it} + \beta_{11} FSS_{it} + \beta_{12} DHF_{it} + \beta_{13} PCL_{it} + \beta_{14} PCF_{it} + \beta_{15} LPOP_{it} + \beta_{16} LCU5_{it} + \beta_{17} LPW_{it} + \beta_{18} LFR_{it} + \beta_{19} LPI_{it} + \beta_{20} AFI_{it} + e_{it}$

Because treat and p01 are dummies and take the values of 0 0r 1, the table below therefore summarizes the outcomes for the fp01 (the interaction terms)

Table 7: Summary of Intervention Variables

Facility Group	Treat	Post	treat*post	Effects excluding X
free & period of no intervention	1	0	0	$\beta_0 + \beta_1$
Free & period1	1	1	1	$\beta_0 + \beta_1 + \beta_2 + \beta_3$
Not free and period of no intervention	0	0	0	β_0
Not free & period 1	0	1	0	$\beta_0 + \beta_2$

As explained earlier in this chapter, the difference-in-difference estimates of the free intervention on utilization of malaria services is equal to:

$DD = [Y_{t\ Post\ free} --- Y_{t\ Pre\ free}] -- [Y_{c\ Post\ free} --- Y_{c\ Pre\ free}]$

Where,

Y is outcome variable,

t = treatment group (F & F)

c = Control group (F & NF)

That is, DD= $[(\beta_0 + \beta_1 + \beta_2 + \beta_3) - (\beta_0 + \beta_1)] - [(\beta_0 + \beta_2 - (\beta_0)]$

$= (\beta_2 + \beta_3) - (\beta_2)$

$= \beta_3$

This therefore shows that the difference-in-difference in each of the interventions is represented by the coefficient of the interaction term β_3.

The four dependent variables for this study are**:**

1. **FUTIL** = *Overall Utilization of Healthcare Services* is the number of available services used by persons who need and presented at a health facility per month.

2. **MUTIL=** *Overall Utilization of Anti- Malaria Services*
    a. **Prevention** = Overall Utilization of Anti-Malaria *Prevention Services* is the number of available preventives services used by pregnant women and caregivers of children under five years of age (vulnerable groups for malaria) in a health facility per month.
    b. **Treatment =** Overall Utilization of Anti-Malaria *Treatment Services* is the number of available Treatment Services used by persons diagnosed with Malaria in a health facility per month
    c. **Diagnosis =** Overall Utilization of Anti-Malaria *Diagnostic Services* is the number of available Diagnostic Services used by persons with acute febrile illnesses who do not know they have malaria in a health facility per month

3. **FUTIL/AFI_MTH** = *Rate of Utilization of Healthcare Services* is the number of available services used by persons who presented at a health facility per month out of the population of those who need the health care services per Local Government Areas.
4. **MUTIL/AFI_MTH** = *Rate of Utilization of Anti-malaria Services*
    a. **Prevention** = Rate of Utilization of Anti-Malaria *Prevention Services* is the number of available preventives services used by pregnant women and caregivers of children under five years of age (vulnerable groups for malaria) in a health facility per month out of the population of the two vulnerable groups in a Local Government Area.

b. **Treatment =** Overall Utilization of Anti-Malaria *Treatment Services* is the number of available Treatment Services used by persons diagnosed with Malaria in a health facility per month out of the population that were diagnosed with malaria per Local Government Area
c. **Diagnosis =** Overall Utilization of Anti-Malaria *Diagnostic Services* is the number of available Diagnostic Services used by persons with acute febrile illnesses who do not know they have malaria in a health facility per month out of the population of all those with acute febrile illness who do not know they have malaria in a Local Government Area

For the second and fourth dependent variables, even though it would be desirable to be able to distinguish between preventive services, treatment services and diagnosis, the data do not permit such distinctions, in which case the regression analysis assumes that the two dependent variables represent utilizations -at least in the loose sense.

Dependent Variable 1

Table 8: Overall Utilization of Healthcare Service

Variables	First 2 free intervention Vs. No intervention	All 3 free intervention together Vs. No intervention	All 3 free intervention Vs. first 2 free intervention
Intervention Variables			
Facilities with free anti-malaria Services	23.6*** (7.540)	17.7*** (8.324)	50.0*** (3.999)
First period of free anti-malaria services	16.3*** (7.283)		
Second period of free anti-malaria services		99.7*** (13.979)	16.0*** (6.635)
Interaction term for treatment in period one	32.5*** (8.202)		
Interaction term for treatment in period two		48.6*** (10.100)	23.5*** (7.270)
Facility Level Characteristics			
Secondary level healthcare facilities	103.5*** (26.302)	189*** (42.781)	156.2*** (28.725)
Number of beds	2.0*** (0.618)	-1.2* (1.007)	0.5* (0.643)
Skilled health personnel	-6.3*** (0.698)	-1.6* (1.098)	-5.0*** (0.704)
Female Skilled health personnel	12.0*** (0.920)	11.0*** (1.392)	13.1*** (0.923)
Facility Support Staff	3.6*** (0.227)	-0.5* (0.337)	1.9*** (0.221)
Distance from health Facility to the farthest community they serve	-2.0*** (0.278)	-1.9*** (0.427)	-2.1*** (0.287)
Proximity of health facility to coastline (Rivers, lakes etc.)	1.0*** (0.417)	1.9*** (0.637)	1.5*** (0.430)
Polio cases treated by health facilities	0.2***	0.4***	0.3***

	(0.033)	(0.047)	(0.033)
Local Government Area (LGA) Level Characteristics			
Population of pregnant women in LGA	34.8*** (6.263)	15.7* (10.463)	35.4*** (5.725)
Local Government Area fertility rate	62.2*** (18.288)	229.4*** (30.807)	88.2*** (16.499)
Local Government Area per capita Income	-17.5*** (4.921)	-61.0*** (7.800)	-30.6*** (5.272)
Total population in Local Government Area	-1.7*** (0.309)	-0.6* (0.529)	-1.7*** (0.285)
Observations	4200	2100	4950
F Value	151.89	79.79	151.03
Prob > F	0.0000	0.0000	0.0000
R^2	0.3526	0.3648	0.3147
Adjusted R^2	0.3502	0.3602	0.3126
Root MSE	96.318	104.4	107.72

