THE PUBLIC AND PRIVATE SECTOR FAMILY PLANNING SUPPLY ENVIRONMENTS AND THEIR INFLUENCE ON CONTRACEPTIVE USE IN URBAN NIGERIA

Jessica K. Levy

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Maternal and Child Health in the Gillings School of Global Public Health.

Chapel Hill
2013

Approved by:

Siân Curtis

Karen Foreit

Herbert Peterson

Ilene Speizer

Catherine Zimmer

ABSTRACT

JESSICA K. LEVY: The Public and Private Sector Family Planning Supply Environments and Their Influence on Contraceptive Use in Urban Nigeria
(Under the direction of Siân L. Curtis)

Background: Over 50% of the world lives in an urban area. The highest rate of urban population growth is in Sub-Saharan Africa, where fertility rates remain high. To slow population growth and improve health and well-being, family planning (FP) advocates argue for increasing the use of modern FP through improved contraceptive access and availability. However, important questions remain about the best way to promote contraceptive use in countries with high fertility.

Purpose: The overarching aim of this dissertation was to explore the influence of the urban public and private FP supply environments on modern contraceptive use.

Methods: Data from the 2010-2011 Nigeria baseline survey conducted by the Measurement, Learning & Evaluation Project were used to create and assign aggregate-level FP supply index scores to nineteen local government areas (LGAs) across six selected cities of Nigeria. It explored relationships between public and private sector FP services and determined whether contraceptive access and availability in either sector was correlated with community-level wealth. Path analysis was then used to estimate the direct effects of the supply environments on modern contraceptive use. Indirect effects were also analyzed using perception of supply as a mediating variable.

Results: Data showed pronounced variability in contraceptive access and availability across LGAs in both sectors, a positive correlation between public and private sector supply environments and localized associations between the supply environments and poverty. Furthermore, after controlling for influential covariates, analyses found that a woman's *perception* of supply had a significant positive effect on contraceptive use, whereas her *actual* immediate supply environment had negligible influence.

Conclusions: The distribution of contraceptive access and availability within an urban area is not a significant indicator of contraceptive use. Contraception must be available for women once (and if) they desire to use it. However, program planners and policy makers should be aware of FP market saturation. When existing demand is met, it may be most efficacious to concentrate on means of internal influence to promote FP, such as education, media and social networking, all of which help make contraceptive use an accepted, normative behavior.

This dissertation is dedicated to my one-eared, loyal companion, Sam.

ACKNOWLEDGMENTS

First, I would like to thank the members of my dissertation committee – Drs. Siân Curtis (chair), Karen Foreit, Herbert Peterson, Ilene Speizer and Catherine Zimmer – for their guidance, endless encouragement and superb mentoring. It has been an honor to have the greatest minds in the field take my ideas seriously and care enough to challenge me to do my best work.

I would also like to thank the Bill & Melinda Gates Foundation, as well as the Measurement, Learning & Evaluation Project for allowing me to use the data from the 2010-2011 baseline survey of the Nigerian Urban Reproductive Health Initiative. I am also grateful to Janine Barden-O'Fallon for her friendship, patience and support throughout this whole process, as well as Meghan Corroon for her insights into the data collection and analysis and for answering my many many questions.

I would be remiss not to thank the numerous strong women with whom I have worked over the years. Whether they live in Latin America, Sub-Saharan Africa or rural North Carolina, it is because of these women that I went into Maternal and Child Health in the first place. And it has been their unwavering courage and determination to improve their own lives and those of their families that has kept me inspired and working in a field that often presents what can feel like insurmountable challenges.

Finally, but certainly not least, I would like to thank my incredible family and friends who have supported me and cheered me on from the beginning to the end. I am certain that I would not have finished this program had I not had the strength of their support to keep me standing and their confidence in my abilities to push me forward. I feel truly blessed.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CPR……Contraceptive Prevalence Rate

DHS……Demographic Health Survey

FP……...Family Planning

GIS……Geographic Information Systems

HF……...Health Facility

LGA……Local Government Area

MLE……Measurement, Learning & Evaluation

NURHI……Nigerian Urban Reproductive Health Initiative

PMS……Patent Medicine Store

SDP……Service Delivery Point

SIS……..Supply Index Score

TFR……Total Fertility Rate

CHAPTER 1

Introduction

High Fertility and the Demographic Transition

The past half of a century has witnessed a worldwide fall in fertility; however, the decrease has taken place at different times and rates within and across countries. Based on the Demographic Transition Theory, a population will naturally progress from high fertility and mortality to low fertility and mortality over a period of four stages. During the first and last stages there is little population growth; however, during the middle stages, births out number deaths, resulting in a population increase.[1] (See Figure 1.1) Many of the poorest countries, especially those in Sub-Saharan Africa, are behind in the demographic transition. Mortality has begun to fall, but fertility rates remain high.[1, 2]

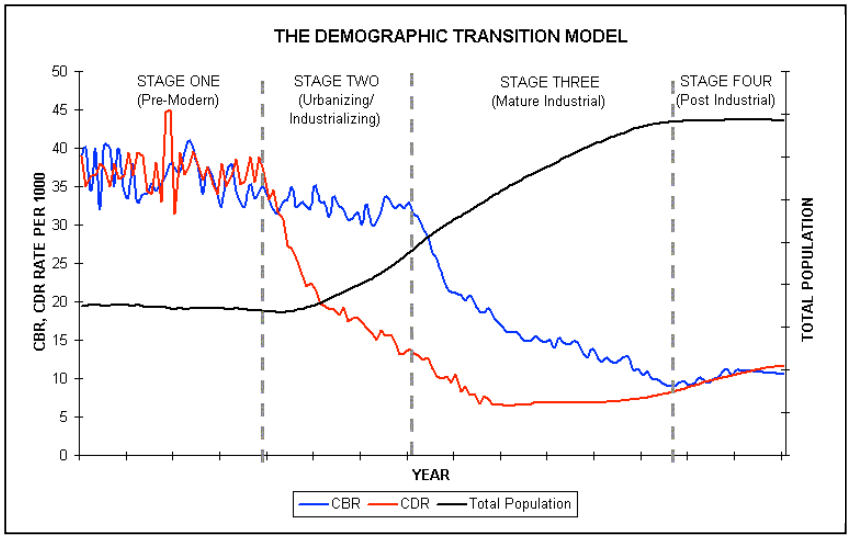
The United Nations (UN) estimates (2010) that at prevailing age-specific fertility rates, a 15 year old in less developed regions of the world can be expected to have 2.7 children in her reproductive lifetime; and in least developed regions – such as Sub-Saharan Africa – she can be expected to have 4.4 children.[3] If these fertility rates remain at their current estimated levels, and mortality continues to fall, the population of developing countries would increase to 9.7 billion in 2050 and 25.8 billion in 2100, instead of the projected 8.0 billion and 8.8 billion, assuming that fertility declines.[a] That is, without further

[a] Over the next decade, the number of women of reproductive age (15-49 years) is expected to grow from the estimated 1.7 billion in 2005 to approximately 1.9 billion globally in 2020.[4] The majority of these women will reside in developing countries where fertility levels remain high.[3] In fact, the percentage of the population under 24 years old in the least developed countries is at an all time high. Children under 15 constitute 40% of their population and youth aged 15-24 account for a further 20%.[4]

reductions in fertility, the world population in 2100 could increase by nearly six times as much as currently projected.[3, 4]

Population growth is not the only concern related to high fertility. High fertility is linked to important factors associated with health, education, economic opportunity, gender equality and environmental stability. In sum, it influences a woman's quality of life and that of her family and the population as a whole.[5, 6]

Figure1.1 Demographic Transition*



**Source: www.uwmc.uwc.edu; CBR- Crude Birth Rate; CDR- Crude Death Rate*

The Demographic Transition and the Role of Family Planning

Considering the consequences of high fertility, scholars have debated for decades as to what determines fertility trends.[1, 7, 8b] Family planning (FP) advocates argue that in order to sustain (or even accelerate) the demographic transition and achieve reductions in fertility,

[b] Bongaarts (1978) proposed a framework that is still used today for analyzing the *proximate determinants* of fertility, suggesting that four main factors have a direct effect: 1) marriage (age at marriage and proportion of women married); 2) contraception (contraceptive use and effectiveness of method); 3) abortion (proportion of pregnancies that are terminated); and 4) infecundity (through lactational amenorrhea or sterility).[7] How these factors affect fertility directly is well understood and relatively straightforward. However, why couples decide to delay sexual debut and marriage, use contraception, breastfeed, or seek an abortion depends on certain values and is influenced by social, political, economic and programmatic factors. The pathways from these distal determinants are more complex and are not fully understood or agreed upon.[1,2,8]

the focus should be on increasing the use of modern contraception.[9] However, there has been a longstanding debate as to how and/or to what extent FP use can be promoted in a country behind in the demographic transition. On the one side, there are social scientists and economists who have claimed that high fertility is a rational response to poverty, and that contraceptive use will not increase until there is improved education and economic development.[10-12] On the other side, proponents of FP maintain that regardless of national poverty, health, and education levels, contraceptive use will increase – and fertility desires and outcomes will change – by meeting FP needs more quickly, effectively and equitably through active intervention.[13]

A much-cited example of this success is in Bangladesh. When Pakistan and Bangladesh (formally east Pakistan) split in 1971, they took different national approaches to population growth. Unlike Pakistan, Bangladesh made FP a priority and, in response, received significant funding from international donors. The resulting difference in population growth is indisputable.[1] Starting at a shared total fertility rate (TFR) of approximately 7[1], Pakistan's TFR was 5.3 in 2001 and is currently 3.6; whereas Bangladesh's TFR was 3.3 in 2001 and is now 2.4.[14] Furthermore, between now and 2050, Pakistan's population is projected to grow by 77% to almost 314 million, while Bangladesh's population is expected to increase by only 50% to almost 226 million.[14]

The example of Bangladesh and Pakistan does not stand alone. In general, over the past half of a century, while new contraceptive technologies, programs and policies burgeoned around the world, contraceptive use simultaneously increased and global fertility desires diminished.[9, 13, 15] By the late 1970s, approximately 25% of all developed and developing countries had adopted voluntary FP programs to lower their national TFR. Just two decades later that number had increased to almost 45%.[13] Now, over 80% of developing countries have a national policy to lower or maintain fertility, and all but four report government support for FP.[16] During this same time period – since the 1970s –

contraceptive prevalence has also increased globally; up to 60% in some regions of the world, where it had been 10% before.[17] Furthermore, the most recent data from 2005-2010 show that fertility has declined by more than 20% in 135 developing countries and by over 50% in 66 of them. These declines bring the average TFR in less developed regions from 5.4 to 2.7 children per woman of childbearing age.[3]

Increasing Contraceptive Use

Despite major progress in increasing contraceptive use and decreasing fertility rates, it has been estimated that over 220 million women living in developing countries still have an unmet need for modern contraception[c], with 162 million of these women living in the 69 poorest countries.[19, 20] Hence, important questions remain about the most effective ways to promote FP in countries behind in the demographic transition.

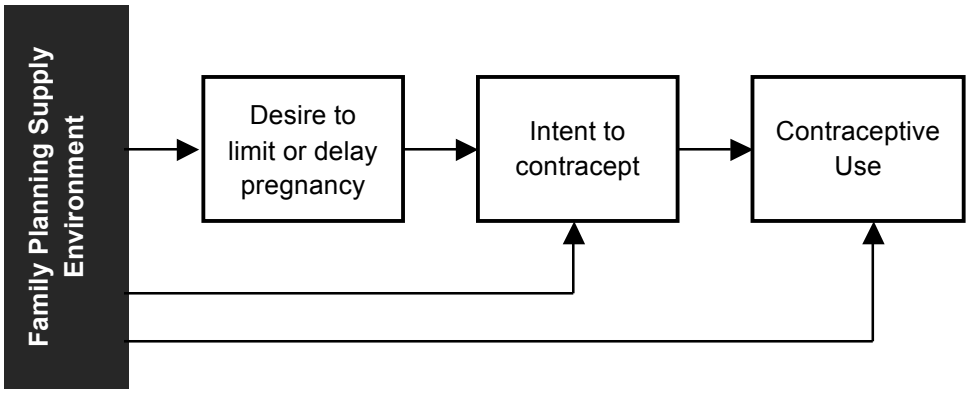
Many FP professionals argue that the current unmet need is predominantly a result of issues related specifically to contraceptive access and availability, and that contraceptive use will therefore increase through improved availability of contraceptive commodities and universal access to FP services.[1, 4, 8, 19, 21, 22] For example, initiatives like Family Planning 2020 (FP2020) have been launched to improve contraceptive supply in order to meet the needs of the existing and rapidly growing potential demand for contraception. Leaders from developing and donor countries, international agencies, foundations and the private sector have pledged $2.6 billion to provide an additional 120 million women in the world's poorest countries access to voluntary FP services, information and supplies by 2020.[22] Likewise, the United States Agency for International Development (USAID), along with other international donor agencies, have spent the last few decades funneling resources into activities that

[c] Women with an unmet need for contraception include sexually active, fecund women between the ages of 15 and 49 who do not want to give birth within the next two years, yet are not using a form of modern contraception.[18]

promote “contraceptive security,” a term that characterizes the possibility for people to choose, obtain, and use high-quality contraceptives whenever they want or need them.[4, 21, 23]

Somewhat implicit to the goals of these initiatives is the assumption that unwanted fertility and “potential demand” for FP will translate into actual demand for contraception if FP services are easily accessible and reliable contraceptive commodities are in stock. For this assumption to hold, contraceptive access and availability – from here forward referred to as the supply environment – would likely increase contraceptive use via one of three pathways.[24] (See Figure 1.2) First, a better supply environment might change fertility desires (and ultimately contraceptive use behaviors) by increasing a woman’s exposure to the idea of regulating fertility and altering social norms regarding family size. Second, exposure to a better supply environment could improve the social acceptability of contraceptive use, thereby changing latent demand for fewer children into actual demand for FP. Third, assuming that a woman wants to use modern contraception, the supply environment could facilitate her use by providing a reliable stock of quality contraceptive commodities and reducing the economic, psychosocial and physical barriers to using them.[24]

Figure 1.2: Possible pathways from the family planning supply environment to contraceptive use



Urban Supply Environment and Contraceptive Use

Contraceptive ever-use and current-use are typically higher in urban areas than in rural areas.[25-27] One explanation for this difference is that women in urban areas have more exposure to information about FP, as well as access to a broader range and supply of FP services and distribution outlets than women in rural areas.[28-31] As a result, the literature often focuses on issues related to contraceptive access and availability in rural areas of the developing world, rather than in urban areas.[31-35]

This dissertation, however, focuses on the *urban* FP supply environment for three main reasons. First, despite better overall aggregate level measures, evidence suggests significant disparities in fertility rates and contraceptive use behaviors among urban wealth quintiles.[36-42] These differences can be attributed to both increased levels of unmet need for FP, as well as higher fertility desires among the urban poor.[25, 36, 37] Regardless, the consequences of these inequalities spiral from an increased number of high-risk pregnancies among the urban poor to a greater need for health service utilization, often decreased opportunity for employment and/or higher education[43] and increased maternal and infant morbidity and mortality[44] within the lower wealth quintiles; all of which, in turn, highlights the importance of finding an effective way to create and/or meet urban demand for contraception so as to help break the cycle of urban poverty and health inequality.[43, 45]

Second, unlike in rural areas, the commercial infrastructure and purchasing power that exist in urban areas allows for many private FP initiatives. It is true that with a larger private sector to supplement the public sector, urban residents are generally exposed to a greater range of FP services and distribution outlets than people living in rural areas.[26,46, 47] Nevertheless, in general, there is no consistent pattern as to how the private FP sector interacts with the public FP sector,[26, 48] and little is known about whether and/or how the different outlets influence urban contraceptive use.[26] Understanding the possible

relationships between different service outlets and contraceptive use can allow program planners and policy makers to better target limited resources for possibly generating demand for contraception in countries behind in the fertility transition, as well as for meeting the FP needs that already exist there.

Finally, the world is becoming more urbanized, and at more than 3% annually, the highest rate of urban population growth is in Sub-Saharan Africa.[3, 41, 49]Due in large part to high levels of urban fertility in this region, the percentage of the world's population living in an urban area will increase from the current 50% to two-thirds by 2050.[36, 50] As the population increases in urban areas, so will unmet need for FP.[26, 48] In light of this rapid urbanization, program planners and policy makers will need to better understand the role of the urban supply environment in contraceptive use, in order to intervene effectively in urban areas and promote contraceptive use in countries behind in the demographic transition.

The Literature

The best way to effectively estimate the influence of contraceptive access and availability on the use of FP would require longitudinal contraceptive-use data for a panel of women with known contraceptive demands that could be linked to facility-level data within the same area unit.[24] Until recently, however, studies exploring this relationship have been limited due to the fact that few facility-level surveys have been collected around the same time as household surveys and/or were not collected in a manner that facilitated strong data linking.[51, 52]

For example, in the 1970s, the World Fertility Surveys (WFS) included a community module for collecting data on the availability of health services, and the early Demographic Health Surveys (DHS) included a service availability module (SAM) for the same purpose.[53] The idea was to link information about the supply environment to population-based health outcome data. However, the problem was that information collected for both the WFS and

early DHS service modules came primarily from key informants; therefore, some argued that the data may not have been valid or reliable.[54, 55] Furthermore, the information was not representative of all service outlets in the country being surveyed.[53]

Magnani et al. (1999) took advantage of one of the few panel surveys conducted by the DHS that included a SAM.[24] They found that method availability at the nearest public facility significantly influenced contraceptive intentions and use. However, in addition to questions of service-data reliability and generalizability, they highlighted the risk of bi-directionality, pointing out the possibility that the FP programs had targeted areas where there was already a high demand for use.[24]

Since the 1990s, DHS has conducted the Service Provision Assessment (SPA), a supplemental survey to collect information related to the health service environment, including services related to FP. The SPA collects latitude and longitude coordinates for the health facilities, which can be linked to geographic information collected for the sample clusters in the DHS surveys.[53] Hong et al (2006), for example, linked 2003 Egypt Interim DHS data to 2002 Egypt SPA data.[56] They found a significant relationship between service quality and use of clinical contraceptive methods in Egypt. However, they point out that women in the linked clusters do not necessarily use the facilities to which they have been linked.[56] Therefore, linking the SPA and DHS data may not be conducive for analyzing individual-level outcomes.

Wang et al. (2012) linked data from DHS and SPA surveys in four Sub-Saharan countries to measure the extent to which contraceptive use is associated with regional contraceptive supply.[53] They found that after controlling for FP facility density and other individual-level variables, an average increase of one contraceptive method available in a region increases women's odds of using modern contraception by 50%. Furthermore, women living in regions with a more favorable service environment (based on 15 service dimension variables related to FP counseling, infection control, pelvic examination, and

management practice) are more likely to use a modern contraceptive method than women living in less favorable environments. However, the authors point out a few limitations with their linked data. To begin, though the sample design of SPA surveys provides representative data of health facilities in the country, information on the facilities nearest to the DHS clusters may not be included. Also, the SPA and DHS data were not collected within the same year. It is possible, therefore, that the facility data might have changed between the time that the SPA and DHS information was collected.[24, 53]

In addition to linking issues, the work conducted by Wang et al. is one of few studies that has explored the influence of contraceptive supply on use within Sub-Saharan Africa. Most research on this topic has focused mainly on countries in Asia, Latin America and North Africa.[24, 56-59] Furthermore, studies focused on intra-urban supply dynamics have been limited by a lack of fine-grained data describing the urban public and private sector FP supply environments. Finally, in many areas of the developing world there has been poor monitoring of the private FP sector, making it difficult to attain reliable private sector data for analysis.[48, 60]

Considering the increasing need to improve contraceptive use in countries such as those found in Sub-Saharan Africa, and the reality of rapid urbanization, program planners and policy makers should have a better understanding of the relationship between the supply environment and contraceptive use in urban areas of the region. Such an understanding can only improve the effectiveness of existing programs and the investment in future initiatives.

CHAPTER 2

Research Aims and Data

Aims and Research Questions

This dissertation uses Nigeria – a country in the early stages of the demographic transition – as a case study to explore the role of the urban family planning supply environment. First, it describes Nigeria's urban supply environment, by creating and analyzing measures that reflect aggregate levels of contraceptive access and availability among public and private service outlets. It then investigates the potential influence of this environment on contraceptive use and intention to use among urban residents. The following specific aims are addressed:

AIM 1: To describe the public and private sector family planning supply environment in urban Nigeria in order to identify patterns and assess whether and where disparities in contraceptive access and availability exist

Question 1.a. Are public sector measures for contraceptive access and availability constant across local government areas (LGAs)? If not, how do they differ?

