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Influence of the Service Delivery Environment on Family Planning Outcomes in Nigeria

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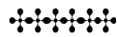
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Influence of the Service Delivery Environment on
Family Planning Outcomes in Nigeria

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Table of Contents

Abstract

Using linked data from the 2009 Community Participation for Action in the Social Sectors project health facility and household surveys, this paper examined the association of the family planning service delivery environment with contraceptive outcomes among males and females in five states of Nigeria. Multilevel logit models were used to assess the association with contraceptive outcomes of method choice, health worker training, equipment availability, quality of provider-client interaction, use of quality assurance methods, and perceived needs in local family planning health facilities. The findings showed a strong positive association of the availability of an increased range of contraceptive methods and the use of quality assurance systems by family planning health facilities in the local government area (LGA) with odds of knowing three or more modern methods of contraception. The breadth of health worker training to provide family planning services had a positive association while a perceived need for staff by family planning providers in the LGA had a negative association with the odds of both lifetime use and current use of a modern method. The quality of family planning provider-client interaction in the LGA was positively associated with current use of a modern method. In LGAs with higher quality family planning provider-client interaction, the odds of ever using and the odds of currently using a modern method were significantly higher for women than for men. To increase knowledge of modern contraception, programs should target LGAs that provide a limited range of contraceptive methods and that use few quality assurance mechanisms. Efforts to increase modern contraceptive use should reach LGAs with staff shortages, low quality of provider-client interaction, and a limited scope of in-service training on the delivery of family planning and reproductive health services.

Introduction

In the last two decades, there has been increased recognition of the importance of the quality of family planning (FP) services for improving contraceptive behavior. Bruce (1990) and Jain (1989) argued that improvements in the quality of care would increase contraceptive adoption and client satisfaction, which would translate in the long run into higher contraceptive prevalence and, ultimately, to improved client health and lower levels of fertility. Despite substantial investment of effort and resources in improving the delivery and quality of FP services, the influence of the service delivery environment of contraceptive outcomes is not well understood. Few health facility (HF) surveys are collected around the same time as are household surveys or designed to be linked with individual data on contraceptive knowledge and outcomes, making it difficult to assess the relative contributions of supply and demand-side factors to FP and reproductive health outcomes. It is widely acknowledged, however, that improved quality of care is a fundamental human right and that higher quality services would lead to greater demand for services, greater client satisfaction, and increased services utilization.

Bruce's (1990) framework on fundamental elements of the quality of care has provided a reference for measuring the readiness of health facilities to provide FP services and the quality of care received by clients in provider-client contacts. According to the framework, quality comprises six elements:

1. choice of methods
2. information given to users
3. technical competence
4. interpersonal relations
5. follow-up or continuity mechanisms
6. appropriate constellation of services

Choice of methods refers to both the number of contraceptive methods offered regularly and the extent to which methods offered meet the needs of significant subgroups. Information given to clients refers to information imparted during provider-client interactions that enables clients' informed choice and satisfaction. Technical competence refers to such factors as clinical techniques, observance of protocols, and maintenance of aseptic conditions required to provide IUDs, implants, and sterilization. Interpersonal relations refer to the personal dimensions of service, which Bruce described as including the program's mission and ideology, management style, resource allocation, the ratio of workers to clients, and supervisory structure. Mechanisms to encourage continuity are described as including but not limited to community media, processes for forwarding appointments, and home visits by health workers. Appropriate constellation of services refers to the situating of FP services so that they are convenient and acceptable to clients, which may happen in vertical programs or in the context of maternal and child health, postpartum, or comprehensive reproductive health (RH) service.

Efforts to relate these dimensions of the quality of care to contraceptive behavior have been characterized by marked differences in how quality of care is defined, in the outcomes and client population examined, and in levels of analysis (Keonig, Hossain & Whittaker, 1997). While some studies have focused on current contraceptive use, others have looked at contraceptive adoption and continuation (Steele, Curtis & Choe, 1999). Most studies have focused on elements of HF readiness — infrastructure, tools, technology, levels of funding, and staffing — and on physical access to services.   Data are limited, however, on the process aspects of quality as captured in provider-client interactions, which is partly due to the private and confidential nature of doctor-

patient consultations (Peabody, Taguiwalo, Robalino & Fenk, 2006). Quality assessments perspectives also differ. Some studies have examined clients' perspectives of quality but increasingly researchers are relying on objective measures of the degree to which healthcare providers adhere to established professional standards of the appropriateness of care.

Although the evidence is inconsistent, the effects often small in magnitude, and causality a concern, a number of studies have found a significant association between elements of HF readiness and contraceptive outcomes, even after controlling for individual-level factors. For example, Hotchkiss and colleagues (Hotchkiss, Magnani, Rous, Azelmat, Mroz & Heikel, 1999) found that HF infrastructure and equipment (measured as an index) was a significant determinant of contraception, after controlling for other variables. Jain (1989) demonstrated a strong relationship between the range of methods available in a country and contraceptive prevalence. Hotchkiss and colleagues (Hotchkiss, Magnani, Rous, Azelmat, Mroz & Heikel, 1995) found a significant positive effect of the availability of pills in local pharmacies and on use of modern contraceptives. In another study (Magnani, Hotchkiss, Florence & Shafer, 1999), the number of methods available in local facilities was positively linked to subsequent contraceptive use among nonusers. Steele et al. (1999) found that the number of methods available in the community significantly increased both the rate of switching from the pill to another modern method and the likelihood of postpartum contraceptive adoption.

Ali (2001) examined the relationship between the availability of trained providers and contraceptive outcomes in Egypt. In service environments characterized by HFs with few trained FP providers or a shortage of female providers, residents were significantly more likely to discontinue pill use compared with those residing in other service environments, after controlling for other factors. Using a composite measure of infrastructure and facility readiness to provide FP services, Hong, Montana, and Mishra (2006) found that measures related to counseling and the examination room had significant positive effects on IUD use in Egypt. Similarly, using an index score of the service delivery infrastructure, medical equipment, essential medicines, number of contraceptive methods available on the day of the visit, and the number of staff trained in FP, Do and Koenig (2007) found that residence in communes with higher quality health centers was associated with significantly lower risk of method discontinuation.

However, other studies have found a weak or non-significant link between HF readiness and client contraceptive behavior (Feyisitan & Ainsworth 1996; Mensch, Arends-Kuenning & Jain, 1996; Magnani et al., 1999). For example, in Morocco, Magnani et al. (1999) found that although the FP service environment was significantly associated with subsequent adoption of a contraceptive method, the effect was mediated by intention to use a method. These findings and those from other studies led RamaRao and Mohanam (2003) to suggest that supply factors may exert a stronger influence on contraceptive intentions than on contraceptive use. Similarly, Feyisetan and Ainsworth (1996) found that HF readiness as measured by whether the facility was privately owned, the presence of at least one doctor, and the number of contraceptives offered was not a strong determinant of current contraceptive use. In contrast to the findings by Steele et al. (1999), a study conducted in Egypt reported a negative association between the range of contraceptive methods available and continuation (Ali, 2001).

Some studies have explored the quality of FP services from the perspectives of the client or community members. Mroz, Bollen, Speizer, and Mancini (1999) found that subjective

perceptions of quality at the community level were positively associated with residents' probability of using contraception in rural Tanzania. By comparison, Koenig et al. (1997) measured the perceptions of quality for individual women in rural Bangladesh. Their study highlighted the crucial role played by interpersonal relationships between providers and clients in women's decisions to use or continue to use a contraceptive method. Women who were not using a method and who scored high on an index of perceived quality of care were 27 percent more likely to adopt a method subsequently, compared to women with a low score. Although the study found a significant positive effect of women's perceptions of service quality on both adoption and continuation of a contraceptive method, the effect was particularly strong for contraception continuation.

Recognizing that clients' perceptions of quality may depend on their individual characteristics (Peabody et al., 2006) and that clients may be unable to judge the technical competence of health providers, there has been increasing reliance on a range of methodologies and on objective evidence-based criteria to measure the quality of care (Bertrand, Hardee, Magnani & Angle, 1995; Bessinger & Bertrand, 2001; Speizer & Bollen, 2000; Williams, Schutt-Aine & Cuca, 2000). However few studies have explored how the actual quality of provider-client interaction is related to contraceptive use or discontinuation. In a Tanzania study, Arends-Kuenning and Kessy (2007) found that while information given to clients and technical competence had a significant positive association with women's contraceptive use, interpersonal relations (as measured by how comfortable the provider was in discussing sexual behavior related to STD/HIV with clients and if the provider routinely asked the patient any such questions if an STD was suspected) was not significant for contraceptive use in rural or urban areas. By comparison, an earlier study, also based on objectively-defined measures of quality, found that in Gambia and Niger women who had received adequate counseling on side effects were more likely to continue using a contraceptive method than those who had not (Cotten, Stanback, Maidouka, Taylor-Thomas & Turk, 1992).

Understanding how supply- and demand-side factors influence contraceptive use is critical to the success of national efforts to reduce the population growth rate and promote FP use. Contraceptive prevalence has remained low in Nigeria over the past 20 years despite national efforts to lower the population growth rate to 2 percent or lower by 2015 and to promote FP use. In 2008, only 10 percent of currently married Nigerian women were using a modern method of contraception, a slight increase from 4 percent in 1990. The total fertility rate was 5.7 births per woman and 16 percent of all women were estimated to have an unmet need for FP (National Population Commission & ICF Macro, 2009). However, relatively few studies have examined the effect of supply-side factors on contraceptive use in Nigeria. This study attempts to fill this gap in the literature by examining the association between the family service delivery environment and contraceptive knowledge and use.

Data

The data for the present study come from the 2009 end-of project survey for the Community Participation for Action in the Social Sectors (COMPASS) project in Nigeria. The survey was implemented by MEASURE Evaluation, which contracted the Center for Research, Evaluation and

Resource Development for the implementation of the household, health facility, and school surveys in 51 local government areas (LGAs) in the Federal Capital Territory (FCT) and the states of Bauchi, Kano, Lagos, and Nasarawa, where the COMPASS project was implemented. The purpose of COMPASS was to integrate health and education by enhancing FP/RH services, promoting child survival and improving basic literacy and numeracy.

The household survey used a multi-stage stratified sampling design and collected information on RH, child health, and primary school education among a representative sample of women aged 15-49 and men aged 15-64. At the first stage of sampling, enumeration areas were selected within each state, with probability proportional to the number of LGAs per state as follows: 1:1:2:2:1 for Bauchi, FCT, Kano, Lagos, and Nasarawa, respectively. At the second stage of sampling, 25 households were selected within each sample enumeration area using systematic random sampling. Fieldwork for the household survey started in mid-June 2009 and was completed by early July 2009.