***** 1% level of significance, ** 5% level of significance, * 10% Level of Significance, Standard Errors in parenthesis**

In table 3 above, the overall utilization of healthcare services increased with introduction of each free intervention. The increase in utilization upon introduction of the first two free interventions (Case management of Malaria and Prevention of Malaria in Pregnancy) compared to the period of no intervention was 32.5 cases, this was even higher, with utilization moving up by 48.6 cases when the third intervention (Parasite based diagnosis of Malaria) was introduced and all three implemented together and compared to the period when there was no free intervention. When all three interventions were compared to the first two interventions together, its show the effect of the third intervention alone which caused an increase in overall healthcare service utilization by 23.5 cases.

Results also show increases in utilization of healthcare services with each secondary facility providing free services; increasing from 103.5 for the first two free interventions and rising up to 189 cases when all three interventions were in place.

Overall utilization of healthcare services is shown to be decreased with each increase in a unit of per capita income. With first two free interventions it is shown to

decrease by 17.4 and by 61.0 with all three interventions together. This is so because the services are free and those with higher per capita income are likely not to value it.

Dependent Variable 2

Table 9: Overall Utilization of Anti-malaria Services

Variables	**First 2 free intervention Vs. No intervention**	**All 3 free intervention together Vs. No intervention**	**All 3 free intervention Vs. first 2 free intervention**
Intervention Variables			
Facilities with free anti-malaria Services	15.5*** (5.786)	11.5** (6.582)	39.0*** (3.145)
First period of free anti-malaria services	14.3*** (5.589)		
Second period of free anti-malaria services		86.7*** (11.054)	14.8*** (5.219)
Interaction term for treatment in period one	27.9*** (6.294)		
Interaction term for treatment in period two		35.7*** (7.987)	12.6*** (5.718)
Facility Level Characteristics			
Secondary level healthcare facilities	134.2*** (20.185)	188.8*** (33.829)	165.3*** (22.595)
Number of beds	-0.6* (0.474)	-2.3*** (0.796)	-1.5*** (0.506)
Skilled health personnel	-3.3*** (0.535)	-1.4* (0.868)	-3.1*** (0.553)
Female Skilled health personnel	8.5*** (0.706)	9.2*** (1.101)	10.2*** (0.726)
Facility Support Staff	2.0*** (0.174)	-0.32* (0.266)	1.0*** (0.173)
Distance from health Facility to the farthest community they serve	-1.4*** (0.213)	-1.2*** (0.337)	-1.4*** (0.225)
Proximity of health facility to coastline (Rivers, lakes etc.)	0.9*** (0.320)	1.7*** (0.503)	1.4*** (0.338)
Polio cases treated by health facilities	0.1*** (0.025)	0.3*** (0.037)	0.2*** (0.026)
Local Government Area (LGA) Level Characteristics			

Population of pregnant women in LGA	19.0*** (4.807)	4.7* (8.273)	20.7*** (4.503)
Local Government Area fertility rate	39.6*** (14.034)	186.0*** (24.361)	63.2*** (12.978)
Local Government Area per capita Income	-12.7*** (3.776)	-48.4*** (6.168)	-26.7*** (4.147)
Total population in Local Government Area	-0.9*** (0.237)	-0.06* (0.418)	-0.9*** (0.224)
Observations	4200	2100	4950
F Value	128.37	70.93	125.53
Prob > F	0.0000	0.0000	0.0000
R^2	0.3152	0.3380	0.2762
Adjusted R^2	0.3127	0.3332	0.2740
Root MSE	73.917	82.559	84.734

***** 1% level of significance, ** 5% level of significance, * 10% Level of Significance, Standard Errors in parenthesis**

Overall utilization of anti-malaria services show a significant increase when interventions became free. The difference in utilization between first two free interventions and when there was no intervention was 27.9, this even increased to 35.7 when all three interventions were implemented together compared to the period of no intervention. Estimating the effect of the third intervention alone by comparing all three interventions together with first two interventions together shows an increase in overall utilization of anti-malaria services by 12.6.

The results as are consistent with the hypothesis that utilization increases with free interventions; overall utilization of anti-malaria services for two interventions together was higher than single intervention alone, and effects of three interventions implemented together is even higher that two together. This suggests that the more free interventions are available, the more increases there will be in overall utilization of anti-malaria.

Outcome of this analysis show that with each woman getting pregnant overall utilization increased by 19.0 for the first two free interventions which has prevention of in pregnancy as one of the component intervention. This is supported by the fact that with increasing fertility rate, overall utilization of healthcare services also

increased; from 39.6 with first two interventions alone to 186 with all three interventions and 63.2 with the third intervention alone.

Another very significant variable is the distance from the health facility to the farthest community it serves. Overall utilization of anti-malaria services is shown to have decreased with increase in each kilometer distance; for first two interventions and third intervention alone utilization decreased by 1.4 while for the three interventions together it decreased by 1.2. This is understandable as distance affects access to health services and by extension anti-malaria services.

Also, overall utilization of anti-malaria services is shown to decrease with addition of each secondary level facility; from 0.6 for first two interventions to 2.3 for all three interventions and 1.5 for the third intervention alone. This reinforces the fact that utilization of anti-malaria services is mainly through out-patient services and mostly at primary level care facilities.