Question 1.b. Are private sector measures for contraceptive access and availability constant across LGAs? If not, how do they differ?

Question 1.c. *Is the public sector contraceptive supply environment correlated with the private sector supply environment? If so, how is contraceptive access and availability among private and public service delivery points correlated within and across LGAs?*

Question 1.d. *Is the level of contraceptive access and availability among the public and/or private family planning sectors correlated with the distribution of community-level wealth within and across cities? If so, how are they correlated?*

AIM 2: To explore the relationship between a woman's immediate family planning supply environment (in terms of public and private access to and availability of contraceptive commodities) and her contraceptive use outcomes (non-use, intent to use family planning and actual use of modern contraception)

Question 2.a. *Does the public and/or private family planning supply environment in which a woman lives have a direct effect on her contraceptive use outcomes?*

Question 2.b. *Does a woman's public and/or private supply environment influence her perception of contraceptive access and availability?*

Question 2.c. *Does a woman's perception of contraceptive access and availability mediate the influence of the supply environment on her contraceptive use outcomes?*

Question 2.d. *Does a woman's perception of contraceptive access and availability have a greater effect on her contraceptive use outcomes than her* actual *supply environment?*

Study setting

Nigeria is located in the western region of Sub-Saharan Africa (See Figure 2.1). It borders the coast of the Gulf of Guinea between Benin and Cameroon- with Niger to the north and Chad to the northeast. Slightly more than twice the size of California, Nigeria is the most populous country in Africa. As of 2012, Nigeria was home to approximately 170 million people,[50] and with almost 44% of the country under 14 years old, that number is expected to double in less than 25 years.[25, 50] According to UN estimates (2011), it will be one of six countries that will account for half of the world's projected population increase by 2100.[3]

Figure 2.1: Map of Nigeria

Source: www.vidiani.com

Most of Nigeria's population growth will occur in its urban areas. As compared to its overall annual growth rate of 2.5%, the country's urban growth rate is 3.75%.[50] Already, over half of the population lives in an urban area, and by 2050, that proportion is projected to

increase to three quarters.[28] Due to rapid urbanization, urban Nigeria suffers from an acute shortage of social amenities and insufficient infrastructure and services.[28] Furthermore, an estimated 63% of Nigeria's urban population lives in slums,[61] where overcrowding, inadequate sanitation, and poor refuse collection lead to outbreaks of infectious diseases such as tuberculosis, hepatitis, dengue, pneumonia, cholera, and diarrheal illnesses.[45]

Research suggests that up to 75% of the urban population growth in Sub-Saharan Africa is a result of fertility rates that have remained high while mortality rates have decreased.[3, 41, 49] In fact, in Nigeria, the overall urban fertility rate has only slowly decreased from 5.1 to 4.7 children per woman since the late 1980s.[44] Therefore, in order to improve the health and wellbeing of those living there, two of the main objectives of Nigeria's National Policy on Population (updated 2004) are to increase the contraceptive prevalence rate for modern methods by at least two percentage points every year and reduce the country's overall fertility rate by at least 0.6 children every five years.[28, 62]

Despite these national-level efforts to promote modern FP use, contraceptive prevalence remains low in Nigeria.[51] According to the latest Nigeria Demographic Health Survey (DHS) report (2008), approximately 10% of all currently married women in Nigeria are using a modern contraceptive method, a slight increase from 8% in 2003.[44] And in urban areas of Nigeria, contraceptive prevalence has only increased from just under 15% in 2003 to 16.7% in 2008.[25]

As a country in the early stages of the demographic transition,[63, 64] Nigeria is an opportune setting in which to explore the influence of the urban public and private FP supply environment on contraceptive use behaviors. A better understanding of this relationship in Nigeria will give insight into the influence of urban supply within other Sub-Saharan African countries that continue to have high fertility rates. It is critical to the success of national and international efforts to promote modern contraceptive use, reduce urban fertility and improve overall health and wellbeing in the region.

Data

To address both dissertation aims, data are used from the 2010-2011 baseline survey of the Nigerian Urban Reproductive Health Initiative (NURHI) undertaken by the Measurement, Learning & Evaluation (MLE) Project.[d] Individual and service delivery point (SDP) data are analyzed from the selected cities of Abuja, Benin City, Ibadan, Ilorin, Kaduna, and Zaria.[65]

Individual Data

The individual-level data were collected between October 2010 and April 2011 via a two-stage stratified sampling design. First, a random sample of urban enumeration areas (EA), or clusters, was drawn from the 2006 Nigeria Population and Housing census within the six study cities. The clusters were selected in each city based on probability proportional to their population size. The number of clusters selected per city was based on information from the 2008 Nigeria DHS regarding the number of women per household in urban areas at the state level. The number of clusters per city in the survey ranged from a low of 74 in Zaria to a high of 102 in Ibadan.[28]

Next, 41 households in each cluster were selected randomly to create an average sample of about 3,000 women in each city. All women, ages 15 to 49, living permanently in the selected households and visitors present on the night before the survey were then asked to participate in a detailed interview with a trained female interviewer following receipt of informed consent.[28] The sample was taken from 20 LGAs and included 16,144 married and unmarried women.

[d] The MLE project was funded by the Bill & Melinda Gates Foundation to conduct a rigorous impact evaluation of their Urban Reproductive Health Initiative (URHI). The URHI aims to promote innovative FP programs in urban areas of four countries: Uttar Pradesh; India; Nigeria; Kenya; and Senegal. The goal of the MLE is to identify the most effective and cost-efficient programmatic approaches to increase access to, demand for, and use of high quality FP among the urban poor in each of the URHI intervention sites.

SDP Data

Between February and June 2011 data on FP services and/or commodities were also collected from a sample of SDPs[66]. Four categories of SDPs were surveyed: 1) public sector health facilities (HFs); 2) preferred private HFs; 3) private pharmacies; and 4) private patent medicine stores (PMSs).[e] Different selection strategies were used for each SDP type. Public HFs, pharmacies and PMSs were identified through a compiled list of verified health outlets obtained from relevant Nigerian health agencies.[f66] All public HFs were visited; to control survey costs, about 100 pharmacies in the larger cities were randomly sampled, as were approximately 100 PMSs in all cities. Preferred private HFs were identified from the MLE individual survey; women were asked where they go for child health, maternal health, FP visits, and HIV testing. All mentioned facilities were included in the preferred facility sample.[g] Three different survey tools were used to collect SDP information: one for the pharmacies, one for the PMSs, and a third for the public and preferred private HFs. Table 2.1 summarizes the sampling approaches.[66]

[e] PMSs, or chemists, are usually small in size and have a license to sell over-the-counter drugs that are considered safe to sell to the general public in prepackaged form. PMSs are the main source of medicines used by the public in many African countries.[63]

[f] The agencies included: the National Bureau of Statistics, Federal Ministry of Health (MoH), National Primary Health Care Development Agency, State MoH offices, Guild of Medical Directors, Association of General Private Medical Practitioners, Association of Private Nurse Practitioners, Association of Community Pharmacists, Association of Proprietary and Patent Medicine Dealers, and a list of registered pharmacies.[63]

[g] In Ibadan, due to the large number of facilities, only the private health facility most commonly mentioned by women in the same cluster was considered to be the preferred facility.[63]

Table 2.1: Sampling approach by city for each type of service delivery point

Service Delivery Point	City	Sampling Approach*
Public health facilities (HF): • Government hospitals, health centers, health posts & dispensaries, child welfare clinics, and maternity homes	All	Census
Preferred private HFs • Faith based, private or non-governmental hospitals, clinics, doctor's offices, and nursing/maternity homes	All	Limited to HFs reported by respondents**
Private pharmacies	Abuja	Random sample of about 100 at city-level
	Kaduna	Random sample of about 100 at city-level
	All others (Benin City, Ibadan, Ilorin, Zaria)	Census
Private patent medicine stores (PMS)	All	Random sample of about 100 at city-level

*The survey design called for a sample of 100 PMSs and 100 pharmacies in each city. In the cities where there were more than 100 PMSs or pharmacies, a random sample of 100 was selected.

**Though the data represent a census of all *preferred* private HFs mentioned by respondents, they do not include all private-sector HFs within each urban local government area sampling frame.

CHAPTER 3

Assessing Gaps and Poverty-Related Inequalities in the Public and Private Sector Family Planning Supply Environments of Urban Nigeria

Brief Overview

In urban areas, both the public and private family planning (FP) sectors are important in ensuring equal access to FP services and availability of modern contraceptives.[26, 46-48, 67, 68] However, to date, there is no fine-grained description of, or comparison between, Nigeria's urban private sector FP supply environment and its public FP supply environment. Furthermore, neither sector has been analyzed in relationship to the different subpopulations of wealth status. As a result, it is unknown whether the two sectors are fully engaged so as to most effectively serve the urban poor.

This study, therefore, fills an important gap in what is known about Nigeria's contraceptive supply environment. Using survey data from FP service outlets – from here forward referred to as service delivery points (SDPs)– it creates supply index scores (SISs) to measure the aggregate-level public and private sector FP supply environment within and across six purposively selected cities of Nigeria. Specifically, it assesses whether the public and/or private sector FP supply environments are consistent across urban local government areas (LGAs)[h], and if not, how they differ. It also explores whether and how services from one sector correlate with and/or compliment services within the other sector. Since there exists no standard measure for quantifying the multidimensional nature of the FP supply

[h] Nigeria is subdivided into states, which are further subdivided into LGAs. This study looks at the urban portions of the LGAs that lie within six cities of Nigeria.

environment, this study draws on the commodity security and logistics framework created by United States Agency for International Development (USAID) to define supply as product availability and access to services.[69] It considers availability as the actual on hand/procurable status of contraceptive commodities at any given SDP and access as the degree to which FP services may be obtained by a large majority of the population.

Finally, by linking aggregate LGA-level SDP data with data collected at the same time from individuals living within corresponding communities, this study explores whether the FP supply environment is correlated with community-level wealth status. A better understanding of these relationships will enable donors, policymakers and program implementers to make informed decisions about limited resource allocation and programming, thereby improving equality in FP access and availability and possibly decreasing overall urban fertility.

Study Sample

Community Sample

The original individual level cluster sample was taken from 20 LGAs and included 16,144 married and unmarried women. Of the full sample, this study only analyzed information collected from women who were surveyed within the 19 LGAs from which the sample of SDP data, described below, were taken (N=16,101).

SDP Sample

SDP data were collected from 25 different LGAs within the six selected cities of Nigeria.[28] This study analyzed data from 19 of these LGAs: five LGAs were dropped because there was no information collected from individuals within them and one was excluded because the sampling frame captured too few SDPs to calculate a representative urban LGA-level SISs. Within the remaining 19 LGAs, information was collected from 1,342

SDPs. Eight of these SDPs were dropped because there was no indication of their SDP type and 114 were dropped because they either did not sell FP or the variable indicating whether they sold FP was missing. With the remaining 1,220 SDPs, the FP SIS for each SDP type within each LGA were created.

Measures

- **Family Planning Supply Environment.**

Supply Index Score

SISs were created to reflect the LGA-level FP supply environment. Four continuous scores were assigned to each LGA: one for public sector FP health facilities (HFs), one for preferred private FP HFs, one for private FP pharmacies, and one for private FP Patent Medicine Stores (PMSs). The SISs were created by multiplying two LGA-level variables for each SDP type: 1) FP supply environment *strength*; and 2) FP supply environment *size*. These two variables were created as follows: (See Figure 3.1 and Table 3.1)

1. FP Supply Environment *Strength*:

This continuous variable was based on seven SDP measures that reflect strength of contraceptive access and availability, including: (1) method availability; (2) availability of injectables[i]; (3) availability of the intra-uterine device (IUD)[j] (only among public HFs and preferred private HFs, as PMSs and pharmacies do not sell the IUD); (4) stockouts of normally available methods; (5) hours FP services are provided; (6) requirements for partner

[i] This measure is being used to reflect the availability of a marker method. According to representative data collected by MLE in 2010, the most commonly used or ever-used modern contraceptive methods among women in union, living in urban areas of Nigeria is the male condom or injectable.[32]

[j] It is more difficult to obtain an IUD in Nigeria than other reversible modern methods, and yet, it is one of the more effective contraceptive choices for preventing pregnancy.[32] Therefore, this measure is being used as a high-level marker of method choice. Note that pharmacies and PMSs do not sell the IUD, so it is only included for public and private health facilities.

consent; and (7) availability of socially marketed products. (See Table 3.1 for summary of measures and Appendix A for a more detailed description of measure creation.)

Using these seven component measures, the variable was created in three steps for each SDP type. First, the values for each of the seven SDP measures were aggregated up to the LGA level. Second, the LGA-level percentage values for each measure were summed within each stratum of SDP type. The range of values for public and private HFs was 0 to 700; and the range for pharmacies and PMSs was 0 to 600. Third, in order to put the final variable on the same 0 to 100 scale for all SDP types, the sum for public and private HFs was divided by 7 and the sum for pharmacies and PMSs was divided by 6.

Case-wise deletion was used to create the seven aggregate-level supply measures. Therefore, due to missing data for some component measures, the range of the number of SDPs included in the final sample for this variable was 1,155 to 1,220. (See Appendix B) Note: only 376 public and preferred private HFs were included in the LGA-level measure for IUD availability. All PMSs and pharmacies were dropped from this measure, as they do not sell IUDs.

2. FP Supply Environment *Size*:

This continuous variable measures the FP service density for each SDP type. It was created by dividing the total number of SDPs within the urban areas of each LGA that provide FP by the square kilometer (SQKM) area of the respective urban LGA. The number of FP SDPs used in the numerator for the public HF, preferred private HF and pharmacy (except in Abuja and Kaduna) density measures were based on the MLE SDP census data. The number of PMSs that sell FP in each urban LGA was estimated by multiplying the ratio of surveyed PMSs that sell FP by the total number of PMSs in the original SDP sample frame obtained prior to sampling. (See Appendix C) The same steps were taken to estimate the number of pharmacies that sell FP in Abuja and Kaduna- where a census of pharmacies

was not taken. The urban geographic area of each LGA – the density denominator – was defined as the number of SQKMs within a 5-kilometer buffer zone around the original LGA SDP sample frame. Geographic information system (GIS) shape files of the LGA boundaries and of the original SDP sample frame were used.[70]

Figure 3.1: Steps taken to create the supply index score for each type of family planning (FP) service delivery point (SDP) within each local government area (LGA)

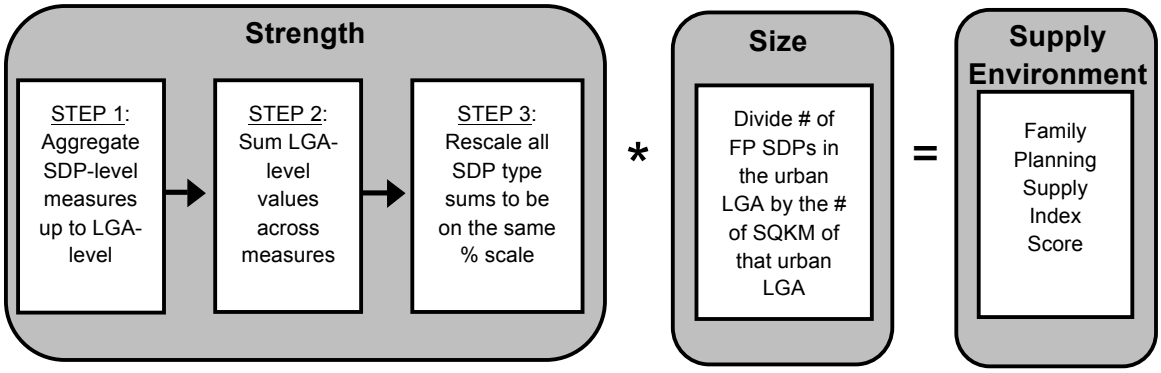


Table 3.1: Critical measures used to reflect the family planning (FP) supply environment at the local government area (LGA) level

	Measure	Definition (within each LGA)	Service Delivery Points (SDPS) measured at the LGA-level
Strength	Method Availability	Mean % of possibly available modern FP methods that are actually provided across FP SDPs	• Public HFs • Preferred Private HFs • Private Pharmacies • Private Patent Medicine Stores (PMS)
	Availability of Injectables	% of FP SDPs that provide an injectable form of contraception	
	Availability of IUD*	% of private and public FP health facilities (HFs) that provide IUDs	
	Stockout day of interview	% of SDPs with no stockouts of any normally available FP method on day of interview	
	Hours FP services are provided	Mean % of potential total hours that FP services are actually offered each week across SDPs	
	Partner Consent	% of SDPs that do not require partner consent to use/access any available form of modern method of contraception	
	Socially marketed products	% of SDPs that provide socially marketed products	
Size	FP Service Density	# of FP SDPs per square kilometer of urban LGA	
Supply Environment	FP Supply Index Score	Measure of the size and strength of the FP supply environment in each LGA	

* This measure is only included among public and private HFs, because pharmacies and PMSs do not sell the IUD.

Community Level Measures:

Two measures of LGA-level poverty were derived using city-specific household wealth quintiles, where Q1 refers to the poorest 20% of the sample surveyed in each city:[k]

- **Distribution of poorest women.** This continuous variable measures the percentage of Q1 that live within each LGA of the city.

$$\frac{\textit{Number of Q1 in LGA}}{\textit{Total number of Q1 in the city}} * 100$$

- **Proportion of LGA in lowest wealth quintile.** This continuous variable measures the percentage of the individual sample within each LGA that falls within Q1.

$$\frac{\textit{Number of Q1 in LGA}}{\textit{Total number of surveyed women in the LGA}} * 100$$

Analysis

The public and private sector supply environments were evaluated and compared at the LGA level within and across the six selected cities in Nigeria, as well as in relation to measures of community-level wealth status. Descriptive analysis, including calculations of Pearson correlation coefficients, paired t-tests and independent sample t-tests, were used to identify patterns and assess whether and where disparities exist.

[k] MLE calculated household wealth scores using principal component analysis, and assigned those scores to the respective household members. They then ranked the individuals living in the same city from poorest to least poor and divided the resulting data into quintiles.

Findings

Strength of LGA-level Public and Private Sector FP Supply Environment

Table 3.2 presents the scores for the strength of the FP supply environments at the aggregate LGA level for each FP SDP type. Paired t-tests were used to compare the mean standardized strength of services between SDP types across LGAs. Results suggest that there is no significant difference between the average strength of public and preferred private FP HFs across LGAs. However, significant differences were found in the average FP supply environment strength of public HFs and pharmacies (t=3.2, p=0.01); public HFs and PMSs (t=6.0, p=0.00); preferred private HFs and pharmacies (t=3.1, p=0.01); preferred private HFs and PMSs (t=8.7, p= 0.00); and pharmacies and PMSs (t=4.2, p=0.00). (See Table 3.2)

Additionally, Pearson correlation coefficient tests were computed to assess the relationships between the strength of the different SDP FP supply environments across LGAs. Tests showed no statistically significant correlations at the 0.05 level between the strength of the LGA-level public sector and any of the LGA-level private sector supply environments. Further, there was no statistically significant correlation across LGAs between the strength of the preferred private HF and pharmacy supply environments, the preferred private HF and PMS supply environments, or the pharmacy and PMS supply environments.

Table 3.2: Summary statistics for the strength of the supply environment among different types of family planning service delivery points across local government areas (LGA)

	Strength of LGA Contraceptive Access/Availability			
Family Planning Service Delivery Points	**Mean (% of total possible points)**	**Standard Deviation**	**Minimum (% of total possible points)**	**Maximum (% of total possible points)**
Public health facilities	64.0	10.38	44.9	81.1
Preferred private health Facilities	62.1	7.88	48.2	82.9
Pharmacies	55.1	7.02	41.9	70.7
Patent Medicine Stores	44.5	6.72	30.0	56.1

Size of supply environment: FP Service Density

A strong contraceptive supply environment is based not only on the strength of its FP SDPs but also on the number and geographic distribution of FP SDPs that exist. Therefore, in addition to LGA-level *strength* of contraceptive access and availability, this study also considered the *size* of the environment in terms of LGA FP service density.

