



USAID
FROM THE AMERICAN PEOPLE

HOW FAMILY PLANNING SUPPLY AND THE SERVICE ENVIRONMENT AFFECT CONTRACEPTIVE USE: FINDINGS FROM FOUR EAST AFRICAN COUNTRIES

DHS ANALYTICAL STUDIES 26



MARCH 2012

This publication was produced for review by the United States Agency for International Development. It was prepared by Wenjuan Wang, Shanxiao Wang, Thomas Pullum, and Paul Ametepi of ICF International.

MEASURE DHS assists countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. Additional information about the MEASURE DHS project can be obtained by contacting MEASURE DHS, ICF International, 11785 Beltsville Drive, Suite 300, Calverton, MD 20705 (telephone: 301-572-0200; fax: 301-572-0999; e-mail: reports@measuredhs.com; internet: www.measuredhs.com).

The main objectives of the MEASURE DHS project are:

- to provide decision makers in survey countries with information useful for informed policy choices;
- to expand the international population and health database;
- to advance survey methodology; and
- to develop in participating countries the skills and resources necessary to conduct high-quality demographic and health surveys.

DHS Analytical Studies No. 26

**How Family Planning Supply and the Service Environment Affect Contraceptive Use:
Findings from Four East African Countries**

Wenjuan Wang

Shanxiao Wang

Thomas Pullum

Paul Ametepi

ICF International
Calverton, Maryland, USA

April 2012

Corresponding author: Wenjuan Wang. International Health and Development, ICF International, 11785 Beltsville Drive, Calverton, Maryland 20705, USA; Phone 301-572-0200; Fax 301-572-0999; Email: wWang@icfi.com

Editor: Bryant Robey
Document Production: Yuan Cheng

This study was carried out with support provided by the United States Agency for International Development (USAID) through the MEASURE DHS project (#GPO-C-00-08-00008-00). The views expressed are those of the authors and do not necessarily reflect the views of USAID or the United States Government.

Recommended citation:

Wang, Wenjuan, Shanxiao Wang, Thomas Pullum, and Paul Ametepi. 2012. *How Family Planning Supply and the Service Environment Affect Contraceptive Use: Findings from Four East African Countries*. DHS Analytical Studies No. 26. Calverton, Maryland, USA: ICF International.

Contents

List of Tables	viii
List of Figures	ix
Preface	x
Executive Summary	xii
1 Introduction	1
1.1 Background.....	1
1.2 Literature Review	1
1.3 Constraints in Linking Data from Facilities Surveys and Data from Population-Based Surveys	2
1.4 Research Questions	3
2 Methodology	4
2.1 Context of Countries Analyzed	4
2.2 Data.....	5
2.3 Measurements.....	7
2.4 Analysis Method	8
3 Descriptive Results	11
3.1 Use and Sources of Modern Contraceptive Methods	11
3.1.1 Background characteristics of currently married women.....	11
3.1.2 Modern contraceptive use.....	12
3.1.3 Sources of modern contraceptive methods	15
3.2 Contraceptive Availability and the Family Planning Service Environment	17
3.2.1 Background characteristics of sample facilities.....	17
3.2.2 Family planning method availability and service environment.....	19
3.2.3 Average number of contraceptive methods available and average family planning service environment score in health facilities, by region.....	27
3.2.4 Bivariate association between contraceptive use and regional method availability and family planning service environment.....	29
4 Multivariate Regression Results	31
4.1 Results of Random-Effects Logic Regressions.....	31
4.2 Simulation Analysis Results.....	34
5 Discussion and Conclusions	35
References	39

List of Tables

Table 1. Analytical models fitted and variables included in each model.....	10
Table 2. Percent distribution of currently married women age 15-49 by selected background characteristics.....	11
Table 3. Among currently married women age 15-49, the percentage who currently use modern contraceptive methods	12
Table 4. Modern contraceptive prevalence rate (CPR) by region in Rwanda, Uganda, and Tanzania.....	13
Table 5. Percent distribution of currently married women age 15-49 who used any modern contraceptive method, by selected background characteristics	14
Table 6. Percent distribution of users of modern contraceptive methods by most recent source, according to method	16
Table 7. Percent distribution of sample facilities by type of facility, managing authority, and region/province	18
Table 8. Method availability and service environment by province in Kenya, SPA 2004	19
Table 9. Method availability and service environment by province in Kenya, SPA 2010	20
Table 10. Method availability and service environment by region in Rwanda, SPA 2007	22
Table 11. Method availability and service environment by region in Uganda, SPA 2007	24
Table 12. Method availability and service environment by region in Tanzania, SPA 2006.....	26
Table 13. Average number of contraceptive methods available and average family planning service score in facilities by region or province	28
Table 14. Results of random-effects logit regression models	32
Table 15. Between-region variation in contraceptive use explained by each model	33

List of Figures

Figure 1. Among currently married women age 15-49, the percentage who currently use modern contraceptive methods (condom excluded) by province, Kenya.....	13
Figure 2. Association between regional CPR and average number of methods available	30
Figure 3. Association between regional CPR and service environment score	30
Figure 4. Current and predicted contraceptive prevalence if method availability or service environment were improved	34

Preface

One of the most significant contributions of the MEASURE DHS program is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries.

The *DHS Comparative Reports* series examines these data across countries in a comparative framework. The *DHS Analytical Studies* series focuses on analysis of specific topics. The principal objectives of both series are to provide information for policy formulation at the international level and to examine individual country results in an international context.

While *Comparative Reports* are primarily descriptive, *Analytical Studies* comprise in-depth, focused studies on a variety of substantive topics. The studies are based on a variable number of data sets, depending on the topic being examined. A range of methodologies is used in these studies, including multivariate statistical techniques.

The topics covered in *Analytical Studies* are selected by MEASURE DHS staff in conjunction with the U.S. Agency for International Development.

It is anticipated that the *DHS Analytical Studies* will enhance the understanding of analysts and policymakers regarding significant issues in the fields of international population and health.

Ann Way
Project Director

Executive Summary

This report uses data from Demographic and Health Surveys (DHS) and Service Provision Assessment (SPA) surveys conducted in Kenya, Rwanda, Uganda, and Tanzania during the period of 2003-2010. Random-effects logit regression models are fitted to examine the extent to which contraceptive use is associated with the regional family planning supply and service environment and to assess the regional variability in contraceptive use that is explained by these two factors. Contraceptive use information is from the DHS surveys, and family planning supply and service environment data are provided in the SPA survey that was conducted within a year of the DHS in each country.

The analysis indicates that, based on the Kenya 2008-09 DHS, Kenya has the highest level of modern contraceptive use among the four countries studied, at 39 percent of women of reproductive age. Contraceptive use is lowest in Uganda, at 18 percent in the 2006 DHS, and only slightly higher in Tanzania, at 20 percent in the 2004–05 DHS. Regional variation in contraceptive use within countries is evident but less so in Rwanda than in the other three countries. In Uganda women rely primarily on private-sector sources, while in the other three countries they primarily use public sources.

Over half of health facilities provide at least one contraceptive method, ranging from 60 percent in Uganda in 2007 to 81 percent in Kenya in 2010. Regional variations in method availability are apparent in all four countries but are most striking in Uganda. In terms of infrastructure and resources to support high-quality family planning services, the majority of facilities in all four countries ensure visual and auditory privacy for counseling and provide visual aids for their family planning clients. Health facilities providing family planning services often have written national family planning guidelines. In Rwanda and Tanzania facilities have limited capacity in infection control. Running water, in particular, is missing at most of the facilities in these two countries. In all four countries fewer than 10 percent of facilities contain all of the items specified for quality of care in pelvic examinations, including a private room offering visual and auditory privacy, an examination bed or table, an examination light, and vaginal speculums.

The lack of routine staff training for family planning providers cuts across all four countries, with one-tenth or fewer of facilities in Uganda and Tanzania and one-third or fewer in Kenya and Rwanda providing routine staff training for family planning providers. In all four countries, however, family planning providers generally receive routine supervision.

There are important regional or provincial variations in the various family planning service components.

Multivariate regression analysis finds that an average increase of one contraceptive method available in a region increases women's odds of using modern contraception by 50 percent if family planning facility density in the region and other individual-level variables are held constant. Women in regions with a more favorable service environment (as measured by a higher service environment score) in facilities are more likely to use a modern contraceptive method. The analysis also suggests that regional-level factors significantly contribute to the between-region variation in contraceptive use. The increased proportion of variation explained by adding regional contraceptive supply and service environment variables to the model is 18 percent and 27 percent, respectively.

Simulation results in the North East province in Kenya and the North region in Uganda suggest that a much higher proportion of women would be using a modern contraceptive method if method availability or the service environment, or both, could be brought up to the national average level.

In light of increasing interest and program efforts to improve contraceptive use in sub-Saharan Africa, these findings may assist donors and program planners to assess the effectiveness of existing programs and to plan for future investment in family planning.

1 Introduction

1.1 Background

As a region, sub-Saharan Africa has the highest fertility level in the world, with an average total fertility rate (TFR) of 5.1 in 2009 (World Bank 2011). In most countries in the region, the TFR has declined over time, but the TFR has remained constant in some countries since 2000, or even risen.

The average contraceptive prevalence rate (CPR) in sub-Saharan Africa in 2009 was 21 percent, far lower than in South Asia (51 percent), Latin America and Caribbean (75 percent), and East Asia (77 percent) (World Bank 2011). Countries in East Africa have observed a greater increase in contraceptive use than countries in West and Central Africa, but in some countries, such as Uganda and Rwanda, the gap between actual and desired fertility has widened since 2000 (Sharan, Ahmed et al. 2010), suggesting that many women are having more children than they would prefer. Recent research has shown that unmet need for family planning remains high in most sub-Saharan countries (Khan, Mishra et al. 2007; Bradley, Croft et al. 2011).

As a result of high fertility and low levels of contraceptive use, sub-Saharan Africa had the highest population growth rate among developing countries during 2005-2010, an annual rate of 2.4 percent compared with 1.4 percent in South Asia and 1.1 percent in Latin America (World Bank 2011). Many countries in sub-Saharan Africa have recognized that rapid population growth impedes their social and economic development and have thus invested in family planning programs. Many of these programs aim to increase contraceptive use through improving the family planning supply and service environment, based on the assumption that greater supply and better service quality will lead to more use.

1.2 Literature Review

A review of the literature reveals that few researchers have actually assessed or measured the magnitude of the effect of family planning supply and service quality on contraceptive use. One of the key reasons for limited pertinent research is the lack of suitable data. Information on family planning supply and the service environment is typically acquired from health facilities. The supply information must then be linked to data on individual women in order to establish its relationship with contraceptive use. An effort to link data from a survey of facilities with data from a population-based survey of women began as early as in the 1970s, when the World Fertility Surveys (WFS) were conducted. A number of WFS surveys included a community module for collecting data on service availability to link with population-based health outcome data. The Demographic and Health Surveys (DHS), in phases I and II, included a service availability module to collect data on local availability of health services. Because the WFS and the early DHS surveys primarily interviewed key informants to collect information on the service environment in a community, the validity and reliability of such data were questioned (Casterline 1987). Moreover, the facilities where the DHS service availability module or the WFS community module collected data may not have been representative of all facilities in the country.

Studies have been conducted to link facilities data and individual data collected in the same survey—specifically, in the same cluster—in order to assess the association between family planning services and contraceptive use. For example, using the service availability data collected in the Guatemala 1987 DHS, Pullum developed an analytical model to measure the importance of service availability for women's contraceptive use in rural Guatemala (Pullum 1991). This study found that service availability both moderates the impact of local development upon contraceptive use and has a direct effect on contraceptive use.

Similarly, Magnani and colleagues linked data on the family planning supply environment collected in the Morocco 1992 DHS and the individual data from the same survey and a household survey in 1995 (Magnani, Hotchkiss et al. 1999). The study found that contraceptive use is significantly associated with family planning method availability at the nearest public clinic. This study also found that several supply factors, including method availability, number of nurses, and staff training at the nearest public clinic are strong predictors of women's intention to use contraception.

Situation analysis developed by the Population Council is another effort in collecting comprehensive data on health facilities focusing on reproductive health services (in some countries, including HIV/AIDS services) (Fisher 1992; Miller, Fisher et al. 1997). Mensch and colleagues linked data from a situation analysis survey conducted in 1992 in Peru with the Peru 1991-92 DHS data at the cluster level and found that contraceptive prevalence is significantly associated with the quality of family planning services. The prevalence would be 16 to 23 percent higher if women were to live in a cluster with the highest quality of care compared with the lowest. (Mensch, Arends-Kuenning et al. 1996).

Since the late 1990s, the Measure DHS project has conducted the Service Provision Assessment (SPA) surveys to collect data on health facilities. At the time of the present study, SPA surveys had been conducted in more than 10 countries in Africa, Latin America, and Asia. The SPA survey is a nationally representative health facilities survey that provides detailed information on the overall service environment and its functioning, for key health service areas, including family planning. In addition, latitude and longitude coordinates have been collected for the health facilities included in the SPA surveys. Because the same geographic information has also been collected for the sample clusters in the DHS surveys, such data provide an opportunity for another type of linkage between health facilities data and data for individual respondents.

For example, Montana and colleagues linked facilities data from the Kenya 1999 SPA and women's data from the Kenya 1998 DHS using coordinates to assess such linkage (Curits, Bessinger et al. 2001). The authors found that a large majority (71 percent) of DHS clusters can be linked to a facility, but women in most of the linked clusters do not necessarily use the facilities to which they are linked, particularly for family planning and antenatal care services. This study recommended not linking the SPA data and DHS data for individual-level analysis.

A similar study in Egypt used geographic information systems (GIS) to link data from the Egypt 2002 SPA and the Egypt 2003 DHS to examine the association between the quality of family planning services and use of intrauterine devices (IUDs) (Hong, Montana et al. 2006). Using GIS, the researchers linked women who were interviewed in the DHS to a sampled facility located within 10 km of their community. The researchers found that service quality is an important determinant of IUD use in Egypt for women who obtained methods from public sources. A better counseling and examination environment is associated with a higher likelihood of using IUDs. This study was constrained by linking women to the closest facility surveyed, which may not be the facility where the individual actually obtained services.