Dependent Variable 3

Table 10: Overall Utilization of Anti-malaria Services

Variables	First 2 free intervention Vs. No intervention	All 3 free intervention together Vs. No intervention	All 3 free intervention Vs. first 2 free intervention
Intervention Variables			
Facilities with free anti-malaria Services	0.007*** (0.003)	0.005* (0.003)	0.02*** (0.001)
First period of free anti-malaria services	0.004* (0.003)		
Second period of free anti-malaria services		0.01***	-0.001* (0.002)
Interaction term for treatment in period one	0.017*** (0.003)		
Interaction term for treatment in period two		0.03*** (0.003)	0.01*** (0.003)
Facility Level Characteristics			
Secondary level healthcare facilities	0.04*** (0.011)	0.09*** (0.016)	0.08*** (0.012)
Number of beds	0.0009*** (().0002)	-0.0004* (0.0003)	0.0003* (0.0002)
Skilled health personnel	-0.003*** (0.0002)	-0.0004* (0.0004)	-0.002*** (0.0003)
Female Skilled health personnel	0.005*** (0.0003)	0.004*** (0.0005)	0.005*** (0.0003)
Facility Support Staff	0.002*** (0.000)	-0.00003* (0.0001)	0.001*** (0.000)
Distance from health Facility to the farthest community they serve	-0.0007*** (0.0001)	-0.0007	-0.0008*** (0.0001)
Proximity of health facility to coastline (Rivers, lakes etc.)	-0.0004*** (0.0001)	-0.0003*** (().0002)	-0.0003* (0.0001)
Polio cases treated by health facilities	0.0001*** (0.000)	0.0001*** (0.000)	0.0001*** (0.000)
Local Government Area (LGA) Level Characteristics			

Population of pregnant women in LGA	0.02*** (0.002)	0.009*** (0.004)	0.02*** (0.002)
Local Government Area fertility rate	-0.005* (0.007)	0.007* (0.012)	-0.01* (0.007)
Local Government Area per capita Income	0.004* (0.002)	-0.01*** (0.003)	0.001* (0.002)
Total population in Local Government Area	-0.0009*** (0.0001)	-0.0004** (0.0002)	-0.0009*** (0.0001)
Observations	4200	2100	4950
F Value	240.69	105.40	210.89
Prob > F	0.0000	0.0000	0.0000
R^2	0.4632	0.4314	0.3907
Adjusted R^2	0.4613	0.4273	0.3888
Root MSE	0.04106	0.04098	0.04617

***** 1% level of significance, ** 5% level of significance, * 10% Level of Significance, Standard Errors in parenthesis**

Difference in the rate of utilization of healthcare services was highest at 3.0% for all three interventions implemented together when compared to the period before interventions were made free. The diiference in rate of utilization increased by 1.7% for the first two interventions and 1% for the third intervention alone.

An increase in one unit of secondary facility that provide free services shows increased rate of utilization of 4% for healthcare services for the first two interventions, this was 9% for all three interventions and 8% for the third intervention alone. Also, for every additional pregnant woman, the rate of utilization of healthcare services went up by 9% when all three free interventions were implemented together.

Dependent Variable 4

Table 11: Rate Utilization of Anti-malaria Services

Variables	First 2 free intervention Vs. No intervention	All 3 free intervention together Vs. No intervention	All 3 free intervention Vs. first 2 free intervention
Intervention Variables			
Facilities with free anti-malaria Services	0.005*** (0.002)	0.004* (0.002)	0.017*** (0.001)
First period of free anti-malaria services	0.004* (0.002)		
Second period of free anti-malaria services		0.02*** (0.004)	0.0002* (0.002)
Interaction term for treatment in period one	0.01*** (0.002)		
Interaction term for treatment in period two		0.02*** (0.003)	0.007*** (0.002)
Facility Level Characteristics			
Secondary level healthcare facilities	0.05*** (0.008)	0.09*** (0.013)	0.08*** (0.009)
Number of beds	-0.00005* (0.0002)	-0.001*** (0.0003)	-0.0005*** (0.0002)
Skilled health personnel	-0.002*** (0.0002)	-0.0006* (0.0003)	-0.001*** (0.0002)
Female Skilled health personnel	0.004*** (0.0003)	0.004*** (0.0004)	0.004*** (0.0003)
Facility Support Staff	0.001*** (0.000)	0.00001* (0.0001)	0.0008*** (0.000)
Distance from health Facility to the farthest community they serve	-0.0005*** (0.000)	-0.0004*** (0.0001)	-0.0005*** (0.000)
Proximity of health facility to coastline (Rivers, lakes etc.)	-0.0002* (0.000)	-0.0002* (0.0002)	-0.0001* (0.0001)
Polio cases treated by	0.00006***	0.0001***	0.00009***

health facilities	(0.000)	(0.000)	(0.000)
Local Government Area (LGA) Level Characteristics			
Population of pregnant women in LGA	0.01*** (0.002)	0.003* (0.003)	0.01*** (0.001)
Local Government Area fertility rate	-0.007* (0.006)	0.01* (0.009)	-0.009** (0.005)
Local Government Area per capita Income	0.0009* (0.001)	-0.01*** (0.002)	-0.002* (0.001)
Total population in Local Government Area	-0.0006*** (0.0001)	-0.00009* (0.0001)	-0.0005*** (0.000)
Observations	4200	2100	4950
F Value	193.48	87.60	169.12
Prob > F	0.0000	0.0000	0.0000
R^2	0.4096	0.3867	0.3396
Adjusted R^2	0.4074	0.3823	0.3376
Root MSE	0.03205	0.3289	0.03621

***** 1% level of significance, ** 5% level of significance, * 10% Level of Significance, Standard Errors in parenthesis**

There was a 2% increase in the rate of utilization of anti-malaria services when all three free interventions worked together. It was lower for the two free interventions alone at 1% and even lower for the third free intervention alone at 0.7%.

In comparison to rate of healthcare service utilization of 4%, the rate of utilization of anti-malaria services is slightly higher at 5% for every one unit increase in the secondary facilities providing free services for the first two free interventions, while it was same for all three interventions together and the third intervention alone.

