A Multilevel Logit Estimation of Factors Associated With Modern Contraception in Urban Nigeria

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This study aimed to estimate the multilevel determinants of modern contraceptive use among reproductive-age women living in six cities in Nigeria (Abuja, Benin, Ibadan, Ilorin, Kaduna, and Zaria). Data from cross-sectional surveys conducted between 2010 and 2011 were linked to provide information on five hierarchical levels of the Socioecological Framework. Multilevel logit models estimated the odds of modern contraceptive use among 9,473 non-pregnant married/cohabiting women aged 15–49 years living in 488 clusters. About 25 percent of the women reported using modern contraceptive methods at the time of survey. Individual-level factors found to have a positive association with modern contraceptive use were parity, family planning self-efficacy, and partner discussion about fertility desires while perception of negative attitudes from community member about contraceptive use was negatively associated with modern contraceptive use ($p < 0.05$). At the community level, media exposure to family planning messages and city of residence were significantly associated with modern contraceptive use in the studied sample ($p < 0.05$). The positive association between parity and modern contraceptive use was modified by the community's ideal family size. The results of this study support the evidence for multilevel interventions as a way to improve the prevalence of modern contraceptive use in urban Nigeria.

KEY WORDS: modern contraceptive use, urban Nigeria

Introduction

Currently, a woman of childbearing age in Nigeria—a west African country—will have on average 5.5 children during her lifetime (NPC Nigeria & ICF Macro, 2014). According to the 2015 World Population Data, Nigeria is currently the most populous country in Africa with a population of 182 million people (PRB, 2015). With an annual population growth rate of about 3 percent, demographers postulate that Nigeria's population will rise to 400 million, making it the fourth most populous country by 2050 (Fotso et al., 2011; PRB, 2015). Currently, about one-half of Nigeria's population lives in urban areas (United Nations, 2015). Urbanization in Nigeria is said to be driven by high fertility more so than rural-to-urban migration and according to the United Nations, two-thirds of urban residents live in slums (UNFPA, 2007). Although evidence suggests that

urban women are more likely to practice family planning compared to their rural counterparts, recent studies find that this urban advantage may be misleading given low levels of contraceptive use among the urban poor. Within urban settings, the poor have been shown to have more social and health disadvantages compared to their wealthier counterparts and, in some cases, compared to those living in rural areas (Ezeh, Kodzi, & Emina, 2010; Magadi, Zulu, & Brockerhoff, 2003). For instance, in several sub-Saharan African countries including Nigeria, Magadi et al. (2003) found that the urban poor women experienced more adverse maternal health outcomes compared to the urban rich women while Ezeh et al. (2010) found that the level of modern contraceptive use among the poorest married women in urban areas was close to or less than that of their counterparts in rural areas. The urban population in Nigeria is expected to triple by 2050, making it the third largest absolute increase in urban population globally, after China and India (United Nations, 2015). To curb the rapid urban population growth and possibly urban poverty in Nigeria, there is a need to improve access to and use of modern contraceptive methods.

Family planning improves maternal and child health through prevention of unwanted pregnancies and prolongation of the inter-pregnancy interval, increases women's empowerment through education and subsequent participation in the workforce, and sustains the environment through population control (Bongaarts, Mauldin, & Phillips, 1990; Canning & Schultz, 2012; Cleland, Conde-Agudelo, Peterson, Ross, & Tsui, 2012). Despite these benefits, not all women who want to avoid getting pregnant use effective contraceptive methods. The modern contraceptive prevalence rate, defined as the percentage of reproductive-age women (ages 15–49) who are using a modern contraceptive method at a specified time, is a commonly used indicator for assessing family planning at the population level (MEASURE Evaluation, 2014). Several studies in the family planning literature have assessed the determinants of modern contraceptive use (Campbell, Sahin-Hodoglugil, & Potts; Welsh, Stanback, & Shelton, 2006). However, there are gaps in the current literature. One such gap is on the community-level determinants of modern contraceptive use. Many studies focus on the effects of individual-level factors such as the women's age, education, and parity on the probability of using modern contraceptive methods with very few studies examining the effects of the household and/or community factors on modern contraceptive use. In the last decade, however, there has been a surge in studies assessing contextual effects on health behaviors. Researchers have found that the characteristics of a community influence the practice of health behaviors including modern contraceptive use (Dereuddre, Van de Velde, & Brackle, 2016; Janevic, Pallas, Ismayilova, & Bradley, 2012; Kaggwa, Diop, & Storey, 2008; Stephenson, Baschieri, Clements, Hennink, & Madise, 2007). For example, Dereuddre et al. (2016) found that country-level gender equality was positively associated with modern contraceptive use among European women. Also, Janevic et al. (2012) found that among women living in 10 European and Asian countries, women who live in poor communities were less likely to report modern contraceptive use compared to those who live in wealthier communities.

Stephenson et al. (2007) found that among women in six sub-Saharan African countries, there were significant associations between modern contraceptive use and community factors such as level of female education, average household wealth, dominant religion, approval of family planning, and level of annual rainfall in the community. Likewise, Kaggwa et al. (2008) found that community exposure to family planning media messages increased the odds of modern contraceptive use while the average number of children per community decreased the odds of modern contraceptive use among women in Mali. A 2015 study on state-level variations in modern contraceptive use in Nigeria found that community factors such as education, workforce participation, and decision-making power of the studied women were positively associated with their modern contraceptive use (Lamidi, 2015). These findings highlight the relevance of accounting for community effects on modern contraceptive use.

Despite the recent increase in the number of studies utilizing a multilevel approach in assessing modern contraception, gaps still exist on the associations between community factors and modern contraceptive use. A majority of the studies focused on assessing the effect of community socioeconomic status (wealth, education, and employment status) on modern contraceptive use (Aremu, 2013; Dias & de Oliveira, 2015; Lamidi, 2015). These studies show a positive association between community socioeconomic status and modern contraceptive use; however, there is a need for evidence on other relevant community factors such as access to health services and fertility norms. Also, most of the prior studies included women living in both rural and urban areas, only controlling for the type of residence (Dias & de Oliveira, 2015; Janevic et al., 2012; Lamidi, 2015; Ngome & Odimegwu, 2014; Stephenson et al., 2007). This type of analysis ignores the heterogeneous effect of community wealth on modern contraceptive use among urban residents as the effect on the urban rich often masks that on the urban poor giving a false impression of an urban advantage. There is a dearth of knowledge on contraceptive use among urban residents. This study fills that gap by answering the following three research questions:

1. Which individual-level factors are associated with modern contraceptive use among non-pregnant reproductive-age women living in urban Nigeria?
2. Controlling for individual-level factors, which community-level factors are associated with modern contraceptive use among these women?
3. Do community-level factors modify the association between individual-level factors and modern contraceptive use among these women?