The survey of primary health care facilities (comprehensive health care centers, public primary health care centers, health clinics, maternity clinics, private clinics, uniformed services clinics, health posts, and dispensaries) and patent medicine vendors (PMVs) was implemented at the same time as the household survey. The sample for the facility survey was drawn from a list of all public and primary health care facilities and PMVs serving the population interviewed in the household survey. As a result, the facility survey included some service delivery points that were located outside of the enumeration areas selected for the household survey. Due to sample size considerations, the LGAs (as opposed to the enumeration areas) were used to link the facility and household survey in order to determine the influence of health service characteristics on individual health outcomes. To the extent possible, all primary health care facilities and PMVs were included when defining LGA-based measures of HF readiness and the quality of care.

Measures

Outcomes

Three outcomes were examined:

1. Knowledge of three or more modern methods of contraception. This was a binary outcome measuring whether the respondent could spontaneously report knowledge of at least three of the following modern methods of contraception: female sterilization, male sterilization, pill, intrauterine device, injection, implants, male condom, female condom, diaphragm, foam/jelly, and emergency contraception.
2. Lifetime contraceptive use: This was a binary outcome measuring whether the respondent reported ever using any of the specific afore-mentioned modern methods of contraception, with the exception of emergency contraception.
3. Current contraceptive use: This was a binary outcome measuring whether the respondent reported current use of any of the specific afore-mentioned modern methods of contraception, with the exception of emergency contraception.

LGA-Level Variables

Bruce's (1990) framework served as a guide for the selection of our level-2 variables (see figure 1).

Method choice: All FP HFs were asked questions about whether they provided the following contraceptive methods : (1) combined oral contraceptive pill; (2) progesterone-only pill; (3) IUD, (4) injectable Depo Provera, once every three months; (5) injectable Noristerat , once every two months; (6) implant, e.g., Norplant; (7) diaphragm/cap; (8) male condom; (9) female condom; (10) foaming tablets/spermicides; (11) emergency contraception (i.e., after sex pill); (12) counseling about natural FP; and (13) counseling about dual protection (i.e., prevention of pregnancy and sexually transmitted infections[STI]/HIV/AIDS). For each method, we created a dichotomous variable indicating whether the HF provided the method. We then calculated the total number of contraceptive methods provided by each FP HF and averaged that over all FP HFs in the LGA to derive the mean number of contraceptive methods provided by FP HFs in the LGA. The mean ranged from 0 to 11.

Workforce trained to provide FP services at minimum standards: This variable measured the extent to which service providers had been trained to provide relevant FP services. As the technical competence of health personal was not evaluated, we used a proxy measure of the availability in the LGA of FP providers who had received life-time in-service training to provide relevant FP/RH services. Separate variables were first created to indicate the presence in the LGA of a service provider with lifetime in-service training for each of the following areas: (1) FP counseling; (2) IUD insertion; (3) mini-laparotomy (4) no-scalpel vasectomy; (5) implants (e.g., Norplant); (6) STI syndromic management; (7) other, STI diagnosis and treatment; and (8) postabortion care. We used the eight resulting variables measuring the availability of FP planning provider in the LGA who had been trained on each of the topics listed and principal components analysis to create an LGA-based index of FP provider lifetime in-service training. The Kaiser-Meyer-Olkin measure of sampling adequacy, which takes on values between 0 and 1, with small values indicating that overall the variables have too little in common to warrant a principal component analysis (PCA), was 0.8602. The first component explained 60.6 percent of the variation in the other components and its predicted values were used to derive an index of the availability in the LGA of FP providers who were received lifetime in-service training in relevant areas of FP service provision. This index ranged from -3.356 to 2.459.

Quality assurance (QA) methods used by FP HFs: This variable measured the extent to which systems for monitoring and evaluating the quality of services were present among FP non-PMVs in the LGA. A set of questions asked whether the health facility used any of the following QA procedures routinely:

- supervisory checklist for health system components (e.g. service specific equipment, meds, and records) based on standards and protocol
- supervisory checklist for health service provision (e.g. observation checklist) based on standards and protocol
- system for identifying and addressing quality of care that is implemented by staff or specific service level (e.g. not carried out facility wide)
- facility-wide review of mortality
- periodic audit of medical records or service registers
- QA committee/team
- regional/district health management teams

We created an additive index measuring the number of QA procedures used routinely by the HF, and then created an LGA-based variable measuring the average number of QA methods used routinely by non-PMVs in the LGA. The alpha coefficient for the variables comprising the seven-item QA index was 0.9298. The index ranged from 0 to 6.

Supportive supervision: The FP supervision index captured the content of supervisory visits that occurred in the past six months and was based on two questions: (1) "When was the last time a supervisor from underline outside this facility visited the facility?" and, if the facility had been visited within the last six months, the following question was asked (2) "The last time that a supervisor from outside the facility visited, did the supervisor: (a) check some registers/books? (b) discuss problems? (c) discuss policy/administrative issues? (d) discuss technical protocols/practices/issues? (e) hold an official staff meeting? (f) observe individual staff providing services? (g) meet with staff individually? (h) meet with clients? (i) do anything else?" FP health facilities that did not have a supervisory visit from outside of the facility in the past six months were coded zero for each of the afore-mentioned items covering supervision content. We created separate binary variables measuring the presence in the LGA of a FP non-PMV that had a supervisory visit in the past six months in which each element of supervision was performed. Cronbach's alpha coefficient for these LGA variables was 0.9244. PCA was used to create a supportive supervision index. Note that the variable measuring the presence in the LGA of a FP non-PMV in which the supervisor from outside the facility checked some registers and books was omitted due to multicollinearity issues, yielding an overall KMO coefficient of 0.8593. The eigen value of the first component explained 70 percent of the variation in the other components and its predicted value was used to create the LGA-based supportive supervision index. We differentiated between LGAs that were at/above the median value of the resulting index and those that were not. Thus our measure of supportive supervision is binary and indicates whether supportive supervision of FP services in the LGA is low (reference category) or high.

Integration: This binary variable measured the presence in the LGA of a FP HF that routinely provided services for STIs and routinely counseled antenatal and postpartum care clients about FP. The information was derived from the following questions: (1) "Are clients routinely treated for STIs or are clients referred to another provider or location for STI treatment?" (2) "Are antenatal care clients routinely counseled about FP?" (3) "Are postpartum clients routinely counseled about FP?"

Visual aids for educating clients: Questions on visual aids inquired as to whether any of the following visual aids for teaching were available in the counseling or service provision area: (1) visual aids on different FP methods; (2) visual aids for teaching about STIs ; (3) visual aids for teaching about HIV/AIDS; (4) visual aids or models for use of male condom; (4) poster on FP; (5) visual aids for teaching about self-breast exams; and (6) cue cards. We allocated one point to each type of visual aids and summed them to create a HF-based index which was averaged over all FP HFs to compute the mean number of topics for which visual aids were available per FP health facility in the LGA. Note that 28 percent of all FP HFs with no visual aids and all LGAs that had no FP HFs were assigned the value of 0 on this indicator. The index of visual aids ranged from 0 to 2.

Availability of basic resources for FP examination: This binary variable measured whether any HFs in the LGA that was prepared to provide FP at a minimum. The LGA was assigned the value 1 if any of its HFs had all of the following 12 items deemed essential for the provision of FP services. These included: (1) equipment for examination; (2) spotlight source, such as flashlight or examination light; and (3) examination bed/table. Items for infection control were also included: (4) hand washing items, such as soap and towel; (5) water for hand washing; (6) clean and sterilized gloves; (7) decontamination solution for clinical equipment; and (8) sharps box. We also examined the

availability of other equipment: (9) blood pressure gauge; (10) stethoscope; (11) weighing scale; and (12) sterile needle and syringe.

General service-provision environment: Three variables measured the general service provision environment. The first variable captured the extent to which the HF collected data revealing the opinion of clients regarding issues related to their satisfaction and was derived from the following questions: (1) "Does this facility have any system for determining client opinion about the HF or services?" (2) "Which of the following systems does the facility have for determining client opinion: (a) suggestion box? (b) client survey form? (c) client interview? (d) other system?" We first calculated the number of methods used by the HF to determine clients' opinion. Note that the questions on methods used to determine clients' opinion were only asked on non-PMVs. Therefore, the variable measured the mean number of methods used by FP non-PMVs in the LGA to solicit client opinion. The variable ranged from 0 to 2.

The second and third variables of the general service provision environment was based on information collected from FP health workers about the problems they think should be addressed to improve their working situation and services: "What is the **most** important issue that you feel needs to be addressed to improve your work in family planning?" Only spontaneous responses were recorded. The second and third measures of the general service provision environment were binary and measured whether any of the FP health workers surveyed in the LGA mentioned that more staff and emergency transport for patients needed to be addressed, respectively.

Quality of FP provider–client interaction: Unlike the other LGA-level measures, this variable was derived from the household survey data. Current users of contraception were asked where they first obtained the current method used and the type of provider the respondents spent the most time with when they first obtained the current method used. The subsequent question asked about various aspects of that interaction: "During that visit, did the provider you saw: (a) greet you? (b) respond to your questions/health concerns? (c) explain possible side effect or problems you might have with the method? (d) explain what to do about side effects? (e) tell you when to return for the next visit? (f) treat you with respect?" The value 1 was assigned if the respondent reported that the provider performed any of these acts and zero if otherwise, and an additive index created. This index captured interpersonal relations as well as information provided to clients during service interactions that could enable informed choice and promote client satisfaction. The additive index was averaged over all current users of contraception in the LGA to create a measure of the overall quality of provider-client interaction as reported by FP users living in the LGA. The index ranged from 0 to 6.

State: State was a five-category variable indicating whether the LGA was based in Bauchi, FCT, Kano, Lagos (reference group), or Nasarawa.