5.1 Summary of Results

Table 12: Summary of Difference-in-difference results

Impacts of Intervention	Overall Utilization of Healthcare Services	Overall Utilization of Anti-malaria Services	Rate of utilization of Healthcare Services	Rate Utilization of Anti-malaria Services
First 2 free intervention compared to No intervention	32.5*** (8.202)	27.9*** (6.294)	0.017*** (0.003)	0.01*** (0.002)
All 3 free intervention compared to No intervention	48.6*** (10.100)	35.7*** (7.987)	0.03*** (0.003)	0.02*** (0.003)
All 3 free intervention compared to first 2 free intervention	23.5*** (7.270)	12.6*** (5.718)	0.01*** (0.003)	0.007*** (0.002)

*** 1% level of significance, ** 5% level of significance, * 10% Level of Significance, Standard Errors in parenthesis

Across all four dependent variables, results of the difference-in-difference estimation show a consistent trend that explains upward increases in utilization with a rise in the number of free interventions. For example, the overall utilization of anti-malaria services was 12.6 for the third intervention (Parasite based diagnosis of malaria) alone, 27.9 for the first two interventions (Case management of malaria and Prevention of malaria in pregnancy) implemented together and 35.7 for all three interventions implemented together. This pattern is also observed for the other three dependent variables. Therefore, the null hypothesis which states that free interventions increased the utilization of anti-malaria services in Niger state, Nigeria is

not rejected. This easily draws the inference that the free interventions were more effective in increasing utilization when they were all implemented together.

A critical look at the size of the effects of the three interventions shows that the third intervention alone; parasite based diagnosis as a single component, contributed most to the increase in utilization of both anti-malaria services and healthcare services in general. There was a significant increase in the number of utilization cases 48.6 when all three free interventions were implemented together. The interventions became three upon the addition of parasite based diagnosis, this explains the beneficial effect of parasite based diagnosis in the increase of utilization.

The rate of utilization of healthcare services increased by 3% with the addition of the third intervention onto the first two interventions. Rates of utilization of anti-malaria services increase by 2% for all three interventions. The more the number of free interventions, the larger the increase in the utilization rates, indicating that services complemented each other and clients benefit more when more interventions can be accessed together at the same point of service.

Chapter 6

Discussions and Conclusions

This study provides information on the facility level and LGA level factors that are associated with increases in utilization of anti-malaria services in Niger state. Generally, health services utilization has two perspectives; the patient's perspective and the physician's perspective. The factors that affect utilization therefore depends on whose perspective we are measuring. Factors affecting patient's perspective usually are subjective and largely linked to access, which describes the ability or capacity to utilize services and it incorporates economics, geographic location, abundance of health services, and physical and social resources. If health services are not accessible, utilization is greatly affected and likely that there will be unmet needs.

Donabedian (1973) describes access as a group of factors that intervene between capacity to provide services and actual provision or consumption of services. Accessibility is a characteristic of the resources themselves that renders these resources more or less easy to use. Several dimensions of access can be measured. Geographical accessibility is based on physical distance between the locations of users and the provision of services. In this study, the variable that measured effects of geographical access (distance from health facility to the farthest communities they serve) is negatively associated with utilization. Results show that the farther the distance the less the utilization of anti-malaria services. Free interventions scarcely has any effects on how physical distance affects utilization of health care services.

Availability of health resources and services (Organizational accessibility) is another dimension of access that is based on schedules and procedures to follow that constitute constraints for individuals. This study shows that primary health care facilities are the main channel through which key treatment and prevention interventions for malaria are delivered. Results show availability of adequate facility support staff and increased number of beds both positively affect the utilization of anti-malaria services. Also, the presence of female skilled health personnel and not

necessarily just any skilled health personnel contributes to an increase in utilization of anti-malaria services. Even when interventions are free, it is imperative that they are available on a continuous basis in order to positively affect utilization of services. Patients may lose interest if services are free but scarcely available.

Social accessibility involves compatibility between services offered and the social and cultural characteristics of individuals. It is a general rule for example that female patients prefer female personnel, this much was demonstrated by the results of this study. Female skilled health personnel and not necessarily just any skilled health personnel contributes to an increase in utilization of anti-malaria services especially where prevention of malaria in pregnancy services was involved.

Affordability is dimension of access that this study on the effects of free interventions on utilization of anti-malaria services largely addressed According to Starfield (1998) economic accessibility is linked to the costs of services in relation to individuals' socio-economic status. Outcome of this study shows that as the number of free interventions increases, the difference-in-difference effects (measure of utilization) rises across the four dependent variables. This clearly indicates that affordability was a major impediment to the use of services in Niger state and that free interventions positively affected the responses of the segment of the population that could not affords that services when user fees were still in effect. Again, free interventions work best for the lower and poorer population and as shown in this study, the more the per-capita income the less the utilization, this is true because when services are free, people with higher per-capita income will value free health services less.

It is noteworthy to mention that, the fact that interventions were free is not the sole reason utilization increased. Other factors that may have contributed to increases in utilization include such things as accompanying behavior change communication (BCC) and mass media campaigns led by the advocacy, communication and social mobilization (ACSM) sub-committee of the state malaria technical working group (TWG) in the state, which informed the public of the services available and where to access them. The results therefore reflects the fact clients

were drawn to accessing services that were implemented together more. That is the more free services were available together, the more clients accessed them. It is possible to go a step further to infer that if other health services other than malaria programme are made free, utilization may increase even further, thereby positively affecting population outcomes.

Other factors positively associated with the utilization of anti-malaria services include fertility rates, population of pregnant women and proximity of health facility to communities on the coastline.