Theoretical Framework

This study used the Socioecological Framework to conceptualize the multiple levels of influence on modern contraceptive use. The framework was developed by Urie Bronfenbrenner in the 1970s and describes the complex relationships between individuals and their physical and social environments (Bronfenbrenner, 1977, 1979). An adapted version of the framework that models the determinants of a health behavior was developed by McLeroy, Bibeau, Steckler, and Glanz

(1988); the adapted framework classified behavioral determinants into five hierarchical levels of influence—intrapersonal, interpersonal, institutional, community, and societal level. These levels are nested within each other and are hypothesized to interact to have differential effects on a behavioral outcome. In this study, the behavior of interest is modern contraceptive use. The intrapersonal level includes the characteristics of the woman that may influence her probability of modern contraceptive use such as her age, education, religion, wealth, and parity. The interpersonal level includes factors that reflect the woman's interactions with people within her immediate social network such as her male partner or other women in her neighborhood. These interpersonal interactions have been shown to influence the woman's probability of practicing contraception (Paek, Lee, Salmon, & Witte, 2008). The factors that exist at the institutional level include the access to and availability of contraceptive services in the health institutions within the community. A recent study in Nigeria found that women who reported having access to health facilities within their communities had higher probability of using modern contraceptive methods (Ejembi, Dahiru, & Aliyu, 2015). The community-level factors include the characteristics of the community in which the woman resides; for example, studies have found that the community poverty level and/or norms about desired family size influence the odds of modern contraceptive use among women living in those communities (Elfstrom & Stephenson, 2012). The societal level includes the family planning policies and programs that exist in the local, state, and/or federal government; these policies and programs influence access to family planning services and thus affect the probability of women in those communities using modern contraception (Bongaarts, 2014). In order to adequately measure the determinants of modern contraceptive use, there is a need to account for the direct and interaction effects of the factors that exist on the multiple socioecological levels on modern contraception.

Data and Methods

Data

This study used data collected in Nigeria by the Measurement, Learning & Evaluation (MLE) project. The MLE project is the evaluation component of the Urban Reproductive Health Initiative, a multi-country family planning program implemented in select cities in four developing countries: India, Kenya, Senegal, and Nigeria (MLE Project, 2014). The program in Nigeria—Nigerian Urban Reproductive Health Initiative (NURHI)—aimed to reduce the barriers to modern contraceptive use. To evaluate NURHI, the MLE project conducted multiple surveys over a five-year period. This study used data from baseline surveys: women's survey, facility audit, and service provider survey. These surveys were conducted in six cities purposively selected by the NURHI program: Abuja, Benin, Ibadan, Ilorin, Kaduna, and Zaria. These cities are located in the northern and southern regions of the country.

Women's Survey. A two-stage cluster sampling design was used to select a representative sample of women in each city. A sampling frame based on the 2006 census (most recent) was used to select a sample of enumeration areas. Enumeration areas are subdivisions of localities; localities are the smallest administrative units in Nigeria. These enumeration areas were used as the primary sampling units and are hereafter termed clusters. In the first stage of sampling, a random sample of urban clusters was selected in each city. The number of clusters selected ranged from 74 in Zaria to 102 in Ibadan resulting in a total of 491 clusters across all cities. For the second stage of sampling, a random sample of 41 households was selected within each cluster. Women aged 15–49 years who resided in the selected households or were visitors present on the night before the survey were eligible to participate in the survey. Following informed consent, the women were interviewed by trained female interviewers using paper questionnaires at private locations within or close to their residence. The women's survey was conducted between October 2010 and April 2011. A total of 16,144 women completed the survey (95 percent response rate). Detailed information about the survey is published elsewhere (MLE Project, NURHI, & NPC Nigeria, 2011).

Facility Audits and Service Provider Survey. Detailed information about the facility audits and service provider survey are published elsewhere (MLE Project, NURHI, & DRMC, 2011); a summary is provided below. The facility surveys were conducted between February and June 2011 in three facility types: health facilities, pharmacies, and drug stores. A list of facilities in the target cities was obtained from relevant agencies such as the Federal and State Ministries of Health. This list was updated during a verification process by visiting all listed facilities and confirming they were open for business. The geographic information system (GIS) points of all verified facilities were collected using global positioning system devices. A master file of the verified facilities was used as the sampling frame.

1. Health facility audit and service provider survey: During the verification process, information was obtained on whether the health facility provided maternal, neonatal, and child health (MNCH) services and on the antenatal care (ANC) client load. The health facilities were classified as high-volume if they provided MNCH services and had ANC client load of more than 1,000 clients per year. In addition, during the women's survey, the women were asked to name the facilities they go to for MNCH services. The most frequently cited facility in each cluster was considered the preferred facility for that cluster. This information was linked to the master file of verified health facilities. The sample for the health facility audit was made up of all high-volume health facilities, all public-sector facilities, and a sample of the preferred facilities. A total of 400 health facilities (hospitals, health centers, maternity homes, nursing homes, and child welfare clinics) across the six cities were surveyed (96 high-volume facilities and 304 non–high volume facilities).

A survey of service providers in the selected health facilities was conducted. Service providers were eligible to participate in the survey if they met the following criteria: (i) medically trained; (ii) permanently employed (full time or part time); and (iii) provide direct clinical reproductive health services. The list of eligible service providers that were on duty on the day of the facility audit was used as the sampling frame. A maximum of four service providers per facility was sampled. In facilities where there were less than four eligible service providers, all service providers were sampled; while in facilities where there were more than four eligible service providers, a simple random sampling procedure was used to select four service providers. A total of 1,479 service providers in all health facilities were interviewed. Information on the providers' demographic characteristics, qualifications, previous and recent family planning training, and provision of family planning services were collected.

2. Pharmacy audit: A random sample of pharmacies was selected from the master file of pharmacies in the six cities. Upon informed consent, the managers of the selected pharmacies were interviewed to obtain information on the infrastructure, client load, provider characteristics, type of services provided, and types of modern contraceptive methods offered. A total of 433 pharmacies were surveyed—96 in Abuja, 89 in Benin, 97 in Ibadan, 48 in Ilorin, 80 in Kaduna, and 23 in Zaria.
3. Drug store audit: A random sample of drug stores was selected from the master file of drug stores in the six cities. The difference between drug stores and pharmacies is that registered pharmacists own pharmacies while non-medical personnel usually own drug stores. Upon informed consent, the managers in the selected drug stores were interviewed to obtain information on the infrastructure, client load, provider characteristics, type of services provided, and types of modern contraceptive methods offered. A total of 555 drug stores were surveyed—94 in Abuja, 95 in Benin, 90 in Ibadan, 90 in Ilorin, 90 in Kaduna, and 96 in Zaria.
4. GIS dataset: This dataset contained information on the longitude, latitude, and distance of the 1,388 facilities (health facilities, pharmacies, and drug stores) from the centroids of 491 clusters.