More variation was found in the density of FP SDP types within and across LGAs than in the strength of the different SDP supply environments. Specifically, the density of PMSs that carry contraceptives varied dramatically across LGAs, with the minimum number of FP PMSs per 100 SQKMs being 13 and the maximum being 498. (Table 3.3)

The variation in the geographic density of SDPs may be related to the size of the LGA population. A larger population might result in higher demand for services and, therefore, higher service density. However, within the urban LGAs of Nigeria – for which population estimates were available[71] – there were no significant correlations at the 0.05 level between the density of any FP SDP type and the size of the urban LGA population. (See Figure 3.2 and Table 3.4)

The density of FP services within an LGA may also vary in conjunction with the strength of services within that LGA. Yet, there were no significant correlations at the 0.05 level between urban LGA-level strength and density of FP services, regardless of the SDP type.

Finally, the density of one type of FP SDP has the potential to drive and/or curb the density of another in and across LGAs. In Nigeria, the density of different FP SDP types were only positively significantly correlated between PMSs and preferred private HFs ($r=0.82$, $p<0.001$); PMSs and public HFs ($r=0.70$, $p<0.001$); and pharmacies and public HFs ($r=0.70$, $p<0.001$). There was no statistically significant correlation between the FP service

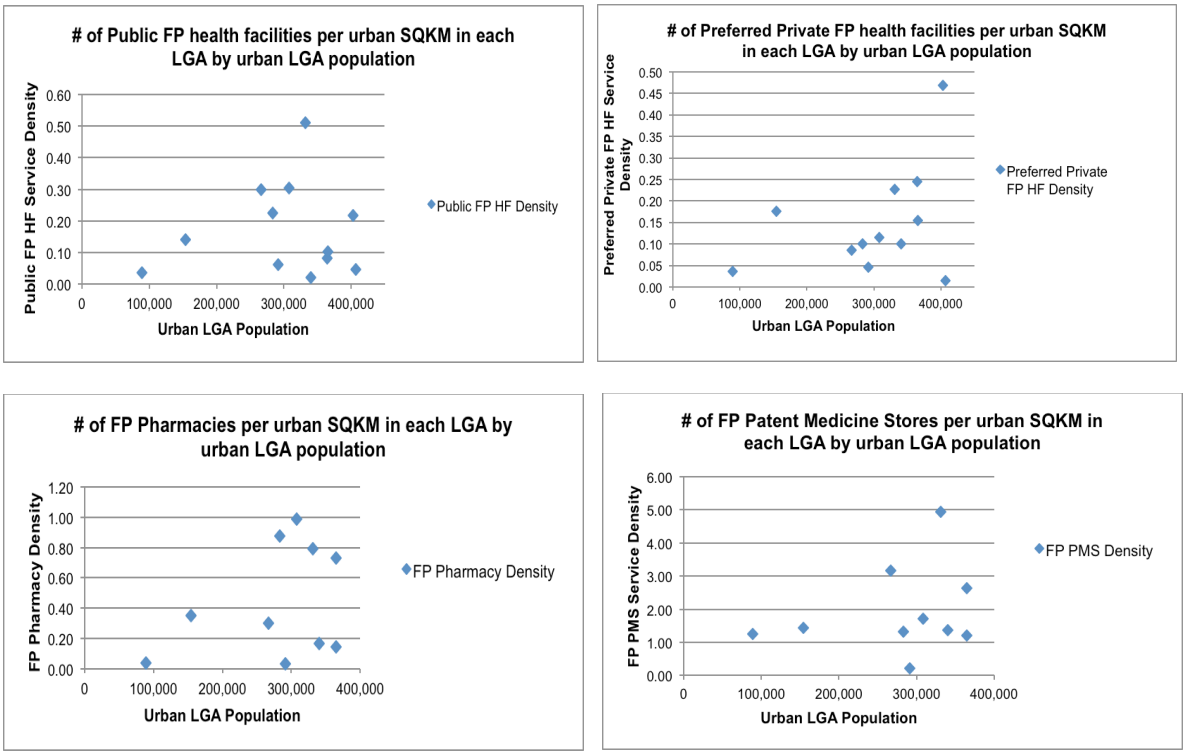
densities of preferred private HFs and public HFs, preferred private HFs and pharmacies, or PMSs and pharmacies.[I]

Table 3.3: Summary statistics of the family planning (FP) service density among different types of FP service delivery points (SDPs) across local government areas (LGAs)

	LGA-level FP Service Density (# of FP SDPs / 100 SQKMs)			
Family Planning Service Delivery Points	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**
Public health facilities	12.4	13.26	1.0	51.0
Preferred Private health facilities	13.2	11.87	1.0	47.0
Pharmacies	33.4	31.63	3.0	99.0
Patent Medicine Stores	178.0	158.51	13.0	498.0

[I] These correlations were not quite statistically significance at the 5% level.

Figure 3.2: Family planning (FP) service density by size of urban local government area (LGA) population in each LGA*



** Source of population data: http://www.citypopulation.de/php/nigeria-admin.php*[71]

Table 3.4: Family planning (FP) service density by urban area (SQKM) and size of urban population within each local government area (LGA)

				Public health facilities		Preferred private health facilities		Pharmacies		Patent Medicine Stores	
City	LGA	Population **	Urban Area (SQKM)	# sell FP	Density (#/ SQKM)	# sell FP	Density (#/ SQKM)	# sell FP	Density (#/ SQKM)	Proxy* # sell FP	Density (#/ SQKM)
Zaria	Sabon Gari	291,358	243.22	15	0.06	11	0.05	8	0.03	50	0.21
	Zaria	406,990	272.39	13	0.05	4	0.01	11	0.04	52	0.19
Kaduna	Chikun		512.66	6	0.01	9	0.02	31	0.06	262	0.51
	Kaduna N	364,575	86.15	7	0.08	21	0.24	63	0.73	103	1.20
	Kaduna S	402,731	59.87	13	0.22	28	0.47	25	0.42	298	4.98
Abuja	AMAC		918.28	13	0.01	24	0.03	200	0.22	117	0.13
	Bwari		385.49	5	0.01	2	0.01	30	0.08	72	0.19
Ilorin	Ilorin E		106.53	4	0.04	8	0.08	22	0.21	16	0.15
	Ilorin S		36.64	5	0.14	10	0.27	8	0.22	120	3.28
	Ilorin W	365,221	97.30	10	0.10	15	0.15	14	0.14	256	2.63
	Offa	88,975	84.77	3	0.04	3	0.04	3	0.04	107	1.26
Ibadan	Ibadan N	308,119	26.33	8	0.30	3	0.11	26	0.99	45	1.71
	Ibadan NE	331,444	17.64	9	0.51	4	0.23	14	0.79	87	4.93
	Ibadan NW	154,029	28.56	4	0.14	5	0.18	10	0.35	41	1.44
	IbadanSE	266,457	23.40	7	0.30	2	0.09	7	0.30	74	3.16
	Ibadan SW	283,098	40.03	9	0.22	4	0.10	35	0.87	53	1.32
Benin City	Egor	340,287	89.92	2	0.02	9	0.10	15	0.17	123	1.37
	Ikpoba-Okha		194.13	5	0.03	12	0.06	6	0.03	251	1.29
	Oredo		91.44	7	0.08	24	0.26	60	0.66	353	3.86

*The number of FP service delivery points (SDPs) is based on SDP census data in the original SDP sample frame. The number of FP PMSs was estimated by multiplying the ratio of surveyed PMSs that sell FP by the total # of PMSs in the original SDP sample frame for each city. The same method was used to estimate the number of pharmacies that sell FP in Abuja and Kaduna.

** *Source: http://www.citypopulation.de/php/nigeria-admin.php*[71] Population census data are only available at the full LGA-level; urban areas are not delineated from non-urban areas. Therefore, for the purposes of this study, population estimates were only included for LGAs that are almost entirely urban. An LGA was considered to be almost entirely urban if the entire SQKM area of the LGA minus the SQKM area from which the SDP sample frame was taken within that LGA was less than 30 SQKM.

Overall Supply Index Scores

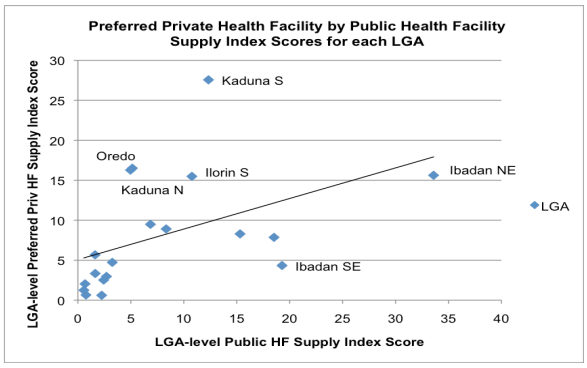
Table 3.5 presents the overall SISs for each SDP type within each LGA. Because there was only moderate variation in the LGA-level strength measures for the different SDP types, the SISs were predominantly driven by the number of FP SDPs per SQKM in each LGA. Pearson correlation coefficient tests showed that the density of each SDP type was strongly correlated at the 0.01 level with the SIS of their respective SDP type.

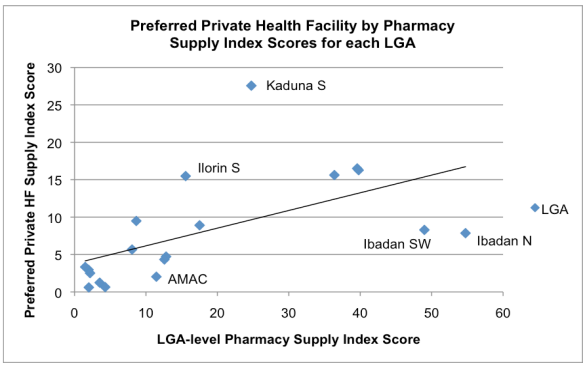
That said, including the strength of the service environment in the overall SIS resulted in significant correlations between all FP SDP type supply environments. The LGA-level SISs for public FP HFs were significantly and positively correlated with preferred private FP HFs ($r=0.46$, $p=0.05$), FP pharmacies ($r=0.61$, $p=0.01$), and FP PMSs ($r=0.72$, $p=0.00$). Additionally, the LGA-level SISs for each private sector FP SDP type were positively correlated with one another: preferred private HFs were correlated with pharmacies ($r=0.57$, $p=0.01$); preferred private HFs were correlated with PMSs ($r=0.82$, $p=0.00$); and pharmacies were correlated with PMSs ($r=0.46$, $p=0.05$). The graphs in Figure 3.3 demonstrate that the distribution of scores among each SDP type is skewed to the low end of the respective SDP SIS range. In fact, there seems to be a cluster of nine LGAs with scores for all SDP types that fall below the corresponding SDP type median: Chikun, AMAC, Bwari, Ikpoba-Okha, Egor, Zaria, Offa, Sabon Gari, Ilorin East. Wider dispersion exists among LGAs with higher scores.

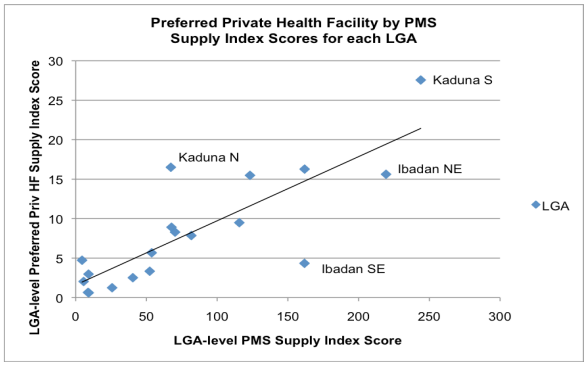
Table 3.5: Family planning supply environment strength, size and supply index score (SIS) for each type of FP service delivery point within each local government area (LGA)

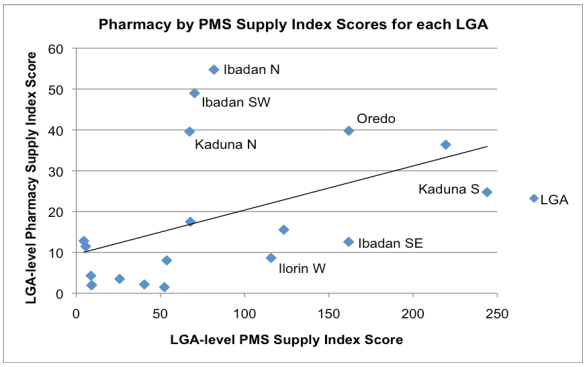
		Public health facilities			Preferred private health facilities			Pharmacies			Patent Medicine Stores		
City	LGA Name	Strength	Size	SIS	Strength	Size	SIS	Strength	Size	SIS	Strength	Size	SIS
Zaria	Sabon Gari	45.00	0.06	2.70	59.39	0.05	2.97	65.20	0.03	1.96	43.18	0.21	9.07
	Zaria	44.91	0.05	2.25	60.98	0.01	0.61	49.99	0.04	2.00	48.53	0.19	9.22
Kaduna	Chikun	56.60	0.01	0.57	62.22	0.02	1.24	58.69	0.06	3.52	50.47	0.51	25.74
	Kaduna N	64.27	0.08	5.14	68.78	0.24	16.51	54.22	0.73	39.58	56.06	1.20	67.27
	Kaduna S	56.06	0.22	12.33	58.64	0.47	27.56	58.94	0.42	24.75	48.99	4.98	243.95
Abuja	AMAC	67.53	0.01	0.68	67.95	0.03	2.04	52.07	0.22	11.46	43.12	0.13	5.61
	Bwari	76.16	0.01	0.76	65.00	0.01	0.65	53.62	0.08	4.29	45.73	0.19	8.69
Ilorin	Ilorin E	81.12	0.04	3.24	59.12	0.08	4.73	61.03	0.21	12.82	29.96	0.15	4.49
	Ilorin S	76.90	0.14	10.77	57.35	0.27	15.48	70.71	0.22	15.56	37.57	3.28	123.22
	Ilorin W	68.51	0.10	6.85	63.25	0.15	9.49	61.76	0.14	8.65	43.98	2.63	115.66
	Offa	60.75	0.04	2.43	62.93	0.04	2.52	54.23	0.04	2.17	32.07	1.26	40.40
Ibadan	Ibadan N	61.74	0.30	18.52	71.43	0.11	7.86	55.29	0.99	54.74	47.79	1.71	81.73
	Ibadan NE	65.86	0.51	33.59	67.91	0.23	15.62	46.05	0.79	36.38	44.50	4.93	219.40
	Ibadan NW	59.55	0.14	8.34	49.50	0.18	8.91	50.03	0.35	17.51	47.04	1.44	67.74
	IbadanSE	64.26	0.30	19.28	48.20	0.09	4.34	41.94	0.30	12.58	51.18	3.16	161.73
	Ibadan SW	69.61	0.22	15.31	82.91	0.10	8.29	56.31	0.87	48.99	53.21	1.32	70.24
Benin City	Egor	81.09	0.02	1.62	56.72	0.10	5.67	47.37	0.17	8.05	39.21	1.37	53.72
	Ikpoba-Okha	54.57	0.03	1.64	55.58	0.06	3.33	49.87	0.03	1.50	40.56	1.29	52.33
	Oredo	62.04	0.08	4.96	62.59	0.26	16.27	60.27	0.66	39.78	41.92	3.86	161.82

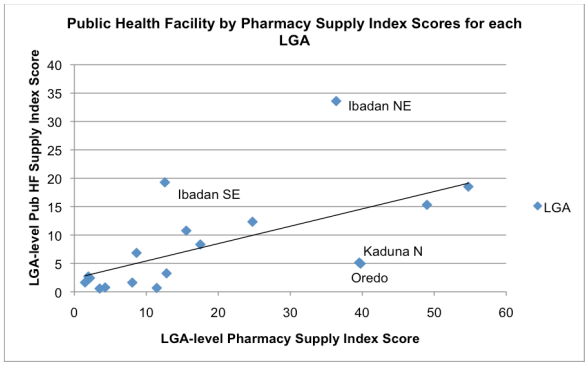
Figure 3.3: Significant positive correlations between local government area (LGA) supply index scores by type of family planning service delivery point

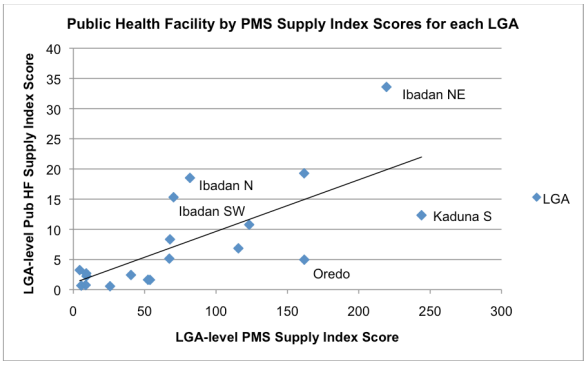










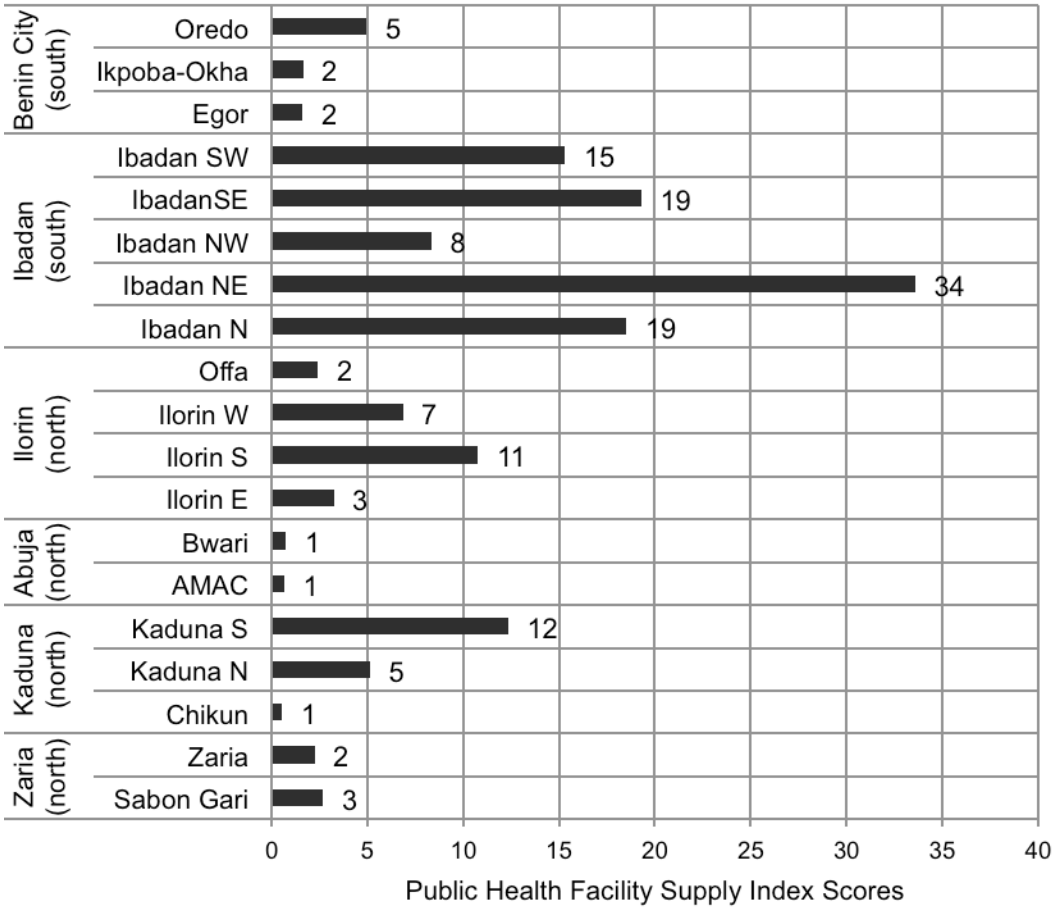


Public and Private Supply Environment: Regional Differences

Broad historical, political and religious differences exist between the north and south of Nigeria, warranting a comparison of the FP supply environments between the two regions. Therefore, independent-samples t-tests were conducted to compare the SISs of the different FP SDP types in the LGAs located in the north (in the cities of Abuja, Ilorin, Kaduna and Zaria) versus those in the south (in the cities of Ibadan and Benin City). Results suggest that the public sector HF supply environment is significantly better in the south (M=12.9, SD=11.0) as compared to the north (M=4.3, SD=4.1); t(2.4)=17, p=0.03. In fact, even without considering the outlier, Ibadan NE, the average SIS for LGAs in the south is almost 2.5 times higher than the average LGA score in the north. Furthermore, the public sector HF environment appears to be strongest in Ibadan, with four LGA-level SISs that are at least five times greater than almost half (47%) of all of the urban LGAs included in this study. (See Figure 3.4)

Among private sector SISs, independent sample t-tests only revealed a significant difference between the pharmacy scores of the south (M=27.4, SD=20.0) and the north (M=11.5, SD=11.7); t(17)=2.2, p=0.04. These results suggest that there is better FP access and availability among pharmacies in the south than in the north; however, there are no significant regional differences among preferred private HFs and PMSs.