The first two interventions (case management of malaria and prevention of malaria in pregnancy) brought quite positive increase in utilization of both the overall healthcare services by 32.5 and of anti-malaria services by 27.9. With each female skilled health personnel, utilization increases, this is true because of cultural reasons. Pregnant women are more prone to visit health facilities where female health healthcare personnel are the service providers. This is corroborated by the analysis of this results, which shows that for each additional female skilled health personnel, utilization of anti-malaria services increases by 8.5 for the first two free interventions that were introduced and implemented together. The trend is the same for the other interventions and across all dependent variables.

Another reason for the positive increase in utilization of these first two free interventions implemented together, specifically the case management of malaria (HMM) component, may be the presence of community home management of malaria that is tightly linked to health facilities for commodity supply chain, supervision and referral purposes. These HMM activities are targeted at high burden communities that are hard-to-reach and close to coastline where which is high source of the disease burden.

Moving from the first two free interventions to all three free interventions implemented together, there were significant increases in the utilization of health services, anti-malaria services, rates of utilization of health services and rates of utilization of anti-malaria services. These significant increases are attributable to the addition of parasite based diagnosis. It is the single component that contributed the

most to the increase in overall utilization of both anti-malaria services and healthcare services. There was a massive awareness campaign in the state on rapid diagnosis and the test kits; Rapid Diagnostic Test kits (RDTs) before the intervention was deployed. The benefits of having a test before treatment was emphasized and communicated to the general public MOH (2011). Accurate diagnosis enables targeting of anti-malarial drugs to those who will benefit, early identification of non-malarial febrile illnesses requiring alternative management, and accurate and complete surveillance for confirmed malaria cases. Reducing drug wastage, in addition to saving money and conserving stocks of Artemisinin-based Combination Therapies (ACT), may prolong the usefulness of ACTs globally by reducing pressure towards resistance. Clinical (symptom-based) diagnosis of malaria has a very poor specificity and in Niger State and many other places around the world microscopy is predominantly limited to larger health facilities where the quality of the result can be assured. Provision of universal access to parasite-based diagnosis for populations at risk of malaria therefore depend on the wide use of malaria rapid diagnostic tests (RDTs); point-of care tests. Sylla (2011) argues that delays in achieving a correct diagnosis and appropriate management may increase mortality from other potentially fatal or debilitating infections. Mortality due to non-malarial febrile disease is twice that of malaria globally, with malaria-endemic countries accounting for a large proportion of this burden.

There was noticeable acceptance and enthusiasm among clients when parasite based diagnosis was introduced. Utilization increased significantly with this intervention as clients believed treatment was based on specific diagnosis and more likely to yield better results that in the past when treatment was based on the assumption that all febrile illnesses are due to malaria. Also, this new form of malaria testing was free, requires a limited sample of blood and produces immediate results, as opposed to the microscopy which was not free, requires some volume of blood and takes much longer time to produce results. More so, the Government of Niger State ensured an adequate supply of the kits throughout the intervention period, by keeping the first stock of over 1.3million kits, with proportional stock replacements for those consumed yearly.

Very important is the fact from this data, the rates of utilization of anti-malaria services rose by 50% even when the rates of utilization of healthcare services only rose by 43% when all three interventions were in place. Malaria being the leading cause of illnesses in Niger State, especially in children under five and pregnant women, the more people access and utilize these services the faster will be the rate of decline in under 5 and maternal mortality in the state.

This justifies Government's investment in free anti-malaria services in the state. Beginning 2009, the Government has made tremendous commitment of funds and human resources to combat malaria in the state. The sum of 127.5 million naira (approximately USD 800,000) was spent by the state Government for operational expenses as co-funding for the house-to-house distribution of free Long Lasting Insecticide treated bed Nets (LLINs) in a mass coverage campaign supported by donor agencies. And in 2010, the state Government made anti- malaria services and commodities free through some routine facilities sampled in this study. From 2010 to 2013, the state Government made annual budget provision averaging of 98 million Naira (approximately USD 615,000) for malaria control in the state DPRS (2010)

The introduction of the free anti-malaria services brought with it other pre-requisite interventions that ensured quality in service delivery. These interventions include capacity building for healthcare personnel to better provide good quality services provision. In preparation for the roll out of free interventions, 2 persons from each primary level and 5 persons from each secondary level implementing facility were trained according to national guidelines and training manuals for malaria control service delivery. The modules covered case management of malaria, prevention of malaria in pregnancy, use of rapid diagnostic test kits, steps in the home management of malaria, referral systems and health communications. The local Government program managers in the health department were also trained on Malaria Programme management with modules covering planning and budgeting, supportive supervision and monitoring and evaluation.

Other health system strengthening activities that were carried out alongside the free interventions include, strengthening of the health management information

systems (HMIS). Training were conducted for 1 person per health facility on HMIS and sufficient quantities of data capture tools were delivered to all the health facilities.

Supply chain management systems (malaria commodities logistics systems) for commodities was also carried out for select individuals from each health facility. Job aids and behavior change communication materials for strengthening advocacy, communication social mobilization were supplied to the health facilities as well. All of these trainings and tools contributed to strengthening not only the malaria control programme but the entire health system.

The free anti-malaria services led to a higher utilization of life-saving high-impact interventions for malaria control in Niger state in the period covered in this study. This is key in reducing malaria morbidity and mortality especially for the vulnerable groups: pregnant women and children under-five. Consequently, riding on the success of the free anti-malaria interventions services and structures, the Government has now planned to embark on free integrated community case management of malaria, diarrhea and pneumonia. Three of the leading causes of childhood mortality in the state. This integrated interventions will be linked to health facilities for the purposes of referrals and commodities safety.

As the years progressed fewer and fewer febrile illnesses and malaria cases were recorded at the health facilities, the can be inferred as beneficial effects of the free interventions as a whole. This is so because as the prevention component of the anti-malaria services becomes effective coupled with the massive behavior change and media messages, people are most likely going to take preventive measures and may not come down with febrile illnesses. Also, because the test component of the intervention screens people with febrile illnesses that are not malaria out from using the malaria services, a number of patients who came to the facilities with febrile illnesses maybe be due of other frontline illnesses rather than malaria, with less and less cases of malaria detected and wastages of services and commodities avoided.