Data from the aforementioned datasets were linked to provide information on the factors that exist on the five levels of the Socioecological Framework. First, the service provider dataset was linked to the health facility dataset to provide information on the average provider characteristics per health facility. Three health facilities were dropped from the sample because they had missing service provider data. The GIS dataset was then linked to the facility dataset containing data from the three facility types. Facilities ($n = 71$) were dropped from the sample if they had missing GIS data (27 health facilities, 12 pharmacies, and 32 drug stores). Data on facilities within a one-kilometer radius of the centroids of the clusters were retained. The one-kilometer radius was thought to be an appropriate distance that women may be willing to travel for health services in

densely populated urban areas. This restriction resulted in a sample of 1,154 facilities within a one-kilometer radius of centroids of 454 clusters. There were 37 clusters with no facility type within a one-kilometer radius of their centroids. The facility dataset was then linked to the women's dataset. The women's dataset contained information on 16,144 women in 491 clusters. Women were dropped from the sample for any of the following reasons: (i) not in union at the time of survey (n = 5,963); (ii) pregnant at the time of survey (n = 465); (iii) had missing data on any of the variables (n = 93); and (iv) lived in clusters with fewer than five women (n = 3). The rationale for dropping women in less-populated clusters was based on a Monte Carlo simulation study that found that multilevel models provide reliable and valid estimates if the groups had at least five observations (Clarke, 2008). Thus, the analytical sample was made up of 9,620 nonpregnant women aged 15–49 years who were either married or in-union living in 488 clusters with information on the characteristics of 1,154 facilities located within a one-kilometer radius of the centroids of 454 clusters. Thus, there were 34 clusters where women lived but there were no facilities within a one-kilometer radius of the centroids of the clusters. On average, there were 36 women per cluster with a range of 6–71 women per cluster.

Dependent Variable

A binary dependent variable measured modern contraceptive use at the time of survey. This variable was created from two sequential questions from the women's survey that asked: (i) "*are you (or your partner) currently doing something or using any method to delay or avoid getting pregnant*?" and (ii) "*which method(s) are you (or your partner) currently using*?" Women were coded "1" if they responded affirmatively to the first question and, in response to the second question, chose any of the following contraceptive methods: daily pills, injectables, implants, intrauterine devices, sterilization (female or male), diaphragms, emergency pills, spermicides (gels or foams), condoms (male or female), and lactational amenorrhea; or coded "0" otherwise.

Independent Variables

The independent variables were identified from previous literature and conceptualized to exist on multiple levels of the Socioecological Framework.

1. Intrapersonal factors: The factors on this level were from the women's dataset. Precisely, the women's ages at the time of survey were categorized into "15–24," "25–34," and "35–49" age groups and their educational attainment was grouped into "no formal education," "primary," "secondary," and "tertiary" education. Religion was dichotomized into "Muslim" versus "non-Muslim." The number of living children was categorized into "0–1," "2–4," or "5 or more" children. The employment status was assessed using two questions that asked the women if they had done any work in the past year and whether they were

paid in cash or kind for the work. Women who were paid in cash or kind for their work were coded "1" while those who were not paid or did not work were coded "0." The wealth status was assessed based on principal component analyses of ownership of several household items and categorized into three groups—poor, middle, and rich households. The women's self-efficacy toward family planning use was assessed with an 8-item Likert scale. This scale had a Cronbach's alpha value of 0.93 and scores ranged from 0 to 8; increasing scores indicated higher levels of self-efficacy toward family planning use. The scores were further categorized into "low" (score = 0–2), "medium" (score = 3–5), and "high" (score = 6–8) levels of family planning self-efficacy.

2. Interpersonal factors: Two variables from the women's dataset assessed interpersonal interactions. The first variable was measured using two questions asked of women who reported having a partner: (i) "*Have you and your spouse/partner ever discussed the number of children you would like to have?*" and (ii) "*Have you ever discussed the use of family planning method with your spouse/partner?*" The response options were "yes" or "no." These responses were recoded to a new variable termed "fertility discussion with male partner" that had three categories: "never discussed desired parity or family planning," "discussed either desired parity or family planning," and "discussed both desired parity and family planning." The second variable at this level was measured with this question: "*Do you think there are some people within this community who will call you bad names or avoid your company if they knew that you were using a family planning/contraceptive method?*" The response options were "yes" or "no."
3. Institutional factors: Three variables were created using information from the facility, service provider, and GIS datasets to measure geographic access to family planning services in the three facility types located within a one-kilometer radius of the centroids of the clusters: "access to family planning services in health facilities," "access to family planning services in pharmacies," and "access to family planning services in drug stores." The measures used to create these variables included characteristics of the facility types: (i) at least one facility type within the specified distance; (ii) at least one facility type provides family planning services; (iii) at least one facility type has a family planning trained provider; (iv) at least one facility type provides ideal contraceptive method mix (a combination of long and short acting modern contraceptive methods); (v) at least one facility type did not have contraceptive method stock-out in the past year; and (vi) at least one facility type does not require partner consent for contraceptive method provision. These measures were summed for each facility type with scores ranging from 0 to 6; increasing score indicated increasing access to family planning services in the facility type. These facility variables were defined at the cluster level and then matched to women living in those clusters. There were 34 clusters where women lived but there was no facility type within a one-kilometer radius; women in those clusters were classified as having an access score of 0. The scores were further categorized into "no access" (score = 0), "low access" (score = 1–4), and "high access" (score = 5–6).

4. Community factors: The community factors were created by aggregating the women's individual responses to the cluster level, subtracting the index woman's response, and dividing by the number of other women in the cluster to give a cluster-level mean value reflective of the characteristics of other women in the same cluster. Three variables from the women's dataset included at this level assessed whether the woman lived in: (i) poor clusters (more than 50 percent of other women in the same cluster live in poor households); (ii) large ideal family size clusters (other women in the same cluster reported wanting an average of five or more children); and (iii) family planning media exposed clusters (more than 50 percent of the other women in the same cluster reported being exposed to family planning messages in the media in the three months prior to survey). These variables were each dichotomized into "yes" or "no."
5. Societal factors: The city variable was used as a proxy for the local and state government family planning policies and programs the women within the cities were experiencing at the time of survey. Six cities were included in this study: Abuja, Benin, Ibadan, Ilorin, Kaduna, and Zaria.