1.3 Constraints in Linking Data from Facilities Surveys and Data from Population-Based Surveys

Although studies linking the SPA facilities data and the DHS women's data have contributed to measuring the effects of family planning services on contraceptive use, constraints exist in such linkages. The current sampling design of the DHS and SPA makes it impossible to link facilities and households at the DHS cluster level. To enable linkage at the cluster level, the SPA surveys should be conducted at facilities in each of the DHS sample clusters. However, problems exist with this approach. First, women may not necessarily use facilities only within their communities. They may use health facilities that are close but geographically outside the DHS clusters. Second, DHS clusters are selected on the basis of population density, but health facilities may not necessarily be distributed according to population density.

Thus, the facilities within DHS clusters may not be representative of all facilities within a country. The current sample design of SPA surveys provides representative data of health facilities in the country, but it may not provide information on the facility nearest to the DHS cluster.

Part of the difficulty associated with sampling health facilities can be addressed by conducting a facility census—that is, by surveying all health facilities in the country. This strategy is very time-consuming and expensive. Moreover, it is still impossible to know whether the nearest facility is the facility that women actually use, unless women can be matched with the facilities that they actually visit for services.

SPA surveys and DHS surveys typically are cross-sectional. Surveys conducted in the same year or just one year apart are usually linked. It is possible that the data on contraceptive availability and family planning environment collected at the time of the SPA survey differ from what they were at the time of the DHS surveys.

Besides these constraints, studies on family planning supply and contraceptive use have focused on countries in Asia, Latin America, and North Africa. Very limited research has been conducted on this topic in sub-Saharan Africa (Kim, Rimon et al. 1992; Koenig, Hossain et al. 1997; Mroz, Bollen et al. 1999; Steele, Curtis et al. 1999; Stephenson and Tsui 2002). In light of increasing interest and program efforts to improve contraceptive use in sub-Saharan Africa, studying the effects of family planning supply and service environment on the use of contraception may assist donors and program planners to assess the effectiveness of existing programs and to plan for future investment in family planning.

1.4 Research Questions

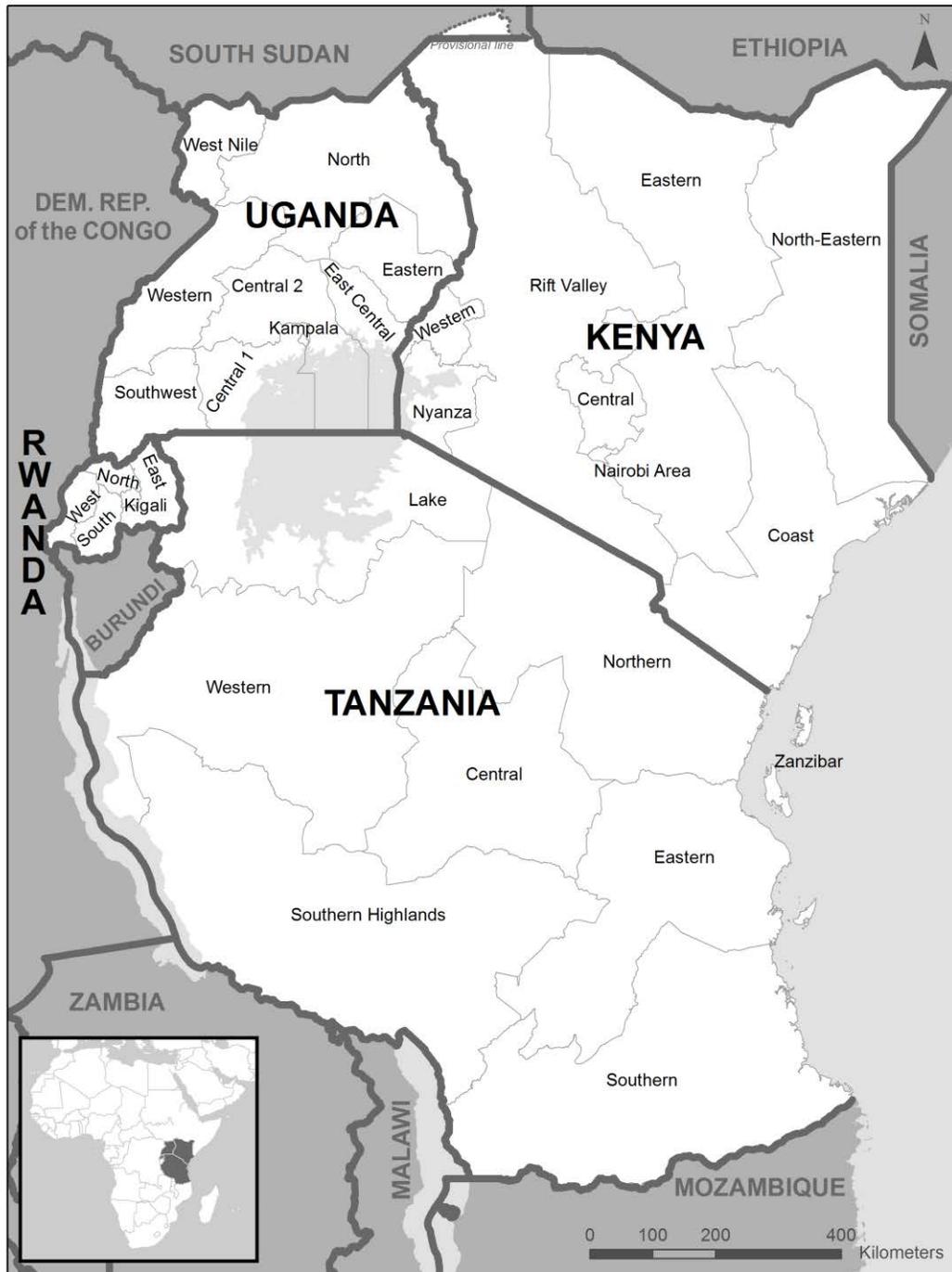
Using a less direct type of linkage, this study uses both SPA and DHS data and links the regional family planning supply and service environment to individual contraceptive use. The study aims to:

- 1) Measure the extent to which contraceptive use is associated with the regional contraceptive supply and family planning service environment;
- 2) Assess the regional variability in contraceptive use that is explained by regional-level variables.

2 Methodology

2.1 Context of Countries Analyzed

This analysis examines four East African countries: Kenya, Rwanda, Uganda, and Tanzania.



To facilitate understanding of the results presented in this paper, brief descriptions of each country follow, focusing on family planning programs.

Kenya. Kenya is known for its history of a strong family planning program. Facing rapid population growth, the Government of Kenya incorporated family planning into the country's overall development policy in 1965. Since then, Kenya has made substantial efforts to expand the use of modern contraception (Magadi and Curtis 2003), and modern contraceptive use has been steadily increasing over the last three decades. As a result, Kenya's TFR declined from eight children per woman in the late 1970s to 4.6 by 2008 (Kenya National Bureau of Statistics (KNBS) and ICF Macro 2010). Although the emphasis on family planning decreased after 2000, Kenya is still one of the few countries in Africa to have reached a high level of contraceptive prevalence.

Uganda. In contrast, Uganda started to implement a family planning policy and to provide services much later. Until the mid-1990s, women in Uganda were not able to obtain family planning services without their husband's permission (Blacker, Opiyo et al. 2005). The Government of Uganda created its first national population policy in 1995, but the political support for family planning programs has been unpromising. Today, Uganda has one of the highest levels of unmet need for family planning among currently married women in Africa (Khan, Bradley et al. 2008).

Rwanda. Rwanda initiated its first population program that included family planning in the early 1980s (May, Mukamanzi and Vekemans 1990). As family planning has become an increasingly important priority for the country, the government has supported and encouraged contraceptive use by making contraception more widely available and affordable and by training providers, particularly in the public health sector. Over the past decade, Uganda has made remarkable progress in increasing the use of modern contraceptive methods (National Institute of Statistics of Rwanda and Macro International Inc. 2000; National Institute of Statistics of Rwanda and Macro International Inc. 2008). The country's TFR has dropped from 6.2 in 1992 to 5.5 in 2008 (National Institute of Statistics of Rwanda and ORC Macro 1993; National Institute of Statistics of Rwanda and Macro International Inc. 2008).

Tanzania. The situation in Tanzania is somewhat similar to that in Uganda. Although Tanzania is one of the first sub-Saharan countries to introduce family planning services, a national population policy was not developed until the late 1990s. Contraceptive prevalence remains low but has increased in the past two decades. The number of women using modern contraceptive methods rose from 6.6 percent in 1992 to 17 percent in 1999 (Tanzania National Bureau of Statistics and Macro International Inc. 1992, 1999). After 2000, modern contraceptive use has continued to increase, but government funding for family planning has stalled because the HIV/AIDS crisis has overwhelmed the Tanzanian healthcare system.

2.2 Data

Our analysis draws data from DHS and SPA surveys in the four selected countries. Each country has at least one pair of a DHS and a SPA survey conducted within a year of each other, permitting a linkage between them. Kenya has two pairs of surveys that can be linked: the 2003 DHS and 2004 SPA, and the 2008-09 DHS and 2010 SPA. In each of other three countries, one DHS and one SPA survey can be linked. These surveys are the 2006 DHS and 2007 SPA in Uganda; the 2007-08 DHS and 2007 SPA in Rwanda; and the 2004-05 DHS and 2006 SPA in Tanzania.

DHS surveys typically adopt a two-stage sample design. The first stage involves selecting clusters with probability proportional to size from a national master sample frame. At the second stage a systematic sample of households is drawn from a listing of households in each of the DHS clusters. All women age 15-49 in the selected households are eligible for individual interview. By interviewing these women, DHS surveys provide data on the current use of contraceptive methods among a nationally representative

sample of women age 15–49. Women are also asked where they obtained their contraceptive method. For the purpose of this analysis, we focus on currently married women in each country. DHS surveys also provide data on background characteristics of women and households, including women’s age, educational attainment, number of children, household wealth status, and urban-rural residence.

The SPA surveys provide data on family planning supply and the service environment. SPA surveys are sample surveys of formal sector health facilities, usually randomly selected from a master facility list of functioning formal health facilities in the country at the time of the survey. The sample selection is usually designed to allow for key indicators to be presented at national and provincial levels, by type of facility, and by the different managing authorities.

The range of services that SPA surveys typically cover are for child health (including immunization, curative care, and growth monitoring), family planning, maternal health (including antenatal and delivery care), malaria, communicable diseases (including sexually transmitted infections (STIs) and tuberculosis (TB), and HIV/AIDS services (including counseling and testing, prevention of mother to child transmission (PMTCT), antiretroviral treatment, and post-exposure prophylaxis).

SPA surveys contain data on infrastructures, resources, and support systems. Infrastructure usually includes privacy, availability of running water and electricity, functioning client toilet/lavrine, environment and practices ensuring infection control (appropriate waste disposal, sterilization, and processing of equipment for reuse). Resources that SPA surveys measure include availability of equipment, laboratory diagnostic capacity of facilities, and pharmaceutical supplies. Information on the support systems of health facilities includes availability of service guidelines and protocols, management and supervision practices, staff training, referral systems, supply logistics, and information systems (service records and individual client records).

SPA surveys typically implement four main types of instruments with different groups of participants in data collection, as follows:

The **facility inventory** module assesses service availability and determines whether the facility has the resources, infrastructure, and support systems to deliver quality services. This interview is usually carried out among facility managers or with a knowledgeable provider for specific services.

Client-provider consultations are observed to assess whether providers adhere to national or international guidelines for provision of each type of service covered by the survey. The sample for observations is usually selected opportunistically. Clients are selected for observation when they arrive for services. Usually, up to five clients for each provider of the service are interviewed, with a maximum of 15 observations in any given facility for each service. In some facilities, fewer clients are interviewed because of low client volume.

The **client exit interview** yields opinions of clients on services that they are observed receiving. All observed clients are approached to give an exit interview before they leave the facility.

The **health provider interview** is conducted with a sample of providers present in the facility on the day of the survey. An average of eight providers per facility are usually randomly selected for this interview. Providers are asked about their qualifications, the type of services that they provide, and training that they may have received.

2.3 Measurements

Outcome variable

The outcome variable for this analysis is women's current use of any modern contraceptive method. Thus, all data on contraceptive use in the report refer to modern contraceptive methods. Condom use is excluded because the sources of condoms are most often beyond the facilities that a SPA survey usually captures. For example, women may obtain their condoms from shops, which are not typically included in SPA surveys.

Key independent variables

Two independent variables are of particular interest, both drawn from SPA surveys. The first is an index of the availability of contraceptive methods in facilities at the regional level. Availability is measured as the average number of methods provided and available on the day of the survey. In the SPA facility inventory survey, health facilities that provide family planning services are asked whether they provide each of the contraceptive methods shown on a list. Interviewers also check each type of contraception that the facilities have in stock and validate the expiration date on the stock. A contraceptive method is considered to be provided and available in a facility if the facility on the day of the survey reports providing this method and also has the product in stock within its expiration date. Thus for each facility surveyed there are a total number of modern methods provided and available. Within a region, we average the total number of methods over the facilities that provide family planning services to obtain the average number of methods provided and available in facilities in that region. As mentioned, condoms are excluded from these totals.

The second variable is an index of the family planning service environment, representing a score based on the responses to 15 variables. These 15 variables only apply to health facilities that provide family planning services; thus the service environment score is only computed for these facilities. A facility is given one point for reporting yes to each variable. By summing up the points that a facility gets for each variable, each facility receives a total score, ranging from 0 to 15. A regional family planning service score is obtained by averaging the scores of all the health facilities that provide family planning services in the region.