6.1 Limitations

This study is not without its limitations, one of which is likely selection bias. Although the Government was said to have used a set of inclusion prior to the commencement of the free interventions to select the health facilities that received the free interventions. These criteria include population size, ethnicity and language, presence of socio-economic activities within the location of health facility, health facility utilization, number of health workers by categories, presence of malaria control activities in the health facilities, training programs received by health facility service providers in the last 2 years, presence or absence of health & development activities by Non-Governmental Organizations, functionality of infrastructure and equipment. The process however couldn't have been devoid of some factors that probably introduced selection bias. Some health facilities that may have met the selection criteria but are far from local government headquarter and hard to reach were mostly not included. This creates problems with comparability between treatment and control groups at pre intervention. This problem was however dealt with by the choice of difference-in-difference regression estimation as the method of analysis which cancels out the differences. The method also resolves possible spillover effects of the interventions.

Another limiting factor in this study is the fact that utilization of anti-malaria is defined by the need for the services, where those in need include those who need and use the services as well as those who need and do not use the services probably due to asymptomatic malaria. However, there is another group do not need but are likely using these services. This is Moral hazard and leads to wastage of resources which can cause inefficiency in the system and impacts negatively on utilization for those who really need the services. There is a need to reach those who need the services and don not use with some form of interventions, like out reaches or periodic malaria parasite screening campaigns. This is because these group of people serve as reservoir of the parasite for continuous reinfections among the population.

6.2 Recommendations

This study has provided information that free interventions are effective in increasing the utilization of anti-malaria services. As such it is recommended that Government considers demand side financing for malaria control and other disease interventions to further step wisely increase utilization of healthcare services, especially those with low uptake of services.

The addition of diagnosis (i.e. third intervention) seems to impact rate of utilization the most. This assures that patients will be receiving the right treatment for the right disease. The Government ensure diagnosis before treatment.

This study provides a baseline model addressing factors that affect the utilization of services. It is therefore recommended that the state government conducts further studies to understand barriers to such other variables like access, equity to health care services and the sustainability of such free interventions.

APPENDIX

Appendix 1: Identification codes and list of Health facilities

LGA	Ward	ID of Health Facility	Name of Health Facility	Health Facility Cadre	Ownership
Agwara	Agwara	02/001	Basic Health Centre Bakatara	Primary	LGA
Agwara	Agwara	02/002	Comprehensive Health Centre Agwara	Primary	LGA
Agwara	Agwara	02/003	Mission Dispensary Agwara	Primary	LGA
Agwara	Agwara	04/004	Dispensary Utula	Primary	LGA
Agwara	Adehe	02/005	Dispensary Adehe	Primary	LGA
Agwara	Rofia	02/008	Primary Healthcare Centre Rofia	Primary	LGA
Agwara	Rofia	02/014	Health Clinic Kwana	Primary	LGA
Agwara	Kokoli	02/009	Dispensary Kokoli	Primary	LGA
Agwara	Kokoli	02/010	Health Clinic Mahuta	Primary	LGA
Agwara	Kokoli	02/011	Health Clinic Kasabu	Primary	LGA
Agwara	Mago	02/012	Health Post, Komala	Primary	LGA
Agwara	Mago	01/017	Primary Healthcare Centre Mago	Primary	LGA
Agwara	Papiri	02/007	Dispensary Papiri	Primary	LGA
Agwara	Kashimi	02/015	Health Clinic Suteku	Primary	LGA
Agwara	Gallah	02/006	Health Clinic Gallah	Primary	LGA
Agwara		02/032	Primary Healthcare Centre Katanda	Primary	LGA
Agwara	Kallah	02/016	Health Clinic Rafin Kallah	Primary	LGA
Agwara		02/033	Health Clinic Tungan Kade	Primary	LGA
Agwara		02/034	Primary Health Clinic Tungan Magaji	Primary	LGA
Agwara		02/035	Primary Healthcare Centre Gajere	Primary	LGA
Agwara	Hikiya	02/013	Primary Healthcare Centre Hikiya	Primary	LGA

Agwara		02/036	Primary Healthcare Centre Ororo	Primary	LGA
Agwara		02/037	Primary Healthcare Centre Tungan Dorowa	Primary	LGA
Agwara	Agwara	02/038	Maternal & Child Health Agwara	Primary	LGA
Bida	Dokoza	03/019	Maternal & Child Health Dokoza	Primary	LGA
Bida	Dokoza	03/020	Maternal & Child Health Etsu Yahaya	Primary	LGA
Bida	Gbazhi	03/005	Primary Healthcare Centre Emir's Palace	Primary	LGA
Bida	Landzu	03/014	Primary Healthcare Centre Kpebegi	Primary	LGA
Bida	Cheniya	03/009	Primary Healthcare Centre Efengi	Primary	LGA
Bida	Masaba II	03/013	Primary Healthcare Centre Ugwan Sanda Ari	Primary	LGA
Bida	Mayaki Ndajiya	03/017	Comprehensive Health Centre Mayaki Ndajiya	Primary	LGA
Bida	Nassarafu	03/015	Maternal & Child Health Nassarafu	Primary	LGA
Bida	Nassarafu	03/022	Primary Healthcare Centre Bangbara	Primary	LGA
Bida	Nassarafu	03/023	Primary Healthcare Centre N/Abubakar	Primary	LGA
Bida	Nassarafu	03/024	Primary Healthcare Centre Laruta	Primary	LGA
Bida	Umaru Ma'ajigi i	03/006	Maternal & Child Health Makwalla	Primary	LGA
Bida	Umaru Ma'ajigi i	03/003	Primary Healthcare Centre Engr A.A Kure	Primary	LGA
Bida	Umaru Ma'ajigi i	03/012	Primary Healthcare Centre Efu Lubasa	Primary	LGA
Bida	Wadata	03/016	Maternal & Child Health Bangaie	Primary	LGA
Bida	Nassarafu	03/028	Primary Healthcare Centre Wambai	Primary	LGA
Bida	Wadata	03/008	Health Post Bazumagi	Primary	LGA
Bida	Bida	03/002	General Hospital Bida	Secondary	State