The study participants provided verbal informed consent prior to study participation, which was documented by the interviewers. The rationale for verbal, rather than written informed consent, was based on the inclusion of sensitive sexual and reproductive health information in all the surveys. All study protocols, documents, and procedures were approved by the National Health Research Ethics Committee (NHREC) Nigeria and the Institutional Review Board at the University of North Carolina at Chapel Hill, USA.

Statistical Analyses

Multilevel models were run to estimate the associations between the socio-ecological factors and modern contraceptive use. Women were nested within clusters in this study; thus, the assumption of independence of observations and residuals together with the assumption of equal variance across the clusters were violated. This clustering effect, if not accounted for, will result in inflation of the estimated standard errors leading to incorrect significance testing of the study hypotheses. Multilevel models assume hierarchical data structure with the dependent variable measured at the lowest level and the independent variables measured at the hierarchical levels, correcting any clustering effects (Rabe-Hesketh, Skrondal, & Pickles, 2005). Also, multilevel models partition the variance in the dependent variable into within-cluster variance (differences between observations within the same cluster) and between-cluster variance (differences between observations in different clusters). In this study, multilevel models were estimated sequentially starting with a null model (intercept-only model) that tested the null hypothesis that there was no between-cluster variation in modern contraceptive use. Given the binary dependent variable, multilevel logit models were fitted. In multilevel logit models, the within-cluster variance

(σ^2) is standardized and fixed at the value of $\pi^{2/3}$ (Rabe-Hesketh, Skrondal, & Pickles, 2004). The null model (Model 0) provided an estimate of the between-cluster variance, which was used to calculate the intra-cluster correlation coefficient (ICC) and the median odds ratio (MOR). ICC is used for linear models while MOR is used for logit models as it transforms the between-cluster variance to an odds ratio scale aiding interpretation (Merlo et al., 2006). All analyses were weighted to account for the study design and nonresponse and were conducted in Stata 14 (StataCorp, 2015). The models were estimated using a user-written command "*gllamm*" through a nonparametric maximum likelihood estimator—discrete factor approximation (Rabe-Hesketh et al., 2004). The coefficients from the models were converted to odds ratios. Goodness-of-fit tests were conducted for each of the models and compared. Although the independent variables included in this study existed on the five hierarchical levels of the Socioecological Framework, these levels were collapsed into two statistical levels: individual level (intrapersonal and interpersonal factors) and community level (institutional, community, and societal factors). Three models were run to test the study hypotheses:

Model 1: Individual-level factors are associated with modern contraceptive use.

Model 2: Controlling for individual-level factors, community-level factors are associated with modern contraceptive use.

Model 3: Community-level factors modify the association between individual-level factors and modern contraceptive use.

Results

Sample Characteristics

Table 1 shows the distribution of the individual-level factors among the study sample. Of the 9,620 nonpregnant women in-union included in this study, 13.7 percent were aged 15–24 years, 44.3 percent were aged 25–34 years, while 42.0 percent were aged 35–49 years. Women aged 25 years or older reported higher proportions of modern contraceptive use compared to younger women aged less than 25 years. About three-quarters of the women had secondary or tertiary education (41.6 percent and 21.9 percent, respectively). Compared to women with no formal education, women with formal education reported higher proportions of modern contraceptive use. About 55.5 percent of the women were Muslims while about 44 percent were Christians with less than 1 percent having indigenous or no religious affiliation. Muslim women reported lower proportions of modern contraceptive use compared to non-Muslim women. About 20.7 percent of the women had less than two children, 50.6 percent had two to four children, while 28.7 percent had five or more children. As expected, women with two or more children reported higher proportions of modern contraceptive use compared to women with less than two children. Two-thirds (66.6 percent) of the women were employed in the year prior to survey and employed women reported higher proportion of modern contraceptive use

Table 1. Distribution of Individual-Level Factors Among Sampled Women

	Unweighted N	Weighted (%)	Using Modern Contraception (%)
Intrapersonal factors			
Age*			
15–24 years	1,381	13.7	15.0
25–34 years	4,166	44.3	26.1
35–49 years	4,073	42.0	27.6
Education*			
No formal education	1,781	16.8	11.3
Primary education	1,956	19.7	23.5
Secondary education	3,840	41.6	27.3
Tertiary education	2,043	21.9	33.4
Religion*			
Muslim	5,669	55.5	19.3
Non-Muslim (christian, other, or none)	3,951	44.5	32.6
Parity (children ever born)*			
0–1 child	1,972	20.7	15.3
2–4 children	4,762	50.6	29.7
5 or more children	2,886	28.7	24.4
Employed in last year*			
Yes	6,570	66.6	28.3
No	3,050	33.4	19.1
Household wealth*			
Poor	3,942	38.9	20.2
Middle	1,936	21.0	25.0
Rich	3,742	40.1	30.2
Self-efficacy toward family planning*			
Mean (SD)	–	4.4 (2.6)	–
Low self-efficacy (score = 0–2)	2,748	25.5	3.9
Medium self-efficacy (score = 3–5)	2,619	28.2	25.5
High self-efficacy (score = 6–-8)	4,253	46.3	36.8
Interpersonal factors			
Fertility discussion with male partner*			
Never discussed parity or family planning	4,070	38.8	9.2
Discussed either parity and family planning	2,630	28.3	20.5
Discussed both parity and family planning	2,920	32.9	48.1
Others' negative attitudes toward her contraceptive use*			
Yes	1,134	12.0	19.3
No	8,486	88.0	26.0
Total	**9,620**	100	–

N: sample size; %: percentage. *Statistically significant differences in weighted proportions using modern contraception at the time of survey at $p < 0.05$.

compared to unemployed women. About 38.9 percent of the women lived in poor households, 21.0 percent lived in middle-wealth households, while 40.1 percent lived in rich households. Women in poor households reported lower proportions of modern contraceptive use compared to women in middle and rich households. On the 8-point scale, the mean score for self-efficacy was 4.4 with a standard deviation of 2.6. Although a majority of the women (46.3 percent) was classified as having high self-efficacy, about 25.5 percent were classified as having low self-efficacy while 28.2 percent were classified as having medium self-efficacy.