The 15 variables used to create the service environment index derive from the environment for four service dimensions: family planning counseling; infection control; pelvic examination; and management practice. These 15 variables are selected based on the availability of data and their relevance to providing good-quality family planning services in a facility¹. These variables are, by service dimension:

Family planning counseling

1. Auditory and visual privacy in the family planning counseling areas
2. Family planning visual aids
3. Individual cards or records for clients
4. Written family planning guidelines

Infection control

1. Running water
2. Hand-washing soap

¹ We do not include variables that more generally reflect the local infrastructure, for example, regular electricity supply, although these can be important for effective service delivery.

3. Hand disinfectant
4. Sharps container
5. Latex gloves

Pelvic examination

1. Auditory and visual privacy in the examination room
2. Spotlight for pelvic exam
3. Exam table/bed
4. Vaginal speculum

Management practice

1. Routine staff training on family planning (at least half of family planning providers interviewed received structured training related to family planning in the past year).
2. Routine staff supervision (at least half of family planning providers interviewed were supervised in the past six months).

All of these variables are dichotomous, coded 0 (“No”) or 1 (—Yéš).

Other independent variables controlled for

In the multivariate analysis, we control for other variables that may influence women’s contraceptive use. At the individual level, these variables include the woman’s age, education, household wealth, urban-rural residence, and number of children, all of which have been shown in the literature to be associated with use of family planning.

At the regional level, we control for a proxy measure of the density of health facilities that provide family planning services. Ideally, the density should be calculated as the total number of facilities divided by the total population of the region. Because of the absence of information on the exact total number of facilities for each region, a proxy measure is generated by dividing the weighted number of health facilities that provide family planning services in the SPA by the weighted sample size in the DHS, within each region and in the country as a whole. A binary variable is created based on a comparison of the regional density with the national density. This variable is coded 1 if the regional density is greater than the national density and coded 0 if it is lower than the national density.

2.4 Analysis Method

For several reasons, we use a random-effects logit regression model for the multivariate analysis. First, DHS data are in a hierarchical structure, that is, individuals are nested within clusters, and clusters are nested within regions. Respondents who live in the same cluster or region may not be independent of one another. Compared with regular individual level regression analyses that assume all individuals are independent, the multilevel modeling approach accounts for the fact that people who live in the same area may be similar in some characteristics.

Second, the outcome of this study is measured at the individual level, but the predictors of most interest are measured at the regional level. Using the standard statistical approach, questions arise about the appropriate unit of analysis. Analyzing data at the individual level ignores the nesting of people within regions, which results in underestimating the standard errors and increasing the chance of incorrectly rejecting null hypotheses (Raudenbush and Bryk 2002). Alternatively, if the unit of analysis is the region, it will be difficult to include individual-level variables in the analysis. We can address these problems

with multilevel modeling and allow for simultaneous investigation of the effects of group-level and individual-level predictors on individual-level outcomes.

Another important feature of the random-effects model is to give information on the proportion of total variation that is explained by regional-level predictors.

Random-effects models typically include a random intercept and/or random slopes. This analysis allows for random intercepts across regions and assumes fixed effects of covariates across regions.

Because each country has only a small number of regions, a single country random-effects analysis could violate the assumption of normal distribution of random effects at the regional level. Therefore, we pool all four countries into a single data file. For Kenya, we include only the most recent survey.

To avoid the analysis being dominated by a country with a large DHS sample size, we adjust the weights to give equal weight to all countries, which means that individuals are weighted proportional to the size of their origin country sample.

The model can be expressed with two equations: one at the individual level and one at the regional level.

Individual level:

$$\text{Log}\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_{0j} + \beta_1 X_{ij} + r_{ij}$$

Regional level:

$$\beta_{0j} = \gamma_{00} + \gamma_{01}R_j + \mu_{0j}$$

$$\mu_{0j} \sim (0, \tau_{00})$$

where p_{ij} is the fitted probability of using a modern contraceptive method for the i th individual in the j th region, X_{ij} is a column vector of individual-level variables, and R_j represents supply variables at the regional level. β_{0j} is a random intercept, which varies across regions, and β_1 is a row vector of fixed coefficients for the predictors. μ_{0j} is the random component of the intercept and is assumed to be normally distributed with mean zero and variance τ_{00} . Significance of the random effect for region will indicate that the regional predictors play a role after adjusting for individual-level variables.

In order to examine the variation in outcomes explained by different sets of variables, particularly the contribution of regional family planning supply and service environment variables to explaining the variation in contraceptive use, we examine five random-effects models sequentially, with different groups of variables included in each model, as shown in Table 1. Model I is a null model with no predictors included. Model II includes only individual-level variables. Model III has the individual-level variables and the regional facility density variable. Adding the regional average number of modern methods available and the service environment variable to Model III separately, we obtain Model IV (average

number of methods available) and Model V (service environment index). The method availability variable and service environment variable could not be put into the same model because of the high correlation between them.

Table 1. Analytical models fitted and variables included in each model

	Models				
	Model I	Model II	Model III	Model IV	Model V
Individual-level variables		Yes	Yes	Yes	Yes
Regional family planning facility density			Yes	Yes	Yes
Regional average number of modern methods available				Yes	
Regional family planning service environment index					Yes

3 Descriptive Results

3.1 Use and Sources of Modern Contraceptive Methods

3.1.1 Background characteristics of currently married women

Table 2 shows selected background characteristics of currently married women included in each survey. Women included in the analyses are similarly distributed across age groups in all surveys, with the most women age 20-34. Also consistently across surveys, the majority of currently married women have completed primary education. Compared with the other three countries, Kenya has a smaller percentage of women with no education and a higher percentage with secondary or higher education. Tanzania shows the highest proportion of women with no education (29 percent) and lowest proportion with secondary or higher education (5 percent). A large majority of women reside in rural areas, ranging from 76 percent in Tanzania to 87 percent in Uganda. The distribution of number of children is similar for all surveys, aside from Uganda where 38 percent of women have more than four children. In all other surveys the range is from 26 percent to 28 percent.

Table 2. Percent distribution of currently married women age 15-49 by selected background characteristics

	Kenya		Rwanda	Uganda	Tanzania
	2003	2008/09	2007/08	2006	2004/05
Age groups					
15-19	6.8	4.3	0.9	7.1	8.5
20-24	19.6	19.4	17.2	21.5	20.1
25-29	21.5	22.1	26.1	21.3	21.7
30-34	17.7	19.5	19.3	18.6	18.6
35-39	14.0	14.1	14.8	13.8	12.7
40-44	12.5	11.1	12.2	10.1	10.0
45-49	7.9	9.5	9.6	7.6	8.3
Education					
No education	15.5	11.5	26.0	24.6	28.7
Primary	58.6	58.4	65.3	60.2	65.9
Secondary	20.6	23.5	7.9	11.0	3.7
Higher	5.4	6.7	0.8	3.3	1.7
Wealth status (quintile)					
Lowest	19.3	17.7	13.6	20.5	19.3
Second	19.4	17.9	27.6	21.4	20.5
Middle	18.6	19.3	20.0	19.5	19.9
Fourth	19.6	20.5	20.5	19.2	19.6
Highest	23.1	24.6	18.4	19.4	20.7
Residence					
Urban	22.2	23.4	14.5	13.0	23.7
Rural	77.8	76.6	85.5	87.0	76.3
Number of live children					
None or one	23.4	20.8	23.6	19.8	27.5
2-4	48.5	52.7	49.7	42.1	47.0
5 or more	28.1	26.5	26.7	38.1	25.5
Total number of women	4,919	4,928	3,888	5,337	6,950

3.1.2 Modern contraceptive use

Table 3 shows contraceptive prevalence among currently married women age 15-49 in each country, at the time of the respective surveys. Kenya has the highest use of modern methods. About 32 percent of married women in 2003 and 39 percent in 2009 reported using a modern method. Uganda has the lowest level of contraceptive use, at 18 percent. Tanzania is not much higher, with 20 percent of married women reporting current use of a modern contraceptive method. In Rwanda prevalence is 27 percent.

The increase in overall contraceptive prevalence in Kenya between 2003 and 2009 is largely attributable to a 7 percent increase in use of injectables. In all four countries injectables are the most commonly used method, ranging from 8 percent in Tanzania in 2004–05 to 22 percent in Kenya in 2008-09. The pill is the second most commonly reported method. No more than 2 percent of married women reported condom use for contraception.

Table 3. Among currently married women age 15-49, the percentage who currently use modern contraceptive methods

	Kenya		Rwanda	Uganda	Tanzania
	2003	2008/09	2007/08	2006	2004/05
Pill	7.5	7.2	6.4	2.9	5.9
IUD	2.4	1.6	0.2	0.2	0.2
Injectables	14.3	21.6	15.2	10.2	8.3
Implants	1.7	1.9	1.6	0.3	0.5
Male condom	1.2	1.8	1.9	1.7	2.0
Female sterilization	4.3	4.8	0.7	2.4	2.6
Male sterilization	0.0	0.0	0.1	0.1	0.0
SDM	0.0	0.0	0.3	0.0	0.0
LAM	0.0	0.5	1.0	0.0	0.5
Any of modern methods	31.5	39.4	27.4	17.9	20.0

Note: if more than one method is used, only the most effective method is considered

SDM = Standard days methods

LAM = Lactational amenorrhoea method

Turning to modern contraceptive use by regions within each country, Figure 1 shows contraceptive prevalence at the provincial level in Kenya based on the 2003 and 2009 DHS surveys. Note that Figure 1 excludes condoms, to be consistent with the outcome used in the multivariate analysis.

Figure 1. Among currently married women age 15-49, the percentage who currently use modern contraceptive methods (condom excluded) by province, Kenya

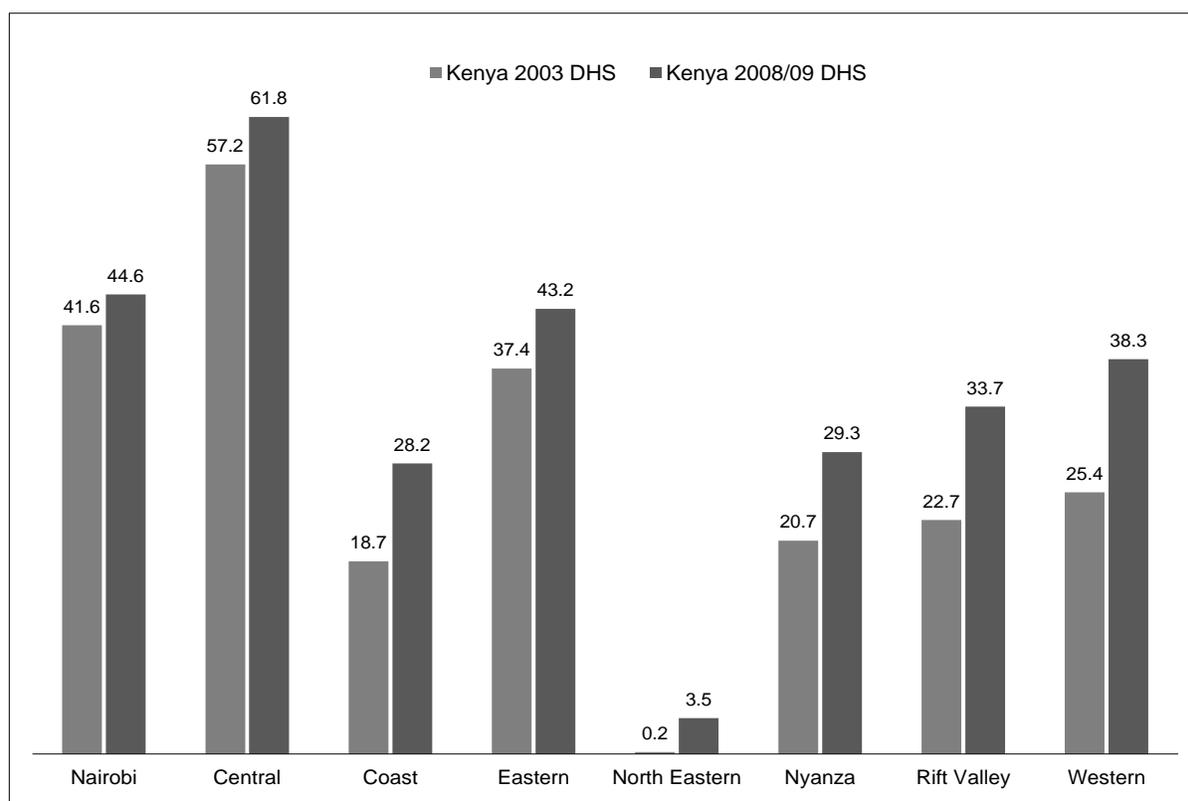


Table 4. Modern contraceptive prevalence rate (CPR) by region in Rwanda, Uganda, and Tanzania

Rwanda 2007/08		Uganda 2006		Tanzania 2004/05	
Province	CPR(%)	Region	CPR(%)	Zone	CPR(%)
North	31.9	Central	24.6	Northern	27.4
South	21.4	Kampala	33.5	Central	18.7
East	24.4	East Central	15.4	Southern Highlands	18.8
West	24.5	Eastern	15.3	Western	7.5
Kigali City	30.6	North	7.3	Lake	10.6
		West Nile	9.0	Southern	27.4
		Western	12.6	Eastern	27.7
		Southwest	17.3	Zanzibar	9.1

Note: Condom is excluded

All eight provinces of Kenya saw an increase in contraceptive use from 2003 to 2009, with greater increases in the Rift Valley (11 percentage points) and Western provinces (13 percentage points) than elsewhere. Regional variation in contraceptive prevalence is large. For example, in the Central province 62 percent of women in 2009 reported current use of a modern method, but only 4 percent in the North East province did so.

Great regional variation is also evident in the other three countries (Table 4). In the North region of Uganda, for example, only 7 percent of women reported current use of a modern method other than the condom compared with one-third of women (34 percent) in Kampala. In Tanzania contraceptive prevalence also varies greatly by regions, but in Rwanda regional differences are not as substantial as in the other three countries.