Bosso	Bosso	05/027	Primary Healthcare Centre Bosso II	Primary	LGA
Bosso	Bosso	05/028	Maternal & Child Health National House	Primary	LGA
Bosso	Chanchaga	05/071	Planned parenthood federation Chanchaga	Primary	LGA
Bosso	Garatu	05/030	Maternal & Child Health Garatu	Primary	LGA
Bosso	Garatu	05/033	Primary Healthcare Centre Gidan Mangoro	Primary	LGA
Bosso	Kampala	05/040	Primary Healthcare Centre Kampala	Primary	LGA
Bosso	Kodo	05/036	Primary Healthcare Centre Kodo	Primary	LGA
Bosso	Maikunkele	05/026	Maternal & Child Health Maikunkele	Primary	LGA
Bosso	Maitumbi	05/008	Primary Healthcare Centre Maitumbi	Primary	LGA
Bosso	Maitumbi	05/034	Primary Healthcare Centre Gadan Yanbiyu	Primary	LGA
Bosso	Shata	05/032	Primary Healthcare Centre Pyata	Primary	LGA
Kontagora	Kontagora	11/002	Central Primary Healthcare Centre Kontagora	Primary	LGA
Kontagora	Kontagora	11/018	Model Clinic Kawo	Primary	LGA
Kontagora	Kontagora	11/004	Primary Healthcare Centre Ubandoma	Primary	LGA
Kontagora	Kontagora	11/005	Primary Healthcare Centre Tukura	Primary	LGA
Kontagora	Kontagora	11/006	Primary Healthcare Centre Maidubu	Primary	LGA
Kontagora	Nassarawa	11/008	Primary Healthcare Centre Nassarawa	Primary	LGA
Kontagora	Kamfanin Waya	11/012	Primary Healthcare Centre Kamfanin Waya	Primary	LGA
Kontagora	Rafin Daji	11/014	Primary Healthcare Centre Rijiyan Daji	Primary	LGA
Kontagora	Rafin Daji	11/015	Primary Healthcare Centre Masuga	Primary	LGA
Kontagora	Dogon Fadama	11/017	Primary Healthcare Centre Dogon Fadama	Primary	LGA
Kontagora	Ganawa	11/025	Primary Healthcare Centre Ganawa	Primary	LGA

Kontagora	Rafin Gora	11/026	Primary Healthcare Centre Rafin Gora	Primary	LGA
Kontagora	Masaha	11/028	Primary Healthcare Centre Masaha	Primary	LGA
Kontagora	Nagwamatse	11/041	311 MRS Barracks	Primary	LGA
Kontagora	Gabas/Kudu	03/042	Maternal & Child Health Tudun Wada	Primary	LGA
Kontagora	Kontagora	11/001	General Hospital Kontagora (ANC)	Primary	LGA
Kontagora	Gabas	11/009	Primary Healthcare Centre Dadinkowa	Primary	LGA
Kontagora	Gabas	11/010	Primary Healthcare Centre Rafin Karma	Primary	LGA
Kontagora	Magajiya	11/029	Primary Healthcare Centre Namaska	Primary	LGA
Kontagora	Masuga	11/016	Primary Healthcare Centre Lioji	Primary	LGA
Kontagora	R/Nagwamatse	11/013	Primary Healthcare Centre R/Nagwamatse	Primary	LGA
Kontagora	Tashan Gari	11/019	Primary Healthcare Centre Tashan Gari	Primary	LGA
Kontagora	Atachu	11/021	Primary Healthcare Centre Atachu	Primary	LGA
Kontagora	Tashan Habu	11/027	Primary Healthcare Centre Tashan Habu	Primary	LGA
Kontagora	Dappo	11/024	Primary Healthcare Centre Dappo	Primary	LGA
Lapai	Arewa/Yamma	12/001	Comprehensive Health Centre Lapai	Primary	LGA
Lapai	Arewa/Yamma	12/003	General Hospital Lapai	Secondary	State
Lapai	Birnin Maza Tashibo	12/005	Primary Healthcare Centre Saminaka	Primary	LGA
Lapai	Duma/Zago	12/013	Primary Healthcare Centre Duma	Primary	LGA
Lapai	Ebbo/Gabchiku	12/019	Primary Healthcare Centre Ebbo	Primary	LGA
Lapai	Gabas/Kudu	12/027	Town Dispensary Lapai	Primary	LGA
Lapai	Gabas/Kudu	12/028	Maternal & Child Health Lapai	Primary	LGA
Lapai	Gulu/Guluvat	12/030	Maternal & Child Health Gulu	Primary	LGA