Women with low self-efficacy had the lowest proportion of reporting modern contraceptive use compared to women with medium or high self-efficacy. About 32.9 percent of the women reported discussing their desired number of children and family planning intention with their male partners, another 28.3 percent reported discussing either desired parity or family planning intention, while 38.8 percent reported never having such discussions. The women who had ever discussed their desired parity and family planning intention with their male partners had the highest proportion of modern contraceptive use compared to those who discussed one of both topics; women who had never had such discussions with their male partners had the lowest proportion of modern contraceptive use. Lastly, 12.0 percent of the women perceived they would be stigmatized if other community members thought they were using a contraceptive method. Women who had such perceptions had lower proportion of modern contraceptive use compared to those who did not have such perceptions.

Table 2 shows the distribution of the community-level factors among the study sample. The mean score of access to family planning services in health facilities was 4.0 (range: 0–6); about 18.4 percent of the women lived in clusters with no access (score = 0), 29.4 percent lived in clusters with low access (score = 1–4), while 52.2 percent lived in clusters with high access (score = 5–6). Women with high access scores to family planning services in health facilities reported the highest proportion of modern contraceptive use compared to those with low or no access. The mean score of access to family planning services in pharmacies was 3.0 with 40.3 percent, 13.6 percent, and 46.1 percent of the women having no, low, and high access to family planning services in pharmacies, respectively. Women with high access scores to family planning services in pharmacies reported the highest proportion of modern contraceptive use compared to those with low or no access. For the drug stores, the mean score was 3.3 with 25.3 percent, 42.1 percent, and 32.6 percent of the women having no, low, and high access to family planning services in drug stores, respectively. On the contrary, women with high access scores to family planning services in drug stores reported the least proportion of modern contraceptive use compared to those with low or no access. A third (33.3 percent) of the women lived in clusters classified as poor clusters; women in poor clusters reported lower proportion of modern contraceptive use compared to women in non-poor clusters. About 18.1 percent of the women lived in clusters classified as having large ideal family size; women in large ideal family size clusters reported lower proportion of modern contraceptive use compared to women in small ideal family size clusters. Also, 59.0 percent of the women lived in clusters classified as having family planning media exposure, with women in family planning media exposed clusters reporting higher proportion of modern contraceptive use compared to those in clusters with no family planning media exposure. About 12.7 percent of the women lived in Abuja, the capital city of Nigeria, while 10.8 percent, 21.1 percent, 16.6 percent, 24.3 percent, and 14.4 percent lived in Benin, Ibadan, Ilorin, Kaduna, and Zaria, respectively.

Table 2. Distribution of Community-Level Factors Among Sampled Women

	Unweighted N	Weighted (%)	Using Modern Contraception (%)
Institutional factors			
Access to FP services in health facility*			
Mean (SD)	–	4.0 (2.2)	–
No access (score = 0)	1,787	18.4	30.6
Low access (score = 1–4)	3,125	29.4	17.0
High access (score = 5–6)	4,708	52.2	28.0
Access to FP services in pharmacy			
Mean (SD)	–	3.0 (2.6)	–
No access (score = 0)	4,151	40.3	23.4
Low access (score = 1–4)	1,297	13.6	24.0
High access (score = 5–6)	4,166	46.1	27.1
Access to FP services in drug store*			
Mean (SD)	–	3.3 (2.2)	–
No access (score = 0)	2,490	25.3	25.8
Low access (score = 1–4)	3,994	42.1	29.3
High access (score = 5–6)	3,134	32.6	19.5
Community factors			
Poor cluster*			
Yes	3,471	33.3	19.9
No	6,149	66.7	27.8
Large ideal family size cluster*			
Yes	1,980	18.1	14.3
No	7,640	81.9	27.6
Family planning media exposed cluster*			
Yes	5,941	59.0	27.3
No	3,679	41.0	22.2
Societal factor			
City of residence*			
Abuja	1,226	12.7	34.6
Benin	1,224	10.8	24.4
Ibadan	1,860	21.1	35.5
Ilorin	1,559	16.6	28.7
Kaduna	1,531	24.3	20.7
Zaria	2,220	14.4	6.1
Number of women		9,620	
Number of clusters		488	
Mean number of women per cluster (SD)		36.3 (10.8)	
Median number of women per cluster (range)		35 (6–71)	

Note: SD: standard deviation; FP: family planning; Poor cluster: >50% of other women in the same cluster live in poor/poorest households; Large ideal family size cluster: average ideal number of children of other women in the same cluster is five or more children; FP-media exposed cluster: >50% of other women in the same cluster report exposure to FP messages in the media in the last 3 months. *Statistically significant differences in weighted proportions using modern contraception at the time of survey at $p < 0.05$

More women in Abuja and Ibadan reported modern contraceptive use compared to women in Benin, Ibadan, Ilorin, and Zaria.

As shown in Figure 1, about one in four women (25.2 percent) reported modern contraceptive use at the time of survey. The most prevalent method was

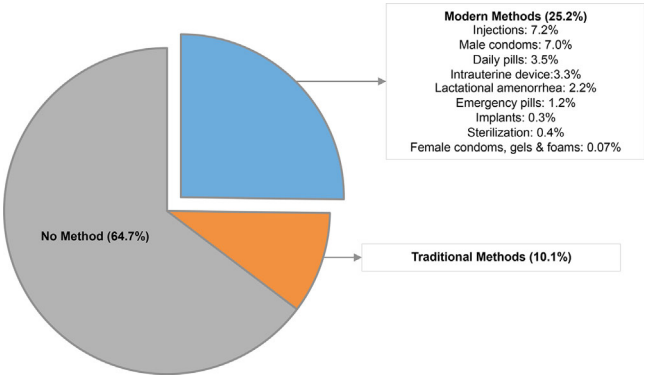

Figure 1. Contraceptive Method Use Among Nonpregnant Women In-Union (Ages 15–49) in Six Cities in Nigeria.

injections (7.2 percent), followed by male condoms (7.0 percent), daily pills (3.5 percent), intrauterine device (3.3 percent), lactational amenorrhea (2.2 percent), and emergency pills (1.2 percent). Less than 1 percent reported using sterilization, implants, female condoms, gels, and foams at the time of survey. Another 10.1 percent reported using traditional methods such as withdrawal method and cycle beads but a majority (64.7 percent) reported not using any form of contraceptive method. Injections and male condoms were the two prevalent contraceptive methods in all cities.