Individual-Level Variables

Control variables included age (as reported in continuous years); sex; highest level of school attended (none [reference group], primary, or secondary or higher); current employment status (unemployed or employed), religion (Christian or non-Christian), and type of place of residence (urban [reference group], semi-urban or rural). Marital status was divided into three categories: married (reference group), living together, and not in union. Principal components analysis was used to construct an index of household wealth based on the presence of particular amenities or items in the household. The items considered were the following: refrigerator, electricity, piped water, flush toilet, bicycle, motorcycle, car, television, radio, and telephone/cellular phone. Scree-plot inspection revealed a distinct one-factor solution. Therefore, the first component was used as

the measurement of the household wealth index since it explained the major part of the common variances of all the ten components (44.2 percent). Scale reliability (alpha coefficient) for the resultant index of household wealth was 0.82 and the Kaiser-Meyer-Olkin measure of sampling adequacy, 0.867. From the predicted wealth index, households were grouped into terciles representing low (reference group), medium and high household wealth.

Each regression also controlled for the number of sources of information on FP to which the respondent was exposed. This variable was derived from the following question, which was administered to all respondents: "In the last 6 months have you heard or seen anything about family planning: (a) on the radio? (b) on the television? (c) in a newspaper or magazine? (d) from a home visit by a community health worker? (e) at the clinic? (f) from a PMV? (g) anywhere or from anyone else?" The value of one was assigned to each information source. Respondent's perception of community approval of FP was included in the contraceptive use regressions and was based on the question: "Do you think that a few, some, most, or almost all the women/men in this community are in favor of the use of modern family planning?" and comprised three categories: (a) none (reference group); (b) a few; and (c) some/most/all.

Statistical Methods

We used F-tests to examine differences between LGAs in the prevalence of knowledge and use of modern contraception by selected measures of the quality of the FP service delivery environment. For the multivariate analysis, we estimated multilevel multivariate logistic regression models using the generalized linear latent and mixed model command (GLLAMM) in Stata 11.0 (Rabe-Hesketh & Skrondal, 2008) as all outcomes of interest were dichotomous. In the analysis, individuals were nested within administrative boundaries of LGAs to detect associations of the family planning service delivery environment with contraceptive outcomes. Multilevel modeling incorporates random effects at the individual and LGA-levels in the regression to account for unobserved individual and LGA-level factors.

Intraclass correlation coefficients (ICC) were used to evaluate how the outcomes of interest varied between LGAs and can be interpreted as the proportion of variation in a given outcome that can be explained at the LGA-level. If a given measure of the FP SD environment was constant within each LGA, the only variation would be between LGAs, and the ICC would be close to 1.0. In contrast, if most of the variation in a given outcome is explained by individual-level measures, the ICC would be close to 0. For a two-level logistic random intercept model with an intercept variance of σ^2_μ, the intraclass correlation is:

$$\rho = (\sigma^2_\mu / (\sigma^2_\mu + \pi^2/3))$$

where $\pi^2/3 = 3.29$ and represents the level-1 residual variance for a logit model.

We estimated odds ratios (ORs) and 95 percent confidence intervals (CIs) from regression statistics. To test for muticollinearity, we calculated variance inflation factors (VIFs) for explanatory variables included in each regression. All VIFs were less than 5, signifying that a given independent variable was not highly correlated with the other independent variables in the regression of interest. We examined interaction terms between gender and selected variables, namely: (1) the presence in the LGA of a FP HF with all basic equipment for FP examination; and (2) the quality of FP provider-client interaction in the LGA. We also examined interaction terms between type of place of residence and selected characteristics of the FP service delivery environment.

Of the 2218 male and 2250 females successfully interviewed, those with missing data on any of the variables of interest were excluded from the analysis, resulting in a sample size of 4124 respondents for the regressions on knowledge and lifetime use of modern methods of FP, and 3941 respondents for the regressions on current use of a modern FP method. It is to be noted that 357 respondents were excluded from the analysis because they were not completely interviewed or because their LGA of residence was not included in the HF sample and that currently pregnant women were omitted from the regressions on current use of a modern method. The total number of LGAs included in the analysis was 45, with the number of respondents per LGA ranging from 13 to 325.

Bivariate Results

Sample Characteristics

Table 1 provides the weighted socio-demographic characteristics of the sample as well as the characteristics of the FP service delivery environment in their LGAs of residence, by sex. Respondents were 32 years old on average. Slightly more than a third were employed, 40 percent were Christian, and close to half were married. On average, respondents had been exposed to 1.8 of information about FP and nearly one in four respondents felt that none of the women in the community approved of FP. The average respondent lived in an LGA in which FP HFs provided about 5.4 different methods of FP and implemented at least two systems that supported quality service delivery. Nearly half of respondents resided in LGAs in which FP health workers perceived a need for more staff and 5 percent in LGAs where health workers perceived a need for emergency transportation. Half of respondents lived in an LGA that had a FP HF with all basic equipment for FP examination and in an LGA with a HF that provided FP counseling in maternal health services. There were significant gender differences in age, education, current employment, marital status, household wealth, and perceived community approval of FP. In general, more male respondents were educated to secondary or higher levels, employed, not in union, residing in rural areas and in Bauchi, and from the wealthiest households compared to female respondents.

Knowledge of Modern Contraception

Table 2 presents the percentage of respondents who knew three or more modern methods of contraception by selected characteristics of the FP service delivery environment in their local government area of residence. LGA characteristics are represented by two types of indicators. The first group of indicators reflects the presence or absence in the LGA of a FP HF with a given characteristic. The second group of indicators measures whether the LGA falls below or at/above the median value of a given index for all 45 LGAs sampled. For ease of interpretation of the results, the term "low" is used to refer to LGAs that fall below the median value of an index. Otherwise, the term "high" is used. Data are presented for males and females separately and for both sexes combined.

Approximately two out of five respondents could spontaneously report three or more modern methods of contraception, with levels of knowledge being significantly higher among females than males (46 percent versus 38 percent; $F(1, 4176) = 17.0619$; $p < .001$). Among both males and females, knowledge of modern contraception was lower in LGAs that had relatively low levels of (1) method choice potential, (2) QA methods used by FP non-PMVs, and (3) supportive supervision of FP non-PMVs. For example, only 34 percent of respondents could spontaneously recall three or more modern contraceptives in LGAs that ranked low in terms of the number of contraceptive methods provided, compared to 47 percent of respondents in LGAs that ranked high on that indicator. These differentials were statistically significant at the 1 percent level.

Similarly, among both males and females, knowledge of three or more modern methods was more widespread in LGAs that had a FP HF that routinely provided STI services and routinely counseled antenatal and postpartum care clients about FP. Information about the problems health workers think should be addressed to improve their working situation and health care is also instructive. Significantly fewer male and female respondents could spontaneously report three or more modern methods of contraception in LGAs with a FP health worker stating that emergency transportation was needed. In the latter case, only 28 percent of respondents could spontaneously name three or more modern methods of contraception if a FP health worker in their LGA of residence expressed a need for emergency transportation, as compared to 43 percent if none of the FP health workers s expressed this need (p < .001). Surprisingly, the proportion of males and females who knew three or more modern methods of contraception was higher in LGAs in which the average number of topics for which visual aids were available in FP HFs was less than 1 (41 percent of males and 49 percent of females) than in other LGAs (35 percent of males and 42 percent of females). This differential was statistically significant.

Few of the associations between the FP service delivery environment and contraception knowledge were sex-specific. The overall quality of provider-client interaction in the LGA and the availability of all basic resources for FP examination were significantly associated with contraceptive knowledge among females but not among males. An expressed need for more staff in any of the FP health facilities in the LGA was associated with significantly lower levels of contraceptive knowledge among males (35 percent versus 43 percent if such a need was not mentioned) but not among females.

Lifetime Use of Modern Contraception

Table 3 presents the lifetime use of modern contraception by selected characteristics of the FP service delivery environment in the LGA of residence for male and females separately, and for the total sample. Roughly one out of five respondents had ever used a modern method of contraception. Whereas knowledge of modern contraception was lower among males than females, lifetime use of a modern method was higher among males than females (25 percent versus 20 percent; p < .01). Both indicators measuring the service provision environment in terms of needs expressed by FP health workers in the LGA were significantly associated with lifetime use of contraception, regardless of respondent's sex. For example, residence in an LGA with a FP HF that had an expressed need for more staff was associated with a lifetime modern contraceptive prevalence of 21 percent (compared to 29 percent if there was no such need) among males and 17 percent (compared to 22 percent) among females (p < .01). The implementation of QA methods among FP non-PMVs and quality of FP provider-client interactions in the LGA were positively associated with the prevalence of lifetime contraceptive use among both male and female residents, as was the presence of integrated FP, STI, and maternal health services. The proportion of respondents who had ever used a modern method was 25 percent in LGAs with a FP HF that provided FP integrated services and 17 percent, otherwise.

The index of provider training in FP and the mean number of systems used to solicit client opinion were the only variables that were unrelated to lifetime prevalence of modern contraception among both males and females. The following measures had significant positive associations with ever use of a modern method among males but not among females: (a) method choice potential; and (b) more intensive supervision of FP non-PMVs located in the LGA. Two indicators had significant associations with the lifetime prevalence of contraceptive use among females but not among males: (a) presence in the LGA of a FP HF with all basic resources for FP examination; and (b) mean number of topics for which visual aids were available in FP HFs.

Current Use of Modern Contraception

The proportion of respondents who were using a modern method of contraception at the time of the survey is shown in Table 3 by selected measures of the LGA FP service delivery environment. Current contraceptive use was low (13 percent) and gender differences in the contraceptive prevalence rate were not statistically significant. Among males and females, the availability of a FP HF with all basic resources for FP examination and the quality of FP provider-client interaction were significantly associated with modern contraceptive prevalence. Although statistically significant, some of the differences in prevalence rates were small when comparing LGAs due, in part to the low overall prevalence of contraceptive use in the sample.

As was observed for the previous two outcomes, there was a positive association between having systems that were supportive of quality FP service delivery and the current contraceptive use rate. The contraceptive prevalence rate was almost twice as high among men in LGAs with a high utilization of quality assurance methods by FP non-PMVs as among their counterparts residing in LGAs with low utilization of these methods. The latter measure was also significantly associated with current use of modern contraception among women. Our proxy measure for the presence of an appropriate constellation of services—presence of FP integrated services in the LGA—was also positively associated with the prevalence of modern contraceptive use among both males and females.

Any perceived shortages of staff and emergency transportation by FP providers in an LGA—a reflection of service delivery needs—were associated with lower rates of contraceptive use among both male and female residents. For example, only 3 percent of female respondents reported current use of a modern method of contraception in LGAs with a perceived need for emergency transportation compared to 12 percent in LGAs with no such perceived need, a probable reflection of broader economic disparities between LGAs. The positive association with current contraceptive use of the index of supervision of FP non-PMVS was statistically significant only among males.