Table 5 shows the percentage of women age 15–49 currently using a modern method, by women’s background characteristics. In general, within each survey women age 25–44 have a higher level of current use of modern contraception than younger or older women. For Kenyan women age 30–34, prevalence reaches the highest level, at 49 percent. In the same survey all age groups have more than 30 percent prevalence, except for women age 15–19, at 20 percent. Also, in every age group a marked increase from the 2003 Kenya DHS to the 2008-09 DHS is apparent, with an almost 10 percentage point increase for women age 25–34. In Tanzania and Uganda the youngest age groups have the lowest levels of contraceptive use, at less than 10 percent for women age 15–19 and less than 20 percent for women under age 25 in Tanzania, or under age 30 in Uganda.

Table 5. Percent distribution of currently married women age 15-49 who used any modern contraceptive method, by selected background characteristics

	Kenya		Rwanda	Uganda	Tanzania
	2003	2008/09	2007/08	2006	2004/05
Age					
15-19	12.7	19.6	23.7	8.3	6.9
20-24	22.4	30.4	21.6	16.2	19.0
25-29	32.6	41.3	30.6	18.4	23.8
30-34	36.6	48.8	34.1	21.7	23.5
35-39	39.7	41.2	30.4	19.3	22.1
40-44	40.8	46.6	25.2	20.3	18.4
45-49	26.7	32.4	14.3	15.0	16.6
Education					
No education	8.0	12.0	18.0	8.9	8.3
Primary	23.1	34.8	26.9	15.7	16.5
Secondary	35.7	41.8	35.9	30.1	25.7
Higher	51.7	52.1	61.8	28.6	38.2
Wealth status(quintile)					
Lowest	11.8	16.9	21.7	7.2	10.7
Second	24.2	33.4	23.2	12.1	12.8
Middle	33.4	43.2	26.8	13.1	15.6
Fourth	41.0	50.4	27.4	20.3	24.1
Highest	44.5	47.9	38.6	37.9	36.0
Residence					
Urban	39.9	46.6	36.1	36.5	34.3
Rural	29.2	37.2	25.9	15.1	15.5
Number of live children					
0	3.1	10.5	0.7	4.1	1.1
1-2	30.3	42.1	25.9	16.5	22.0
3-4	39.5	46.4	32.5	20.0	24.4
5+	27.9	33.2	30.2	19.6	19.0
Total	31.5	39.4	27.4	17.9	20.0
Total number of women	4,919	4,928	3,888	5,337	6,950

Education appears to have the most significant and consistent relationship with the level of current use of modern methods. Women with secondary or higher education show a much higher percentage of contraceptive use than women without education or with a primary education. In both surveys analyzed in Kenya, more than half of women with higher than secondary education currently use modern contraception. In the other surveys studied, the level ranges from 29 percent in Uganda to 62 percent in Rwanda. Among women with no education, in every survey 8 percent to 12 percent of women use a modern method, except for Rwanda, where the level is substantially higher, at 18 percent.

As often observed, women in the highest wealth quintile have the highest level of current contraceptive use. Prevalence generally decreases with a decrease in wealth, although in Kenya the difference between the two highest wealth quintiles is small. The gap between the richest and the poorest is around 30 percent for all surveys, apart from Rwanda, where the survey shows relative equality among wealth quintiles, with a range of only 22 percent to 27 percent across the lowest four quintiles.

In general, urban women are more likely than rural women to use a modern contraceptive method. Prevalence is highest in urban Kenya in 2008-09, at 47 percent, and lowest in rural Uganda, at 15 percent. The gap between urban and rural women is relatively small in Kenya and Rwanda, but larger in Uganda and Tanzania, with a difference of almost 20 percent. Women who have three to four children are more likely to use a modern method of contraception than women with fewer children or with more than four children, across all surveys. Women with no children are the least likely to report current use of a modern method, at 11 percent in Kenya 2008-09 and less than 5 percent in all other surveys.

Notably, a comparison between the two surveys conducted in Kenya five years apart shows an increase in current use of modern contraceptive methods in every socio-demographic group, defined by women's age, education level, wealth status, and number of children.

3.1.3 Sources of modern contraceptive methods

The surveys ask current users of a modern contraceptive method where they obtained the method the last time they acquired it. Table 6 shows the sources of the two most commonly reported methods, including condoms, as well as the overall source for all modern methods excluding condoms.

Table 6. Percent distribution of users of modern contraceptive methods by most recent source, according to method

	Kenya 2003				Kenya 2008/09			
	Injectables	Pill	Condom	All modern methods but condom	Injectables	Pill	Condom	All modern methods but condom
Public								
Public hospital	13.3	11.3	15.6	20.3	20.6	13.9	9.6	25.3
Public health center	24.6	17.7	14.9	18.3	17.7	14.2	1.5	16.3
Public clinic / dispensary	22.6	21.2	2.2	17.0	26.9	14.4	8.0	21.0
Other public	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0
Private								
Private hospital/ clinic	38.1	22.6	11.2	36.6	25.5	12.0	14.2	27.1
Private pharmacy	0.5	20.4	11.8	5.3	3.5	40.5	1.1	9.2
Other private	0.9	4.4	0.0	1.9	5.1	3.0	2.0	0.6
Other sources								
Shop	0.0	0.8	31.1	0.2	0.0	0.7	37.6	0.1
Friends/church	0.0	1.5	10.9	0.4	0.0	0.0	16.5	0.0
Other or missing	0.0	0.0	2.3	0.0	0.6	1.3	8.7	0.4
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total number of women	706	371	60	1,491	1,246	398	220	1,855

	Rwanda 2007/08				Uganda 2006			
	Injectables	Pill	Condom	All modern methods but condom	Injectables	Pill	Condom	All modern methods but condom
Public								
Public hospital	7.1	10.9	8.6	11.5	11.5	5.1	5.1	19.3
Public health center	85.6	76.6	39.8	78.9	24.1	20.8	13.8	21.4
Public clinic / dispensary	0.0	0.0	0.0	0.0	2.2	0.6	0.0	2.2
Other public	2.7	2.5	4.3	2.6	0.9	0.0	3.2	0.6
Private								
Private hospital/ clinic	1.7	4.2	1.1	3.0	54.4	51.0	17.4	47.8
Private pharmacy	0.6	0.3	14.4	0.5	4.4	16.6	8.2	5.8
Other private	1.6	3.4	0.0	2.2	0.5	2.4	4.4	0.8
Other sources								
Shop	0.0	0.0	23.9	0.0	0.0	0.0	32.5	0.0
Friends/church	0.2	1.1	2.0	0.4	0.5	1.1	4.5	0.5
Other or missing	0.5	1.0	5.7	0.9	1.5	2.4	10.8	1.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total number of women	592	249	73	976	547	156	91	816

(Continued...)

Table 6. – Continued

	Tanzania 2004/05			
	Injectables	Pill	Condom	All modern methods but condom
Public				
Public hospital	12.4	14.5	4.0	21.5
Public health center	23.1	20.3	10.0	18.9
Public clinic / dispensary	46.4	38.6	19.7	35.8
Other public	0.7	7.2	2.4	2.8
Private				
Private hospital/ clinic	7.8	5.3	2.0	9.6
Private pharmacy	7.8	1.8	2.2	5.9
Other private	1.1	10.3	21.8	4.0
Other sources				
Shop	0.0	1.2	36.5	0.4
Friends/church	0.2	0.2	1.5	0.1
Other or missing	0.3	0.6	0.0	1.0
Total	100.0	100.0	100.0	100.0
Total number of women	575	412	136	1,253

In all the countries over 90 percent of contraceptive users obtained their methods (excluding condoms) from the formal health sector, including public hospitals, public health centers, public clinics/dispensaries, and private hospitals/clinics. Public facilities are the primary sources of non-condom modern methods except in Uganda, where more than half of women report that private hospitals or pharmacies are their sources. Notably, in Rwanda about 90 percent of modern contraceptive users rely on public hospitals or public health centers as their sources. Looking at injectables in each country, we find that public hospitals and public health centers are the key sources in Rwanda and Tanzania; but private hospital or clinics are also a common source in Kenya (38 percent in 2003, 26 percent in 2008-09) and Uganda (54 percent).

Condom users are more likely than users of other methods to obtain their supplies from informal sources, including shops, friends, or churches. Except in Rwanda, more than 30 percent of married women who currently use condoms obtained them from shops. This finding justifies the exclusion of condom in our analysis.

3.2 Contraceptive Availability and the Family Planning Service Environment

3.2.1 Background characteristics of sample facilities

Table 7 shows the characteristics of the SPA samples. In Kenya, 440 facilities in 2004 and 695 facilities in 2010 were covered. Both samples included hospitals, health centers, maternity and nursing homes, clinics and stand-alone VCT facilities under public, faith-based, private, and NGO managing authorities. By region, Rift Valley region has the largest percentage of facilities in the sample (29 percent in 2004 and 25 percent in 2010) and North Eastern region has the smallest (2 percent in 2004 and 3 percent in 2010).

Table 7. Percent distribution of sample facilities by type of facility, managing authority, and region/province

Facility characteristics	Kenya		Rwanda 2007	Uganda 2006		Tanzania 2006		
	2004	2010						
Type of facility								
Hospital	6	7	Hospital	8	Hospital	4	Hospital	4
Health center	28	11	Health center/ Polyclinic	72	HC-IV	6	Health center	9
Clinic	5	2	Dispensary/ clinic/health post	20	HC-III	32	Dispensary/ stand-alone VCT	87
Maternity	2	29			HC-II	58		
Dispensary/ stand-alone VCT	60	50						
Managing authority								
Public	56	50	Public	57	Public	76	Public	65
NGO/ faith- based	30	16	Government- assisted	25	Private	24	Private for- profit	17
Private for profit	14	34	Private/NGO	18			Parastatal/ faith-based	17
Region/province								
Nairobi	9	6	North	17	Central	20	Northern	18
Central	11	18	South	22	Kampala	2	Central	8
Coast	11	12	East	21	East		Southern	
Eastern	19	17	West	25	Central	16	Highlands	16
North Eastern	2	3	Kigali City	16	Eastern	10	Western	13
Nyanza	12	12			North	15	Lake	15
Rift Valley	29	25			West Nile	7	Southern	10
Western	7	6			Western	12	Eastern	17
					Southwest	17	Zanzibar	4
Total	100	100		100		100		100
Total number of facilities	440	695		538		491		611

In Rwanda, 538 facilities were included in the sample covering hospitals, health centers, dispensaries, clinics, and health posts. Health centers and clinics accounted for more than two-thirds of the sample. The majority of the facilities were public, while 18 percent were private, including for-profit or not-for-profit facilities. Sampled facilities were relatively evenly distributed across five regions.

In Uganda, among 491 facilities interviewed, 90 percent were health center III (at the sub-county level) and health center II (at the parish level). The sampled facilities represented different managing authorities including public, private-for-profit, parastatal, and faith-based organizations. The regional distribution of the sample facilities skewed to the Central region and the Southwest region.

A sample of 611 facilities was included for the Tanzania SPA. Most of the facilities (87 percent) were dispensaries. Hospitals, including national referral hospitals, regional general hospitals, and

district/district-designated hospitals, accounted for 4 percent of the sample. About two-thirds of these facilities were managed by the government.

3.2.2 Family planning method availability and service environment

Tables 8–11 present information on contraceptive availability in health facilities as well as indicators of the family planning service environment by region in each of the four countries studied.

Table 8. Method availability and service environment by province in Kenya, SPA 2004

Percentages of facilities that provide modern contraceptive methods, have infrastructure to support quality counseling, infection control, and pelvic examination, and have management practice to support quality FP services, by province, Kenya 2004 SPA.

Province	Method availability		Infrastructure to support quality FP counseling			
	Any modern FP method provided and available (condom excluded) ¹	Total number of facilities	Privacy	Visual aids	Written FP guidelines	Individual patient cards
Nairobi	45.2	41	88.8	95.7	40.9	92.0
Central	69.6	50	93.1	76.8	3.5	69.1
Coast	71.3	49	95.9	88.7	62.2	72.2
Eastern	63.6	83	78.4	90.0	48.9	56.7
North Eastern	62.7	8	98.3	59.8	9.6	40.5
Nyanza	89.1	54	91.4	78.2	27.6	56.2
Rift Valley	64.2	126	83.2	86.4	23.4	68.5
Western	76.8	29	97.9	95.1	19.6	81.6
Total	67.6	440	87.8	85.5	31.1	66.7

Province	Infrastructure for infection control				
	Running water	Soap	Latex gloves	Disinfecting solution	Sharps box
Nairobi	90.4	84.8	98.3	43.5	93.8
Central	90.7	67.7	98.8	60.9	98.7
Coast	98.6	70.8	90.4	52.1	98.6
Eastern	98.4	83.8	92.5	82.6	92.0
North Eastern	54.8	30.5	95.0	25.9	79.1
Nyanza	80.2	75.3	96.0	49.7	87.2
Rift Valley	95.8	63.3	95.7	32.6	95.5
Western	74.4	68.8	95.5	46.5	96.1
Total	91.1	71.5	95.1	52.0	94.0

(Continued...)

Table 8. – Continued

Province	Infrastructure for pelvic examination				Management practice to support quality FP services		Total number of facilities offering any FP services
	Privacy	Examination bed/table	Examination light	Vaginal speculum	Routine staff training	Routine staff supervision	
Nairobi	90.1	99.1	42.2	66.2	54.2	89.6	18
Central	93.4	90.7	18.7	26.8	38.1	80.5	42
Coast	90.4	99.3	15.0	31.2	43.0	68.6	35
Eastern	85.2	99.5	16.2	36.8	22.5	97.1	62
North Eastern	90.4	100.0	5.0	5.0	23.6	67.6	6
Nyanza	74.5	99.1	27.7	27.0	31.1	95.5	49
Rift Valley	83.4	100.0	27.3	12.1	33.4	83.2	89
Western	89.0	100.0	13.5	27.1	30.2	97.8	22
Total	85.4	98.4	22.3	27.1	33.6	86.9	323

¹Any of following methods is provided and available on the day of the survey: contraceptive pills (combined or progestin only), injectables (combined or progestin-only), implants, IUDs, emergency pill, male or female sterilization.

Table 9. Method availability and service environment by province in Kenya, SPA 2010

Percentage of facilities that provide modern contraceptive methods, have infrastructure to support quality counseling, infection control, and pelvic examination, and have report management practice to support quality FP services, by province, Kenya 2010 SPA.