Figure 3.4: Public health facility supply index scores by region



Supply Environment and Poverty

Addressing poverty-related inequalities in FP behavior and fertility outcomes may require targeted interventions that improve contraceptive access and availability for the urban poor. In order to assess what, if anything, needs to be done, it is important to not only identify possible gaps and inequalities in the supply environment but also to define the target population and identify where they live.[39] If wealth was evenly distributed across each city, we would expect that, by definition, approximately 20% of the sample in each LGA would fall within Q1.[a] Instead, as seen in Figure 3.5, it seems that some LGAs are slightly better off than others; the observed percentage of Q1 in each LGA sample varies across LGAs by a standard deviation of 6.50 from the mean, 19.4%, (min=10.0%, max=41.4%)

LGAs that are disproportionately poor are not necessarily the same LGAs where most of the urban poor live. Concentration of poverty is a function of both the distribution of the poor, as well as the distribution of the total population across LGAs. Where Figure 3.5 shows the proportion of each LGA that is in Q1, Figure 3.6 demonstrates where most of each city's Q1 can be found.

Despite the disparities in wealth distribution and SISs across LGAs, Pearson correlation coefficient tests showed no significant correlation between the SIS of any SDP type and the percentage of each LGA that are in Q1. Furthermore, there is no clear pattern between the SISs and the distribution of Q1 across each city. For example, the concentration of Q1 in Oredo is not appreciably different from that in Ikpoba-Okha; however the two LGAs have markedly different SISs across SDP types. Also, Oreda in Benin City, is the only LGA that contains both the highest percentage of Q1, as well as the highest LGA-level SIS for each SDP type. (See Table 3.6)

[a] Reminder: The sample was designed to produce estimates with acceptable precision at the city level not the LGA level, therefore there will be potentially large sampling error at the LGA level.

Figure 3.5: Percentage of sample in each local government area that falls within Q1

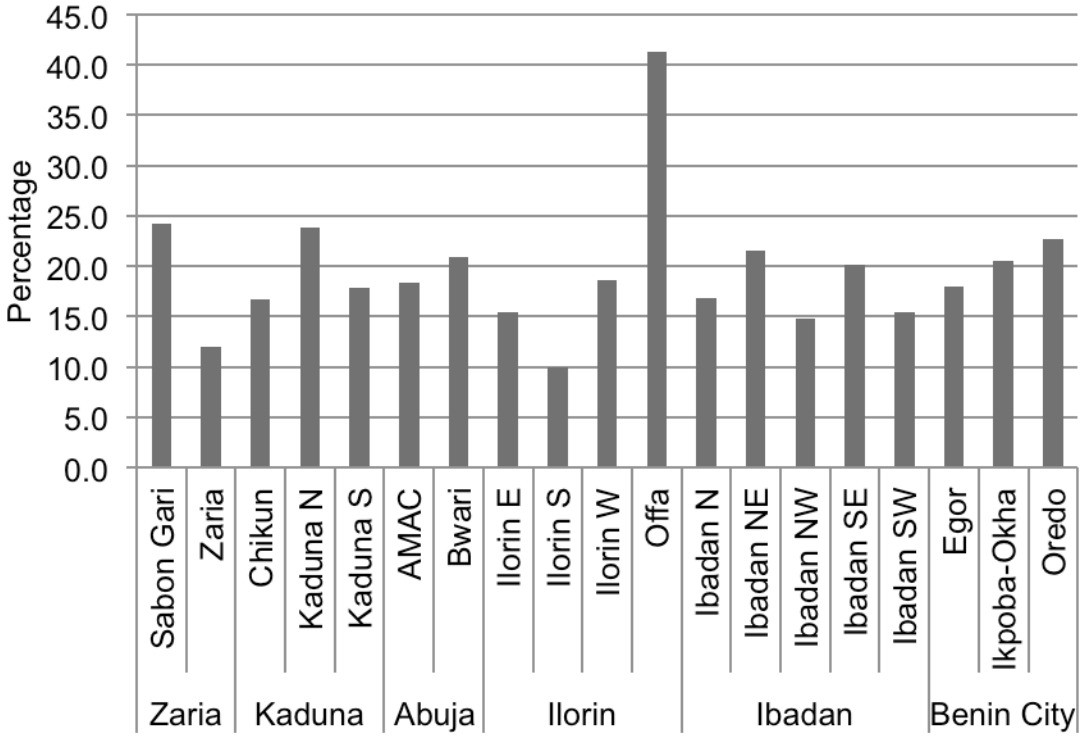


Figure 3.6: Percentage of city's total Q1 who live within each urban local government area

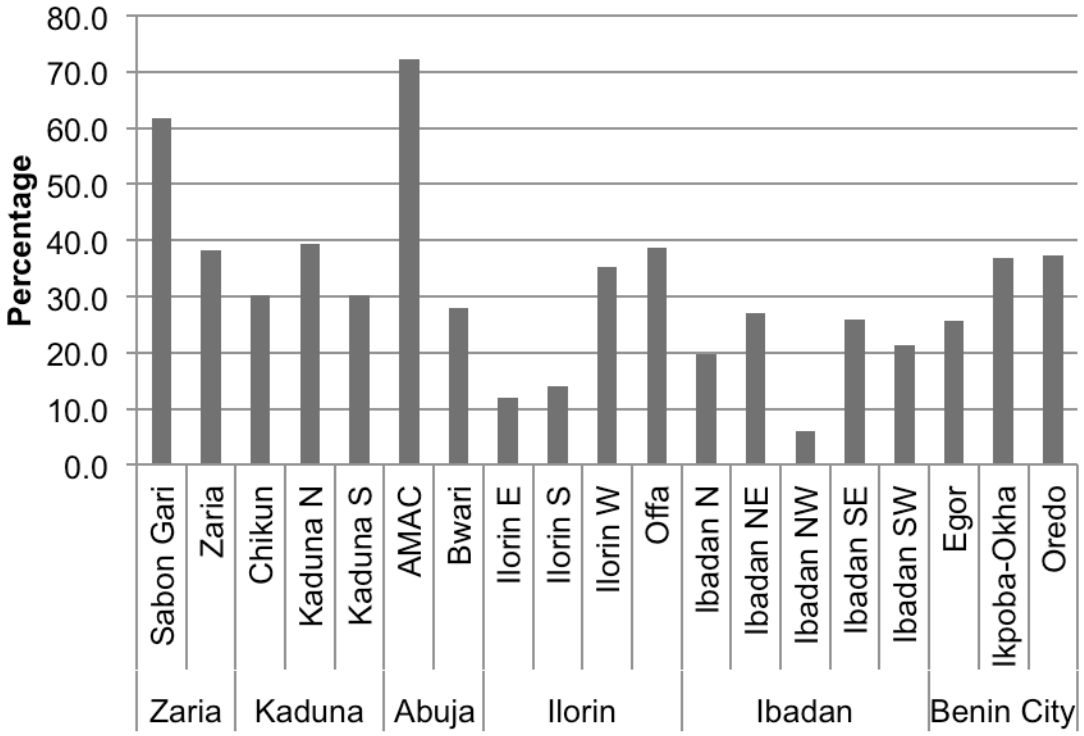


Table 3.6: Distribution of city's poorest women across local government areas (LGA) compared to public and private family planning supply index score (SIS)*

City	LGA	Urban LGA population**	% of city's poorest women in each LGA	Public health facility SIS	Preferred private HF SIS	Pharm-acy SIS	PMS SIS
Zaria	Sabon Gari	291,358	**61.69**	**2.7**	**3.0**	2.0	9.1
	Zaria	406,990	38.31	2.3	0.6	2.0	9.2
Kaduna	Chikun		30.26	0.6	1.2	3.5	25.7
	Kaduna N	364,575	**39.44**	5.1	16.5	**39.6**	67.3
	Kaduna S	402,731	30.30	**12.3**	**27.6**	24.8	**244.0**
Abuja	AMAC		**72.14**	0.7	**2.0**	**11.5**	5.6
	Bwari		27.86	0.8	0.7	4.3	**8.7**
Ilorin	Ilorin E		11.98	3.2	4.7	12.8	4.5
	Ilorin S		14.05	**10.8**	**15.5**	**15.6**	**123.2**
	Ilorin W	365,221	35.27	6.9	9.5	8.7	115.7
	Offa	88,975	**38.70**	2.4	2.5	2.2	40.4
Ibadan	Ibadan N	308,119	19.65	18.5	7.9	**54.7**	81.7
	Ibadan NE	331,444	**27.13**	**33.6**	**15.6**	36.4	**219.4**
	Ibadan NW	154,029	5.94	8.3	8.9	17.5	67.7
	IbadanSE	266,457	25.91	19.3	4.3	12.6	161.7
	Ibadan SW	283,098	21.37	15.3	8.3	49.0	70.2
Benin City	Egor	340,287	25.66	1.6	5.7	8.1	53.7
	Ikpoba-Okha		36.94	1.6	3.3	1.5	52.3
	Oredo		**37.40**	**5.0**	**16.3**	**39.8**	**161.8**

*Cells are highlighted to show the LGAs that contain the highest % of each city's poorest women, as well as the LGAs that have the highest SIS for each service deliver typey (SDP) type within each city.

** *Source: http://www.citypopulation.de/php/nigeria-admin.php*[71] Population census data are only available at the full LGA-level; urban areas are not delineated from non-urban areas. Therefore, for the purposes of this study, population estimates were only included for LGAs that are almost entirely urban. An LGA was considered to be almost entirely urban if the entire SQKM area of the LGA minus the SQKM area from which the SDP sample frame was taken within that LGA was less than 30 SQKM.

Discussion

Over 50% of the world's population lives in an urban area. Due in large part to high levels of fertility in urban areas of the developing world, that number is projected to increase to two thirds by 2050.[50] Over time, there will be more people seeking employment, housing and other limited resources in urban areas, further exacerbating already depleted living conditions and overall poor health.[36, 72] As a result, governments and donor organizations have become increasingly vigilant of poverty-related inequalities in urban fertility, as well as in urban contraceptive use behaviors and service utilization.[28, 36, 72] At the same time, inequalities in the urban FP supply environment have become an area of interest for FP program and policy makers.[46, 73, 74]

As the most populous country in Africa, with an urban growth rate that indicates continued rapid population growth and urbanization, Nigeria is an opportune setting in which to explore inequalities in the urban FP supply environment. This study aimed to identify how the public and private sector FP supply environments vary and interact within and across urban LGAs. It also explored whether Nigeria's urban FP supply environment is correlated with community-level wealth, so as to mitigate obstacles related to contraceptive access and availability among the urban poor.

Access to FP is contingent on the consistent and convenient availability of contraceptive methods. Therefore, two important components of contraceptive access and availability were used to define the aggregate-level FP supply environment: the overall strength of supply among the SDPs within each LGA; and the density of SDPs that provide FP within each LGA.

Of note, the variable measuring average *strength* of each SDP type supply environment was low relative to the highest possible score that could have been given. These results imply that there is a substantial percentage of SDPs in each LGA that either do not offer all of the methods that should normally be available in each SDP type, including

important marker methods such as injectables and IUDs; experience commodity stockouts; are not open for the maximum number of hours per week; do not offer socially marketed products; and/or require partner consent in order to obtain at least one available method (not including forms of sterilization). Using paired t-tests to compare the means of these component measures, it seems that, among public and preferred private sector FP HFs, the measures that increased the LGA strength scores were the number of hours that the SDPs were open, the percentage that sold IUDs, and the percentage that sold injectables. On the other hand, the overall strength scores for public and private HFs were brought down mostly due to the fact there was a large percentage of them in each LGA that required partner consent for reversible modern contraceptive methods. On average, 60.4% of public and 76.1% of preferred private FP HFs in each LGA required partner consent for at least one available method. Among pharmacies and PMSs, the component scores are highly correlated. However, 71.9% of pharmacies offered the injectable form of modern contraception, which brought its overall mean strength score up; and only 17.5% of PMSs offered the injectable, which pulled its overall mean strength score down.

Though one might have expected their scores to be even higher than was observed, it comes as little surprise that public and preferred private FP HFs received significantly higher standardized LGA-level strength scores than the pharmacies and PMSs. Public HFs more often follow government standards of service provision and are more easily monitored and regulated. Also, the private HFs used in this analysis were identified as *preferred* providers, which in and of itself might introduce positive bias to the results. Furthermore, pharmacies and PMSs are significantly less likely to provide socially marketed products or injectables than public and private HFs, and they are not open for as many hours.

On the other hand, although there was no discernible pattern for variation across LGAs, the average density of pharmacies and PMSs far outweighed those of the public and private FP HFs. Partly due to their sheer numbers, pharmacies and PMSs serve as crucial

points for contraceptive commodity provision; as such, they are a good starting point for improving the FP supply environment in urban Nigeria.[25, 28, 44]

When comparing the calculated SISs for each SDP type, data showed wide variability in the public and private sectors across urban LGAs. Where there was a good public FP supply environment, there was increased likelihood that there was also a good private sector FP supply environment. This outcome could reflect greater demand for all health services and, thus, more providers within those LGAs. However, according to the analysis, the density of providers was not significantly correlated to urban LGA population size. Another interpretation of this outcome is that neither sector is working to fill service gaps where the other sector is lacking.[60] Modern contraception may be more accessible if the government increased public FP HFs in areas that lack private SDPs.

Finally, there is no evidence of significant correlation between the public or private sector FP supply environments and the percentage of the population in each LGA that falls within the lowest wealth quintile. Furthermore, data suggest that the level of public and private sector contraceptive access and availability is not correlated with how the poorest women are distributed within each city. These results likely reflect the fact that the FP service environment answers to and/or serves needs that are not wealth-based. It also suggests that people who are poor are just as likely to live in a good FP supply environment as those who are wealthy, depending on the city in which they live. In order to better target the urban poor, efforts to improve FP access and availability may need to be focused, therefore, on urban LGAs, such as AMAC, Sabon Gari and Offa, where the proportion of each city's population of poorest women is highest.

Limitations

This study gives insight into Nigeria's urban FP supply environment, highlighting possible gaps in public and private sector contraceptive access and availability; however, there are certain limitations to the study. Inherent to any secondary data analysis, the data used in this study lacked certain information needed to better fit its aims. For example, to reflect the strength of the supply environment, it might have been beneficial to also include measures such as distance between individuals/clusters and service outlets[75] and location of SDPs in relation to highly traveled areas, such as markets, public transportation, etc.[31] Also, measures to reflect cost of contraceptives and medical barriers, including FP restrictions based on age and parity, were collected by MLE, however, not in a manner that fit the methodology of this study. Therefore, though they are important indicators of access and availability, they were not used in analysis.

Additionally, the definition of "urban geographic area" varies widely from country to country. In this study, the unit of analysis was the *urban* portion of each LGA that falls within six selected Nigerian cities. However, though LGA boundaries have been defined, there are no official boundaries to geographically delineate their urban portions; and in some cases, the LGAs might be considered largely rural. Therefore, despite the use of GIS tools to make careful approximations of the urban areas within each LGA, calculations of service density may be over or under estimated.

Due to the prohibitive cost of obtaining information from all SDPs, one sampling limitation was that there was not a census taken of pharmacies (in two cities) or PMSs (in any city). Instead, these SDPs were randomly sampled at the city level. Because the random sample was not stratified by LGA, there is no guarantee of proportionate SDP representation across LGAs due to sampling error. Also, the sampling frame of private HFs was designed as a census of private facilities reportedly used by surveyed individuals. The intention was to allow for individual linking of women to their *preferred* HFs. However, for the

purposes of this study, it would have been beneficial to have a census or random sample of all private HFs, in order to assess and generalize the findings to the overarching private sector HF universe. Therefore, the degree to which this limitation is a problem for this study depends on the extent to which preferred private HFs represent the actual private HF frame. This information, however, is unknown.

Finally, one aim of this study was to obtain a better understanding of intracity distribution of public and private sector contraceptive access and availability. For that reason, data were analyzed at the LGA level instead of at the city level. However, the small number of urban LGAs included in the analysis limited the findings. To improve the statistical power of the results, future research would benefit from including more urban LGAs within Nigeria, which would require collecting data from more Nigerian cities.

Concluding Remarks and Recommendations

An outstanding question that is beyond the scope of this study is whether the geographic distribution of family planning services affects individual contraceptive use in urban areas. Unlike in most rural areas, services in urban areas are denser and travel between communities is easier. While rural populations tend to frequent SDPs based on proximity to residence and affordability, urban populations are exposed to a greater choice and number of SDPs and, therefore, demonstrate more complex patterns for accessing health care.[28] Hence, further research should be conducted to analyze the relationship between a woman's immediate supply environment and demand-side factors, such as her use of contraception.

As it is, however, this study provides sound baseline measures of the strength and size of the public and private FP supply environments in urban Nigeria and documents for the first time spatial relationships between them. It identifies LGAs that have a weaker supply environment than others and compares those areas with those in which the urban

poor can be found. Though no systematic pattern was identified between the private and public FP supply environment and urban poverty, program planners and policy makers can still use this information to identify localized areas in which efforts can be made to improve equal access to contraception. More specifically, it can be used as a gauge to determine possible windows for encouraging private sector expansion and/or redistribution of public services in highly concentrated poor areas that also suffer from poor FP access and availability.

CHAPTER 4

Does a Woman's Immediate Contraceptive Supply Environment Influence Her Use or Intention to Use Family Planning?

Brief Overview

Increasing the use of modern contraceptive methods in Sub-Saharan Africa has the potential to avert 29% of all maternal deaths in the region, as well as 13% of childhood deaths and 22% of infant deaths.[19] It would also reduce poverty and hunger and contribute substantially to gender equality, achievement of universal primary schooling, and long-term environmental sustainability.[5, 6] Despite the benefits, contraceptive prevalence remains lower in Sub-Saharan Africa than in any other region of the world,[3] resulting in high fertility, rapid population growth, and unmet need for family planning (FP).[19]

Important questions remain about the most effective ways to promote contraceptive use in low-prevalence countries. Specifically, there has been a longstanding debate as to whether and to what extent contraceptive access and availability influences a woman's use or intention to use modern contraception.[10, 11, 13, 76-79] On the one side, there are social scientists and economists who have claimed that high fertility is a rational response to poverty and until there is improved education and economic development, there will be little desire to use contraception and limit pregnancy.[10-12] On the other side, there are FP advocates who maintain that there is substantial unwanted fertility throughout the developing world and that contraceptive use

will increase through improved availability of contraceptive commodities and universal access to FP services.[1, 4, 8, 19, 21, 22]

This paper explores the role of contraceptive access and availability in promoting contraceptive use, and argues that it is an important topic to consider within urban areas. According to the findings from the first paper of this dissertation, community-level access to FP services and availability of commodities – from here forward referred to as the "supply environment" – is not consistent across or within urban areas of Nigeria (See Dissertation Chapter 3).[b] That said, it is not known whether a woman's immediate urban supply environment influences her contraceptive behavior. If there is, in fact, a predictive relationship between the supply environment and contraceptive use, then program planners and policy makers need to consider the unequal distribution of urban contraceptive access and availability in their efforts to mitigate existing disparities in contraceptive use behaviors among urban residents.[36-42]

Using Nigeria – a country that continues to have high fertility – as a case study, this paper fills an important gap in the literature. Based on a previous thorough analysis of supply measures in urban Nigeria (See Dissertation Chapter 3) it links community-level FP supply index scores (SISs) to information regarding individual intent to use FP and actual use of modern contraception. Furthermore, it provides a nuanced perspective on the influence of the supply environment, by considering whether/how different types of public and private service delivery outlets relate to FP intentions and use.

[b] Though it has been shown that, at the individual level, disparities exist in FP behavior and service utilization among urban wealth quintiles,[36-39] the first paper of this dissertation did not find correlations between the distribution of the supply environment in urban Nigeria and wealth among urban residents. Therefore, this paper does not look at the influence of supply on individuals stratified by wealth.