Table 4 shows the percentage of current users who were satisfied with services received at the first visit for contraceptive method currently used (whether modern or traditional) by various aspects of provider-client interaction. Note that of the 52 respondents who were currently using withdrawal, 14 were currently using one method of contraception, 33 were currently using two methods of contraception, and five were currently using three methods of contraception. Consequently, for 38 of these 52 respondents, it is unclear as to which method of contraception client satisfaction pertained. Overall, 83 percent of current users were satisfied with the services received at their first visit. Client satisfaction rates were significantly lower if the provider did not perform any of the specified tasks than if the provider did. The tasks included greeting the client; responding to the client's questions/health concerns; explaining common side effects if medication was provided; explaining what to do about common side effects; telling the client when to return for the next visit; and treating the client with respect. Client satisfaction rates were at least twice as high if the respondent reported that the provider greeted her or treated her with respect. These two aspects of interpersonal relations showed the greatest differentials in the client satisfaction rate. For example, only 38 percent of current users who reported that the provider did not greet them reported being satisfied with services received at their first FP visit as compared to 96 percent of current users who reported that the provider greeted them.

Ideally, the second, third, and fourth tasks would empower clients in choosing and using a method of contraception with competence and together with the fifth task measure "information given to clients" during service interactions. Less than half of current users reported that the provider

explained common side effects if medication was provided or explained what to do about common side effects. About 28 percent of users stated that the provider did not respond to their questions or health concerns (not shown). Analyses not presented here showed that there was a positive association between the quality of provider-client interaction in the LGA and satisfaction rates among LGA residents who were currently using a method of contraception. Ninety-one percent of clients residing in LGAs with a high index of FP counseling were satisfied with the services received at the first visit for the current method used compared to 80 percent in LGAs with a low index. These differentials were significant at the five percent level.

Multivariate Results

LGA-Level Effects

Table 5 presents the multivariate results. The average number of contraceptive methods provided and the average number of QA systems used to support service delivery in FP HFs in respondents' LGA of residence were positively associated with the odds of knowing three or more modern methods of FP. The odds of knowing three or more modern methods of contraception increased by 12 percent with each additional FP method provided in the average FP clinic in the LGA (OR = 1.120; 95 percent CI = 1.029, 1.220; p = 0.009). The higher the number of QA methods used by FP health facilities in an LGA, the greater was the likelihood that people living in the LGA knew three or more modern methods of contraception. Contrary to expectations, respondents residing in LGAs in which FP counseling was integrated in maternal health services had significantly lower odds of knowing three or more modern methods as compared to those who did not. This association was significant at the one percent level.

Although the degree of method choice in the LGA was significantly associated with the odds of knowing three or more modern methods of contraception, we found no significant association with respect to the odds of ever using a modern method. The index of health worker training to provide FP services in the LGA was the only quality-of-care variable that had a significant positive association with respondents' odds of ever using a modern method of FP (OR = 1.136; 95 percent CI = 1.043, 1.238; p = 0.004). Respondents who lived in an LGA in which FP health workers perceived a need for more staff were significantly less likely than those who did not to have ever used a modern method of FP. The presence in the LGA of a FP health worker with relevant FP/RH visual aids was negatively associated with the odds of ever using a modern method (or = 0.600; 95percent CI = 0.425, 0.848); p = 0.004).

Three measures of the HF readiness and the quality of the FP service delivery environment were significantly associated with the odds of currently using a modern method of contraception. Respondents residing in LGAs with a perceived need for more staff among FP health workers were significantly less likely than were other respondents to be current users of modern methods of FP (OR = 0.627; 95 percent CI = 0.451, 0.871; p = 0.005). The results also indicated that respondents' odds of currently using a modern method of contraception was significantly higher in LGAs with higher indices of FP health worker training (OR = 1.187; 95 percent CI = 1.092, 1.290; p = 0.001) and higher quality of FP provider-client interaction (OR = 1.298; 95 percent CI = 1.105, 1.525; p = 0.001).

Individual-Level Effects

The individual-level results were worthy of note. The odds of knowing three or more modern method of contraception and of ever using a modern methods were significantly higher for respondents who were older, those who were educated, those who were employed, those who

were Christian, or those who had been exposed to more sources of FP information in the past six months; and significantly lower in Bauchi than in Lagos state, or among rural as compared to urban residents. Although respondents living in households with medium and high compared to low levels of wealth had significantly higher odds of knowing three or more modern methods of contraception, household wealth was not associated with the odds of ever or currently using a modern method of contraception. For the models examining contraceptive use, the odds of using a modern method were significantly higher among respondents who perceived that some/most/all women in their community approved of FP compared with those who felt none of the women in their community did.

Random Effects

To assess whether there were significant differences between LGAs in contraceptive outcomes of interest we first estimated a multi-level model with just a multilevel constant term, the LGA-specific random effect and no explanatory variables. The results from the null logit model yielded a level-2 (between-LGA) variance of 1.475 (S.E. = -0.365) for knowledge of three or more modern methods, 2.442 (S.E. = -0.656) for ever use of a modern method of contraception, and 2.481 (S.E. = -0.742) for current use of a modern method of contraception. We calculated an approximate Wald statistic for each outcome (Wald statistic = (estimated level 2 variance / standard error)^2) and tested it in a chi-squared distribution with one degree of freedom. The resulting p-values were halved because the alternative hypothesis is one sided given that variances are by definition non-negative (i.e., H_A: $\sigma^2_\mu > 0$).

Our calculations yielded a Wald statistic of 16.3 for contraceptive knowledge, 13.9 for lifetime use of a modern method, and 11.2 for current use of a modern method. Halving the tail probability associated with a chi-squared distribution with one degree of freedom yielded $p < .001$ for all outcomes considered. Thus it can be concluded that difference between LGAs were highly significant for all three outcome. The significance of the random intercepts implied that contraceptive knowledge and decisions were determined by factors not captured by the observed covariates. Important unmeasured factors could have included variations in cultural beliefs surrounding contraceptive use and factors underlying the placement of FP services.

The relative importance of individual-level and LGA-level variables in accounting for variation in contraceptive outcomes was estimated by calculating the ratio of the LGA-level variance to the total variance (the intraclass correlation), a measure of the degree to which contraceptive outcomes were clustered at the LGA-level. Using the estimates from the null model, we obtained an intra-LGA correlation of 0.310 for knowledge of three or more modern methods, 0.426 for lifetime use of a modern method, and 0.430 for current use of a modern method of contraception. These estimates implied that even though more than half the variation in contraceptive outcomes is explained by individual-level characteristics, there is a considerable proportion of the explained variance that is attributable to LGA-level measures of the FP service delivery environment.

Gender and Urban-Rural Interactions

Table 6 presents the results of adding gender interactions to the models presented in table 5. The interaction terms indicated that the odds of ever using a modern method among those residing in LGAs with higher quality FP provider-client interaction were significantly higher for women than for men (p = 0.006). Similarly, the odds of currently using a modern method among respondents residing in LGAs with higher quality FP provider-client interaction were significantly higher for women than for men (OR = 1.294; 95 percent CI = 1.063, 1.575; p = 0.010). In the model examining lifetime use of a modern method of contraception, the odds ratios were lower for

women living in LGAs with a FP HF that had all basic equipment for FP examination than for their male counterparts. However, these results were marginally significant (OR = 0.944; 95 percent CI = 0.995, 2.085; p = 0.053).

In table 7, we present the results of regression models with interaction terms between the type of place of residence and the following level-2 variables: method choice potential, index of health worker training to provide FP services, mean number of QA methods used, high level of supportive supervision, and index of provider-client interaction. The interaction terms were added to the models shown in table 5. The results of our analysis showed that the odds of knowing three or more modern methods of contraception were 19 percent higher among rural residents in LGAs that offered more contraceptive methods, 32 percent and 23 percent higher among semi-urban and rural residents, respectively, in LGAs that used more QA methods than among urban residents in those LGAs. By comparison, the odds of knowing three or more modern methods were lower among rural residents in LGAs with higher indices of health worker training and among semi-urban residents in LGAs with high supportive supervision of FP non-PMVs compared with urban residents in those LGAs. In LGAs that had high levels of supportive supervision, the odds of ever using a modern method of contraception were significantly higher among rural residents than among their urban counterparts whereas in LGAs that had higher levels of health worker training in FP, the odds of lifetime use of a modern method were significantly lower among rural residents than among urban residents. In LGAs that provided a higher number of contraceptive methods, the odds of currently using a modern method were lower among respondents in semi-urban areas as compared with those residing in urban areas. In LGAs with a higher number of QA methods used in FP non-PMVs and in LGAs with higher quality of provider-client interaction, there was a 52 percent and 56 percent higher likelihood of currently using a modern method in semi-urban areas than in urban areas.

Discussion

The findings of this study showed some strong associations between measures of HF readiness and contraceptive knowledge and use. The number of methods provided and the number of QA systems used by FP health facilities in the LGA were significantly associated with an increased likelihood of knowing three or more modern methods, after controlling for other variables, lending support to the argument for diversifying methods provided and systems of QA in FP clinics. However, method choice potential in an LGA was not significantly associated with lifetime or current use of a modern method, although its association with the likelihood of current use of a modern method was significantly lower in semi-urban than in urban areas. These results were contrary to previous findings of a significant positive effect of the number of methods available in local facilities on subsequent contraceptive use among nonusers (Magnani et al., 1999) and of the number of methods available in a community on postpartum contraceptive adoption in Morocco (Steele et al., 1999). In order to interpret our findings better, further information is needed on variability within and across LGAs in contraceptive stocks and in the amount of information that clients receive about each method provided.

The data offered an opportunity to examine the links between the availability of providers trained in key areas of FP/RH service delivery and contraceptive behavior. The results showed that residents of LGAs characterized by higher availability of trained providers were significantly more likely than others to have ever used or to be currently using a modern method. Evidence suggests that health worker training improves providers' skills in presenting clients with FP information, promotes attitudinal change among providers themselves, improves client satisfaction, improves providers' tendency to ask clients about their reproductive intentions and prior experience with contraceptive methods, and increases client's likelihood to return for follow-up visits (Kim et al.,

1992; Huntington, Lattenmaier & Obeng-Quaidoo, 1990; Costello, Lacuesta, RamaRao & Jain, 2001; RamaRao & Mohanam, 2003). Not surprisingly, the results also showed that the likelihood of contraceptive use was higher in LGAs with higher quality of provider-client interaction than in other LGAs and that higher quality of provider-client interaction in an LGA increased the likelihood of current use of a modern method among semi-urban residents compared to their urban counterparts.