Province	Method availability	Total number of facilities	Infrastructure to support quality FP counseling			
	Any modern FP method provided and available (condom excluded)		Privacy	Visual aids	Written FP guidelines	Individual patient cards
Nairobi	62.8	45	88.9	88.9	46.9	76.9
Central	75.6	125	100.0	75.0	31.0	75.2
Coast	74.9	81	99.5	76.1	51.9	81.0
Eastern	78.8	118	92.5	76.8	33.8	57.4
North Eastern	66.0	24	84.0	100.0	18.8	10.8
Nyanza	89.9	83	85.8	79.1	37.2	46.5
Rift Valley	89.0	175	91.2	79.5	24.0	62.8
Western	93.0	44	95.3	91.9	51.3	75.5
Total	81.1	695	93.2	79.6	34.4	64.2

(Continued...)

Table 9. – Continued

Province	Infrastructure for infection control				
	Running water	Soap	Latex gloves	Disinfecting solution	Sharps box
Nairobi	89.4	83.9	93.1	64.4	96.6
Central	96.2	81.0	95.8	90.7	95.8
Coast	83.5	74.8	96.8	95.3	100.0
Eastern	76.3	77.3	87.6	51.4	91.1
North Eastern	64.5	55.8	98.6	53.3	100.0
Nyanza	77.3	71.2	88.7	77.9	98.3
Rift Valley	69.1	70.9	88.2	77.2	97.3
Western	71.0	72.0	90.6	89.3	98.1
Total	78.9	74.6	91.1	77.0	96.5

Province	Infrastructure for pelvic examination				Management practice to support quality FP services		Total number of facilities offering any FP services
	Privacy	Examination bed/table	Examination light	Vaginal speculum	Routine staff training	Routine staff supervision	
Nairobi	93.1	92.2	57.8	62.7	39.0	69.8	28
Central	100.0	99.5	39.9	43.3	16.2	62.2	113
Coast	100.0	100.0	49.0	30.4	30.9	82.6	67
Eastern	93.3	96.5	20.9	23.3	13.6	91.1	102
North Eastern	91.3	69.4	8.7	2.1	5.7	86.9	16
Nyanza	91.1	92.4	20.9	27.9	25.2	89.5	79
Rift Valley	89.3	98.8	30.0	26.1	18.9	78.2	167
Western	95.3	97.9	22.5	45.5	18.2	85.4	41
Total	94.0	96.7	31.4	31.9	20.4	79.7	613

¹Any of the following methods is provided and available on the day of the survey: contraceptive pills (combined or progestin only), injectables (combined or progestin-only), implants, IUDs, emergency pill, male or female sterilization.

Table 9 shows that Kenya has achieved a fairly high level of overall contraceptive availability. More than 80 percent of health facilities had at least one modern method provided and available in 2010. The level reached 90 percent or higher in Nyanza and Western provinces. A large increase in availability of contraceptive methods, from 68 percent to 81 percent, occurred between 2004 and 2010. All eight provinces showed improvement, but the magnitude of increase varied. Four provinces—Nairobi, Western, Rift Valley, and Eastern—demonstrated large increases in contraceptive availability during the period, and the remaining four provinces showed only a slight increase. For example, the percentage of health facilities that provided and had modern methods in stock in Rift Valley increased from 64 percent in 2004 to 89 percent in 2010. The change in North Eastern province was only 3 percentage points. In both the 2004 and 2010 SPA surveys, the North Eastern province had the lowest percentage of health facilities having one or more contraceptive methods provided and available.

Tables 8 and 9 also provide information on 15 indicators of the service environment related to family planning counseling, infection control, pelvic examination, and management practices that support good family planning services. With regard to facility infrastructure and resources to support quality family planning counseling, in 2010 (Table 9) the majority of facilities in Kenya ensured both visual and

auditory privacy for counseling family planning clients (93 percent) and provided visual aids for family planning clients (80 percent). To ensure that family planning service providers adhere to national guidelines, health facilities must acquire written national family planning guidelines or protocols. In 2010 Kenya had a low proportion of facilities with these guidelines or protocols (34 percent), slightly higher than the level of 31 percent in 2004. Health facilities are expected to keep a supply of blank individual client cards for writing down services that clients receive and give them to clients to keep. In 2010, 64 percent of facilities had a supply of blank individual client cards, slightly lower than the level of 67 percent in 2004.

Pelvic examination is usually necessary to assess method suitability, to insert a contraceptive device, or to evaluate problems associated with method use. Infrastructures for infection control and pelvic examination are therefore essential. In general, health facilities that provided family planning services in Kenya were well equipped in terms of infection control. For example, in 2010 more than 90 percent of facilities had latex gloves and sharps boxes, and 75 percent to 80 percent had running water, soap, and disinfecting solution. Except for running water, the environment ensuring infection control improved from 2004 to 2010. Privacy and an examination bed/table were offered in most of the facilities that provided family planning services. The percentage of facilities with private rooms to provide visual and auditory privacy for clients increased from 85 percent in 2004 to 94 percent in 2010. Pieces of equipment commonly missing in 2010 were an examination light (available in 31 percent of facilities) and a vaginal speculum (available in 32 percent of facilities), but both had improved since 2004 (22 percent and 27 percent in 2004, respectively).

Management practices, including staff development activities and staff supervision, are important to improve providers' knowledge of various contraceptive methods, their skills in performing services, and their adherence to standards. A facility is considered to offer routine staff development activities if at least half of interviewed family planning providers at that facility received any relevant and structured training during the 12 months preceding the SPA survey, including both pre-service and in-service training.

Results from the Kenya 2010 SPA survey indicate that, among health facilities providing family planning services, 20 percent offered routine staff development activities, a decline from 34 percent in 2004. Routine supervision was commonly reported. In 2010, 80 percent of health facilities that provided family planning services had given personal supervision to at least half of the family planning staff during the six months preceding the survey, a slight decline from 87 percent in 2004.

Table 10. Method availability and service environment by region in Rwanda, SPA 2007

Percentage of facilities that provide modern contraceptive methods, have infrastructure to support quality counseling, infection control, and pelvic examination, and report management practice to support quality FP services, by province, Rwanda 2007 SPA

Province	Method availability		Infrastructure to support quality FP counseling			
	Any modern FP method provided and available (condom excluded)	Total number of facilities	Privacy	Visual aids	Written FP guidelines	Individual patient cards
North	48.9	90	97.1	88.6	57.1	97.1
South	63.2	117	90.1	86.4	42.0	96.3
East	58.4	113	93.3	75.6	38.9	95.6
West	76.5	132	93.6	76.1	41.3	90.8
Kigali City	34.9	86	89.1	76.1	39.1	78.3
Total	58.6	538	92.9	80.3	43.4	92.7

(Continued...)

Table 10. – Continued

Province	Infrastructure for infection control				
	Running water	Soap	Latex gloves	Disinfectant	Sharps box
North	52.9	32.9	75.7	75.7	85.7
South	40.7	38.3	74.1	76.5	87.7
East	42.2	34.4	63.3	60.0	78.9
West	60.6	42.2	76.1	80.7	89.0
Kigali City	71.7	58.7	84.8	80.4	76.1
Total	52.3	39.9	73.7	74.2	84.3

Province	Infrastructure for pelvic examination				Management practice to support quality FP services		Total number of facilities offering any FP services
	Privacy	Examination bed/table	Examination light	Vaginal speculum	Routine staff training	Routine staff supervision	
North	100.0	97.1	7.1	2.9	21.7	94.2	70
South	92.6	79.0	18.5	14.8	20.5	96.2	81
East	92.2	81.1	12.2	6.7	26.7	98.8	90
West	94.5	86.2	17.4	11.0	24.8	96.2	109
Kigali City	91.3	78.3	26.1	21.7	51.3	74.4	46
Total	94.2	84.6	15.7	10.6	26.5	94.2	396

¹Any of following methods is provided and available on the day of the survey: contraceptive pills (combined or progestin only), injections (combined or progestin-only), implants, IUDs, spermicidal, diaphragm, male sterilization, or female sterilization

Table 10 presents information on family planning method availability and the service environment in Rwanda based on the 2007 SPA survey. Overall, 59 percent of health facilities offered at least one modern contraceptive method and had that method available on the day of the survey, with a range from 35 percent in Kigali City to 77 percent in the West province. The low level of method availability in Kigali City might be due to the fact that about 60 percent of facilities surveyed in Kigali are dispensaries, clinics, or health posts, where family planning services are less often provided compared with hospitals and health centers. As in Kenya, most facilities surveyed that provide family planning services in Rwanda provided private rooms for family planning counseling (93 percent) and visual aids for informing clients about family planning methods (80 percent). Fewer than half the facilities had written family planning guidelines. In 93 percent of the facilities surveyed, individual patient cards were available for recording patients' information.

In terms of conditions for infection control, facilities often lacked soap and running water. Only 40 percent of facilities had soap and 52 percent had running water, but conditions in facilities in Kigali City were better than those in the provinces. For other infection control items examined, 74 percent of facilities had latex gloves and disinfectant solution, and 84 percent had a sharps box. As in Kenya, the majority of health facilities that offer family planning services in Rwanda had a private room and a bed or table for pelvic examinations, but they commonly lacked an examination light and vaginal speculum. Only 16 percent of facilities had an examination light, and just 11 percent had a vaginal speculum.

Facilities in Rwanda differed substantially with respect to two types of management practices to support family planning services—routine supervision was common but routine staff development was

uncommon. Overall, 94 percent of facilities provided routine supervision to family planning staff, although facilities in Kigali City were less likely to do so (74 percent), probably due to the large proportion of dispensaries and private clinics in the Kigali sample. In contrast, only 27 percent of facilities met the criteria for providing routine staff development activities—that is, gave structured training relevant to family planning to at least half of their family planning providers in the past 12 months. Facilities in Kigali City were at least twice as likely as facilities in other provinces to provide routine staff development activities.

Table 11. Method availability and service environment by region in Uganda, SPA 2007

Percentage of facilities that provide modern contraceptive methods, have infrastructure to support quality counseling, infection control, and pelvic examination, and report management practice to support quality FP services, by region, Uganda 2007 SPA

Region	Method availability	Total number of facilities	Infrastructure to support quality FP counseling			
	Any modern FP method provided and available (condom excluded)		Privacy	Visual aids	Written FP guidelines	Individual patient cards
Central	86.5	98	86.2	80.4	67.9	48.0
Kampala	56.3	9	100.0	84.2	32.9	61.5
East Central	43.8	78	82.0	79.5	61.0	22.0
Eastern	75.7	49	92.6	94.7	82.6	29.8
North	31.6	78	75.5	73.8	39.3	37.6
West Nile	53.6	37	79.0	79.0	46.2	55.9
Western	60.3	60	84.6	66.4	67.1	65.9
Southwest	64.8	83	100.0	75.5	65.5	28.4
Total	60.1	491	86.6	78.6	62.2	39.7

Region	Infrastructure for infection control				
	Running water	Soap	Latex gloves	Disinfectant	Sharps box
Central	62.5	67.3	72.4	65.1	74.1
Kampala	69.0	71.6	55.8	48.2	66.5
East Central	46.5	74.0	80.3	61.9	82.4
Eastern	71.5	67.6	63.8	54.4	77.3
North	62.7	66.9	66.5	62.0	62.0
West Nile	76.9	63.8	60.8	63.1	77.0
Western	76.4	59.5	78.5	67.5	72.0
Southwest	68.2	67.0	78.1	61.2	90.4
Total	64.3	67.4	72.7	62.2	76.8

(Continued...)

Table 11. – Continued

Region	Infrastructure for pelvic examination				Management practice to support quality FP services		Total number of facilities offering any FP services
	Privacy	Examination bed/table	Examination light	Vaginal speculum	Routine staff training	Routine staff supervision	
Central	75.5	82.2	14.0	2.3	7.9	95.7	94
Kampala	88.0	92.4	24.1	24.2	13.3	70.3	6
East Central	53.0	60.4	3.4	4.4	7.4	91.6	68
Eastern	85.0	81.4	1.1	1.9	15.6	91.3	44
North	84.7	81.9	9.1	2.2	25.8	94.1	51
West Nile	81.5	83.5	21.0	10.5	9.8	97.4	26
Western	63.7	79.0	1.6	2.8	4.8	82.0	44
Southwest	97.1	81.9	1.1	2.0	7.6	91.6	65
Total	76.7	78.2	7.3	3.5	10.7	91.7	398

¹Any of the following methods is provided and available on the day of the survey: contraceptive pills (combined or progestin only), injections (combined or progestin-only), implants, IUDs, spermicidal, diaphragm, male sterilization, or female sterilization.

Table 11 shows the percentage of health facilities in Uganda that have at least one modern contraceptive method available and have various service infrastructure items by region, based on the Uganda 2007 SPA survey. On average, 60 percent of health facilities had at least one contraceptive method provided and available on the day of the survey. Although contraceptive methods were widely available in some regions, as in the Central region (87 percent) and Eastern region (76 percent), availability was limited in others, as in the North region (32 percent) and East Central region (44 percent).

As in Kenya and Rwanda, most health facilities in Uganda that provide family planning services provided a private room for family planning counseling (87 percent) and had visual aids (79 percent) for family planning education, but fewer facilities (40 percent) kept individual patient cards. Uganda differed from Kenya and Rwanda in that a much higher percentage of facilities observed written family planning guidelines (available in 62 percent of facilities compared with 43 percent in Rwanda and 34 percent in Kenya).

All of the assessed items for infection control were available in the family planning service area in one-third of the health facilities that offer family planning services. Overall, soap and disinfecting solution were less likely to be present. The Eastern and West Nile regions had the highest proportion of facilities with all the items for infection control; the Northeast region had the lowest coverage (27 percent). Looking at the pelvic examination environment, a private room and examination bed or table were observed in the majority of facilities, but examination lights were available in only 7 percent of facilities and vaginal speculums were available in just 4 percent.