	sa				
Lapai	Gulu/Guluvatsa	12/031	Basic Health Centre Gulu	Primary	LGA
Lapai	Gupa/Abugi	12/038	Primary Healthcare Centre Gupa	Primary	LGA
Lapai	Kpada/Evuti	12/045	Primary Healthcare Centre Kpada	Primary	LGA
Lapai	Kpada/Evuti	12/046	Primary Healthcare Centre Evuti	Primary	LGA
Lapai	Muye/Egba	12/052	Basic Health Centre Muye	Primary	LGA
Lapai	Takuti/Shaku	12/060	Health post Takuti Shaba	Primary	LGA
Lapai	Takuti/Shaku	12/070	Model Primary Healt Care Centre Shaku	Primary	LGA
Lapai	Arewa/Yamma	12/026	Primary Healthcare Centre Gbanchiku	Primary	LGA
Lapai	Birnin Maza Tashibo	12/009	Primary Healthcare Centre Dangana	Primary	LGA
Lapai	Duma/Zago	12/014	Primary Healthcare Centre Nassarawa	Primary	LGA
Lapai	Gupa/Abugi	12/044	Primary Healthcare Centre Chepa	Primary	LGA
Lapai	Gupa/Abugi	12/043	Primary Healthcare Centre Yelwa	Primary	LGA
Paikoro	Gwam	19/030	Maternal & Child Health Gwam	Primary	LGA
Paikoro	Ishau	19/069	Maternal & Child Health Ishau	Primary	LGA
Paikoro	Jere	19/005	Primary Healthcare Centre Towu	Primary	LGA
Paikoro	Kafin Koro	19/090	General Hospital Kafin Koro	Secondary	State
Paikoro	Kafin Koro	19/051	Maternal & Child Health Adunu	Primary	LGA
Paikoro	Kwakuti	19/054	Basic Health Centre Kwakuti	Primary	LGA
Paikoro	Kwakuti	19/056	NCMS C/Doki	Primary	LGA
Paikoro	Kwangana	19/075	Primary Healthcare Centre Zubakpere	Primary	LGA
Paikoro	Tungan Mallam	19/009	Basic Health Centre Tungan Mallam	Primary	LGA

Paikoro	Tungan Mallam	19/015	Primary Healthcare Centre Nikuchi	Primary	LGA
Paikoro	Paiko	19/001	Model Clinic Paiko	Primary	LGA
Paikoro	Paiko	19/002	Town Clinic Paiko	Primary	LGA
Paikoro	Tutungo/Jedna	19/022	Primary Healthcare Centre Tutungo	Primary	LGA
Paikoro	Tutungo/Jedna	19/024	Primary Healthcare Centre K/Shaka	Primary	LGA
Paikoro	Kafin Koro	19/043	Primary Healthcare Centre Sabon Gari	Primary	LGA
Paikoro	Kwakuti	19/055	Primary Healthcare Centre Baidna	Primary	LGA
Paikoro	Ishau	19/070	Primary Healthcare Centre Amale	Primary	LGA
Paikoro	Kafin Koro	19/020	Maternal & Child Health Kafin Koro	Primary	LGA
Paikoro	Tutungo/Jedna	19/036	Primary Healthcare Centre Tungan Makeri	Primary	LGA
Paikoro	Kwakuti	19/061	Primary Healthcare Centre Tatiko	Primary	LGA
Paikoro	Kafin Koro	19/048	Primary Healthcare Centre Kamfanin Dorowa	Primary	LGA
Paikoro	Kafin Koro	19/047	Primary Healthcare Centre Sesita	Primary	LGA
Paikoro	Kwakuti	19/060	Primary Healthcare Centre Chimbi	Primary	LGA
Paikoro	Gwam	19/035	Primary Healthcare Centre Pita	Primary	LGA
Shiroro	Allawa	22/089	Basic Health Centre Allawa	Primary	LGA
Shiroro	Bagajiya	22/002	Maternal & Child Health Kuta	Primary	LGA
Shiroro	Egwa/Gwada	22/028	Primary Healthcare Centre Egwa	Primary	LGA
Shiroro	Erena	22/066	Maternal & Child Health Erena	Primary	LGA
Shiroro	G/Kato	22/022	Primary Healthcare Centre Kunu	Primary	LGA
Shiroro	Erena	22/076	Primary Healthcare Centre Bassa	Primary	LGA
Shiroro	Gwada/West	22/118	Maternal & Child Health Gwada	Primary	LGA

Shiroro	Galadima Kogo	22/057	Primary Healthcare Centre Galadima Kogo	Primary	LGA
Shiroro	Gurmana	22/106	Primary Healthcare Centre Gurmana	Primary	LGA
Shiroro	Gussoro/Zumba	22/052	Primary Healthcare Centre Gussoro	Primary	LGA
Shiroro	Kurebe Kushaka	22/099	Primary Healthcare Centre Kurebe	Primary	LGA
Shiroro	Kwaki Chukuba	22/093	Primary Healthcare Centre Kwaki	Primary	LGA
Shiroro	Manta	22/113	Primary Healthcare Centre Manta	Primary	LGA
Shiroro	Pinna/She	22/145	Primary Healthcare Centre She	Primary	LGA
Shiroro	Ubandoma	22/017	Primary Healthcare Centre Tawo	Primary	LGA
Shiroro	Erena	22/065	Basic Health Centre Erena	Primary	LGA
Shiroro	Pinna/She	22/032	Basic Health Centre Gunu	Primary	LGA
Shiroro	Gussoro/Zumba	22/053	Primary Healthcare Centre Zumba	Primary	LGA
Shiroro	Bagajiya	22/001	Rural Hospital Kuta	Secondary	State
Shiroro	Pina/She	22/039	Primary Healthcare Centre Kurmi Danjuma	Primary	LGA
Shiroro	Gwada	22/067	Primary Healthcare Centre Sabon Bmanape	Primary	LGA
Shiroro	Gwada	22/047	Primary Healthcare Centre Tapila	Primary	LGA
Shiroro	Gwada	22/048	Primary Healthcare Centre Chiri	Primary	LGA
Shiroro	Gwada	22/045	MDG Gwada Gwari	Primary	LGA
Shiroro	Gwada	22/143	Primary Healthcare Centre Zari	Primary	LGA
Shiroro	Ubandoma	22/144	Primary Healthcare Centre Kwaita	Primary	LGA
Shiroro	Ubandoma	22/014	Primary Healthcare Centre Gbayi	Primary	LGA
Shiroro	Egwa/Gwada	22/029	Primary Healthcare Centre Ebbe	Primary	LGA

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