Multilevel Modeling of Modern Contraceptive Use

Table 3 shows the results of the multilevel models (Models 0–3); the results of Models 0 and 1 are summarized, while the result of Models 2 and 3 are discussed in details. Model 0 (null model) provided information on the between-cluster variance. With a between-cluster variance of 1.01 ($p < 0.001$), the estimated ICC was 0.23 meaning that 23 percent of the variance in modern contraceptive use was explained by the variation between clusters. The MOR was 2.61, indicating that women living in clusters with higher levels of modern contraceptive use were more than twice as likely to use modern contraceptive methods compared to women living in clusters with lower levels of modern contraceptive use ($p < 0.001$). Model 1 tested the first study hypothesis—individual-level factors are associated with modern contraceptive use. The results indicated that the women's level of education, parity, employment, family planning self-efficacy, and fertility discussion with male partner were positively associated with modern contraceptive use while fearing negative attitudes from community members about contraceptive use was negatively associated with modern contraceptive use. The inclusion of the individual-level factors reduced the between-cluster variance from 1.01 to 0.45. This reduction indicated that the individual-level factors explained about 55 percent of the between-cluster variation in the odds of modern contraceptive use.

Table 3. Multilevel Logit Models of Association Between Modern Contraception and Individual, Community, and Interaction Variables

	Model 0 OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Individual-level effects				
Age (ref = 15–24 years)				
25–34 years	–	1.08 (0.87–1.33)	0.99 (0.80–1.23)	1.00 (0.81–1.24)
35–49 years	–	1.03 (0.81–1.30)	0.90 (0.71–1.14)	0.90 (0.71–1.14)
Education (ref = no formal education)				
Primary	–	1.33 (1.06–1.66)*	1.27 (1.00–1.59)	1.27 (1.00–1.59)
Secondary	–	1.29 (1.04–1.60)*	1.21 (0.97–1.51)	1.21 (0.97–1.50)
Higher	–	1.34 (1.05–1.70)*	1.26 (0.99–1.61)	1.26 (0.99–1.61)
Religion (ref = non-Muslim)				
Muslim	–	0.99 (0.87–1.13)	0.96 (0.83–1.10)	0.96 (0.83–1.10)
Parity (ref = 0–1 child)				
2–4 children	–	1.83 (1.54–2.18)***	1.89 (1.60–2.25)***	Interacted variable
5 or more children	–	2.16 (1.74–2.68)***	2.48 (2.00–3.08)***	Interacted variable
Employed in last year (ref = no)				
Yes	–	1.15 (1.01–1.31)*	1.04 (0.91–1.19)	1.04 (0.91–1.19)
Household wealth index (ref = Poor)				
Middle	–	1.05 (0.89–1.23)	1.05 (0.90–1.23)	1.05 (0.90–1.23)
Rich	–	1.10 (0.95–1.27)	1.13 (0.98–1.32)	1.13 (0.97–1.32)
Family planning self-efficacy (ref = low self-efficacy)				
Medium self-efficacy	–	5.62 (4.37–7.24)***	5.21 (4.05–6.72)***	5.22 (4.05–6.72)***
High self-efficacy	–	7.54 (5.89–9.66)***	6.96 (5.43–8.91)***	6.96 (5.43–8.92)***
Fertility discussion with partner (ref = never discussed)				
Discussed either parity or family planning	–	1.87 (1.59–2.21)***	1.72 (1.46–2.04)***	1.73 (1.46–2.04)***
Discussed both parity and family planning	–	5.47 (4.65–6.44)***	4.90 (4.17–5.76)***	4.90 (4.17–5.76)***
Others' negative attitude to her contraceptive use (ref = no)				
Yes	–	0.75 (0.62–0.91)**	0.81 (0.67–0.98)*	0.81 (0.67–0.98)*
Community-level effects				
Access to FP in nearby health facility (ref = no/low access)				
High access	–	–	0.96 (0.83–1.12)	0.96 (0.83–1.12)
Access to FP in nearby pharmacy (ref = no/low access)				
High access	–	–	1.09 (0.96–1.25)	1.10 (0.96–1.25)
Access to FP in nearby drug store (ref = no/low access)				
High access	–	–	1.14 (1.01–1.31)*	1.14 (1.01–1.31)*
Poor cluster (ref = no)				
Yes	–	–	0.99 (0.84–1.16)	0.99 (0.84–1.16)
Large ideal family size cluster (ref = no)				
Yes	–	–	0.83 (0.68–1.01)	Interacted variable

Table 3. Continued

	Model 0 OR (95% CI)	Model 1 OR (95% CI)	Model 2 OR (95% CI)	Model 3 OR (95% CI)
Family planning media exposed cluster (ref = no)				
Yes	–	–	1.15 (1.01–1.32)*	1.15 (1.01–1.32)*
City of residence (ref = Abuja)				
Benin	–	–	0.53 (0.42–0.68)***	0.53 (0.42–0.67)***
Ibadan	–	–	1.24 (0.99–1.55)	1.24 (0.99–1.54)
Ilorin	–	–	1.07 (0.85–1.34)	1.06 (0.85–1.34)
Kaduna	–	–	0.72 (0.56–0.91)**	0.72 (0.56–0.91)**
Zaria	–	–	0.33 (0.24–0.44)***	0.33 (0.24–0.44)***
Community ideal family size X individual-level parity				
Clusters with large ideal family size				
Parity = 0-1 child	–	–	–	Ref
Parity = 2-4 children	–	–	–	0.92 (0.56–1.50)
Parity = 5 or more children	–	–	–	0.86 (0.51–1.46)
Clusters with small ideal family size				
Parity = 0–1 child	–	–	–	Ref
Parity = 2-4 children	–	–	–	1.91 (1.59–2.29)***
Parity = 5 or more children	–	–	–	2.53 (2.02–3.17)***
Parity = 0–1 child				
Live in a cluster with small ideal family size	–	–	–	Ref
Live in a cluster with large ideal family size	–	–	–	0.91 (0.58–1.43)
Community-level variance	1.01***	0.45***	0.10***	0.10***
Proportion explained by model[a]	Reference	0.55	0.90	0.90
Median odds ratio (MOR)	2.61	1.90	1.35	1.35
Intra-class correlation coefficient (ICC)	0.23	0.12	0.03	0.03
Log-likelihood ratio (Chi-square) test[a]	Reference	1,589.65***	1,759.33***	1756.65***
Log-likelihood	−4,911.73	−4,116.91	−4,033.56	−4,033.40
Akaike information criteria (AIC)	9,833.46	8,275.82	8,123.13	8,134.81
Bayesian information criteria (BIC)	9,869.32	8,426.42	8,360.62	8,378.64

Note: OR: odds ratio; CI: confidence interval; FP: family planning; $^{*}p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$; Model 0: null model; Model 1: multivariate multilevel model including individual-level variables only; Model 2: multivariate multilevel model including individual-level and community-level variables; Model 3: multivariate multilevel model including individual-level, community-level, and interaction variables; Poor cluster: >50% of other women in the same cluster live in poor households; Large ideal family size cluster: average ideal number of children of other women in the same cluster is five or more children; FP-media exposed cluster: >50% of other women in the same cluster report exposure to family planning messages in the media in the last three months. [a]Compared to the null model (i.e., model with no covariates).