Health facilities in Uganda that provide family planning services did not often provide routine staff development activities; only 11 percent of facilities offered pre-service or in-service training relevant to family planning for at least half of family planning providers. Routine staff supervision was commonly reported, with over nine facilities in every ten meeting the criterion for routine staff supervision.

Table 12. Method availability and service environment by region in Tanzania, SPA 2006

Percentage of facilities that provide modern contraceptive methods, have infrastructure to support quality counseling, infection control, and pelvic examination, and report management practice to support quality FP services, by region, Tanzania 2006 SPA

Zone	Method availability	Total number of facilities	Infrastructure to support quality FP counseling			
	Any modern FP method provided and available (condom excluded)		Privacy	Visual aids	Written FP guidelines	Individual patient cards
Northern	61.4	110	95.7	90.9	35.6	87.0
Central	93.1	47	100.0	100.0	22.8	80.9
Southern Highlands	80.2	95	99.9	93.5	44.0	60.3
Western	79.4	82	100.0	87.3	36.9	87.6
Lake	78.0	89	83.6	83.2	41.2	70.3
Southern	75.8	61	99.7	92.0	47.5	89.0
Eastern	51.7	102	94.4	81.2	25.6	79.7
Zanzibar	65.6	25	96.1	94.2	32.5	92.2
Total	71.6	611	95.7	89.3	36.7	78.6

Zone	Infrastructure for infection control				
	Running water	Soap	Latex gloves	Disinfectant	Sharps box
Northern	67.5	81.7	86.0	73.1	88.7
Central	30.9	92.7	96.8	76.5	89.5
Southern Highlands	70.1	90.1	96.4	77.0	95.1
Western	19.5	74.6	97.7	70.3	89.7
Lake	26.6	72.2	92.3	66.5	94.2
Southern	36.7	81.0	97.3	68.9	89.3
Eastern	64.1	75.4	72.5	42.4	76.8
Zanzibar	68.2	95.5	86.4	89.6	96.1
Total	47.8	81.2	90.7	68.5	89.6

(Continued...)

Table 12. – Continued

Zone	Infrastructure for pelvic examination				Management practice to support quality FP services		Total number of facilities offering any FP services
	Privacy	Examination bed/table	Examination light	Vaginal speculum	Routine staff training	Routine staff supervision	
Northern	90.4	87.4	20.0	10.7	5.6	88.7	76
Central	100.0	93.6	1.7	2.0	0.7	96.8	44
Southern Highlands	99.9	96.7	10.5	7.6	5.2	85.0	83
Western	99.8	91.5	0.7	9.8	4.0	86.8	66
Lake	81.8	92.4	11.2	7.5	2.8	87.2	75
Southern	91.7	97.3	3.7	2.6	0.3	94.6	49
Eastern	96.1	93.7	8.7	5.0	2.1	76.8	67
Zanzibar	100.0	96.1	37.0	3.9	15.9	90.4	17
Total	94.2	93.2	9.9	6.9	3.7	87.3	476

¹Any of following methods is provided and available on the day of the survey: contraceptive pills (combined or progestin only), injections (combined or progestin-only), implants, IUDs, spermicidal, diaphragm, male sterilization, or female sterilization

Table 12 presents information on contraceptive availability and the family planning service environment in Tanzania, based on the Tanzania 2006 SPA survey. In 72 percent of facilities, at least one contraceptive method was provided and available on the day of the survey. Contraceptive availability was greatest in the Central zone, at 93 percent of facilities. The Eastern zone had the lowest level of contraceptive availability, at 52 percent.

Concerning the family planning service environment, as in the other three countries, among health facilities in Tanzania that provide family planning services, the majority offered privacy for counseling, visual aids, and individual client cards. Written family planning guidelines were often missing, however. Soap, latex gloves, disinfecting solution, and a sharps box were observed in 69 percent to 91 percent of facilities, but fewer than half had running water in the service area. Most facilities throughout the country had a private room and an examination table or bed for pelvic examination. On average, however, only 10 percent of facilities had a functioning examination light, and just 7 percent had a vaginal speculum. Routine staff supervision was commonly reported in Tanzania, but routine staff development activities were not common. Overall, only 4 percent of facilities provided routine staff development activities.

3.2.3 Average number of contraceptive methods available and average family planning service environment score in health facilities, by region

As described earlier, we average the total number of methods over those facilities in the same region that provide family planning services to get the average number of methods in health facilities of that region. A higher average number of methods available indicates that people in the region have a wider variety of contraceptive choices. A regional family planning service score is obtained by averaging the scores of all facilities that provide family planning services in the region, where the score of each facility is based on the 15 service environment indicators presented in the last section. A region with a higher score has a better service environment for delivering family planning to clients.

Table 13. Average number of contraceptive methods available and average family planning service score in facilities by region or province

	Average number of methods available		Average service environment score	
	2004	2010	2004	2010
Kenya				
Nairobi	3.0	3.8	10.3	10.3
Central	1.9	2.8	8.9	10.2
Coast	2.4	2.5	9.7	10.4
Eastern	2.1	2.7	9.6	8.8
North Eastern	1.7	2.2	6.9	7.6
Nyanza	2.0	3.2	8.7	8.9
Rift Valley	2.1	3.3	8.7	9.0
Western	2.4	3.9	9.1	10.0
Total	2.2	3.1	9.1	9.4
Rwanda	2007		2007	
North	1.5		8.7	
South	2.4		8.4	
East	1.5		7.7	
West	2.3		8.6	
Kigali City	1.6		8.7	
Total	1.9		8.4	
Uganda	2007		2007	
Central	1.8		8.0	
Kampala	2.0		8.2	
East Central	0.9		7.1	
Eastern	1.6		8.0	
North	0.9		7.2	
West Nile	1.8		8.0	
Western	1.8		7.9	
Southwest	1.5		8.2	
Total	1.5		7.7	
Tanzania	2006		2006	
Northern	2.4		9.1	
Central	2.3		8.9	
Southern Highlands	2.2		9.4	
Western	2.5		8.7	
Lake	2.2		8.2	
Southern	1.5		9.0	
Eastern	2.1		8.1	
Zanzibar	2.3		9.9	
Total	2.2		9.0	

Table 13 shows the average number of contraceptive methods available and the average service environment score by region in each country surveyed. In Kenya, the average number of contraceptive methods available in health facilities was 2.2 in 2004 and 3.1 in 2010. Nairobi and Western province in

2010 had the widest range of method choices in health facilities, with the average number of methods 3.8 in Nairobi and 3.9 in Western province. Over time, average contraceptive availability increased in all eight provinces of Kenya. In 2004, Nairobi was the only province to have achieved an average of three methods available, but in 2010 three other provinces (Nyanza, Rift Valley, and Western) also had an average of three or more methods available in health facilities. The average service environment scores in 2004 and 2010 did not differ substantially, yet the score increased in almost all the provinces except in Nairobi, where it remained the same, and in Eastern province, where it decreased by eight-tenths of a point.

In Rwanda in the 2007 SPA, the average number of methods available in health facilities was 1.9, with two provinces—South and West—having an average of more than two methods per facility. The family planning service score was fairly similar across provinces, except for East province.

In Uganda in 2007, health facilities provided limited method choices for clients. Except in Kampala, all other regions averaged less than two methods per facility. Health facilities in the East Central and North regions had less than one method, on average. The service environment score averaged 7.7, ranging from 7.1 in East Central region to 8.2 in Kampala and Southwest region.

The Tanzania 2006 SPA survey showed an average of 2.2 methods available in health facilities. All regions of the country averaged more than two methods except the Southern zone, with an average of 1.5. The service environment score averaged 9.0, with the highest level in Zanzibar.

3.2.4 Bivariate association between contraceptive use and regional method availability and family planning service environment

In the initial stages of exploring the association between levels of contraceptive use and family planning method availability and the service environment, we constructed a scatter-plot diagram of two pairs of variables: regional method availability and contraceptive prevalence; and regional family planning service environment and contraceptive prevalence. Figures 2 and 3 present the scatter plots.

Figure 2 shows a positive association between contraceptive prevalence and average number of methods available at the regional level: contraceptive prevalence was higher in regions where health facilities had more methods available. The R-square is 0.25—that is, 25 percent of the variation in regional contraceptive prevalence can be explained by the regional average number of methods. Figure 3 shows an even stronger positive association between contraceptive prevalence and the regional facility service environment score. At the regional level, about 35 percent of variation in contraceptive prevalence can be explained by the facility service environment score.

Figure 2. Association between regional CPR and average number of methods available

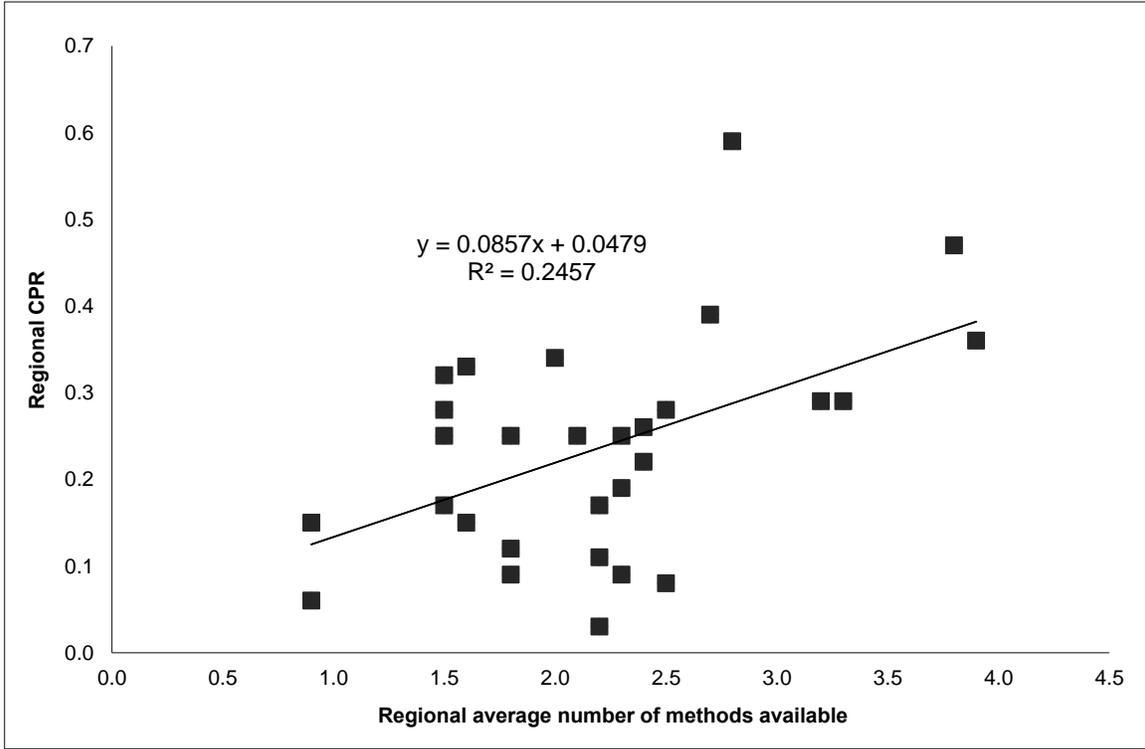
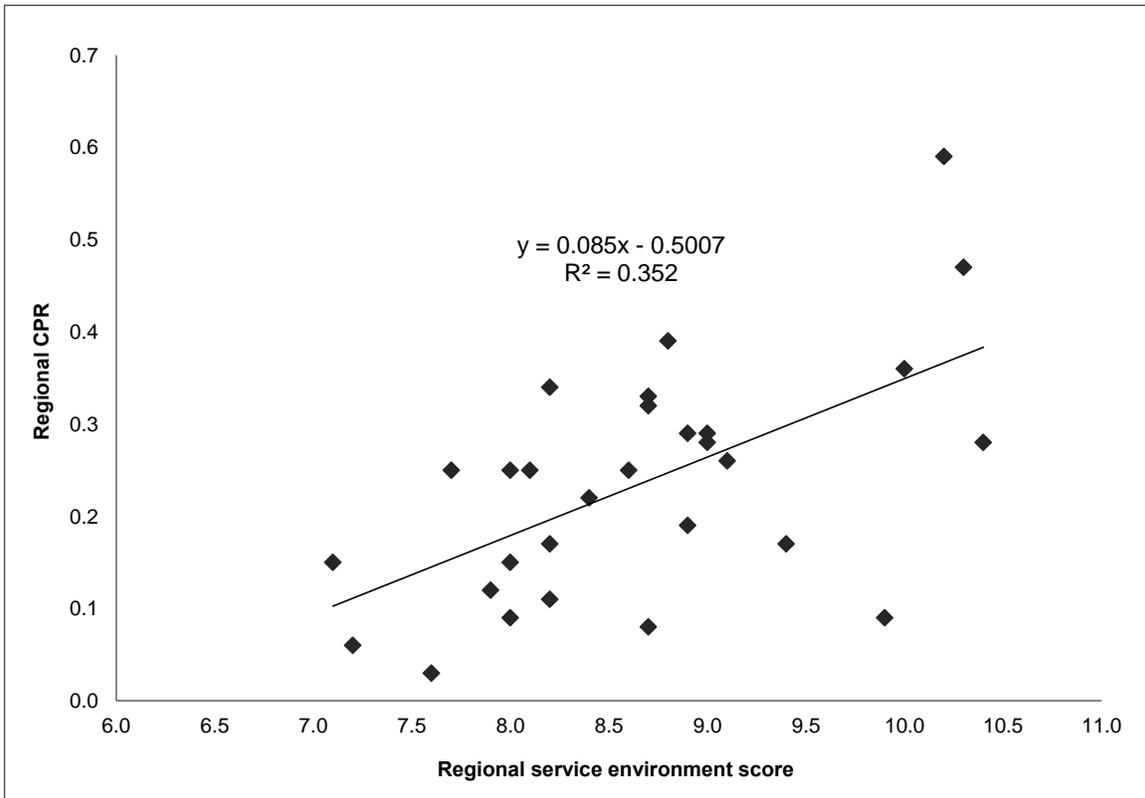


Figure 3. Association between regional CPR and service environment score



4 Multivariate Regression Results

4.1 Results of Random-Effects Logic Regressions

As described in the section on methods, five random-effects logit regression models are fitted in the multivariate analysis. The purpose behind the sequential models is to look at the variation explained by different sets of variables, so that the contribution of regional-level variables in explaining variability in contraceptive use can be evaluated. Table 14 shows the estimated coefficients and 95 percent confident intervals of the variables included in each model. In addition, the table shows two other parameters. One parameter is σ_u , the standard deviation of the regional level random intercept. By squaring it, we obtain the between-region variance in contraceptive use. The other parameter is ρ , the intra-class correlation coefficient, which measures the proportion of variation in use that is between regions. The total variance can be partitioned into within-region variance and between-region variance. While individual-level variables could explain within-region and between-region variance, regional-level variables can explain only variance at the regional level. As more predictors are added to the model, σ_u and ρ are expected to move toward zero.