A comparison of these findings with previous studies that have examined the influence of HF readiness and the quality of care on contraceptive behavior was limited by the variety of indicators that have been used to define these concepts, the different methodologies used for data collection, and the different outcomes examined. Bearing these differences in mind, our findings are in line with those of other authors who have examined how individual and community perception of the quality of available FP services are related to contraceptive adoption. Keonig and colleagues (1997) found that women who perceived that they received good quality care as measured by interpersonal rapport with a field worker were significantly more likely than those who did not to use a contraceptive method within the next 30 months. In Tanzania, Mroz et al. (1999) found that perceptions of quality at the community had significant effects on contraceptive use, after controlling for individual-level factors. The likelihood of contraceptive use was higher in communities where quality was perceived to be high than in communities where quality was perceived to be low.

The results of the present study indicated that quality of care had a much stronger association with women's than with men's contraceptive behavior. As our proxy measure of the quality of care captured both interpersonal and technical aspects of provider-client contact, there is a possibility that the variables used to construct the index were not sensitive to factors that may affect men's perception of the interpersonal aspects of quality or their FP/RH concerns (see Speizer & Bollen, 2000, for a more detailed discussion). We also were unable to capture how non-clients perceived quality, which could have biased the parameter estimates.

The analysis also demonstrated that men and women from LGAs with perceived shortages of medical staff were significantly less likely than those from LGAs without perceived staff shortages to have ever used or to be currently using a modern method. While perceived shortages of medical staff are indicative of human resources for the provision of health services, they could also be a reflection of limited funding, payment schemes, and incentives; poor geographic access; poor working conditions, which make it difficult to retain health workers; long waiting times; unnecessary medical policies and practices, which increase health worker burden; or the sex and ethnic composition of providers, which could affect psychosocial aspects of the utilization of FP services. Additional data are necessary, therefore, to understand these findings better.

We found a negative association between our contraceptive outcomes of interest and the following measures: (a) presence in the LGA of a FP health facility with visual aids for FP/RH counseling; (b) presence in the LGA of a FP HF with all basic equipment for FP examination; and (c) presence of FP services that are integrated with STI and maternal health services. While some of these negative associations attained statistical significance, we did find a more positive, albeit marginally significant (p =0.053), association of the availability of basic equipment for FP examination in LGA HFs with the odds of ever using a modern method among females as compared to males. These findings were unexpected because programs that are better supplied in terms of equipment and informational and educational materials could indirectly facilitate contraceptive adoption by providing better quality care than programs that are not so well equipped and by helping to ensure that examinations are conducted and individuals provided with relevant information.

Possible explanations for our findings could stem from the way the variables were defined. We had to balance use of a multidimensional construct of HF readiness with measurement of distinct components of Bruce's (1990) quality of care framework and with minimizing multicollinearity between LGA variables. It is also possible that the presence of visual aids in a HF may not have necessary translated into their use by health care providers if providers felt that they already knew what to do or if providers did not want to appear ignorant or inexperienced in front of clients (RamaRao & Mohanam, 2003). Problems of endogeneity could have arisen if HFs made a conscious decision to procure more visual aids, ensure the availability of basic equipment for FP examination, or promote FP counseling in maternal health services in response to a low prevalence of knowledge and adoption of modern contraception in their catchment areas.

Limitations

Although this study has highlighted the importance of several components of health service delivery for contraceptive knowledge and use, the analysis has some limitations. Due to lack of data, we were unable to measure directly two key element of Bruce's (1990) framework— technical competence, which encompasses providers' clinical techniques and observance of protocols and asepsis in clinical conditions; and mechanisms for ensuring continuity and follow-up, which could include both mass media and client-based follow-up mechanisms, including return appointments and home visits to clients. Chart abstraction, clinical vignettes, and direct observation and recording of visits are commonly used in low income countries to measure the process aspects of quality. However, these methodologies were not incorporated into the COMPASS surveys. While our index of the quality of FP provider-client interaction incorporated aspect of interpersonal relations, as well as information given to clients during FP interactions, we were unable to measure the level of empathy, confidentiality, and privacy, or sensitivity by providers to clients' needs.

A second limitation of the analysis stemmed from the cross-sectional nature of the data, which made it difficult to establish causality. Endogeneity was of concern because decisions about the placement of services are often not random. If FP HFs are placed and higher contraceptive technology provided in LGAs where demand for contraceptives is high, failure to consider this factor could lead to an overstatement of the effects of the FP service delivery environment. If facilities are placed or FP integrated in maternal health services in LGAs with low contraceptive prevalence, the effects of the service variables could be understated (see Steele et al., 1999). It may also happen that users of modern contraception may selectively migrate to LGAs with higher levels of facility readiness and higher quality services. If so, the observed correlations between LGA service environments and contraceptive outcomes may be a reflection of unmeasured processes by which individuals sort themselves into different LGAs (see Sampson, 2003).

One option would have been to construct LGA measures from the 2005 baseline and 2007 midline cross-sectional surveys, which would have ensured that our measures of the service environment preceded our contraceptive outcomes of interest. If, however, the service environment changed in the two-to-five year period preceding the 2009 survey, then those service measures based on the earlier facility surveys may not be relevant for current contraceptive knowledge and behavior. As all LGAs surveyed were those in which the COMPASS project implemented interventions to improve health services and community health behaviors, we had reason to believe that structural and process aspects of quality changed over the two-to-five year period.

The literature suggests three ways of dealing with endogeneity: (1) actually measuring crucial omitted variables; (2) applying multilevel instrumental variables estimation techniques; (3) using repeated measures in a longitudinal fixed effects model based on the nesting of panel

observations for those who change neighborhoods (Subramanian, Jones & Duncan, 2003). Some studies have also addressed issues of causality by implementing experimental and quasi-experimental designs. However, none of these methodologies were within the scope of the present study due, in part, to the difficulty of finding instruments and to the fact that the facility and household surveys did not implement a panel design. Although the baseline, midline, and endline surveys were implemented in the same LGAs, the household respondents, and facilities surveyed were different in each wave. Further work will be necessary, therefore, to clarify the causal mechanisms by which contraceptive outcomes are influenced by FP service delivery factors.

One methodological issue in the present study was defining the relevant higher level units to be included in the multilevel analysis. Many studies of contextual and community effects on health outcomes in sub-Saharan Africa have utilized the enumeration area or census tract to define the higher level units. Recognizing that individuals may go several communities away in search of better health services, the sampling frame for the 2009 facility survey was based only on HFs (including all public and private primary HFs) serving the populations interviewed in the baseline, midline, and endline household surveys. Hence, the HF survey included some facilities that were located outside the enumeration areas selected for the household survey, thereby violating the inherent assumption in our multilevel analysis that people living in the same geographic area shared similar FP services. The use of a higher level of aggregation than the enumeration area to link the service environment to contraceptive outcomes may not have completely addressed this problem. Six of the 51 LGAs targeted by the COMPASS project were omitted from the present study as they were not canvassed in the HF survey. In some LGAs the number of HFs surveyed was small, raising questions as to the extent to which these service delivery points indicated the level of readiness of the LGA to offer FP services. These issues can only be addressed through a HF census in order to obtain a larger number of HFs per LGA, but the costs of implementing such a study could be prohibitive.

Despite these methodological constraints, we believe that our health service environment measures were more meaningful at the higher level of aggregation (i.e., the LGA) than at lower levels (i.e., the enumeration area). As community-specific estimates depend on the sample size in specific communities, defining our level-2 units in terms of the LGA also ensured a higher number of individuals in each level-2 unit, an issue that is related to the precise power of calculations within multilevel models. Note also that the HF and household surveys were conducted in the 51 LGAs that were targeted at the start of the COMPASS project; hence the results of our analysis were not representative of all HFs and households in Bauchi, FCT, Lagos, Kano, or Nasarawa states. Future studies should assess whether the effect of residing in LGAs with high-quality FP services varies with individuals' background characteristics and is associated with health outcomes other than contraceptive use.

Program and Policy Implications

The findings call for interventions that target specific elements of FP service-delivery. First, expanding contraceptive choice by introducing more methods to existing FP programs in LGAs that offered fewer contraceptive methods could expand individual's awareness of how different methods could be used to satisfy diverse family needs. Second, training health care providers in specific elements of FP service delivery, including FP counseling and technical competence, can facilitate clients' decision making to adopt modern methods of contraception. The significant negative associations with contraceptive use of health worker identification of shortages of staff in family clinics points to the importance of having providers in an LGA evaluate their own services to identify constraints to FP service delivery. The use of provider self-assessment tools such as the client-oriented, provider-efficient (COPE) services (EngenderHealth, 2003), continuous quality

improvement (CQI), and other QA tools for improving quality of care could be encouraged while recognizing that possible solutions to staff shortages and other problems may require a sizeable investment of resources, close collaboration between healthcare providers and management, and political commitment to implement solutions (e.g., see Bradley, Wambwa, Beattie & Dwyer, 1998).