Operational Hypotheses

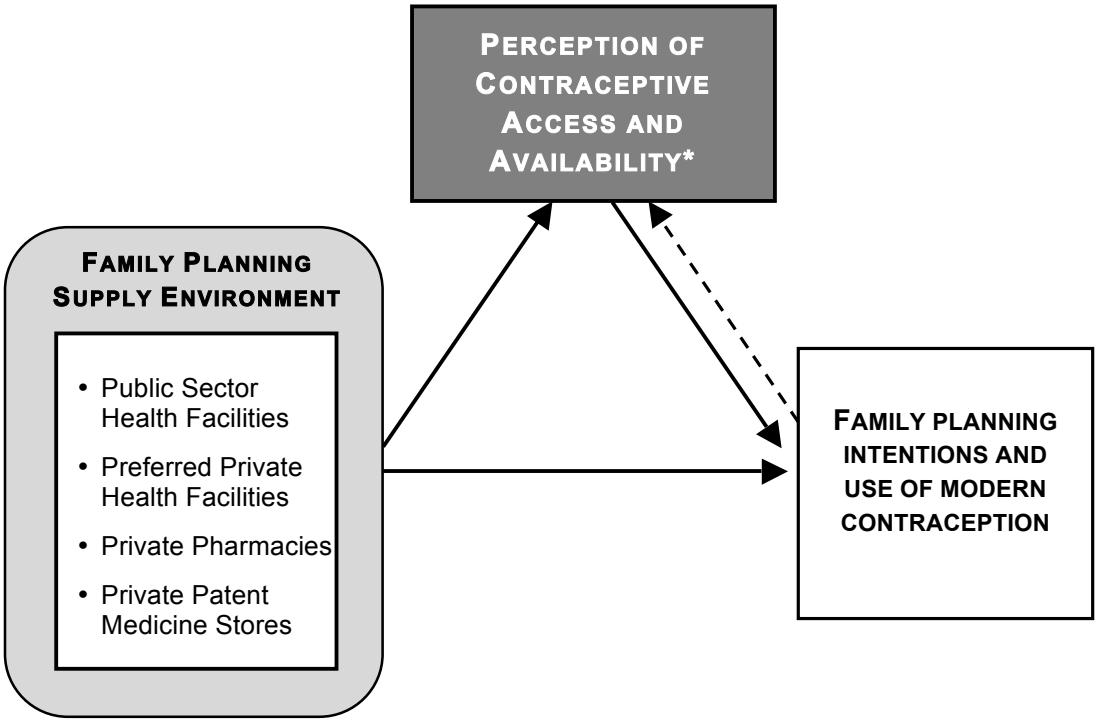
The *Diffusion of Innovations Theory* provides one explanation for how new ideas, products and social practices cumulatively diffuse or spread within a society or from one society to another.[80] It posits that diffusion begins with a small portion of society (the "innovators") initially accepting/using an innovation and continues as more and more individuals exponentially follow the trend.[81] This theory has become a popular framework for understanding and measuring the adoption of modern contraception.[82-85] It portrays potential users as passing through four sequential stages: 1) becoming aware of the possibility to control fertility; 2) becoming informed about and evaluating the means of fertility control; 3) testing a contraceptive method and 4) adopting a method.[34]

There are both internal and external factors that generate diffusion effects, influencing whether and how quickly a woman passes through these four stages.[83, 84] As an external influence, a good family planning supply environment could theoretically facilitate stages one and two by increasing a woman's exposure to the concept of FP and improving her knowledge of how and where to obtain contraceptive methods. Moreover, by providing a range of reliably stocked, quality contraceptives, a good FP supply environment could also facilitate stages three and four, once the desire to test and/or use FP exists.

Using the above rationale, this paper tests the influence of the public and private sector FP supply environment on intention to use family planning and actual use of modern contraception. Considering different types of public and private sector service outlets, it analyzes three hypotheses (See Figure 4.1). First, it hypothesizes that a better FP supply environment will improve a woman's perception of both her ability to get to a place where FP services are offered, as well as her ability to obtain contraception once if she decides to use it. It also hypothesizes that a woman's immediate FP supply environment, as well as her perception of contraceptive supply, have direct, positive influences on the likelihood that she will intend to use some for of FP or actually use modern contraception. Third, it

hypothesizes that a woman's perception of supply mediates the pathway from her immediate supply environment to her contraceptive use outcome.

Figure 4.1: Conceptual Model



*The dotted line represents the potential feedback from current use to perception of supply.

Sample

Individual-level sample

The original cluster sample was taken from 20 local government area units (LGAs) and included 16,144 married and unmarried women. This study is restricted to sexually active women, defined as married women, as well as unmarried women who had reported having sex in the last year (N=12,055). All resided within the 19 LGAs from which the service delivery point (SDP) data were taken (See Dissertation Chapter 3).

SDP-level sample

SDP measures from the first paper (Dissertation Chapter 3) are used in this paper. Therefore, the SDP-level sample does not change.

Measures

Table 4.1 provides the description, type, and level of measurement for the key independent variables, the mediator variable and the other covariates in the model.

Table 4.1: Study Measures

Variable Description	Type of Variable	Level of Measurement
Dependent Variable		
Contraceptive Use, Intent to Use and Non-Use	Multinomial	Individual
Key Independent Variables		
Public health facility (HF) supply index score (SIS)	Continuous Index	LGA (SDP data)
Preferred Private HF SIS	Continuous Index	LGA (SDP data)
Pharmacy SIS	Continuous Index	LGA (SDP data)
Patent Medicine Store SIS	Continuous Index	LGA (SDP data)
Mediator Variable		
Perception of FP Supply Environment	Continuous Index	Individual
Control Variables		
Age	Continuous	Individual
Education	Categorical	Individual
Religion	Categorical	Individual
Wealth Quintile	Categorical	Individual
Parity	Continuous	Individual
Fertility Preference	Categorical	Individual
City	Categorical	Individual
Perception of Social Use	Continuous	Individual

Dependent Variable

- **Modern Contraceptive Use, Intent to Use and Non-Use.**

The individual-level use, intent to use and non-use of FP will be examined as the outcome. The *Theory of Planned Behavior*, suggests that, barring circumstances beyond an individual's control, a person's behavior is ultimately determined by his/her intention to perform the behavior.[86] Using this theory, and based on previous research indicating strong relationships between reported contraceptive intentions and probabilities of subsequent use,[24, 87, 88] it is assumed that intention to use FP provides a valid measure of probable contraceptive use in the future. This multinomial outcome variable has three categories:

(1) Not using and no intention to use any form of family planning: This category includes individual women who reported not using family planning, and who did not intend to use in the next 12 months.[c]

(2) Not currently using, but intends to use family planning: This category includes respondents who identified as not currently using family planning, however, reported intent to use some form of family planning within the next 12 months.

(3) Currently using modern contraception: This category includes respondents who reported current use of any form of modern contraception.[d]

[c] Due to the skip pattern in the questionnaire, only women who reported knowledge of at least one form of modern or traditional method of contraception were asked about their current contraceptive use. Women who had no knowledge (n=634) are therefore assumed to be not using and have no intention to use in the next twelve months. Also, women who reported that they "did not know" if they would use family planning in the next twelve months (n=592) were included in the in the category of not using and having no intention to use FP.

[d] This study uses the Nigeria DHS definition of "modern contraception", which includes the following methods: female and male sterilization, male and female condoms, the pill, intra-uterine device (IUD), injectables, implants, diaphram, foam/jelly, lactational amenorrhea and emergency contraception.[44]

Key Independent Variables

- **Supply Environment**

Supply index scores (SIS) were created to reflect the LGA-level FP supply environment. (See Table 4.2) Four continuous scores were assigned to each LGA: one for public sector FP health facilities (HFs), one for preferred private FP HFs, one for private pharmacies, and one for private FP Patent Medicine Stores (PMSs). The SISs were created by multiplying two LGA-level variables for each SDP type: 1) FP supply environment *strength*; and 2) FP supply environment *size*. Refer to Dissertation Chapter 3 for more details on how the SISs were created.

Table 4.2: Distribution of supply index scores for each type of family planning service delivery point (SDP) across local government areas (LGAs)

	Supply Index Scores				
Family planning SDPs	**Number of Observations (LGAs)**	**Mean**	**Standard Deviation**	**Min**	**Max**
Public health facilities	19	7.3	8.3	0.6	33.6
Preferred private health facilities	19	8.1	7.6	0.6	27.6
Private pharmacies	19	17.0	16.0	1.5	54.7
Private Patent Medicine Stores	19	78.5	76.5	4.5	243.9

Mediator

• **Perception of supply.**[e] This continuous index reflects a woman's perception of supply and is based on two measures:

1) *Perception of Access* measures whether the respondent perceives family planning to be accessible. Each woman was asked to strongly agree, agree, disagree or strongly disagree to the following statement: "You could get to a place where family planning methods are offered if you decided to use one."

2) *Perception of Availability* measures whether the respondent perceives family planning to be available. Each woman was asked to strongly agree, agree, disagree or strongly disagree to the following statement: "You could obtain a family planning method if you decided to use one."

The index was created by averaging the numerical values associated with the responses given to the above questions. The index range is from one to four, with 1 (one) corresponding to a low perception (strongly disagree) and 4 (four) corresponding to a high perception of access and availability to family planning (strongly agree).

Individual-level Control Variables (See Table 4.3 for Distribution of Covariates)

• **Age.** A continuous variable defined as a woman's age in years at time of interview.

• **Education.** A categorical variable defined as the highest level of education attained by the woman at the time of the interview. Three dummy variables were created: primary; junior/senior secondary; and higher. The reference category used was no education.

• **Parity.** A continuous variable defined as the number of self-reported children ever born.

[e] In the original MLE survey, these questions were meant to measure a woman's self-efficacy for overcoming barriers related to accessing and obtaining contraception. See limitations section for further comments.

- **Religion.** A categorical variable defined as the woman's self-reported religious affiliation. Two dummy variables were created: Muslim; and No religion/other. The reference category was Christian, which included Christian, Catholic and Protestant.

- **Wealth Quintile.** A categorical asset based index. Four dummy variables were created for women who fall within the: second quintile; third quintile; fourth quintile and fifth quintile. The reference category was the first quintile.

- **Fertility Preferences.** This categorical variable measures a woman's desire to have a child within the next two years. Two dummy variables were created for women who reported wanting: a child within the next two years; and a child after two years. The reference category was women who wanted no/no more children.

- **City.**[f] This categorical variable indicates the city in which a woman lives. Five dummy variables were created for women who live in: Ilorin; Kaduna; Zaria; Benin; or Ibadan. The city Capital of Nigeria, Abuja, was used as the reference group.

- **Perception of Social FP Use.**[g] This categorical variable measures a woman's perception of whether her close friends and relatives use family planning. All women in the sample were asked: "How many of your close friends and relatives would you say use family planning?" Three dummy variables were created from the response categories: some; most; and all. The reference category was none.

---

[f] Broad historical, political and religious differences exist between the north and south of Nigeria, which may influence whether a woman uses or intends to use modern contraception. This variable was introduced to account for some of these cultural influences.

[g] According to the Diffusion of Innovations Theory, both internal and external factors influence whether and how quickly a woman passes through the four stages that lead to contraceptive use. Adoption of modern contraception also depends on the extent to which other individuals have already adopted birth control and the degree of social interaction between adopters and non-adopters. This variable was introduced to test and control for the influence of these internal factors.[80-83]

Table 4.3: Percent distribution and means of covariates

	Zaria		Kaduna			Abuja		Ilorin				Ibadan					Benin City		
LGA	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Total Sample	1,042	1,307	761	595	638	1,251	408	313	518	749	319	457	552	168	580	574	547	706	654
Mean Age*	30.9	30.5	30.3	32.0	31.3	31.7	31.6	30.6	32.7	32.1	30.0	32.4	32.1	31.9	32.1	32.4	31.9	30.9	31.5
Education																			
None (r)	19.0	14.0	7.2	27.9	15.7	8.4	5.8	19.8	9.2	18.7	2.6	2.2	3.8	45.7	5.9	1.4	13.4	3.1	4.5
Primary	37.4	43.5	15.6	14.4	22.3	11.2	12.3	25.1	17.2	24.7	16.5	19.2	26.6	18.1	27.3	13.4	13.4	16.1	11.7
Secondary	29.1	32.2	49.5	36.6	42.1	33.8	38.6	34.9	38.5	31.8	28.3	54.1	54.4	15.4	46.3	56.1	52.1	59.6	58.5
Higher	14.4	10.0	27.0	20.3	18.5	46.1	42.4	20.2	34.9	24.7	52.3	24.2	13.6	20.8	20.2	27.8	19.6	19.7	25.0
Missing	0.1	0.3	0.7	0.8	1.4	0.5	0.9	0.0	0.2	0.1	0.3	0.3	1.6	0.0	0.3	1.3	1.5	1.5	0.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Religion																			
Christian (r)	22.1	4.3	71.6	21.5	27.1	73.8	77.0	22.1	43.2	16.4	37.5	52.4	43.5	53.0	41.1	58.8	87.3	96.2	93.3
Muslim	77.3	95.2	27.5	77.7	71.2	25.7	22.7	77.6	56.8	83.1	62.0	46.9	56.2	47.0	58.0	40.5	3.3	2.6	4.5
No relig/other	0.3	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.2	0.0	9.4	1.2	2.2
Missing	0.3	0.4	0.9	0.6	1.7	0.4	0.3	0.3	0.0	0.3	0.5	0.5	0.3	0.0	0.7	0.7	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Wealth																			
1 (r)	26.0	13.0	16.5	25.9	17.0	19.4	22.2	15.3	10.0	18.2	38.0	16.0	20.9	13.1	19.9	15.0	20.2	21.1	22.7
2	19.5	20.1	22.3	22.1	18.9	17.7	22.6	21.2	16.8	23.1	12.8	23.6	27.5	14.8	21.1	17.4	21.3	21.0	20.2
3	19.9	23.3	23.8	17.6	22.4	21.9	22.1	27.9	20.2	19.9	16.5	18.6	24.7	17.2	19.7	20.6	23.5	21.5	19.1
4	16.7	23.3	16.8	18.1	23.9	19.7	18.9	22.0	24.6	20.9	17.1	23.6	16.4	24.8	19.9	22.4	17.3	17.4	20.3
5	17.9	20.3	20.6	16.3	17.8	21.3	14.2	13.6	28.4	17.9	15.6	18.2	10.5	30.1	19.4	24.6	17.7	19.0	17.7
Missing	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Mean Parity**	4.3	4.6	2.7	3.9	3.8	2.3	2.4	2.9	2.8	3.2	2.0	2.6	2.7	2.5	2.6	2.4	2.2	2.2	2.1
Fertility Preference																			
No child (r)	19.3	16.2	26.0	23.2	22.6	25.0	29.6	27.1	34.8	30.1	25.2	34.6	29.9	30.1	27.1	31.4	23.6	25.0	23.8
Wants now	64.6	68.9	62.1	57.2	63.6	58.4	50.8	60.2	50.5	58.8	53.5	48.5	59.2	59.0	63.5	55.4	57.1	61.2	50.3
Wants later	14.7	13.2	10.3	7.6	11.7	14.1	17.8	11.5	12.5	10.7	20.9	13.3	9.8	10.6	9.1	12.1	17.5	13.0	24.7
Missing	1.4	1.7	1.6	12.0	2.1	2.5	1.8	1.2	2.2	0.4	0.4	3.6	1.1	0.3	0.3	1.1	1.8	0.8	1.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Perceived Social FP use***																			
None use (r)	28.0	40.9	6.3	5.2	18.8	13.6	15.0	25.3	22.3	20.9	18.8	27.5	21.7	17.9	24.3	19.7	29.3	14.4	10.1
Some use	34.6	21.9	51.6	27.3	33.4	46.6	55.4	24.3	30.8	27.9	32.5	35.7	33.8	32.4	37.6	43.0	41.5	35.0	30.1
Most use	1.9	1.0	24.7	3.0	8.1	8.1	6.4	5.5	4.3	4.2	7.2	2.2	4.7	11.2	4.6	5.0	4.3	9.3	4.9
All use	0.5	0.0	1.4	0.0	0.6	2.2	1.3	1.0	1.4	1.2	0.0	0.4	0.3	0.2	0.0	0.8	2.4	2.4	1.8
Doesn't know	34.7	36.0	15.3	64.2	38.8	29.2	21.9	43.6	40.2	45.0	41.3	33.1	39.2	38.3	33.0	30.7	22.5	38.9	53.0
Missing	0.3	0.2	0.7	0.3	0.3	0.3	0.0	0.3	1.0	0.8	0.2	1.1	0.3	0.0	0.5	0.8	0.0	0.0	0.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

*=Age range was min=15, max=49, SD=9.0 ; **=Parity range was min=0, max=18, SD=2.6 ; ***=Perceived Social FP Use; (r)=reference group

Analysis

Multivariate path analysis was used to analyze the pathways for the three hypotheses being tested in the conceptual model with control variables: (1) Ordinary least squares regression (OLS) is used to estimate the relationships of the four continuous family planning supply environment independent variables – public sector, preferred private sector, pharmacy and PMS SISs – on the continuous mediator, perception of supply. (2) Three binary logistic regression models[t] were used to estimate the effects of the independent variables and the mediator variable on the multinomial outcome, FP intention and use of modern contraception: one comparing current use of modern FP with non-use; one comparing intent to use FP with non-use; and one comparing intent to use with current use of modern FP. (3) To test the full mediation model pathways, probit models were estimated using the software, M*plus*, Version 7[u]. The significant probit mediated effect coefficients were multiplied by 0.625, a constant multiplier that transforms probit coefficients into logit coefficients, in order to get mediation effects that could be compared to the logistic regression direct effects.[89, 90]

The relative strength, sign and statistical significance of the unstandardized parameter estimates were assessed with the full model results, and listwise deletion was used to remove observations with missing values. To address the mediation pathways, the indirect effects of all independent variables were first tested and calculated through the mediator. The structural model equation for pathways to the mediator is as follows:

$$Y_1 = \gamma_{1,1}x_1 + \gamma_{1,2}x_2 + \gamma_{1,3}x_3 + \gamma_{1,4}x_4 + \gamma_{1,(5\text{-}8)}x_{(5\text{-}8)} + \zeta_1$$

[t] There is no documented way to calculate mediating effects on a multinomial outcome using a multinomial logistic regression model; binary logistic regressions must be used.[89]

[u] In order to calculate indirect effects, the path coefficients of the indirect effects are typically multiplied; however, in this model the paths of the indirect effects are not in the same units. The path running from the SIS variables to perception are OLS coefficients, and the paths from perception to the outcomes are log-odds coefficients. Therefore, probit regression was necessary, as was the use of M*plus*. All other pathways were estimated using STATA 12.1.

where terms in the model include (See Figure 4.2):

Y_1 = The mediating variable- perception of supply

$X_{(1-4)}$ = The LGA-level supply environment indicators (key independent variables)

$X_{(5-8)}$ = The control variables

$\gamma_{(1-4)}$ = The path coefficients for key independent variables

$\gamma_{(5-8)}$ = The path coefficients for control variables

ζ_1 = The error in equation

The structural model equation needed to address questions regarding the direct influence of the independent variables and mediating variable on the three binary outcomes of contraceptive use and intent to use were as follows:

$$Y_2 = \gamma_{2,1}X_1 + \gamma_{2,2}X_2 + \gamma_{2,3}X_3 + \gamma_{2,4}X_4 + \gamma_{2,(5-8)}X_{(5-8)} + \beta_{2,1}Y_1 + \zeta_2$$

$$Y_3 = \gamma_{3,1}X_1 + \gamma_{3,2}X_2 + \gamma_{3,3}X_3 + \gamma_{3,4}X_4 + \gamma_{3,(5-8)}X_{(5-8)} + \beta_{3,1}Y_1 + \zeta_3$$

$$Y_4 = \gamma_{4,1}X_1 + \gamma_{4,2}X_2 + \gamma_{4,3}X_3 + \gamma_{4,4}X_4 + \gamma_{4,(5-8)}X_{(5-8)} + \beta_{4,1}Y_1 + \zeta_4$$

where terms in the model include (See Figure 4.2):

Y_1 = The mediating variable- perception of supply

Y_2 = The outcome variable, the log-odds of current modern contraceptive use/non-use (intent to use FP excluded)

Y_3 = The outcome variable, the log-odds of intent to use FP/non-use (current modern contraceptive use excluded)

Y_4 = The outcome variable, the log-odds of intent to use FP/current use of modern contraception (not using and no intention to use excluded)

$X_{(1-4)}$ = The LGA-level supply environment indicators (key independent variables)

$X_{(5-8)}$ = The control variables

$\gamma_{(1.)}$ = The direct path coefficients from key independent variables and controls to the mediatior

$\gamma_{(2.)}$ = The direct path coefficients from key independent variables and controls to the outcome