Model I is a null model without any predictor included. ρ is 0.13, which indicates that between-region variance accounts for 13 percent of the total variance. The model also gives σ_u 0.69.

Model II includes individual-level variables: women's age, education, rural-urban residence, wealth status, and number of living children. The results show that all these variables are significantly associated with contraceptive use. For example, the coefficient of the primary education category is 0.78, corresponding to an odds ratio of 2.18, which means that compared with women with no education, women with primary education have more than twice the odds of using a modern contraceptive. The odds for women with secondary education are more than three times as large. Women who live in urban areas are more likely to use modern contraception than women in rural areas. Having more children predicts a higher likelihood of using modern contraception. Women with five or more children have more than three times the odds of using modern contraception compared with women who have only one child or no children.

In Model II σ_u drops (from 0.69 to 0.58) and ρ drops (from 0.12 to 0.09) compared with their values in Model I. Some between-region variation is explained by individual variables included in the model. Between-region variation now accounts for 9 percent of the total variation in contraceptive prevalence.

In Model III, family planning facility density is added to the regression in addition to the individual-level variables. Compared with Model II, all individual-level variables remain significant and their coefficients hardly change. Both σ_u and ρ drop by a small amount, from 0.58 to 0.55 and from 0.093 to 0.086, respectively. The regression coefficient for the density variable is 0.34 and not significant.

Table 14. Results of random-effects logit regression models

	Model I		Model II		Model III		Model IV		Model V		
	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	Coef.	95% CI	
Regional level variables											
Method availability							0.40	0.14 - 0.65			
Service environment score									0.46	0.25 - 0.67	
Family planning facility density					0.34	-0.09 - 0.77		0.40	0.03 - 0.77	0.30	-0.03 - 0.63
Individual level variables											
Age groups											
15-19 (ref.)											
20-24			0.22	-0.02 - 0.46	0.22	-0.02 - 0.46	0.22	-0.02 - 0.46	0.22	-0.02 - 0.46	
25-29			0.28	0.03 - 0.52	0.28	0.03 - 0.52	0.28	0.03 - 0.52	0.28	0.03 - 0.52	
30-34			0.25	0.00 - 0.51	0.25	0.00 - 0.51	0.26	0.00 - 0.51	0.26	0.00 - 0.51	
35-39			0.12	-0.13 - 0.39	0.12	-0.13 - 0.39	0.13	-0.13 - 0.39	0.13	-0.13 - 0.39	
40-44			0.10	-0.17 - 0.37	0.10	-0.17 - 0.37	0.10	-0.17 - 0.37	0.10	-0.17 - 0.37	
45-49			-0.33	-0.61 - 0.04	-0.33	-0.61 - 0.05	-0.33	-0.61 - 0.04	-0.33	-0.61 - 0.04	
Education											
No education (ref.)											
Primary			0.78	0.66 - 0.89	0.78	0.66 - 0.89	0.78	0.66 - 0.89	0.78	0.66 - 0.89	
Secondary			1.17	1.02 - 1.32	1.17	1.02 - 1.32	1.17	1.02 - 1.32	1.17	1.02 - 1.32	
Higher			1.18	0.97 - 1.40	1.18	0.97 - 1.40	1.18	0.96 - 1.39	1.18	0.96 - 1.39	
Household wealth status											
Lowest (ref.)											
Second			0.38	0.24 - 0.51	0.38	0.24 - 0.51	0.38	0.24 - 0.51	0.38	0.24 - 0.51	
Middle			0.53	0.39 - 0.66	0.53	0.39 - 0.66	0.53	0.39 - 0.66	0.53	0.39 - 0.66	
Fourth			0.74	0.61 - 0.88	0.74	0.61 - 0.88	0.74	0.61 - 0.88	0.74	0.61 - 0.88	
Highest			1.00	0.84 - 1.15	1.00	0.84 - 1.15	1.00	0.84 - 1.15	1.00	0.84 - 1.15	
Residence											
Urban (ref.)											
Rural			-0.28	-0.39 - 0.17	-0.28	-0.40 - 0.17	-0.28	-0.39 - 0.17	-0.28	-0.39 - 0.17	
Number of living children											
0-1 (ref.)											
2-4			1.04	0.93 - 1.16	1.04	0.92 - 1.16	1.04	0.93 - 1.16	1.04	0.93 - 1.16	
5 or more			1.24	1.10 - 1.39	1.24	1.10 - 1.39	1.24	1.10 - 1.39	1.24	1.10 - 1.39	
Sigma U	0.6936		0.5822		0.5571		0.4776		0.4267		
rho	0.1276		0.0934		0.0862		0.0648		0.0525		

We obtain Model IV by adding the method availability variable to Model III. For the individual-level variables, the estimated coefficients and significance are the same as in Model III. The coefficient of the method availability variable is 0.40 (the 95 percent confidence interval ranges from 0.14 to 0.65), which indicates that method availability is positively and significantly associated with modern contraceptive use. The odds ratio is 1.5, which means that an increase of one method in the average number of contraceptive methods available in a region corresponds with a 50 percent increase in the odds of use. The facility density variable becomes positively associated with contraceptive use, having a coefficient 0.4 (but a wide confidence interval), which means that women living in a region with a facility density higher than the national average are more likely to use contraception, given the level of the method supply and other individual variables controlled in the model.

In this model, sigma u and rho both drop again from their values in Model III. Less regional variability remains unexplained, and only 6 percent of the total remaining variation is between regions.

Model V differs from model IV only by replacing method availability with the service environment score. The coefficients and significance of individual-level variables remain similar. The service environment variable is significantly associated with contraceptive use. The coefficient of 0.46 has a 95 percent confidence interval from 0.25 to 0.67. The odds ratio is about 1.6, which means that an increase of one unit in the service environment score corresponds with a 60 percent increase in women’s odds of using contraception.

In Model V, facility density returns to insignificance (at the 0.05 level). Sigma u and rho are again reduced, compared with their values in Model III.

The results of the five models address the second research aim of our study—to assess the regional variability in contraceptive use that is explained by regional-level variables. The analysis suggests that regional supply and service environment explain a significant portion of variance in contraceptive use. Table 15 shows the residual variation in contraceptive use between regions after adjusting for different sets of variables. The numbers in the first row are simply the square of sigma u from each of five models.

Table 15. Between-region variation in contraceptive use explained by each model

	Model I	Model II	Model III	Model IV	Model V
Between-region variance	0.4811	0.3390	0.3104	0.2281	0.182
% of variation explained ¹		30%	35%	53%	62%
Increased % of variation explained ²				17%	27%

¹Relative to Model I

²Relative to Model III

To calculate the proportion of variance explained by each model, we subtract the between-region variance in a later model from that in the null model (Model I) and divide by the variance in the null model. Results are shown in the second row of Table 14. After controlling for individual variables, Model II accounts for 30 percent of the variation across regions in contraceptive use. The percentage of variation explained increases to 35 percent after the regional family planning density variable is added to the model. This percentage jumps to 53 percent after the region’s average number of methods available is entered into the model, and to 62 percent after the service environment variable is included. Compared with Model III, the increased proportion of variation explained by adding regional contraceptive supply and service environment variables to the model is 17 percent for Model IV and 27 percent for Model V.

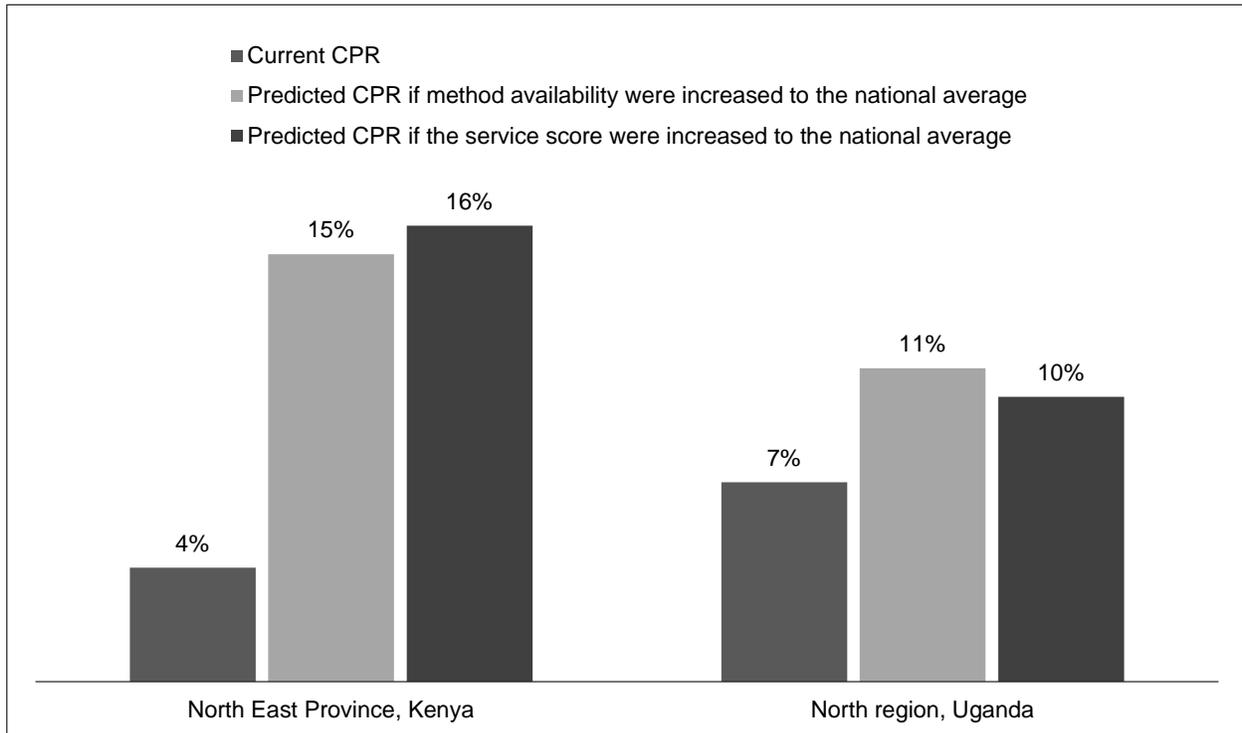
4.2 Simulation Analysis Results

To better illustrate the effects of family planning method availability and the service environment on contraceptive use, we conducted a simulation analysis. In the simulations, regional contraceptive prevalence rates are predicted under different scenarios of method availability and service environment, with all other variables in the model remaining at their observed values. Two regions, the North East province in Kenya and the North region in Uganda, are chosen for this purpose. Both regions have very low contraceptive prevalence and poor method availability and service environment.

Figure 4 shows the observed CPRs and compares them with simulated levels in two hypothesized scenarios: first, where method availability is improved to the national average, and second, where the service environment is improved to the national average. In the North East province of Kenya, modern contraceptive prevalence was just 4 percent in 2010. If the average number of methods per health facility in this region were to rise from the observed level, 2.2, to the national average, 3.1, the predicted proportion of women in this region using modern contraceptives would be 15 percent, almost four times the current level. In the scenario where the family planning service environment score rises to the national level, 9.4, the proportion of women using a modern method would be 16 percent.

Similarly, in the North region of Uganda, modern contraceptive prevalence was 7 percent in 2007. If the average number of modern contraceptive methods available were to increase to the national level, contraceptive prevalence would rise to a predicted 11 percent. With an improvement of the family planning service environment to the national average, contraceptive prevalence would rise to 10 percent. These simulations demonstrate that increasing the availability of modern contraception and improving the service delivery environment in a country could have substantial positive effects on contraceptive prevalence.

Figure 4. Current and predicted contraceptive prevalence if method availability or service environment were improved



5 Discussion and Conclusions

Interventions to improve levels of contraceptive use require a better understanding of how contraceptive supply and the family planning service environment affect contraceptive use. We use data from nationally representative household and health facility surveys and link family planning facility information at the regional level to contraceptive use at the individual level. Considering the relative lack of knowledge of the effect of family planning supply and services on contraceptive use in sub-Saharan Africa, findings from this study could inform family planning programs in addressing supply-based unmet need for family planning.

The analysis indicates that, based on the Kenya 2008-09 DHS, Kenya has the highest level of modern contraceptive use among the four countries studied, at 39 percent of women of reproductive age, which is an increase of 7 percentage points from the 2003 DHS in Kenya. Contraceptive use is lowest in Uganda, at 18 percent in the 2006 DHS, and only slightly higher in Tanzania, at 20 percent in the 2004–05 DHS. In all four countries injectables are the most commonly used method, followed by pills. Male condom use was seldom reported by women in any of these countries. Regional variation in contraceptive use within countries is evident but less so in Rwanda than in the other three countries.

DHS data show that women rely primarily on formal health facilities, including public hospitals, public health centers, public clinics, and private hospitals and clinics, for contraceptive supplies. In Uganda women rely primarily on private-sector sources, while in the other three countries they primarily use public sources. Women who use condoms obtain them primarily from informal sources, such as shops and friends. Such findings justify our exclusion of condoms from both method use and availability.