Model 2 tested the second study hypothesis by simultaneously estimating the associations between the individual-level and community-level factors and modern contraceptive use. The estimated associations at each of the socio-ecological levels are described below. This model had a residual between-cluster variance of 0.10, a reduction from 1.01 of the null model. This reduction indicated that the individual-level and community-level factors explained 90 percent of the between-cluster variation in the odds of modern contraceptive use.

1. Effects at the intrapersonal level: Only two factors at this level (parity and family planning self-efficacy) were found to be significantly associated with modern contraceptive use, controlling for factors on the other levels. Specifically, women with two or more children had higher odds of modern contraceptive use compared to those with fewer than two children (OR: 1.89 for women with two to four children and OR: 2.48 for women with five or more children; $p < 0.001$). Compared to women with low family planning self-efficacy, women with medium self-efficacy (OR: 5.21; 95% CI: 4.05–6.72) or high self-efficacy (OR: 6.96; 95% CI: 5.43–8.91) had higher odds of modern contraceptive use. The women's age, level of education, religion, employment status, and household wealth were not significantly associated with modern contraception, controlling for factors on the higher socioecological levels ($p > 0.05$).
2. Effects at the interpersonal level: The two factors included at this level were found to be significantly associated with modern contraceptive use, controlling for factors on the other levels. Compared to women who had not had fertility discussions with their male partners, those who discussed either desired parity or family planning intention had higher odds of modern contraceptive use (OR: 1.72; 95% CI: 1.46–2.04), while those who discussed both desired parity and family planning intention also had higher odds of modern contraceptive use (OR: 4.90; 95% CI: 4.17–5.76). On the contrary, women who perceived negative attitudes from other community members had lower odds of modern contraceptive use compared to those who did not have such perceptions (OR: 0.81; 95% CI: 0.67–0.98).
3. Effects at the institutional level: Controlling for factors on the other levels, only one of the institutional-level factors had statistically significant associations with modern contraceptive use. Women who had high access to family planning services in drug stores within a one-kilometer radius of their residence had higher odds of modern contraceptive use compared to those who had no or low access (OR: 1.14; 95% CI: 1.01–1.31). However, there was no significant association between modern contraceptive use and access to family planning services in health facilities and pharmacies.
4. Effects at the community level: Three variables were included at this level; however, only one factor had statistically significant association with modern contraceptive use controlling for factors on the other levels. Women who lived in clusters classified as having family planning media exposure had higher odds of modern contraceptive use compared to those who lived in

clusters not classified as having family planning media exposure (OR: 1.15; 95% CI: 1.01–1.32). Living in a poor cluster or in a large family size cluster was not significantly associated with the odds of modern contraceptive use ($p > 0.05$).

5. Effects at the societal level: Controlling for factors on the other levels, women who lived in Benin, Kaduna, and Zaria had 47 percent, 28 percent, and 67 percent lower odds of modern contraceptive use compared to women in the capital city—Abuja ($p < 0.01$). Women who lived in Ibadan and Ilorin were not statistically different from those who lived in Abuja in terms of their odds of modern contraceptive use.

In addition to estimating the direct effects of the socioecological factors on modern contraceptive use, a cross-level interaction effect was estimated in Model 3 to test the third study hypothesis. The estimated cross-level interaction was selected based on the fact that, if significant, it may be easily addressed through a family planning intervention. The direct effects of factors at all the levels remained about the same except for those of the variables included in the interaction terms. Thus, only the cross-level interaction effects are discussed below.

1. Cross-level interaction effect: The interaction term was between the individual-level parity (number of living children) and the community-level ideal family size (average ideal number of children of the other women in the same cluster). The hypothesis was that the community norms about family size will modify the association between parity and modern contraceptive use, controlling for factors on the other socioecological levels. The interaction was found to be statistically significant for those living in clusters with small ideal family size (fewer than five children). Specifically, women with two to four children living in small ideal family size clusters had higher odds of modern contraceptive use compared to those with fewer than two children living in the same cluster (OR: 1.91; 95% CI: 1.60–2.29). Also, women with five or more children living in small ideal family size clusters had higher odds of modern contraceptive use compared to those with fewer than two children living in same clusters (OR: 2.53; 95% CI: 2.02–3.17). On the other hand, there was no statistically significant difference in the odds of modern contraceptive use among the parity groups for women living in large ideal family size clusters ($p > 0.05$). For women with fewer than two children, there was no statistically significant difference in their modern contraceptive use depending on whether they lived in large versus small ideal family size clusters ($p > 0.05$). Thus, the effect of parity on modern contraceptive use is pronounced among women living in clusters with small ideal family size but not among women living in clusters with large ideal family size.

Discussion and Policy Implications

This study aimed to provide a multilevel analysis of the determinants of modern contraceptive use in urban Nigeria, a diverse and growing region of sub-Saharan

Africa. The study findings indicate that several factors existing on multiple levels of a Socioecological Framework were significantly associated with modern contraceptive use among nonpregnant women in union aged 15–49 years and living in six cities in Nigeria. The information provided by this study corresponds with existing literature on the global determinants of modern contraception and fill the gap in the literature on modern contraception in urban sub-Saharan Africa. The findings of this study answered three research questions providing information on the individual-level and community-level determinants of modern contraceptive use among urban women in Nigeria—an African country with high fertility rate and low contraceptive prevalence rate. The finding that only two intrapersonal factors—parity and family planning self-efficacy—were significantly associated with modern contraceptive use is consistent with previous findings in the literature (Aremu, 2013; Campbell et al., 2006; Dias & de Oliveira, 2015; Ezeh et al., 2010; Lamidi, 2015; OlaOlorun & Hindin, 2014). However, these studies found significant positive associations between modern contraceptive use and other individual-level factors such as age, education, and household wealth, which this study did not find. This is an important finding as prior studies included women living in both rural and urban areas while this study only included women in urban areas. This finding lends support to the hypothesis that a different set of interpersonal factors may be playing a role in urban versus rural areas highlighting the need to tailor family planning interventions to the context of the target community. Such interventions should aim to improve women's self-efficacy toward modern contraceptive use as this study found that urban women with high levels of self-efficacy toward contraceptive use were almost seven times as likely to report modern contraceptive use as their counterparts with low self-efficacy toward contraceptive use.