$\beta_{(2.)}$ = The path coefficients from the mediator to the outcomes

$\zeta_{(2.)}$ = The errors in equation

To estimate indirect effects, three additional models were estimated using probit regression. The only differences between these models and the logit models written out above are that the dependent variables were:

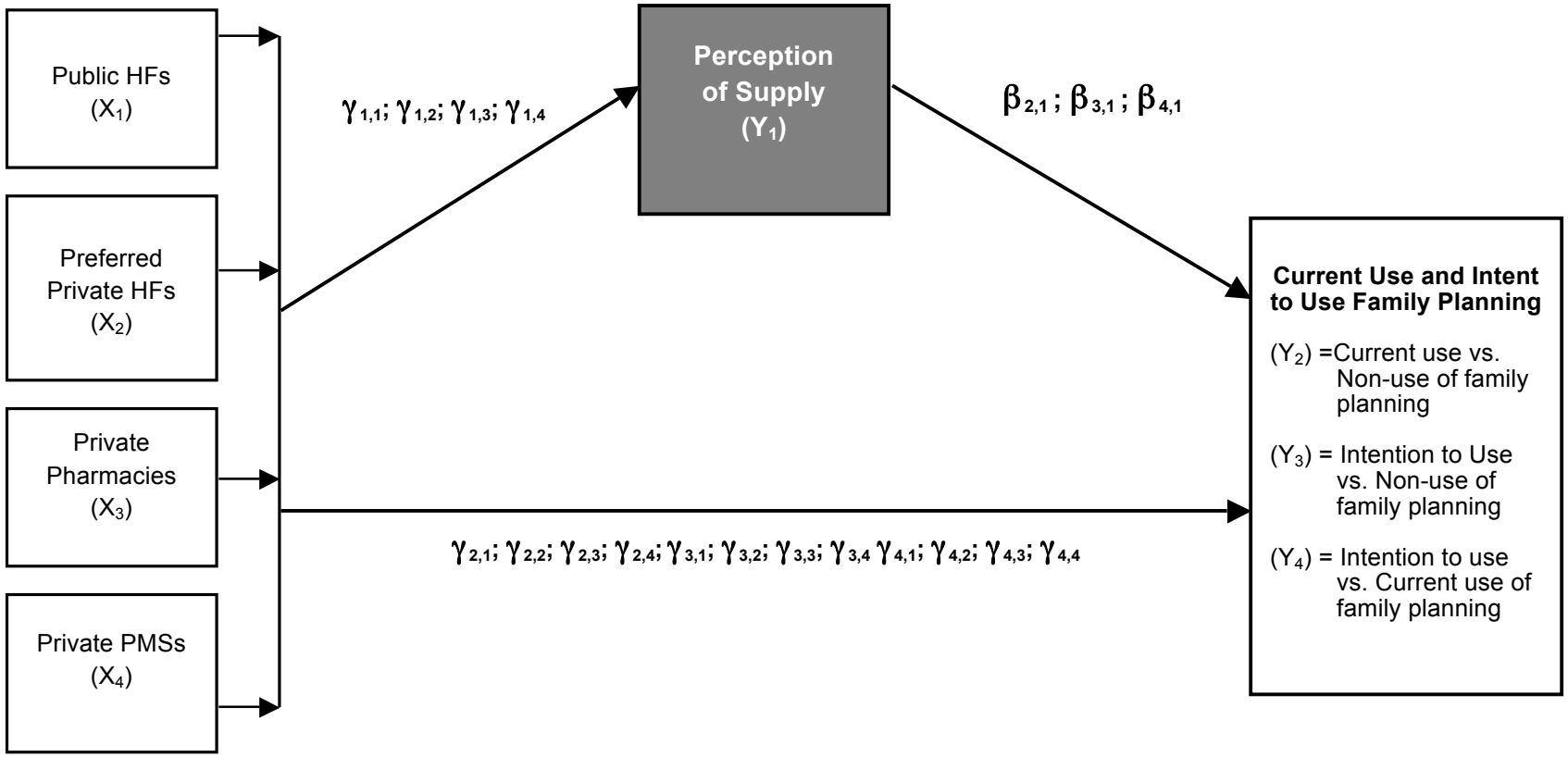
Y_2 = The outcome variable, the probit of current modern contraceptive use/non-use (intent to use FP excluded)

Y_3 = The outcome variable, the probit of intent to use FP/non-use (current modern contraceptive use excluded)

Y_4 = The outcome variable, the probit of intent to use FP/current use of modern contraception (not using and no intention to use excluded)

Path analysis is an appropriate approach for estimating this model because it can conduct mediational analysis- estimating the direct and indirect relationships between variables. Also, it can handle the levels of measurement, categorical and continuous, of all variables in the model. Finally, path analysis is appropriate for this study's complex sample design. The clustering of women at the EA level is taken into account at all stages of the model.

Figure 4.2: Operational Model with Equation Variables*



*Control variables are not shown.

Findings

Hypothesis 1: A better family planning supply environment will improve a woman's perception of her ability to access and obtain modern contraception.

Table 4.4 presents the frequency distributions of perception of FP supply by LGA for the whole sample, as well as for modern-method users only. It also shows the SISs for the key independent variables, public, preferred private, pharmacy and PMS SISs across LGAs. As shown, the distribution of the perception index is slightly skewed to the higher numbers (strongly agree that FP is accessible and available), with the unweighted mean across LGAs at 2.9 (SD= 0.83) and 3.3 (SD= 0.60) for all women and for the sample of modern contraceptive users respectively.

Table 4.5 presents the OLS regression coefficients and standard errors for the relationship between LGA-level SISs for each SDP type and perception of FP accessibility, as well as for other control variables. Results suggest that *hypothesis 1* is only supported in relation to the supply environment of private pharmacies. For every 1-unit increase in the SIS of private pharmacies, perception of access and availability goes up 0.01 units (p=0.001). The SISs representing the public sector HF, preferred private facility and private PMS FP supply environments had no statistically significant relationship with a woman's perception of supply above and beyond the influence of the covariates. That said, it is worth noting how much stronger the effect of other variables appears to be on perception of access and availability. It is difficult to interpret the difference in magnitude of effect, because the SIS variables are on such a different scale than the covariates. However, it does suggest that the supply environment is less influential than other socio-economic and demographic factors on perception.

Table 4.4: Percent distribution of perception of family planning (FP) supply and the supply index scores (SIS) by local government area (LGA) and type of FP service delivery point (SDP)

	Zaria		Kaduna			Abuja		Ilorin				Ibadan					Benin City		
LGA	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**
SISs across LGAs by type of SDP																			
FP SDP																			
Public HF	2.7	2.3	0.6	5.1	12.3	0.7	0.8	3.2	10.8	6.9	2.4	18.5	33.6	8.3	19.3	15.3	1.6	1.6	5.0
Pref Priv HF	3.0	0.6	1.2	16.5	27.6	2.0	0.7	4.7	15.5	9.5	2.5	7.9	15.6	8.9	4.3	8.3	5.7	3.3	16.3
Pharmacy	2.0	2.0	3.5	39.6	24.8	11.5	4.3	12.8	15.6	8.7	2.2	54.7	36.4	17.5	12.6	49.0	8.1	1.5	39.8
PMS	9.1	9.2	25.7	67.3	244.0	5.6	8.7	4.5	123.2	115.7	40.4	81.7	219.4	67.7	161.7	70.2	53.7	52.3	161.8
Percent Distribution of Perception of FP Supply Among All Women in Each LGA Sample																			
1	5.2	8.7	0.3	1.9	11.6	1.2	0.6	5.6	4.6	7.6	4.2	2.6	2.0	1.3	3.3	2.4	5.4	4.7	2.2
1.5	5.1	10.5	0.9	1.6	1.5	1.2	2.6	3.9	2.6	5.0	2.3	7.0	6.8	3.2	4.9	2.7	1.2	3.2	0.7
2	29.7	33.6	4.4	22.5	29.4	7.1	10.8	12.5	8.8	9.2	19.1	6.6	9.4	5.4	20.8	8.9	11.6	5.4	6.1
2.5	12.1	12.8	11.3	14.8	5.0	5.2	4.9	3.5	3.3	2.9	5.6	6.6	3.6	6.8	5.8	4.3	8.9	10.4	2.5
3	32.2	20.2	35.5	35.1	27.5	50.1	53.0	35.9	41.1	37.4	32.0	18.3	33.8	48.7	35.6	42.5	27.1	22.8	40.0
3.5	7.4	5.3	20.4	9.0	8.8	12.3	5.3	7.9	10.0	9.3	13.9	40.6	28.1	18.6	11.7	25.0	11.5	20.6	8.2
4	8.2	9.0	27.4	14.7	16.1	22.5	22.8	30.6	28.7	27.1	22.9	17.6	16.2	16.0	17.6	14.3	33.4	32.9	40.2
Missing	0.2	0.0	0.0	0.7	0.1	0.5	0.0	0.2	0.9	1.5	0.0	0.8	0.1	0.0	0.3	0.0	0.9	0.0	0.2
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total Number of women	1,042	1,307	761	595	638	1,251	408	313	518	749	319	457	552	168	580	574	547	706	654
Percent Distribution of Perception of FP Supply Among Modern Contraceptive Users																			
1	0.0	0.0	0.7	0.0	0.0	0.4	0.0	1.4	1.3	1.2	0.0	2.5	1.5	0.0	0.6	1.3	0.6	3.2	0.2
1.5	0.0	0.0	0.0	0.0	0.5	0.2	0.0	1.3	0.0	0.5	0.0	2.7	3.7	0.0	5.1	2.4	1.0	1.7	1.1
2	2.1	6.4	5.1	3.6	1.8	2.3	1.3	2.9	0.6	1.0	0.9	7.1	2.0	1.4	9.7	4.2	5.1	3.6	2.4
2.5	6.1	7.0	10.2	8.1	4.6	4.0	0.0	0.0	0.7	2.4	7.7	6.5	5.0	0.0	4.9	3.3	8.0	8.6	0.7
3	58.1	31.4	31.7	42.8	44.7	52.8	63.4	38.2	47.3	42.5	31.2	20.5	33.8	58.7	51.7	45.9	37.0	24.4	45.6
3.5	11.1	11.6	16.8	18.5	19.1	12.5	4.5	7.5	12.2	13.3	17.9	44.4	34.4	21.6	12.7	25.2	14.8	21.0	10.2
4	22.7	43.6	35.6	26.9	29.3	27.6	30.8	48.6	37.2	36.7	42.4	16.3	19.5	18.3	15.2	17.7	33.5	37.6	39.3
Missing	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.7	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4
Total	100	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Number of women Using Modern FP	96	60	262	89	110	456	162	73	161	193	93	183	203	70	190	206	142	230	236

Table 4.5: Results of ordinary least squares regression analyses examining the relationship between family planning (FP) supply and perception of FP supply

Variable	Perception of FP access and availability	
	β	(SE)
FP supply index score		
Public HFs	0.01	(0.006)
Preferred private HFs	-0.01	(0.007)
Private Pharmacies	0.01**	(0.002)
Private PMSs	-0.00	(0.001)
Age	-0.01**	(0.002)
Education		
None (r)	0.00**	——
Primary	0.13**	(0.033)
Secondary	0.28**	(0.034)
Higher	0.36**	(0.041)
Religion		
Christian (r)	0.00	——
Muslim	-0.21**	(0.024)
No religion/other	-0.53**	(0.103)
Wealth Quintile		
1 (r)	0.00	——
2	0.02	(0.028)
3	0.05	(0.031)
4	0.05	(0.033)
5	0.05	(0.036)
Parity	0.03**	(0.005)
Fertility Preferences		
No more child (r)	0.00	——
Wants child now (<2 yrs)	-0.07**	(0.025)
Wants child later (>2 yrs)	-0.14**	(0.033)
City		
Abuja (r)	0.00	——
Ilorin	0.16**	(0.053)
Kaduna	0.01	(0.057)
Zaria	-0.36**	(0.044)
Benin City	0.20**	(0.043)
Ibadan	-0.17	(0.089)
Perceived Social FP Use		
None use (r)	0.00	——
Some use	0.40**	(0.027)
Most use	0.40**	(0.052)
All use	0.50**	(0.070)
Does not know	0.13**	(0.027)

Notes: **Significant at p≤0.01;
(r) = reference category; —— = Not applicable;
Number of weighted observations=10,651

Hypothesis 2: The supply environment and a woman's perception of supply have direct, positive influences on the likelihood that a woman will use, intend to use or not use family planning.

Binary logistic regression models were run to test the direct effects of the continuous SISs for each SDP type on the dependent multinomial variable: FP intentions and use of modern contraception. (See Table 4.6) The continuous mediating variable, perception of supply, as well as the categorical and continuous control variables were also tested. To aid interpretation, the log-odds coefficients were converted to odds ratios. Many significant relationships were found between the control variables and the outcomes. However, because the focus of the present study is to evaluate the impact of the FP supply environment, as well as, a woman's perception of supply, on FP intentions and use of modern contraception, the findings will focus mainly on these variables.

The results suggest that the odds of a woman using modern contraception versus not using did not differ significantly in relationship to her LGA's public sector, preferred private sector, pharmacy or PMS index scores. Furthermore, none of the SDP index scores showed a predictive relationship with the odds that a woman would intend to use a form of FP versus not use one. Finally, with a 1-unit increase in the preferred private HF SIS the odds of a woman using modern contraception was 5% lower than the odds of her intending to use some form of FP. Yet, with a 1-unit increase in the PMS SIS the odds of a woman using modern contraception was 1% ($p<0.01$) *higher* than the odds of her intending to use a form of FP. The public sector and private pharmacy SISs showed no significant effect.

A woman's perception of contraceptive access and availability had much larger effects on her intention to use FP and her current use of modern contraception versus non-use. For every 1-unit increase in a woman's perception of supply, the odds of her using a modern form of contraception were 95% higher than the odds of her not using ($p<0.01$).

Also, with 1-unit increase in perception, she was 2.47 times more likely to intend to use FP in the next 12 months than she was to not use ($p<0.01$). There was no predictive relationship, however, between perception and the likelihood of use versus intention to use.

Hypothesis 3: A woman's perception of supply mediates the pathway between the supply environment and her contraceptive use outcome.

Hypothesis 3 was only supported for the pathways between the private pharmacy supply environment and the odds that a woman would intend to use FP versus not use it, and the odds that she would be currently using a form of modern contraception versus not-using. With perception of supply as a mediator, a 1-unit increase in the pharmacy SIS would increase the odds that she intended to use contraception, rather than not use, by .001 units ($P<0.01$); and it would increase the odds that she would *use* modern contraception versus *not* use by .001 units ($p<0.01$). Perception of supply did not mediate the causal pathway between the pharmacy index score and the odds that she would use versus intend to use; nor did it mediate the pathways from any of the other SDP index scores to any of the binary outcomes.

Table 4.6: Odds ratios and standard errors for the pathways from family planning (FP) supply and perception of FP supply to the outcomes of interest

Variable	Use vs. Non-use (n=10,497)		Intent to use vs. Non-use (n=8,335)		Use vs. Intent (n=4,020)	
	OR	SE	OR	SE	OR	SE
Perception of FP Supply	1.95**	(0.11)	2.47**	(0.19)	1.00	(0.08)
FP supply index score						
Public HFs	1.00	(0.01)	1.03	(0.02)	0.98	(0.02)
Preferred private HFs	0.98	(0.02)	1.03	(0.03)	0.95*	(0.02)
Private Pharmacies	1.00	(0.01)	0.99	(0.01)	1.01	(0.01)
Private PMSs	1.00	(0.00)	1.00	(0.00)	1.01*	(0.00)
Age	0.94**	(0.01)	0.89**	(0.01)	1.08**	(0.01)
Education						
None (r)	0.00	——	0.00	——	0.00	——
Primary	1.38*	(0.20)	1.26	(0.20)	0.90	(0.18)
Secondary	1.88**	(0.26)	1.25	(0.23)	1.20	(0.25)
Higher	2.47**	(0.41)	1.47	(0.38)	1.32	(0.32)
Religion						
Christian (r)	0.00	——	0.00	——	0.00	——
Muslim	0.68**	(0.06)	1.00	(0.12)	0.65**	(0.07)
No religion/other	1.20	(0.41)	2.66*	(1.10)	0.45	(0.25)
Wealth Quintile						
1 (r)	0.00	——	0.00	——	0.00	——
2	1.27*	(0.14)	0.82	(0.13)	1.49**	(0.21)
3	1.26*	(0.14)	1.01	(0.16)	1.33	(0.20)
4	1.39**	(0.15)	0.92	(0.15)	1.61**	(0.25)
5	1.27*	(0.16)	0.93	(0.18)	1.43*	(0.25)
Parity	1.14**	(0.02)	1.22**	(0.03)	0.88**	(0.03)
Fertility Preferences						
No more child (r)	0.00	——	0.00	——	0.00	——
Wants child now (<2 yrs)	0.34**	(0.03)	0.34**	(0.04)	1.21	(0.15)
Wants child later (>2 yrs)	0.72**	(0.09)	0.22**	(0.05)	3.35**	(0.80)
City						
Abuja (r)	0.00	——	0.00	——	0.00	——
Ilorin	0.85	(0.14)	0.86	(0.20)	0.95	(0.19)
Kaduna	0.47**	(0.09)	0.42**	(0.09)	1.12	(0.26)
Zaria	0.17**	(0.03)	0.52**	(0.10)	0.33**	(0.07)
Benin City	0.78	(0.14)	0.74	(0.16)	1.03	(0.22)
Ibadan	1.03	(0.25)	0.45*	(0.16)	1.88	(0.62)
Perception of Social FP Use						
None use (r)	0.00	——	0.00	——	0.00	——
Some use	2.34**	(0.23)	2.33**	(0.29)	1.14	(0.15)
Most use	3.72**	(0.53)	3.94**	(0.87)	1.04	(0.21)
All use	7.09**	(2.44)	1.09	(0.58)	5.64**	(2.88)
Does not know	1.06	(0.10)	1.19	(0.15)	1.03	(0.15)

Notes: *Significant at $p \leq 0.05$, **$p \leq 0.01$; (r) = reference category; —— = Not applicable

Discussion

The benefits of modern contraceptive use are well documented.[5, 6] Yet, there are countries, such as those in Sub-Saharan Africa, where contraceptive prevalence remains low, resulting in unmet need for FP, high fertility and rapid population growth.[19] Many proponents of FP argue that low contraceptive use is largely a result of poor access to FP services and unreliable availability of contraceptive commodities. In fact, it has been estimated that over 200 million women living in developing countries want to avoid pregnancy but are unable to do so because of contraceptive access and availability issues.[20]

Though access and availability are obstacles traditionally associated with rural FP, there are unanswered questions about the role of supply in urban areas that merit further attention. Furthermore, in light of rapid urbanization, especially in Sub-Saharan Africa, program planners and policy makers need to better understand the role of the urban supply environment in contraceptive use, in order to intervene effectively in urban areas.

This study explored how and whether a woman's immediate urban supply environment – i.e., aggregate LGA-levels of contraceptive access and availability – influences her intention to use FP and her use of modern contraception. It hypothesized both direct and indirect effects, specifically that: (1) a better FP supply environment will improve a woman's perception of both her ability to get to a place where FP services are offered, as well as her ability to obtain modern contraception once she has arrived; (2) a woman's surrounding FP supply environment and her perception of contraceptive supply have direct, positive influences on the odds that she will intend to use a form of FP or actually use a modern form of contraception; and (3) a woman's perception of supply mediates the pathway from her surrounding supply environment to her contraceptive use outcome.

Starting with the third hypothesis, we found only one significant indirect relationship from the supply environment through perception of supply to contraceptive use. Perception of supply seems to have a minimal, positive mediating effect on the causal sequence between the private pharmacy supply environment and a woman's intention to use FP versus her not using, as well as her actual use of modern contraception versus her non-use. However, the effect is quite small.

Working backwards in the model, a woman's perception of her ability to get to a place where FP services are offered, and her perception of being able to obtain modern contraception once she desires to use it, had, as expected, a significant positive effect on both whether she was intending to use FP versus not using, as well as whether she was actually using modern contraception versus not using. However, her perception of supply did not influence whether she intended to use FP versus whether she was actually using a form of modern contraception.

The *actual* level of access and availability among public sector health facilities had no relationship with any of the contraceptive use outcomes; and the private sector SDP types had little to no relationship with the odds of her intending to use FP versus not using, nor with the odds of her actually using a form of modern contraception versus not using. The logit model did find, however, that LGA-level access and availability among private PMSs significantly, though minimally, increased the odds that a woman living within the respective LGA would be using modern contraception versus intending to use FP.