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Availability		Choice of Methods		Contraceptive Knowledge
Infrastructure		Information Given to Clients		
		Technical Competence of Health Personnel		Client Satisfaction
		Interpersonal Relationships		
		Follow-up/ Continuity Mechanisms		Contraceptive Use
		Appropriate Constellation of Services		
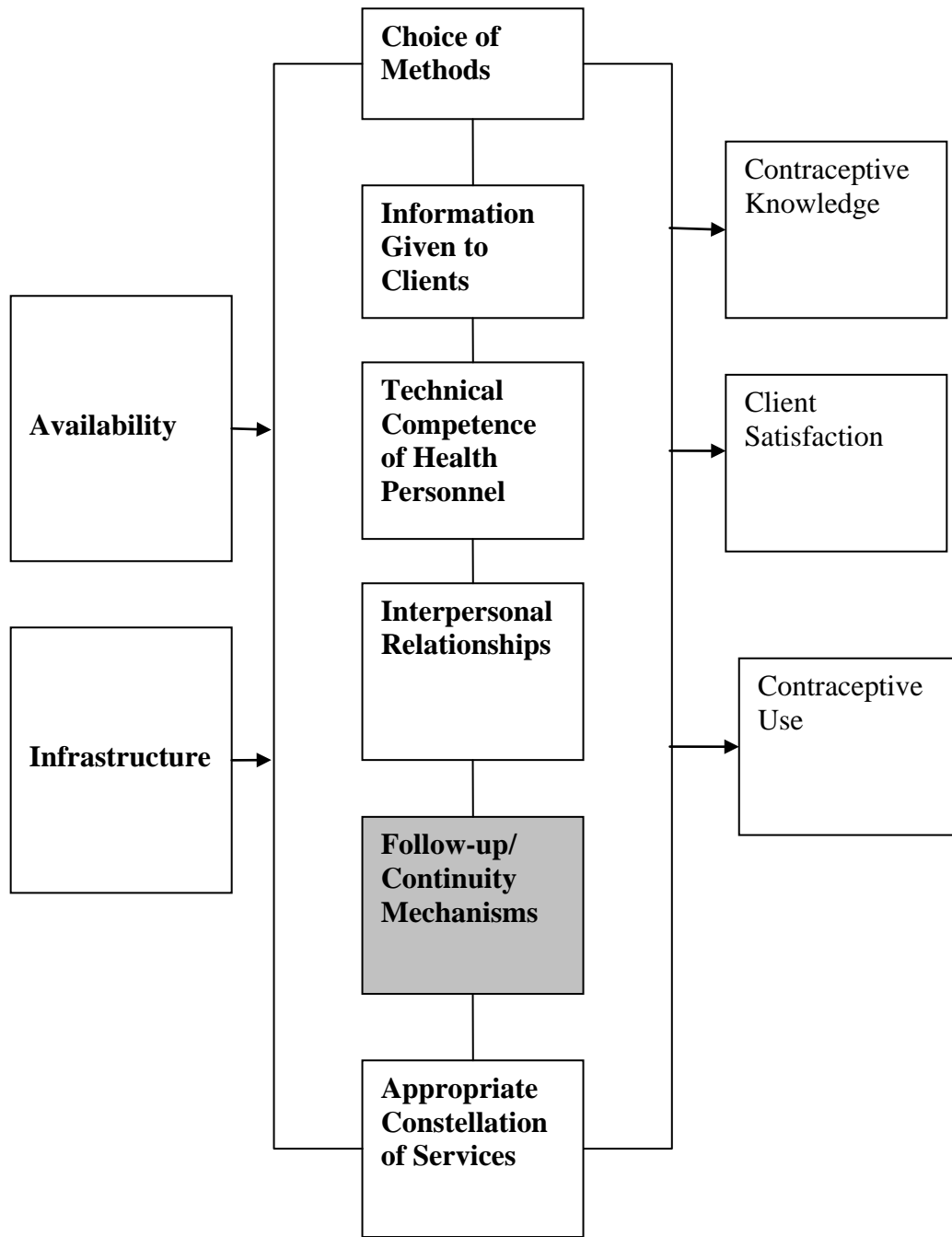
Source: Adapted from Bruce (1990).

Figure 1:   Framework for examining the relationship between the family planning service environment and contraceptive outcomes.

Table 1:   Characteristics of the Sample, Nigeria 2009

	Male		Female		Total	
	% or Mean (S.E)	N	% or Mean (S.E.)	N	% or Mean (S.E.)	N
Age ***	33.6 (0.434)	2068	29.8 (0.313)	2056	31.7 (0.287)	4124
Education **						
None	23.4	508	28.9	662	28.5	1,174
Primary	29.9	630	30.5	632	30.6	1,262
Secondary/higher	46.7	930	40.6	758	40.9	1,688
Current employment ***						
Unemployed	49.8	1104	67.8	1447	62.6	2,581
Employed	50.2	964	32.2	579	37.4	1,543
Religion						
Non-Christian	61.2	1275	58.8	1221	60.5	2,496
Christian	38.8	793	41.2	835	39.5	1,628
Marital status ***						
Married	43.6	916	54.8	1146	49.2	2,062
Living together	11.2	253	14.8	316	13.0	569
Not in union	45.2	899	30.4	594	3781	1,493
Household wealth **						
Low	30.6	738	25.2	633	27.8	1,371
Medium	32.3	636	38.7	733	35.5	1,369
High	37.1	692	36.1	690	36.6	1.382
No. of FP information sources	1.720 (0.064)	2068	1.791(0 .064)	2056	1.756 (0.057)	4124
Perceived level of approval of FP among women in community **						
None	25.2	551	19.3	446	22.2	997
Few	34.5	705	31.3	647	32.9	1352
Some/most/all	40.4	812	49.5	963	44.9	1775
LGA-level variables						
Mean no. of FP methods provided	5.226 (0.283)	2068	5.665 (0.299)	2056	5.445 (0.278)	4124
Index of HW training to provide FP services	-0.1072 (0.197)	2068	-0.050 (0.205)	2056	-0.078 (0.191)	4124
Mean no. of QA systems used by FP HFs	2.828 (0.186)	2068	2.791 (0.179)	2056	2.809 (0.174)	4124
High (supportive) supervision of FP HFs	57.5	2068	58.1	2056	57.8	4124
Integration of FP with STI/MH services	68.0	2068	71.8	2056	69.9	4124
Mean no. of FP/RH topics with visual aids per FP HF	0.411 (0.045)	2068	0.408 (0.048)	2056	0.410 (0.045)	4124
Presence of FP HF with all basic equipment for FP examination	55.7	2068	55.7	2056	55.7	4124
Mean no. of systems used by FP HFs to solicit client opinion	0.134 (0.030)	2068	0.169 (0.038)	2056	0.151 (0.032)	4124
Perceived need for more staff by FP HWs	53.3	2068	51.0	2056	52.2	4124
Perceived need for emergency transport by FP HWs	5.3	2068	4.1	2056	4.7	4124
State ***						
Lagos	42.7	505	51.0	604	46.9	1109
Bauchi	17.7	339	11.9	228	14.8	567
FCT	4.3	297	5.0	352	4.6	649
Kano	29.5	618	25.7	540	27.6	1158
Nasarawa	5.9	309	6.4	332	6.1	641
Type of place of residence **						
Urban	54.5	855	61.7	927	58.1	1782
Semi-urban	14.6	403	15.0	440	14.8	843
Rural	30.9	810	23.3	689	27.1	1499
Index of FP provider-client interaction	2.707 (0.158)	2068	2.683 (0.127)	2056	2.695 (0.135)	4124

Data are weighted. Significance levels pertain to gender differences in background characteristics.
***   p < .001   **   p < .01   *   p < .05

Table 2: Percent of Respondents Who Knew Three or More Modern Methods of Contraception by Selected Characteristics of the Family Planning Service Environment in the Local Government Area of Residence and Sex, Nigeria 2009

LGA Characteristics	Male		Female		Total	
	%	N	%	N	%	N
CHOICE OF METHODS						
Number of contraceptive methods provided (lgafpmedmethtot)	***		***		***	
Below Median	30.8	1049	38.7	906	34.3	1955
At/above Median	44.6	1019	49.8	1150	47.4	2169
SYSTEMS THAT SUPPORT QUALITY FP SERVICE DELIVERY	***		***		***	
Mean no. of quality assurance methods used by FP Non-PMVS (lgafpavgqocmeth)						
Below Median	31.8	1068	39.3	1103	35.5	2171
At/above Median	42.8	1000	49.9	953	46.4	1953
PCA index of supervision for FP NON-PMVs (lgafpmedsupervpca)	**		***		***	
Below Median	34.8	980	39.6	977	37.2	1957
At/above Median	41.2	1088	50.2	1079	45.7	2167
TECHNICAL COMPETENCE						
Index of provider training in family planning (lgafpmedtrain)	***		ns		**	
Below Median	42.0	1190	46.7	1175	44.4	2365
At/above Median	33.8	878	44.7	881	39.3	1759
RESOURCES FOR FP EXAMINATION						
LGA has FP HF with all basic resources for FP examination (lgafpallequip)	ns		*		***	
No	36.4	966	42.8	962	39.6	1928
Yes	40.1	1102	48.1	1094	44.1	2196
APPROPRIATE CONSTELLATION OF SERVICES						
LGA has FP HF routinely providing integrated FP/STI/ANC/PPC services (lgafpancppcsti)	*		*		***	
No	34.8	773	41.2	715	37.8	1488
Yes	40.1	1295	47.6	1341	44.0	2636
ITEMS TO SUPPORT FAMILY PLANNING COUNSELING						
Mean no. of FP visual aids per HF	**		**		**	
0	41.1	1292	48.5	1310	44.8	2602
1	34.6	776	41.8	746	38.2	1522
MEAN INDEX OF FP PROVIDER-CLIENT INTERACTION (lgafphwinteract1)	ns		***		***	
Low	36.4	813	40.4	790	38.3	1603
High	40.1	1255	49.8	1266	45.1	2521
Mean no. of systems used to solicit client opinion in FP HFs	ns		ns		ns	
0	38.1	1793	47.0	1739	42.4	3532
1	41.0	252	39.6	289	40.3	541
2	39.1	23	35.7	28	37.3	51
SERVICE PROVISION ENVIRONMENT						
LGA has FP HF mentioning more staff needed (lgafpneedstaff)	**		ns		ns	
No	42.7	1003	44.8	1075	43.4	2078
Yes	34.7	1065	46.7	981	40.6	2046
LGA has FP HF mentioning emergency transportation needed (lgafpneedtrans)	***		*		***	
No	39.3	1931	46.3	1946	42.8	3877
Yes	23.4	137	33.5	110	27.8	247
Total	38.4	2068	45.8	2056	42.1	4124

Data are weighted
ns   Not significant
***   p < .001 **   p < .01   *   p < .05

Table 3: Percent of Respondents Who Have Ever Used a Modern Method and the Percent Currently Using a Modern Method of Contraception by Selected Characteristics of the Family Planning Service Environment in the Local Government Area of Residence and Sex, Nigeria 2009