The findings at the interpersonal level indicated that male partners played an important role in modern contraceptive use as women who had fertility discussions with their male partners had higher odds of modern contraceptive use. This finding is consistent with results from previous studies (Paek et al., 2008; Stephenson et al., 2007), and confirms that partner communication is an important determinant in urban areas as well. This finding further reinforces the need to promote partner communication as a means to improve modern contraceptive use. Family planning interventions need to highlight the benefits of having such conversations through empowering women to have the capability to initiate such discussions and/or by encouraging men to do so through male engagement programs. Such interventions also need to emphasize the continuity of these conversations as evidence suggests a positive dose–effect relationship between the frequency of partner discussion about family planning and modern contraceptive use (Stephenson et al., 2007). Additionally, it is often believed that community norms do not have strong effects on women in urban areas because of the cultural diversity that exists in urban settings. However, the results of this study refute that belief as it was found that the perception of disapproval of contraceptive use from other community members was associated with decreased odds of modern contraceptive use among urban women. This finding suggests the existence of social pressure to conform to normative behaviors even in urban

areas. The negative attitudes toward contraceptive use at the community level often stem from the misconceptions about the adverse effects of modern contraceptive methods. A recent study found that the prevalence of myths and misconceptions about the side effects of modern contraceptive methods was high in cities in Kenya, Nigeria, and Senegal (Gueye, Speizer, Corroon, & Okigbo, 2015). According to the study, both men and women erroneously believed that modern contraceptive methods damage the uterus and were dangerous to women's health; women who held such misconceptions had lower odds of modern contraceptive use. Thus, family planning interventions need to accurately inform the community about the mechanisms of action and potential side effects of the different types of modern contraceptive methods to dispel such myths. Studies on contraceptive counseling have shown that women who were informed of the potential side effects of a modern contraceptive method were more likely to continue using the chosen method over time compared to those who did not receive such information and thus discontinued method use when they experienced side effects (Halpern, Lopez, Grimes, Stockton, & Gallo, 2013; Oye-Adeniran et al., 2007). Family planning interventions geared at improving the knowledge of and attitudes toward contraceptive use should be implemented at the community level as they are likely to reach a broader audience compared to the more frequent facility-based interventions. One way to target a broader audience is through mass media interventions and/or community outreach programs.

This study also found that the characteristics of the community where the women resided had considerable effects on the odds of modern contraceptive use. Community exposure to family planning messages in the media had a positive association with modern contraceptive use. This finding supports the evidence that mass media interventions are effective ways to improve knowledge of contraceptive methods, which will in turn increase modern contraceptive method adoption and use (Bankole, Rodriguez, & Westoff, 1996; Kane, Gueye, Speizer, Pacque-Margolis, & Baron, 1998; Piotrow et al., 1990). This study did not find any significant associations between modern contraceptive use and having access to family planning services in health facilities and pharmacies within a one-kilometer radius of their community of residence. This finding is surprising as the literature suggests that having access to family planning services increases the odds of modern contraceptive use (Campbell et al., 2006; Levin, Caldwell, & Khuda, 1999; Welsh et al., 2006). However, this study found that urban women who had high levels of access to nearby drug stores that provide family planning services had higher odds of using modern contraceptive methods compared to their counterparts who did not highlight the need to decentralize and diversify the provision of family planning services. Purchasing modern contraceptive methods from nearby drug stores may be favored over getting such service from nearby health facilities and pharmacies that may require more scheduling procedures and cost such as making an appointment and/or buying a registration card. The providers at the drug stores should, however, be required to receive training on how to provide quality contraceptive services. Another reason for failure to observe significant associations between modern contraceptive use and

access to family planning services in health facilities and pharmacies should be due to the fact that this study examined mainly geographic access to family planning services. Urban areas often have higher levels of geographic access to health services compared to rural areas, so it is possible that other aspects of *access* such as economic, information, psychosocial, and administrative access as described by Welsh et al. (2006) may be playing a bigger role in urban areas. Future studies should examine what aspect of access to family planning services matters in urban areas in order to better inform programs and policies that aim to improve modern contraceptive use in urban areas.

Another contribution of this study is the estimation of the modifying effects of community-level fertility norms on the association between individual-level parity and modern contraceptive use. Previous studies suggest that women living in communities where large family size is the norm are less likely to use modern contraceptive methods (Kaggwa et al., 2008; Ngome & Odimegwu, 2014). However, there is no information on the interaction effect of community fertility norms and individual parity on modern contraceptive use. This study fills that gap as results indicated that women with children living in communities with small ideal family size had significantly higher odds of modern contraceptive use; however, women with children living in communities with large ideal family size had lower odds of modern contraceptive use, though this did not reach statistical significance. This contradictory finding supports the construct of peer modeling of behaviors, which describes how behaviors are learned from observing people (friends and neighbors) practice the behavior. Given that large family size is still desirable in urban Nigeria (Fotso et al., 2011), family planning interventions need to emphasize small family size.

Limitations and Concluding Remarks

Despite the evidence this study provides on the multilevel determinants of modern contraception in urban Nigeria, there are some limitations. First, the use of cross-sectional data did not allow for the estimation of temporality of the variables and causal associations. Future studies should estimate causality through the use of longitudinal data to eliminate any form of endogeneity. Another limitation of this study is with the use of self-reported data, which have the potential for social desirability bias especially as sensitive sexual and reproductive health questions were asked. However, this bias is probably minimal since the interviews were conducted in private locations and by female interviewers to ensure privacy and confidentiality. Furthermore, this study assumed that an urban cluster represents an urban community. This assumption may not hold and may be the reason no associations were found between modern contraceptive use and some of the community-level variables. There is a need for further research to define what constitutes an urban community. One way to do so may be through the use of social network analysis. Finally, this study did not include all the factors that have been found in the family planning literature to have an association with modern contraceptive use; however, the factors included

in this study are relevant to the study population and have policy implications. Notwithstanding these limitations, the results of this study are pertinent to improving modern contraceptive use in urban Nigeria. The Nigerian Government, as reported in the 2014 Family Planning Blueprint, proposes to increase contraceptive prevalence rate from 15 percent in 2013 to 36 percent by 2018 with the goal of averting 1.3 million infant and child deaths and 1.6 million unintended pregnancies (Federal Ministry of Health, 2014). To achieve this goal, access to and use of contraceptive services should be on the forefront of the national health and development agenda. Programs should consider community characteristics in the design, implementation, and evaluation of their family planning intervention. Also, such interventions should be multi-pronged and multi-level as these types of interventions may be the best strategies to improve modern contraceptive use in diverse and densely populated urban areas.

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Notes

Conflicts of interest: None declared.
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