These results suggest that a woman's perception of contraceptive access and availability is more important overall than the degree to which contraception is *actually* accessible, in advancing a woman through the Diffusion of Innovations framework for understanding the adoption of modern contraception. That said, the supply environment among private PMSs did, in fact, have a positive influence – above and beyond that of a woman's perception of supply – on the odds that a she would be using a modern form of

contraception versus only intending to use. It may be, therefore that *actual* supply among PMSs is what enables a woman to move from the second stage of the framework (becoming informed about and evaluating the means of fertility control) into the final two stages (experimenting and adopting a method). That is, once a woman has the desire to use FP, immediate access and availability of modern contraceptives among PMSs allows her to meet that demand.[34v] It is worth noting here that, according to the 2008 Nigeria DHS, 60% of modern contraceptive users in Nigeria obtain their method from the private sector, and of those women, 40% use private PMSs.[44] It is perhaps not surprising, therefore, that the PMS supply environment would have a small influence on shifting a woman from intent to use.

Next, considering its importance in influencing the outcome, the logical question becomes: what improves a woman's perception of access and availability? It had been hypothesized that a woman's immediate FP supply environment would have a positive influence on her perception of contraceptive supply by increasing her exposure to FP. However, according to the analysis, the relationships between the private and public supply environments and a woman's perception of supply were not significant. On the other hand, as a possible internal influence,[83, 84] a woman's perception of whether some, most, or all of her friends use FP versus her perception that none of them use, showed a significant positive relationship with her perception of supply (See Table 4.5 above). Assuming that the variable used in this study to measure a woman's perception of contraceptive access and availability is an indicator of her being informed about and having evaluated the means of fertility control, these results suggest that internal, social influences may be more important than external, supply influences in advancing a woman through the first two steps of the

[v] The negative influence of the preferred private HFs (See Table 5 above) is not discussed. There is no logical interpretation of these results, other than the fact that there may be aspects of the supply environment among preferred private HFs – that have not been measured here – that discourage women from actually using modern contraception, despite their initial intent to use FP.

Diffusions of Innovations framework: exposing a woman to the possibility of fertility control and passing on information about how and where to obtain it.

In sum, after controlling for influential covariates, analyses found that a woman's immediate urban supply environment had negligible influence in the operational model (See Figure 4.2 above). There are a few possible explanations for these findings. First, this study linked aggregate LGA-level SDP data with data collected from individuals living within the corresponding LGAs. Inherent to this approach is the assumption that the LGA is the relevant zone of influence, and that women are most exposed to and/or use the SDPs within their immediate surroundings. However, in urban areas – as compared to in most rural areas – there are a greater number of SDPs and travel between communities is easier. Therefore, unlike rural residents who tend to frequent SDPs based on proximity to residence and affordability,[28] women living in urban areas may not be as reliant on the SDPs within their immediate community and are likely exposed to different supply environments within the city. As a result, the influence of her immediate LGA supply environment is not relevant to her perception of supply, or even whether she uses or intends to use contraception. Finally, in urban areas, a woman's desire to space or limit fertility (which, as seen in Table 4.6 above, did significantly increase the odds of her using and intending to use versus not using at all) may overcome any obstacles related to contraceptive access and availability within her immediate community. That is, in an urban area, women who do not want to have a child in the next 2 years, have the option to find contraception elsewhere within the city.

Limitations

In addition to the supply environment measurement and sampling limitations described in Chapter 3 of this Dissertation, this study was also limited by its measure of "perception of supply". The model would have benefitted from more variables reflecting perception of supply at the individual level, such as perception of stockouts, cost, and travel

time to an SDP that provides FP.[91, 92] However, as stated in Chapter 3, these measurement limitations are inherent to any secondary data analysis. Also, the survey questions used in this study to reflect "perception of supply" were originally meant to measure self-efficacy. Therefore, the answers to these questions may reflect whether the woman felt competent (self-efficacious) to overcome perceived barriers to accessing and obtaining FP, rather than her thoughts about the barriers themselves. One might argue, however, that the distinction is subtle and likely insignificant when it comes to whether/how these feelings relate to the actual supply environment and her contraceptive use outcomes. Unfortunately, it is out of the scope of this study to measure how the interpretation of the questions may influence the outcome.

Another possible measurement limitation stems from the fact that analyzing aggregate LGA-level indices makes it difficult to ascertain which aspects of access and availability might be specifically influencing the outcomes in the model. However, the aim of the proposed study is to understand how a woman's immediate supply environment influences her use and intent to use modern contraception. Therefore, access and availability indices at the LGA level act as more qualitative, contextual variables.

Analytically, this study is limited by the cross-sectional nature of the data. Endogeneity is an obvious potential issue, as there is no way to control for bidirectional causality between the dependent and independent variables or between the mediator and dependent variable. For example, it is plausible that using a method of contraception predicts a woman's perception of supply. It can be argued that if she uses contraception, then she likely knows how to access it and feels capable of doing so. Conversely, just because a woman is using does not mean that she thinks it is easy to access and obtain. In fact, only 30% of the modern contraceptive users in this study's sample received the highest score, a 4 (four), on the perception index. The degree to which perception of supply

introduces bidirectional effects depends in large part on how the survey questions for perception of supply were translated and interpreted.

Also, it is unclear as to how/why the contraceptive resources are distributed the way that they are within and across urban areas in Nigeria. It may be that there is better access and availability in areas where there is existing contraceptive demand. That said, in Nigeria, FP supply is, for the most part, facilitated by donor and government influence rather than from market demand.[23, 93] Therefore, the distribution of contraceptive access and availability is likely not demand-based and does not introduce bidirectional causality.

Conclusion:

Currently, international donors focus much of their efforts on improving contraceptive access and availability in order to increase contraceptive use. This study suggests that immediate access and availability among PMSs may make it easier for a woman to move from intending to use FP to actually using modern contraception. However, overall, the results demonstrate that in urban areas, a woman's immediate contraceptive supply environment does not have a substantively significant influence on whether she uses or intends to use FP. Moreover, it suggests that in a country like Nigeria, a woman's *actual* immediate supply environment is less predictive of her contraceptive use outcome than her *perception* of that environment. And her perception of supply is facilitated by whether or not she thinks that her friends and family use contraception.

Certainly, contraception must exist and be accessible in order for a woman to use it once (and if) she desires to do so. However, the findings from this study highlight the importance of program planners and policy makers being aware of the point at which the market for contraception is saturated and when there is a reduced return on investment in expanding contraceptive access. Once that threshold has been met, promoting contraceptive use may be more efficacious through means of internal influence, such as

education, media and social networking, which make contraceptive use an accepted, normative behavior. Understanding these relationships will enable donors, policymakers and program implementers to make informed decisions about limited resource allocation and programming, thereby improving contraceptive use behaviors and decreasing overall urban fertility.

CHAPTER 5

Conclusions and Implications

Worldwide, fertility desires and rates have decreased over the past half-century.[79] However, there are countries, such as Nigeria, that remain in the early stages of the demographic transition.[3, 63] The consequences of high fertility pose a real concern for women, their families and the population as a whole.[5, 6] Considering changing age demographics due to previous high fertility trends, the need to decrease fertility levels among countries behind in the demographic transition is more pressing than ever;[3] and in light of rapid urbanization, the need to focus efforts on urban contraceptive use is key. Using Nigeria as a case study, this dissertation aimed to improve our understanding of contraceptive access and availability within the private and public urban family planning (FP) supply environment. It also aimed to provide insight into the potential influence of that environment on contraceptive use in a country still in the early stages of the demographic transition.

In brief, by creating and analyzing innovative measures of aggregate-level FP access and availability, the first paper found pronounced variability in the public and private sector supply environments across Nigeria's urban local government areas (LGAs), as well as a positive correlation between the two sectors. However, the data showed only localized associations between the FP supply environments and poverty, suggesting that the distribution of contraceptive access and availability is not wealth based in urban Nigeria.

Then, using the supply environment measures created in the first paper, the second paper tested the pathways from the LGA-level public and private sector supply environments to a woman's intent to regulate her fertility and to her actual use of modern contraception. It estimated direct effects from the supply environment onto the study outcomes, as well as indirect effects from the supply environment through a woman's perception of supply.

After controlling for influential covariates, this study found that a woman's immediate urban supply environment had negligible influence on her intent to use FP and her actual use of modern contraception. The only significant correlation that was found was between the level of access and availability among private Patent Medicine Stores (PMSs) and the odds that a woman would use a modern form of contraception versus intend to use FP. Strong correlations, however, were found between a woman's perception of supply and the likelihood that she would intend to regulate her fertility versus not use, as well as the likelihood that she would be using a form of modern contraception versus not using.

Programmatic Implications

As program planners and policy makers prepare to funnel more money into efforts to decrease unmet need for FP, there are lessons to be learned from this study that can be applied to other urban areas within Sub-Saharan Africa. First, it is important to remember the measures that were used to create the FP supply index scores (SISs) for this study: method availability, including the availability of important marker methods; stockouts of normally available methods; hours FP services are provided; requirements for partner consent; availability of socially marketed products; and density, based on the number of SDPs per square kilometer.

Let us begin with density: There is only minimal evidence in the literature that supports the importance of distance to FP services as a major obstacle to contraceptive

use.[30, 94] And it is rarely a reason given for non-use among women in developing countries who have an unmet need for FP.[40] As Cleland et al. (2006) point out, if women have a strong desire to delay or limit pregnancy, then they are often prepared to travel long distances for contraception, especially if those methods are long acting and require infrequent or no further visits, such as the intra-uterine device (IUD) and sterilization.[9] It comes as little surprise, then, that in urban areas, where there are a number of FP service outlets and options, the distribution of services (i.e., being more dense in some areas than in others) may not have a large influence on contraceptive use. That said, in this study, the SDP type with the highest density was the PMS. And it was the PMS index score that showed any effect on contraceptive use (despite the fact that it scored low on some of the other access components, such as requiring partner consent for use). It may be, therefore, that when urban women would like to use a non-clinical method, (i.e., the only methods that are available at PMS outlets) density of services plays a role in changing her intention to use FP to actual use of FP.

The other components of the SIS, mainly stockouts and method mix, have been shown in the literature to have an influence on whether women initiate or continue use of modern contraception. As Wang et al. (2012) found, even after controlling for FP service density, a woman's odds of using modern contraception increases by 50% for an average one extra contraceptive method that is available in a region.[53] Pariani et al. (1991) also demonstrate that most women know which contraceptive method they want to use when they seek out FP services, and failure to obtain that method is one of the biggest deterrents to adoption and sustained use.[95] In this study, however, the SDP types with the highest number and choices of methods available, as well as the fewest stockouts, were the public health facilities (HFs) and the preferred private HFs. Neither of these SDP types showed a significant relationship with any of the contraceptive use outcomes. In fact, preferred private HFs presented a significant (though likely substantively insignificant) negative relationship

on contraceptive use versus intent to use. It may be that the distribution of SDPs with high method mix and a low number of stockouts is not an important indictor for FP adoption and continuation. If the contraception that a woman wants to use is not available at her current location, then she can relatively easily go to another SDP.

Research Implications

In addition to the program and policy implications laid out in Chapters 3 and 4, this dissertation highlights the difficulty in linking data and asking questions related to the supply environment and contraceptive use outcomes. Although studies linking SDP and individual-level data have contributed to measuring the effects of the FP supply environment on contraceptive use, there are still limitations with the data linking process. As Wang et al. (2012) points out, due to sampling approaches, much of the data that are available do not enable linking SPDs and households at the cluster level. In order to overcome this obstacle, they suggest conducting surveys at SDPs within each of the individual sample clusters. However, problems also exist with this approach. As seen with Hong et al., (2006) women may not use the SDPs that are located within their immediate community.[56] Furthermore, as data suggest in Chapter 4 of this Dissertation, women living in urban areas are exposed to a greater density of services and may be more likely to use SDPs near high traveled areas, such as markets, public transportation depots, etc.[31]

Also, individual-level data, such as those collected by the Demographic Health Survey (DHS) and Measurement, Learning and Evaluation (MLE) project, are often compiled via a two stage sampling design that selects clusters based on population density. As seen in Chapter 3 of this Dissertation, the supply environment may not necessarily be distributed in relationship to population density. Therefore, the SDPs that fall within the selected clusters may not be representative of all SDPs within the area of study.[53] One way to address these obstacles is to conduct a census of all SDPs. Although ideal in theory,

conducting a census requires a level of funding and time that are often not available. This study, for example, had access to census data for the public sector as well as for private pharmacies in all but two cities, but most of the private sector was too big to survey all SDPs within it.

Another major limitation to data linking is that SDP-level data are many times not collected within the same time period as individual-level data.[53] The passing of time between the collection of the two data sets may introduce bias into the model estimates.[24, 53] In order to overcome this obstacle, data should be collected within the same time period. Though this study had the advantage of having access to SDP and individual-level data collected within the same time period, it was limited by the fact that it was cross sectional. As MLE enters the 2nd and 3rd wave of data collection, these limitations can be better addressed.

Finally, to answer questions that are specific to how commodity availability and access to services influence FP use, both SDP and individual-level questionnaires should be designed with these aims in mind. Additionally, further qualitative work focused on supply is needed to fill in the quantitative gaps, and give a more nuanced understanding of the supply environment and women's contraceptive use. Based on the literature and the lessons learned from this dissertation, specific recommendations include:

Recommendations for data collection

- Conduct prospective, longitudinal research[40, 96]
- Use a mixed method approach, incorporating both qualitative and quantitative methods
- Change survey methodology so that women who use traditional methods of contraception will be asked about their intent to use modern contraception in the future. Currently, due to skip patterns, these women not asked this question in the MLE and DHS questionnaires.[44]
- Ask more open-ended questions. For example, ask women whether they would "want to take a medication or use a device that prevents pregnancy. If they say no, ask them why.

If they are using a method, ask them whether they are satisfied with the method, its use, and its availability."[97]

Recommendations for data analysis

- Use a sampling strategy that allows multi-level modeling between the supply environment and individual level contraceptive use.[98]
- Address the complexity of multi-level influences on unmet need and influence of supply, by taking advantage of more powerful statistical approaches, such as Structural Equation Modeling (SEM) and Network Modeling.
- Run regressions to analyze how supply influences: the perception of supply and knowledge of modern contraception among non-users of FP; the use of clinical versus non-clinical method use; the intention to use modern methods versus the intention to use traditional methods; and unmet need for limiting versus spacing pregnancy

Concluding Remarks

No one argues that there is only one way to successfully promote contraceptive use in countries behind in the demographic transition. However, a primary focus on access and availability may not be the most successful or cost effective strategy in countries where there is decreased actual demand for services. Moreover, even in urban areas of these countries, where the potential FP market is larger, information regarding FP is better distributed and the infrastructure for delivering services is stronger than in most rural areas, the supply environment still seems to have little influence on demand generation.

Certainly, contraception must exist and be accessible in order for a woman to use it once (and if) she desires to do so. However, it is possible that in urban areas of countries like Nigeria the market for contraception has been saturated, and investment in expanding contraceptive access and availability (beyond avoiding widespread systemic stockouts)

should no longer be a principle priority. It may be more efficacious to generate demand for contraception – among women who want to limit or delay pregnancy – through means of internal influence, such as education, media and social networking, which make contraceptive use an accepted, normative behavior.

APPENDIX A: Steps for creating local government area (LGA) level variables that were used to measure family planning (FP) supply environment "strength" for each service delivery point (SDP) type

VARIABLE	SURVEY QUESTION	SDP LEVEL	LGA LEVEL
Method Choice: This continuous variable reflects FP availability and choice. It measures the mean. % of possibly available modern contraceptives that are *actually* offered across FP SDPs within the LGA.	*"Does this SDP provide 'X modern' family planning method?"* *	• Created a dichotomous variable indicating whether each method was provided: yes=1 and no=0 • Added the total # of methods available at each FP SPD • The range was from 0 to 10 among public and private HFs; and 0 to 6 among private pharmacies and PMSs	• Averaged the # of methods provided among each FP SDP type in the LGA • Divided that # by the # of methods that the respective FP SDP type could be offering, if they offered all possible contraceptive choices (10 for public and private HFs and 6 for PMSs and pharmacies) • Divided the final ratio by 100
Availability of Injectables: This variable is a marker of the availability of a commonly used form of modern FP in Nigeria. It measures the % of FP SDPs that provide an injectable form of contraception.	*"Does this SDP provide injectable contraceptives?"*	• Created a dichotomous variable indicating whether the SDP provides the method: yes=1 and no=0.	• Summed the total # of FP SDPs that provided injectables • Divided that # by the total # of FP SDPs within the LGA • Multiplied the final ratio by 100
Availability of IUD: This variable is a marker of superior method choice. It measures the % of private and preferred public FP HFs that provide an IUD within the LGA.	*"Does this SDP provide the IUD?"*	• Created a dichotomous variable indicating whether the SDP provides the method: yes=1 and no=0.	• Summed the total # of FP SDPs that provided IUDs • Divided that # by the total # of FP SDPs within the LGA • Multiplied the final ratio by 100
Stockouts: This variable is an indicator of stockout frequency. It measures the % of FP SDPs that had all normally available FP methods/brands in stock on the day of the interview.	*"Is X modern method currently available?"***	• Created a dichotomous variable indicating current method availability: yes=0 and no=1 ("Don't know" was marked as missing) • If the SDP did not carry a certain method, then the answer was not applicable • Summed the # of normally available methods/brands that were not available on the day of the interview • If the sum was greater than "0" (e.g., that SDP had at least 1 method out of stock), then that SDP was marked as "1"; otherwise the SDP was marked as "0"	• Summed the # of FP SDPs that had a stockout of at least 1 modern FP method • Divided that # by the total # of FP SDPs in the LGA • To put the measure on the same % scale as the other measures, subtracted the ratio from one and multiplied it by 100. *Example: [(Total # of SDPs at least one stockout on the day of the interview / Total # of FP SDPs) – 1] * 100*

* Modern methods included: 1) combined oral contraceptive pill; 2) progesterone-only pill; 3) emergency contraception; 4) male condom; 5) female condom; 6) injectables; 7) implants; 8) Intrauterine device (IUD); 9) female sterilization; and 10) male sterilization. The pharmacies and PMSs were not asked about forms of sterilization, the IUD or implants.

**These methods included: 1) combined oral contraceptive pill; 2) progesterone-only pill; 3) emergency contraception; 4) male condom; 5) female condom; 6) injectables; 7) implants; 8) Intrauterine device (IUD). Forms of sterilization were not included.