LGA Characteristics	Lifetime Use			Current Use		
	Male	Female	Total	Male	Female [a]	Total
CHOICE OF METHODS						
Number of contraceptive methods provided	***	ns	***	***	ns	***
Below Median	18.6	17.3	18.0	10.2	10.0	10.1
At/above Median	30.0	21.2	25.3	16.7	12.9	14.8
SYSTEMS THAT SUPPORT QUALITY FP SERVICE DELIVERY						
Mean no. of quality assurance methods used by FP Non-PMVS	***	**	***	***	***	***
Below Median	19.8	16.2	18.0	9.9	8.1	9.0
At/above Median	28.3	22.1	25.2	16.5	14.3	15.4
PCA index of supervision for FP NON-PMVs	**	ns	ns	*	ns	*
Below Median	20.8	19.7	20.6	11.3	11.2	11.3
At/above Median	28.0	19.9	23.9	15.7	12.7	14.1
TECHNICAL COMPETENCE						
Index of provider training in family planning	ns	ns	ns	ns	*	*
Below Median	24.2	20.1	22.2	13.0	10.2	11.7
At/above Median	25.8	19.4	22.6	14.9	13.9	14.5
RESOURCES FOR FP EXAMINATION						
LGA has FP HF with all basic resources for FP examination	ns	*	*	**	*	***
No	22.8	17.0	19.9	10.8	9.3	10.1
Yes	26.6	22.0	24.3	16.3	13.9	15.1
APPROPRIATE CONSTELLATION OF SERVICES						
LGA has FP HF routinely providing integrated FP/STI/ANC/PPC services	***	*	***	***	**	***
No	17.4	16.0	16.7	7.7	8.5	8.0
Yes	28.5	21.3	24.8	16.7	13.2	15.0
ITEMS TO SUPPORT FP COUNSELING						
Mean no. of FP visual aids per HF	ns	*	*	*	ns	*
0	26.2	21.7	23.9	15.6	12.3	14.6
1	23.2	17.0	20.1	11.3	11.3	11.3
MEAN INDEX OF FP PROVIDER-CLIENT INTERACTION	**	***	***	*	**	***
Below Median	21.1	14.1	17.7	11.2	9.0	10.2
At/above Median	28.0	24.0	26.0	16.0	14.0	15.0
Mean no. of systems used to solicit client opinion in FP HFs	ns	ns	ns	ns	ns	ns
0	25.5	19.8	22.7	13.8	11.9	12.9
1	21.1	19.6	20.2	14.6	11.7	13.1
2	26.1	25.0	25.5	8.7	18.5	14.0
SERVICE PROVISION ENVIRONMENT						
LGA has FP HF mentioning more staff needed	***	*	***	***	**	***
No	29.4	22.4	25.8	18.2	14.6	16.5
Yes	21.0	17.2	19.2	10.0	9.2	9.6
LGA has FP HF mentioning emergency transportation needed	***	**	***	*	**	***
No	25.8	20.2	23.0	14.2	12.2	13.3
Yes	9.6	9.9	9.7	7.3	3.4	5.7
Total	24.9	19.8	22.4	13.8	11.9	12.9
N	2068	2056	4124	2068	1873	3941

Data are weighted
a   Excludes women who are currently pregnant
ns   Not significant
***   p < .001 **   p < .01   *   p < .05

Table 4:   Percent of Respondents (Male and Female) Currently Using a Method of Contraception Who Were Satisfied with Their First Visit to a Health Facility for the Current Method Used by Various Aspects of Provider-Client Interaction, Nigeria 2009

Components of Provider-Client Interaction	Percent Satisfied	N
Provider greeted you	***	
No	38.4	94
Yes	95.9	401
Provided responded to your questions/health concerns	***	
No	58.8	138
Yes	95.4	357
If medication provided, did provider explain common side effects	***	
No	73.9	255
Yes	96.4	240
Provider explained what to do about common side effects	***	
No	74.7	271
Yes	96.5	224
Provider told you when to return for next visit	***	
No	82.5	225
Yes	96.7	236
Provider treated you with respect		
No	47.3	118
Yes	96.2	377
Total	83.1	495

Data are weighted.
***   p < .001   **   p < .01   *   p < .05

Table 5: Multilevel Logit Regressions of Contraceptive Outcomes, Nigeria 2009

	Knowledge of 3 or More Modern Methods		Ever Use of a Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Individual-level variables						
Age	1.018***	(1.010, 1.026)	1.011*	(1.002, 1.021)	1.004	(0.992, 1.017)
Sex						
Male	1.00		1.000		1.000	
Female	1.413***	(1.202, 1.661)	0.739**	(0.612, 0.893)	0.905	(0.720, 1.138)
Education						
None	1.000		1.000		1.000	
Primary	1.959***	(1.566, 2.451)	1.448*	(1.073, 1.955)	1.691*	(1.116, 2.562)
Secondary/higher	2.519**	(1.995, 3.179)	1.424*	(1.053, 1.927)	1.772**	(1.173, 2.677)
Current employment						
Unemployed	1.000		1.000		1.000	
Employed	1.296**	(1.098, 1.529)	1.530***	(1.264, 1.852)	1.733***	(1.367, 2.198)
Religion						
Non-Christian	1.000		1.000		1.000	
Christian	1.548***	(1.290, 1.857)	1.253*	(1.026, 1.530)	1.218	(0.955, 1.554)
Marital status						
Married	1.000		1.000		1.000	
Living together	1.057	(0.843, 1.324)	0.848	(0.651, 1.105)	0.982	(0.713, 1.354)
Not in union	0.772**	(0.638, 0.934)	1.097	(0.877, 1.372)	1.172	(0.891, 1.543)
Household wealth						
Low	1.000					
Medium	1.428**	(1.128, 1.806)	1.240	(0.915, 1.680)	1.392	(0.947, 2.046)
High	1.451**	(1.123, 1.876)	1.285	(0.931, 1.773)	1.441	(0.960, 2.164)
No. of FP information sources	1.310**	(1.248, 1.375)	1.157***	(1.098, 1.219)	1.147***	(1.078, 1.221)
Perceived level of approval of FP among women in community						
None			1.000		1.000	
Few			1.890***	(1.363, 2.622)	2.106**	(1.317, 3.367)
Some/most/all			2.574***	(1.872, 3.540)	2.988***	(1.898, 4.706)
LGA-level variables						
Mean no. of FP methods provided	1.121**	(1.029, 1.221)	1.061	(0.980, 1.149)	0.999	(0.920, 1.085)
Index of HW training to provide FP services	0.965	(0.871, 1.069)	1.136**	(1.043, 1.238)	1.187***	(1.092, 1.290)
Mean no. of QA systems used by FP HFs	1.142*	(1.010, 1.290)	0.964	(0.866, 1.073)	1.039	(0.930, 1.162)
High (supportive) supervision of FP HFs	1.165	(0.722, 1.881)	1.178	(0.750, 1.850)	0.961	(0.591, 1.563)
Integration of FP with STI/MH services	0.472**	(0.269, 0.826)	0.648	(0.339, 1.238)	0.699	(0.306, 1.597)
Presence of FP/RH topics with visual aids	0.766	(0.499, 1.177)	0.600**	(0.425, 0.847)	0.758	(0.531, 1.083)
Presence of FP HF with all basic equipment for FP examination	0.931	(0.615, 1.409)	0.739	(0.495, 1.103)	0.998	(0.643, 1.549)
Mean no. of systems used by FP HFs to solicit client opinion	0.739	(0.487, 1.121)	0.814	(0.576, 1.152)	0.984	(0.691, 1.402)
Perceived need for more staff by FP HWs	1.223	(0.839, 1.784)	0.654*	(0.471, 0.909)	0.627**	(0.451, 0.871)

	Knowledge of 3 or More Modern Methods		Ever Use of a Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Perceived need for emergency transport by FP HWs	0.835	(0.370, 1.881)	0.845	(0.441, 1.620)	0.799	(0.398, 1.603)
State						
Lagos	1.000		1.000		1.000	
Bauchi	0.404*	(0.202, 0.810)	0.165**	(0.086, 0.314)	0.153***	(0.063, 0.374)
FCT	1.165	(0.596, 2.274)	0.669	(0.407, 1.100)	0.609*	(0.370, 1.001)
Kano	0.565*	(0.341, 0.934)	0.076***	(0.045, 0.129)	0.097***	(0.048, 0.194)
Nasarawa	0.961	(0.508, 1.818)	0.338***	(0.189, 0.606)	0.472*	(0.247, 0.903)
Semi-urban	0.895	(0.684, 1.169)	0.823	(0.608, 1.115)	0.965	(0.683, 1.364)
Rural	0.683*	(0.489, 0.955)	1.613*	(1.068, 2.434)	1.182*	(0.708, 1.973)
Index of FP provider-client interaction			1.018	(0.903, 1.147)	1.298***	(1.105, 1.525
Constant (S.E.)	-2.776 ***	(0.415)	-2.123	(0.459)	-4.103	(0.572)
LGA Random Part						
Variance (covariance)	0.179(0.062)		0.042 (0.035)		6.615e-19 (2.527e-10)	
No. of respondents	4124		4124		3941	
No of LGAs	45		45		45	
Log likelihood	-2208.19		-1606.62		-1606.62	

***   p < .001   **   p < .01   *   p < .05   S.E.   Standard error

Table 6:   Multilevel Logit Regression of Contraceptive Outcomes with Selected Gender Interactions, Nigeria 2009

	Knowledge of 3 or More Modern Methods		Lifetime Use of a Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Individual-level variables						
Age	1.018***	(1.010, 1.026)	1.012*	(1.002, 1.022)	1.005	(0.992, 1.017)
Sex						
Male	1.000		1.000		1.000	
Female	1.113	(0.759, 1.634)	0.311***	(0.170, 0.569)	0.357*	(0.159, 0.798)
Education						
None	1.000		1.000		1.000	
Primary	1.965***	(1.570, 2.458)	1.475*	(1.092, 1.991)	1.738**	(1.146, 2.638)
Secondary/higher	2.531***	(2.005, 3.196)	1.457*	(1.076, 1.973)	1.829**	(1.208, 2.769)
Current employment						
Unemployed	1.000		1.000		1.000	
Employed	1.295**	(1.097, 1.528)	1.533***	(1.266, 1.856)	1.737***	(1.368, 2.205)
Religion						
Non-Christian	1.000		1.000		1.000	
Christian	1.550***	(1.292, 1.859)	1.253*	(1.026, 1.531)	1.212	(0.949, 1.547)
Marital status						
Married	1.000		1.000		1.000	
Living together	1.055	(0.842, 1.322)	0.848	(0.651, 1.105)	0.982	(0.713, 1.355)
Not in union	0.771**	(0.638, 0.933)	1.088	(0.870, 1.362)	1.169	(0.888, 1.539)
Household wealth						
Low	1.000		1.000		1.000	
Medium	1.426**	(1.127, 1.804)	1.237	(0.912, 1.677)	1.390	(0.944, 2.046)
High	1.446**	(1.118, 1.869)	1.274	(0.922, 1.759)	1.426	(0.949, 2.142)
No. of FP information sources	1.310***	(1.249, 1.375)	1.158***	(1.099, 1.221)	1.149***	(1.079, 1.224)

Table 6 continued

	Knowledge of 3 or More Modern Methods		Lifetime Use of a Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Perceived level of FP approval among women in community						
None	1.000		1.000		1.000	
Few			1.906***	(1.374, 2.645)	2.120**	(1.325, 3.391)
Some/most/all			2.598***	(1.888, 3.576)	3.004***	(1.906, 4.733)
LGA-level variables						
Mean no. of FP methods provided	1.111*	(1.019, 1.211)	1.062	(0.980, 1.150)	0.998	(0.919, 1.084)
Index of HW training to provide FP services	0.967	(0.873, 1.071)	1.132**	(1.039, 1.233)	1.183***	(1.088, 1.287)
Mean no. of QA systems used by FP HFs	1.144*	(1.012, 1.293)	0.964	(0.866, 1.074)	1.039	(0.930, 1.161)
High supportive supervision of FP HFs	1.147	(0.710, 1.852)	1.200	(0.762, 1.889)	0.959	(0.590, 1.560)
Integration of FP with STI/MH services	0.493*	(0.281, 0.868)	0.639	(0.335, 1.218)	0.691	(0.303, 1.573)
Mean no. of FP/RH topics with visual aids	0.777	(0.505, 1.195)	0.627**	(0.443, 0.888)	0.799	(0.558, 1.144)
Presence of FP HF with all basic equipment for FP examination	0.899	(0.578, 1.397)	0.638*	(0.412, 0.988)	0.969	(0.595, 1.578)
Mean no. of systems used by FP HFs to solicit client opinion	0.753	(0.496, 1.144)	0.820	(0.579, 1.160)	0.992	(0.696, 1.412)
Perceived need for more staff by FP HWs	1.232	(0.844, 1.797)	0.652*	(0.468, 0.908)	0.629**	(0.453, 0.874)
Perceived need for emergency transportation by FP HWs	0.810	(0.359, 1.828)	0.861	(0.449, 1.651)	0.801	(0.400, 1.603)
State						
Lagos	1.000		1.000		1.000	
Bauchi	0.408*	(0.204, 0.817)	0.162***	(0.085, 0.310)	0.151***	(0.062, 0.367)
FCT	1.144	(0.585, 2.235)	0.675	(0.410, 1.113)	0.603*	(0.366, 0.991)
Kano	0.576*	(0.348, 0.953)	0.075***	(0.044, 0.127)	0.094***	(0.047, 0.189)
Nasarawa	0.914	(0.481, 1.739)	0.331	(0.184, 0.594)	0.458*	(0.239, 0.880)

Table 6 continued

	Knowledge of 3 or More Modern Methods		Lifetime Use of a Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Type of place of residence						
Urban	1.000		1.000		1.000	
Semi-urban	0.898	(0.687, 1.174)	0.813	(0.600, 1.102)	0.952	(0.673, 1.345)
Rural	0.682*	(0.488, 0.953)	1.594*	(1.055, 2.410)	1.173	(0.700, 1.965)
Index of FP provider-client interaction			0.944	(0.829, 1.076)	1.184	(0.994, 1.410)
Interaction terms						
Female x Presence of FP HF with all basic equipment for FP examination	1.135	(0.838, 1.537)	1.441	(0.995, 2.085)	1.146	(0.727, 1.806)
Female x Index of FP provider-client interaction	1.057	(0.968, 1.153)	1.231**	(1.061, 1.428)	1.294**	(1.063, 1.575)
Constant (S.E.)	-2.758 (0.418)		-1.849 (0.469)		-3.823 (0.585)	
LGA-level random part						
Intercept variance (covariance)	0.179 (0.062)		0.043 (0.035)		1.025e-20 (2.969e-11)	
No. of respondents	4124		4124		3941	
No. of EAs	45		45		45	
Log likelihood	-2207.279		-1602.105		-1116.197	

*** $p < .001$ ** $p < .01$ * $p < .05$

Table 7: Multilevel Logit Regression of Contraceptive Outcomes with Selected Type-of-Place-of-Residence Interactions, Nigeria 2009

	Knowledge of 3 or more Modern Methods		Lifetime Use of Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Individual-level Variables						
Age	1.018***	(1.010, 1.026)	1.011*	(1.001, 1.021)	1.004	(0.991, 1.016)
Sex						
Male	1.000		1.000		1.000	
Female	1.430***	(1.216, 1.682)	0.727***	(0.601, 0.878)	0.889	(0.705, 1.120)
Education						
None	1.000		1.000		1.000	
Primary	1.978***	(1.580, 2.478)	1.455*	(1.078, 1.964)	1.626*	(1.067, 2.476)
Secondary or higher	2.523***	(1.997, 3.187)	1.446*	(1.068, 1.958)	1.750**	(1.152, 2.657)
Employment						
Unemployed	1.000		1.000		1.000	
Employed	1.282**	(1.086, 1.514)	1.514***	(1.251, 1.832)	1.717***	(1.352, 2.180)
Religion						
Non-Christian	1.000		1.000		1.000	
Christian	1.543***	(1.286, 1.852)	1.235*	(1.011, 1.509)	1.170	(0.912, 1.502)
Marital Status						
Married	1.000		1.000		1.000	
Living together	1.060	(0.846, 1.332)	0.846	(0.650, 1.101)	1.021	(0.739, 1.411)
Not in union	0.766**	(0.633, 0.926)	1.096	(0.876, 1.371)	1.194	(0.906, 1.573)
Household Wealth						
Low	1.000		1.000		1.000	
Medium	1.452**	(1.148, 1.836)	1.258	(0.933, 1.695)	1.368	(0.927, 2.019)
Higher	1.436**	(1.111, 1.858)	1.279	(0.929, 1.762)	1.461	(0.966, 2.209)
No. of FP information Sources	1.316***	(1.253, 1.381)	1.162***	(1.102, 1.225)	1.153***	(1.082, 1.228)
Perceived FP Approval in community						
None						
Few			1.837***	(1.326, 2.546)	2.029***	(1.265, 3.257)
Some/Most/All			2.511***	(1.828, 3.449)	2.891***	(1.829, 4.570)
LGA-level Variables						
Mean no. of FP methods provided	1.054	(0.972, 1.143)	0.997	(0.930, 1.069)	1.008	(0.923, 1.102)
Index of HW raining to provide FP services	1.037	(0.931, 1.155)	1.178***	(1.084, 1.279)	1.225***	(1.106, 1.357)
Mean no. of QA systems used by FP HFs	0.983	(0.859, 1.125)	0.981	(0.872, 1.103)	1.060	(0.918, 1.224)
High supportive supervision of FP HFs	1.940*	(1.095, 3.437)	0.799	(0.458, 1.395)	0.616	(0.303, 1.250)
Integration of FP with STI/MH services	0.561*	(0.341, 0.921)	0.905	(0.475, 1.726)	0.805	(0.309, 2.095)
Mean no. of FP/RH topics with visual aids	0.643*	(0.441, 0.937)	0.744	(0.527, 1.051)	0.711	(0.450, 1.122)
Presence of FP HF with all basic equipment for FP examination	0.876	(0.618, 1.241)	0.887	(0.598, 1.316)	1.069	(0.647, 1.768)
Mean no. of systems used by FP HFs to solicit client opinion	0.732	(0.513, 1.045)	0.833	(0.615, 1.128)	0.834	(0.562, 1.237)

Table 7, continued.

	Knowledge of 3 or more Modern Methods		Lifetime Use of Modern Method		Current Use of a Modern Method	
	OR	95% CI	OR	95% CI	OR	95% CI
Perceived need for more staff by FP HW	1.135	(0.808, 1.596)	0.740*	(0.552, 0.992)	0.709	(0.489, 1.029)
Perceived need for emergency transport-ation by FP HWs	0.619	(0.311, 1.231)	0.785	(0.440, 1.400)	0.708	(0.325, 1.540)
State						
Lagos	1.000		1.000		1.000	
Bauchi	0.401**	(0.215, 0.746)	0.122***	(0.061, 0.242)	0.198**	(0.071, 0.552)
FCT	1.147	(0.640, 2.054)	0.509**	(0.318, 0.815)	0.592	(0.315, 1.112)
Kano	0.487**	(0.304, 0.780)	0.074***	(0.042, 0.131)	0.113***	(0.051, 0.249)
Nasarawa	0.937	(0.532, 1.651)	0.256***	(0.138, 0.475)	0.456	(0.196, 1.061)
Residence						
Urban	1.000		1.000		1.000	
Semi-urban	0.603	(0.301, 1.207)	0.900	(0.207, 3.918)	0.193	(0.030, 1.267)
Rural	0.217***	(0.097, 0.487)	1.260	(0.316, 5.019)	0.311	(0.047, 2.066)
Index of FP provider-client interaction			1.193	(0.961, 1.480)	1.141	(0.861, 1.513)
Interaction-terms						
Semi-urban * Methods provided in LGA	1.046	(0.955, 1.144)	0.982	(0.863, 1.118)	0.816*	(0.693, 0.961)
Rural * Methods provided in LGA	1.190***	(1.079, 1.313)	1.092	(0.978, 1.219)	1.133	(0.966, 1.329)
Semi-urban * HW training index	0.985	(0.817, 1.186)	0.946	(0.769, 1.162)	0.873	(0.674, 1.132)
Rural * HW training index	0.745**	(0.616, 0.901)	0.804*	(0.664, 0.973)	0.970	(0.751, 1.253)
Semi-urban * QA index	1.320**	(1.106, 1.574)	1.017	(0.786, 1.318)	1.517*	(1.084, 2.122)
Rural * QA index	1.227*	(1.034, 1.455)	0.953	(0.777, 1.169)	0.891	(0.677, 1.174)
Semi-urban * High supportive supervision	0.442*	(0.215, 0.906)	1.009	(0.446, 2.283)	1.563	(0.570, 4.283)
Rural * High supportive supervision	0.779	(0.373, 1.627)	3.274**	(1.442, 7.434)	1.381	(0.459, 4.153)
Semi-urban * Provider-client interaction index			0.969	(0.704, 1.334)	1.557*	(1.044, 2.322)
Rural * Provider-client interaction index			0.806	(0.636, 1.022)	1.218	(0.888, 1.671)
Constant (S.E.)	-2.305 ***	(0.402)	-2.426	(0.530)	-3.630	(0.700)
LGA Random Part						
Variance (covariance)	0.096 (0.050)		1.206e-16 (2.926e-09)		9.986e-21 (1.444e-11)	
No. of respondents	4124		4124		3941	
No of LGAs	45		45		45	
Log likelihood	-2191.849		-1598.098		-1107.1122	

***   p < .001   **   p < .01   *   p < .05