APPENDIX A: Continued

VARIABLE	SURVEY QUESTION	SDP LEVEL	LGA LEVEL
Hours provide FP services: This continuous variable is an indicator of physical access. It measures the average % of potential total hours (168 hours in a week: 24hrs * 7 days) that FP services/commodities are actually offered each week across SDPs.	PMSs and Pharmacies: *"On average, how many hours per day is this (SDP) open?; and on average, how many days per week is this (SDP) open?"* Public and Private HFs: *What time does the facility typically open?; What time does the facility typically close?; and how many days per week is FP counseling and services available?*	PMSs and Pharmacies: • Multiplied the avg # of hrs the SDP was open by the avg # of days the SDP was open each week. NOTE- Made the assumption that if a pharmacy or PMS offers FP, then they do so at all times that the facility is open.) Public and Private HFs: • Subtracted the time open from the time closed and multiplied that # by the # of days FP is offered in the week NOTE: For all data sets, responses- "Don't know" were recoded as missing and "Open 24 hours" were recoded as 24.	• Averaged the # of hrs that each SDP type was open in a week across the LGA (the range was 0 to 168 hrs) • Divided that # by the maximum # of hrs that each SDP could be/and are known, in cases, to be open (168 hrs a week: 24hrs * 7days) • Divided the final ratio by 100
Partner Consent: This variable is an indicator of administrative accessibility. It measures the % of FP SDPs in each LGA that require partner consent for at least one available modern method of contraception.	*"Do you require a partner's consent before you will provide X modern method?"*	• Created dichotomous variable indicating partner requirement for each method: yes=1 and no=0 • Summed the answers within each SDP • If the sum was > than "0" (e.g., that SDP required partner consent for at least one available FP method), then the SDP was marked as "1"; otherwise, it was "0"	• Summed the # of FP SDPs that were marked "1" • Divided that # by the total # of FP SDPs in the LGA • Multiplied the final ratio by 100
Socially marketed contraceptives: This variable is an indicator of economic accessibility. It measures the % of FP SDPs that provide socially marketed contraceptives (contraceptives that are often sold at a lower price than commercial brands) within each LGA.	*"Does this SDP have socially marketed contraceptive products in stock?"*	• Created a dichotomous variable indicating whether the SDP provides at least one socially-marketed brand: yes=1 and no=0.	• Summed the total # of FP SDPs that provide socially marketed contraceptives within the LGA • Divided that # by the total # of FP SDPs in the LGA. • Multiplied the final ratio by 100

APPENDIX B: Number of family planning (FP) service delivery points (SDPs) per local government area (LGA) used to create LGA-level strength of contraceptive access and availability*

			Private FP SDPs			
City	**LGA**	**Public health facility**	**Preferred private HF**	**Pharmacy**	**PMS**	**Total Sample of SDPs**
Zaria	Sabon Gari	15	11	8	25	59
	Zaria	13	4	11	29	57
Kaduna	Chikun	5-6	9	19-20	33	66-68
	Kaduna N	7	18-21	44-46	10-11	79-85
	Kaduna S	12-13	28	12	35	87-88
Abuja	AMAC	12-13	24	64-84	47-54	148-175
	Bwari	5	2	12	34	53
Ilorin	Ilorin E	4	8	22	2	36
	Ilorin S	5	9-10	8	16-17	38-40
	Ilorin W	9-10	15	14	32-33	70-72
	Offa	3	2-3	3	13-14	21-23
Ibadan	Ibadan N	8	2-3	20-26	12-13	43-50
	Ibadan NE	9	4	11-14	23-24	47-51
	Ibadan NW	4	4-5	9-10	11	28-30
	Ibadan SE	7	2	6-7	20	35-36
	Ibadan SW	8-9	4	32-35	15	59-63
Benin City	Egor	2	8-9	13-15	14-15	39-41
	Ikpoba-Okha	5	11-12	6	32-33	54-56
	Oredo	6-7	23-24	57-60	45-46	131-137
Total Sample		**141-145**	**191-198**	**373-413**	**450-464**	**1,155-1,220**

*Case-wise deletion was used to create the seven aggregate-level supply measures representing strength of FP supply environment. Therefore, in some cases a range of number of facilities has been given due to missing data for some measures.

APPENDIX C: Number of surveyed Patent Medicine Store (PMSs) versus actual number of PMSs in total frame by local government area (LGA)

City	LGA	Number of PMSs surveyed	Total number of PMSs in frame
Zaria	Sabon Gari	26	37
	Zaria	42	52
	Total Number	**68**	**89**
Kaduna	Chikun	39	310
	Kaduna N	11	103
	Kaduna S	40	340
	Total Number	**90**	**753**
Abuja	AMAC	60	128
	Bwari	34	72
	Total Number	**94**	**200**
Ilorin	Ilorin E	12	163
	Ilorin S	23	107
	Ilorin W	40	310
	Offa	14	14
	Total Number	**89**	**594**
Ibadin	Ibadan N	14	48
	Ibadan NE	26	94
	Ibadan NW	13	48
	Ibadan SE	21	78
	Ibadan SW	16	56
	Total Number	**91**	**324**
Benin City	Egor	15	123
	Ikpoba-Okha	34	251
	Oredo	46	353
	Total Number	**95**	**727**

REFERENCES

1. Cross H, Hardee K, Ross J. Completing the demographic transition in developing countries. *POLICY Occasional Paper #8* 2002.

2. Caldwell JC, Orubuloye IO, Caldwell P. Fertility decline in Africa: A new type of transition? *Population and Development Review* 1992;18(2):211-42.

3. United Nations, Department of Economic and Social Affairs, Population Division. World population prospects: The 2010 revision, highlights and advance tables 2011. Available at: http://www.un.org/esa/population/unpop.htm. Accessed February, 2012.

4. Gribble J. Contraceptive security: A toolkit for policy audiences. *Population Reference Bureau* 2010, April.

5. Potts M, Fotso J-C. Population growth and the Millenium Development Goals. *Lancet* 2007;369(9559):354-5.

6. Information and External Relations Division of UNFPA, the United Nations Population Fund. State of world population 2011: People and possibilities in a world of 7 billion. Available at: http://foweb.unfpa.org/SWP2011/reports/EN-SWOP2011-FINAL.pdf. Accessed June, 2012.

7. Bongaarts J. A framework for analyzing the proximate determinants of fertility. *Population and Development Review* 1978;4(11):104-32.

8. Guengant J-P, May JF. Impact of the proximate determinants on the future of fertility in sub-Saharan Africa. In: *Prospects for Fertility Decline in High Fertility Countries*. New York: Population Division, United Nations; 2001.

9. Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, Innis J. Family planning: The unfinished agenda. *Lancet* 2006;368(9549):1810-27.

10. Pritchett LH. Desired fertility and the impact of population policies. *Population and Development Review* 1994;20(1):1-55.

11. Freedman R. Do family planning programs affect fertility preferences? A literature review. *Studies in Family Planning* 1997;28(1):1-13.

12. Ratcliffe J. Social justice and the demographic transition: Lessons from India's Kerala State. *International Journal of Health Services* 1978;8(1):123-44.

13. Tsui AO. Population policies, family planning programs, and fertility: The record. *Population and Development Review* 2001;27(Supplement: Global Fertility Transition):184-204.

14. Population Reference Bureau. 2011 World population data sheet: The world at 7 billion. Available at: http://www.prb.org/pdf11/2011population-data-sheet_eng.pdf. Accessed June, 2012.

15. Sinding S. Overview and perspective. In: Robinson WC, Ross JA, eds. *The Global Family Planning Revolution: Three Decades of Population Policies and Programs*. Washington DC: The International Bank for Reconstruction and Development/ The World Bank; 2007.

16. United Nations, Department of Economic and Social Affairs, Population Division. World fertility policies 2011. Available at: http://www.un.org/esa/population/. Accessed February, 2012.

17. Mwaikambo L, Speizer I, Schurmann A, Morgan G, Fikree F. What works in family planning interventions: A systematic review. *Stud Fam Plann* 2011;42(2):67-82.

18. Bradley SE, Croft TN, Fishel JD, Westoff CF. Revising unmet need for family planning. *DHS Analytical Studies No.25* 2012.

19. Singh S, Darroch JE. Adding it up: Costs and benefits of contraceptive services-estimates for 2012. In: Guttmacher Institute and United Nations Population Fund (UNFPA), ed. New York; 2012.

20. Cohen SA. London summit puts family planning back on the agenda, offers new lease on life for millions of women and girls. *Guttmacher Policy Review* 2012;15(3):20-4.

21. PATH. Ensuring contraceptive supply security. *Outlook* 2003, July;20(3).

22. UK Government, Bill & Melinda Gates Foundation, in partnership with UNFPA, et al. Family Planning 2020. Available at: www.londonfamilyplanningsummit.co.uk. Accessed April 2013.

23. Setty-Venugopal V, Jacoby R, Hart C. Family planning logistics: Strengthening the supply chain. In: *Population Reports, Series J, No.51*. Baltimore: The Johns Hopkins Bloomberg School of Public Health, Population Information Program; 2002.

24. Magnani R, Hotchkiss D, Florence C, Shafer L. The impact of the family planning supply environment on contraceptive intentions and use in Morocco. *Studies in Family Planning* 1999;30(2):120-32.

25. Fotso JC, Ajayi JO, Idoko EE, et al. Family planning and reproductive health in urban Nigeria: Levels trends and differentials. In: *MLE Techinical Working Paper 2-2010*: Measure, Learning & Evaluation Project; 2011.

26. Winfrey W, Heaton L, Fox T, Adamchak S. Factors influencing the growth of the commercial sector family planning service provision. In: The POLICY Project, ed. *Working Paper No. 6*. Washington, DC: The Futures Group International; 2000.

27. Khan S, Mishra V, Arnold F, Abderrahim N. Contraceptive trends in developing countries. In: Macro International, ed. *DHS Comparative Reports #16*. Calverton, Maryland, USA; 2007.

28. Measurement, Learning & Evaluation Project, Nigerian Urban Reproductive Health Initiative, National Population Commission. 2010-2011Nigeria baseline survey for the Urban Reproductive Health Initiative. Available at: http://www.nurhi.org/sites/nurhi.k4health.org/files/2011_Nigeria_Urban_Reproductive_Health_Survey_FINAL.pdf. Accessed March 2012.

29. Hamid S, Stephenson R. Provider and health facility influences on contraceptive adoption in urban Pakistan. *International Family Planning Perspectives* 2006;32(2):71-8.

30. Tsui AO, Ochoa L. Source proximity as a determinant of contraceptive behavior: Evidence from cross-national studies of survey data. In: Phillips JF, Ross JA, eds. *Family Planning Programmes and Fertility*. Oxford: Oxford University Press; 1992.

31. Tsui AO, Hogan DP, Teachman JD, Chanes CW. Community availability of contraceptives and family limitation. *Demography* 1981;18(4):615-25.

32. Prata N, Vahidnia F, Potts M, Dries-Daffner I. Revisiting community-based distribution programs: Are they still needed? *Contraception* 2005;72:402-7.

33. Entwisle B, Rindfuss RR, Guilkey DK, Chamratrithirong A, Curran SR, Sawangdee Y. Community and contraceptive choice in rural Thailand: A case study of Nang Rong. *Demography* 1996;33(1):1-11.

34. Hammerslough CR. Proximity to contraceptive services and fertility transition in rural Kenya. *International Family Planning Perspectives* 1992;18(2):54-8.

35. Rodriguez G. Family planning availability and contraceptive practice. *International Family Planning Perspectives* 1978;4(4):100-15.

36. Speizer IS, Nanda P, Achyut P, Pillai G, Guilkey DK. Family planning use among urban poor women from six cities of Uttar Pradesh, India. *Journal of Urban Health* 2012;DOI: 10.1007/s11524-011-9667-1.

37. Stephenson R, Hennink M. Barriers to family planning service use among the urban poor in Pakistan. In: *Opportunities and Choices Working Paper No.2* 2004.

38. Kongsri S, Limwattananon S, Sirilak S, Prakongsai P, Tangcharoensathien V. Equity of access to and utilization of reproductive health services in Thailand: National Reproductive Health Survey data, 2006 & 2009. *Reprod Health Matters* 2011;19(37):86-97.

39. Foreit K. Addressing poverty: A guide for considering poverty-related and other inequities in health. In: USAID and MEASURE Evaluation; 2012, Accessed: http://www.cpc.unc.edu/measure/publications/ms-08-27:70.

40. Sedgh G, Hussain R, Bankole A, Singh S. Women with an unmet need for contraception in developing countries and their reasons for not using a method. In: *Occasional Report No. 37*. New York: Guttmacher Institute; June 2007.

41. Ezech AC, Kodzi I, Emina J. Reaching the urban poor with family planning services. *Studies in Family Planning* 2010;41(2):109-16.

42. Gillespie D, Ahmed S, Tsui A, Radloff S. Unwanted fertility among the poor: an inequity? *Bulletin of World Health Organization* 2007;85:100-107.

43. Federal Government of Nigeria. Health Policy Project. RAPID: The change we seek, Nigeria 2011. Available at: www.healthpolicyproject.com/pubs/37_FINALRAPIDNigeriaFertilityMCHNovFORWEfinal.pdf Accessed January 2013.

44. National Population Commission (NPC) [Nigeria] and ICF Macro. Nigeria Demographic and Health Survey 2008. In. Abuja, Nigeria: National Population Commission and ICF Macro; 2009.

45. World Health Organization Centre for Health Development UNHSP. Hidden cities: Unmasking and overcoming health inequities in urban settings 2010. Available at: http://www.hiddencities.org/report.html. Accessed February, 2013.

46. Sharma S, Dayaratna V. Creating conditions for greater private sector participation in achieving contraceptive security. *Health Policy* 2005;71:347-57.

47. Peters DH, Mirchandani GG, Hansen PM. Strategies for engaging the private sector in sexual and reproductive ealth: How effective are they? *Health Policy and Planning* 2004;19(Suppl. 1):i5-i21.

48. Berman P, Rose L. The role of private providers in maternal and child health and family planning services in developing countries. *Health Policy and Planning* 1996;11(2):142-55.

49. Brockerhoff MA. An urbanizing world. *Population Bulletin* 2000;55(3):1-44.

50. Central Intelligence Agency. The World Factbook. Available at: https://www.cia.gov/library/publications/the-world-factbook/geos/ni.html. Accessed March 2012.

51. Gage A, Zomahoun D. Influence of the service delivery environment on family planning outcomes in Nigeria. In: USAID | MEASURE Evaluation; 2011.

52. Guilkey D, Speizer I, Lance P. Study design for the Measurement, Learning & Evaluation Project. In: Project for the Urban Reproductive Health Initiative, ed.; 2009.

53. Wang W, Wang S, Pullum T, Ametepi P. How family planning supply and the service environment affect contraceptive use: Findings from four east African countries. In: *DHS Analytical Studies 26*. Calverton, Maryland, USA: ICF International; 2012.

54. Arends-Kuernning M, Mensch B, Garate MR. Comparing the Peru service availability module and Situation Analysis. *Studies in Family Planning* 1996;27(1):44-51.

55. Casterline J. The collection and analysis of community data: The WFS experience. In: Cleland J, Scott C, eds. *World Fertility Survey: Assessment of Its Contribution*. Oxford: Oxford University Press; 1987.

56. Hong R, Montana L, Mishra V. Family planning services quality as a determinant of use of IUD in Egypt. *MBC Health Service Research* 2006;6(79):1-8.

57. Koenig MA, Hossain MB, Whittaker M. The influence of quality of care upon contraceptive use in rural Bangladesh. *Studies in Family Planning* 1997;28(4):278-89.

58. Stephenson R, Tsui A. Contextual influences on reproductive health service use in Uttar Pradesh, India. *Stud Fam Plann* 2002;3(4):309-20.

59. Stash S. Explanations of unmet need for contraception in Chitwan, Nepal. *Studies in Family Planning* 1999;30(4):267-87.

60. SHOPS Project | USAID. Nigeria private health sector assessment. Brief. In: *Strengthening Health Outcomes through the Private Sector Project, Abt Associates*. Bethesda, MD; 2012.

61. United Nations Statistics Division | Department of Economic and Social Affairs | United Nations. Millennium Development Goals Indicators: The official United Nations site for the MDG Indicators 2012. Available at: http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=710&crid=566. Accessed February, 2013.

62. Nigeria National Population Commission. Population Policy and Action 2012. Available at: http://www.population.gov.ng/index.php/population-programmes/population-policy. Accessed January, 2013.

63. United Nations Development Programme (UNDP). Human Development Report. In. New York: Oxford University Press; 1990.

64. Guengant J-P, May J. Proximate determinants of fertility in sub-Saharan Africa and their possible use in fertility projections. In: *United Nations, Department of Economic and Social Affairs, Expert Paper No. 2011/13, eds.* Paper presented at the United Nations Expert Group Meeting on Completing the Fertility Transition, New York; 2011.

65. Guilkey D, Speizer I, Lance P. Study design for the Measurement, Learning & Evaluation Project. In: *Technical Working Paper*: Measurement, Learning & Evaluation Project for the Urban Reproductive Health Initiative; 2009.

66. Measurement Learning & Evaluation Project, Nigerian Urban Reproductive Health Initiative, National Population Commission. 2010-2011 Baseline facility survey for the Nigerian urban reproductive health initiative. Available at: http://www.urbanreproductivehealth.org/sites/mle/files/nurhi_baseline_facility_report_23feb12_final.pdf. Accessed March 2012.

67. Patouillard E, Goodman CA, Hanson KG, Mills AJ. Can working with the private for-profit sector improve utilization of quality health services by the poor? A systematic review of the literature. *International Journal of Equity in Health* 2007;6(17).

68. Montagu D, Prata N, Campbell MM, Walsh J, Orero S. Kenya: Reaching the poor through the private sector- a network model for expanding access to reproductive health services. In. Washington, DC: The International Bank for Reconstruction and Development/The World Bank; 2005.

69. MEASURE Evaluation PRH. Commodity Security and Logistics. Available at: http://www.cpc.unc.edu/measure/prh/rh_indicators/crosscutting/commodity-security-and-logistics-1. Accessed December 2011.

70. Consultive Group on International Agricultural Research. Poverty mapping: Income poverty, vitamin A and Iodine in Nigeria 2006. Available at: http://gisweb.ciat.cgiar.org/povertymapping. Accessed January, 2012.

71. Population C. States and local government areas: The population of the states and local government areas of Nigeria. Available at: http://www.citypopulation.de/php/nigeria-admin.php. Accessed October 2012.

72. Hanson K, Kumaranayake L, Thomas I. Ends versus means: The role of markets in expanding access to contraceptives. *Health Policy and Planning* 2001;16(2):125-36.

73. USAID | DELIVER PROJECT. Contraceptive security indicators 2010. Available at: http://deliver.jsi.com/dhome/resources/publications/allpubs/pubsforcountry?p_persp=PERSP_DLVR_CNTRY_NG. Accessed January 2012.

74. DELIVER and Task Order 1 of the USAID/Health Policy Initiative. Contraceptive security index 2006: A tool for priority setting and planning. In. Arlington, VA: DELIVER, for the U.S. Agency for International Development; December 2006.

75. Entwisle B, Hermalin A, Kamnuansilpa P, Chamratrithirong A. A multi-level model of family planning availability and contraceptive use in rural Thailand. *Demography* 1984;21(4):559-74.

76. Bongaarts J. The impact of population policies: Comment. *Population and Development Review* 1994;20(3):616-20.

77. Knowles JC, Akin JS, Guilkey DK. The impact of population policies: Comment. *Population and Development Review* 1994;20(3):611-15.

78. Bongaarts J, Mauldin WP, Phillips J. The demographic impact of family planning programs. *Studies in Family Planning* 1990;21(6):299-310.

79. Sinding S. The great population debates: How relevant are they for the 21st century? *American Journal of Public Health* 2000;90(1841-5).

80. Rogers EM. Diffusion of Innovations. 3rd ed. New York: Free Press; 1983.

81. Wejnert B. Integrating models of diffusion of innovations: A conceptual framework. *Annu Rev Sociol* 2002;28:297-326.

82. Rosero-Bixby L, Casterline J. Interaction diffusion and fertility transition in Costa Rica. *Social Forces* 1994;72(2):435-62.

83. Rosero-Bixby L, Casterline JB. Modeling diffusion effects in fertility transition. *Population Studies* 1993;47(1):147-67.

84. Bongaarts J, Watkins SC. Social interactions and contemporary fertility transitions. *Population and Development Review* 1996;22(4):639-82.

85. Watkins SC. The fertility transition: Europe and the Third World compared. *Sociological Forum* 1987;2:645-73.

86. Ajzen I, Madden TJ. Prediction of goal-directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental social psychology* 1986;22:453-474.

87. Curtis S, Westoff CF. Intention to use contraceptives and subsequent contraceptive behavior in Morocco. *Studies in Family Planning* 1996;27(5):239-50.

88. Tan PC, Trey NP. Do fertility intentions predict subsequent behavior? Evidence from Peninsular Malaysia. *Studies in Family Planning* 1994;25(4):222-231.

89. Mackinnon DP. Introduction to Statistical Mediation Analysis. New York London: Lawrence Erlbaum Associates; 2008.

90. Amemiya T. Introduction to Statistics and Econometrics: Harvard University Press; 1994.

91. Cornelius RM, Novak JA. Contraceptive availability and use in five developing countries. *Studies in Family Planning* 1983;14(12):302-17.

92. Welsh MJ, Stanback J, Shelton J. Access to modern contracepion. *Best Practice & Research Clinical Obstetrics and Gynaecology* 2006;20(3):323-38.

93. United Nations, Department of Economic and Social Affairs, Population Division. World Contraceptive Use 2010. In; 2011.

94. Bongaarts J, Bruce J. The causes of unmet need for contraception and the social content of services. *Studies in Family Planning* 1995;26(2):57-75.

95. Pariani S, Heer D, VanArsdo M. Does choice make a difference to contraceptive use? Evidence from east Java. *Studies in Family Planning* 1991;22(6):384-90.

96. Frankenberg E, Sikoki B, Suriastini W. Contraceptive use in a changing service environment: Evidence from Indonesia during the economic crisis. *Studies in Family Planning* 2003;34(2):103-16.

97. Foster DG. An unmet need...for a better measurement of contraceptive need. In: *Advancing New Standards in Reproductive Health: News and views on reproductive health research*: Bixby Center for Global Reproductive Health; 2011.

98. Ashraf N, Field E, Lee J. Household bargaining and excess fertility: An experimental study in Zambia. 2010:1-27.