Using data from SPA surveys in each country, we examine contraceptive method availability and a number of indicators of the family planning service environment. Well over half of health facilities provide at least one contraceptive method, at 81 percent in Kenya in 2010, 59 percent in Rwanda in 2007, 60 percent in Uganda in 2007, and 72 percent in Tanzania in 2006. Regional variations in method availability are apparent in all four countries but are most striking in Uganda. For example, 87 percent of facilities in Uganda's Central Region but only 32 percent in its North Region have one or more methods available.

In terms of infrastructure and resources to support high-quality family planning services, the majority of facilities in all four countries ensure visual and auditory privacy for counseling and provide visual aids for family planning clients. Except in Uganda, health facilities providing family planning services often have written national family planning guidelines, but regional variations exist. In Rwanda and Tanzania, facilities have limited capacity in infection control. Running water, in particular, is missing at most of the facilities in these two countries. In all four countries fewer than 10 percent of facilities contain all of the items specified for quality of care in pelvic examinations, including a private room offering visual and auditory privacy, an examination bed or table, an examination light, and vaginal speculums.

The lack of routine staff training for family planning providers cuts across all four countries, with one-tenth or fewer of facilities in Uganda and Tanzania and one-third or fewer in Kenya and Rwanda providing routine staff training for family planning providers. In all four countries, however, family planning providers generally receive routine supervision.

There are important regional or provincial variations in the various family planning service components. In Kenya, for example, Central province demonstrates a better capacity than other regions of the country in infection control and routine staff training but underperforms in having written family planning guidelines and visual aids for family planning clients. Almost all facilities in the North Eastern province

offer privacy for family planning counseling, but very few facilities have written family planning guidelines or possess all essential items for infection control and good-quality pelvic examinations. In Rwanda, Kigali City has the smallest proportion of facilities offering one or more contraceptive methods, but it has more facilities with a better family planning service environment than other regions of the country.

Kenya is the only country studied with more than one SPA survey, allowing us to examine recent trends in contraceptive method availability and the service environment. Between 2004 and 2010, method availability improved in all eight provinces of Kenya. By the 2010 SPA survey, four regions had an average of at least three contraceptive methods available in health facilities. The change in service environment between 2004 and 2010 is insignificant, which may reflect the structural inertness of the health system.

Using random-effects logistic regression models, the study finds that an average increase of one contraceptive method available in a region increases women's odds of using modern contraception by 50 percent (if family planning facility density in the region and other individual-level variables are held constant). Women in regions with a more favorable service environment (as measured by a higher service environment score) are more likely to use a modern contraceptive method.

We also measure the contributions of regional-level factors to between-region variance in contraceptive use. In the initial null model, 13 percent of the total variance is between regions. This proportion is reduced when individual-level and regional-level variables are incorporated in successive models. When individual-level predictors and regional method availability or the service environment score are included, the between-region variance in contraceptive use drops by more than half. By including the method availability variable, 53 percent of the variance between regions is explained. Similarly, when substituting the family planning service environment score for the method availability variable, 62 percent of between-region variance is explained. In sum, regional level supply-side factors explain a substantial and statistically significant portion of variance between regions in modern contraceptive use.

The simulation analysis estimates the proportion of women using a modern contraceptive method in hypothesized scenarios, in which the regional average number of methods available or the service environment score would be improved to the national average level. Simulation results in the North East province in Kenya and the North region in Uganda suggest that a much higher proportion of women would be using a modern contraceptive method if method availability or the service environment, or both, could be brought up to the national average level.

Several limitations should be acknowledged when interpreting the results. As discussed earlier (see Section 1.3), because the current sample design in SPA surveys prevents us from linking health facilities to households at a smaller level of aggregation, such as the cluster, we link family planning services at a regional level to individual women's contraceptive use within that region. This approach assumes that individual behavioral decision-making is likely to be influenced by the service access and quality in a large geographic area, such as a region. The regional method availability and family planning service environment score measured in this analysis characterize the health facilities that provide family planning services sampled in the region. These facilities may not be the facilities that individual women actually use. The facilities they use might not be included in the linked SPA survey.

The level of local development also could affect women's contraceptive use. For example, Pullum found that in rural Guatemala contraceptive prevalence is much higher in clusters where a local distribution program exists than in clusters without such programs (Pullum 1991). He also found a direct effect of service availability on contraceptive use even after controlling for the level of local development. Controlling for some development measurements in the multivariate analysis will help avoid the

confounding effect of development on the individual contraceptive use. However, in this study we are not able to adjust for more local development variables. The primary reason is that few degrees of freedom are available for regional-level variables because of the small number of second-level units (i.e. regions) in the model. It is possible that the estimated effect of family planning services on contraceptive use partly reflects unmeasured local development. Since the regional development level is the aggregate of the socioeconomic characteristics of individuals in the region, we hope this factor has been at least partially controlled by the inclusion of individual-level variables such as education, wealth, and urban–rural residence.

The cross-sectional nature of both SPA and DHS surveys prevents us from providing a more rigorous estimate of the influence of family planning supply on use, especially if the resources are non-randomly distributed, that is, if their placement is related to actual demand or consumption (Pitt, Rosenzweig et al. 1993). When more family planning resources are placed in an area with little contraceptive use (for example, because of political favoritism toward certain regions) and information on prior contraceptive prevalence is not available, the apparent effect of the supply of family planning services on contraceptive use could be misinterpreted.

In the analysis, when we aggregate several family planning service variables to obtain the regional-level service environment score, equal weight is assigned to each variable. Those variables may have different impacts on family planning use, however, depending on the country and method, and this simplification overlooks such differences.

Finally, while the SPA and DHS data were collected within one year of each other, we cannot rule out the possibility that the data on contraceptive availability and family planning environment collected at the time of the SPA survey differ from what they were at the time of the DHS surveys.

In conclusion, this study suggests that family planning supply plays an important role in increasing the prevalence of modern contraceptive use. Better measurement could help determine where the needs are greatest and suggest how to meet them. To make up for a lack of suitable information, more effort invested in data collection could facilitate a better linkage between the family planning supplies and services offered by health facilities and the characteristics of the population to be served (Turner, Angeles et al. 2001).

References

- Blacker, J., C. Opiyo, M. Jasseh, A. Sloggett, and J. Ssekamatte-Ssebuliba. 2005. "Fertility in Kenya and Uganda: A comparative study of trends and determinants." *Population Studies* 59(3): 355-373.
- Bradley, S. E.K., T. N. Croft, J. D. Fishel, and C. F. Westoff. 2012. *Revising Unmet Need for Family Planning*. DHS Analytical Studies No. 25. Calverton, Maryland, USA: ICF International.
- Casterline, J. B. 1987. "The collection and analysis of community data: The WFS experience." In *World Fertility Survey: Assessment of Its Contribution*, edited by J. Cleland, and C. Scott, 882-905. Oxford: Oxford University Press.
- Curtis, S. L., R. Bessinger, and L. S. Montana. 2001. *Linking Health Facility and Population Level Data in Kenya Using Geographic Information Systems*. Calverton, Maryland, USA: Macro International.
- Fisher, A. 1992. *Guidelines and Instruments for a Family Planning Situation Analysis Study*. New York: The Population Council.
- Hong, R., L. Montana, and V. Mishra. 2006. "Family planning services quality as a determinant of use of IUD in Egypt." *BMC Health Services Research* 6: 79.
- Khan, S., S. E. K. Bradley, J. Fishel, and V. Mishra. 2008. *Unmet Need and the Demand for Family Planning in Uganda: Further Analysis of the Uganda Demographic and Health Surveys, 1995-2006*. Calverton, Maryland, USA: ICF Macro.
- Khan, S., V. Mishra, F. Arnold, and N. Abderrahim. 2007. *Contraceptive Trends in Developing Countries*. DHS Comparative Reports #16. Calverton, Maryland, USA: Macro International.
- Kim, Y. M., J. Rimon, K. Winnard, C. Corso, I. V. Mako, S. Lawal, S. Babalola, and D. Huntington. 1992. "Improving the quality of service delivery in Nigeria." *Studies in Family Planning* 23(2): 118-127.
- Koenig, M. A., M. B. Hossain, and M. Whittaker. 1997. "The influence of quality of care upon contraceptive use in rural Bangladesh." *Studies in Family Planning* 28(4): 7.
- Magadi, M. A., and S. L. Curtis. 2003. "Trends and determinants of contraceptive method choice in Kenya." *Studies in Family Planning* 34(3): 149-159.
- Magnani, R. J., D. R. Hotchkiss, C. S. Florence, and L. A. Shafer. 1999. "The impact of the family planning supply environment on contraceptive intentions and use in Morocco." *Studies in Family Planning* 30(2): 120-132.
- Mensch, B., M. Arends-Kuenning, and A. Jain. 1996. "The impact of the quality of family planning services on contraceptive use in Peru." *Studies in Family Planning* 27(2).
- Miller, R., A. Fisher, K. Miller, L. Ndhlovu, B. N. Maggwa, I. Askew, D. Sanogo, and P. Tapsoba. 1997. *The Situation Analysis Approach to Assessing Family Planning and Reproductive Health Services: A Handbook*. New York: The Population Council.

- Mroz, T. A., K. A. Bollen, I. S. Speizer, and D. J. Mancini. 1999. "Quality, Accessibility, and Contraceptive Use in Rural Tanzania." *Demography* 36(1).
- National Institute of Statistics of Rwanda and Macro International Inc. 2000. Demographic and Health Survey 2000. Calverton, Maryland, USA: ORC Macro.
- National Institute of Statistics of Rwanda and Macro International Inc. 2008. Demographic and Health Survey 2007-2008. Calverton, Maryland, USA: ICF Macro.
- National Institute of Statistics of Rwanda and ORC Macro. 1993. Demographic and Health Survey 1992. Calverton, Maryland, USA: Macro International.
- Pitt, M. M., M. R. Rosenzweig, and D. M. Gibbons. 1993. "The determinants and consequences of the placement of government programs in Indonesia." *World Bank Economic Review* 7(3): 313-334.
- Pullum, T. 1991. "The relationship of service availability to contraceptive use in rural Guatemala." DHS Working Paper #2. Calverton, Maryland, USA: Macro International.
- Raudenbush, S. W., and A. S. Bryk. 2002. *Hierarchical Linear Models: Applications and Data Analysis Methods*. London: Sage Publications.
- Sharan, M., S. Ahmed, J. May, and A. Soucat. 2010. *Family Planning Trends in Sub-Saharan Africa: Progress, Prospects, and Lessons Learned*. Baltimore, Maryland, USA: Johns Hopkins Bloomberg School of Public Health.
- Steele, F., S. L. Curtis, and M. Choe. 1999. "The impact of family planning service provision on contraceptive use dynamics in Morocco." *Studies in Family Planning* 30(1): 5.
- Stephenson, R., and A. Tsui. 2002. "Contextual influences on reproductive health service use in Uttar Pradesh, India." *Studies in Family Planning* 33(4): 12.
- Turner, A. G., G. Angeles, A. O. Tsui, M. Wilkinson, and R. Magnani. 2001. *Sampling Manual for Facility Surveys for Population, Maternal Health, Child Health and STD Programs in Developing Countries*. MEASURE Evaluation Manual Series #3. Chapel Hill, North Carolina, USA: MEASURE Evaluation, Carolina Population Center, University of North Carolina at Chapel Hill.
- World Bank. 2011. *World Development Indicators*. World Bank.

DHS Analytical Studies Series

1. Westoff, Charles F. 2000. *The Substitution of Contraception for Abortion in Kazakhstan in the 1990s*.
2. Rafalimanana, Hantamalala, and Charles F. Westoff. 2001. *Gap between Preferred and Actual Birth Intervals in Sub-Saharan Africa: Implications for Fertility and Child Health*.
3. Mahy, Mary, and Neeru Gupta. 2002. *Trends and Differentials in Adolescent Reproductive Behavior in Sub-Saharan Africa*.
4. Westoff, Charles F., and Akinrinola Bankole. 2001. *The Contraception- Fertility Link in Sub-Saharan Africa and in Other Developing Countries*.
5. Yoder, P. Stanley, and Mary Mahy. 2001. *Female Genital Cutting in Guinea: Qualitative and Quantitative Research Strategies*.
6. Westoff, Charles F., Jeremiah M. Sullivan, Holly A. Newby, and Albert R. Themme. 2002. *Contraception-Abortion Connections in Armenia*.
7. Bell, Jacqueline, Siân L. Curtis, and Silvia Alayón. 2003. *Trends in Delivery Care in Six Countries*.
8. Westoff, Charles F. 2005. *Recent Trends in Abortion and Contraception in 12 Countries*.
9. Westoff, Charles F., and Anne R. Cross. 2006. *The Stall in the Fertility Transition in Kenya*.
10. Gebreselassie, Tesfayi. 2008. *Spousal Agreement on Reproductive Preferences in Sub-Saharan Africa*.
11. Gebreselassie, Tesfayi, and Vinod Mishra. 2007. *Spousal Agreement on Family Planning in Sub-Saharan Africa*.
12. Mishra, Vinod, Rathavuth Hong, Shane Khan, Yuan Gu, and Li Liu. 2008. *Evaluating HIV Estimates from National Population-Based Surveys for Bias Resulting from Non-Response*.
13. Westoff, Charles F. 2008. *A New Approach to Estimating Abortion Rates*.
14. Gebreselassie, Tesfayi, Shea O. Rutstein, and Vinod Mishra. 2008. *Contraceptive Use, Breastfeeding, Amenorrhea and Abstinence during the Postpartum Period: An Analysis of Four Countries*.
15. Mishra, Vinod, and Simona Bignami-Van Assche. 2008. *Orphans and Vulnerable Children in High HIV-Prevalence Countries in Sub-Saharan Africa*.
16. Bradley, Sarah E.K., and Vinod Mishra. 2008. *HIV and Nutrition among Women in Sub-Saharan Africa*.
17. Johnson, Kiersten, and Amber Peterman. 2008. *Incontinence Data from the Demographic and Health Surveys: Comparative Analysis of a Proxy Measurement of Vaginal Fistula and Recommendations for Future Population-Based Data Collection*.
18. Hindin, Michelle J., Sunita Kishor, and Donna L. Ansara. 2008. *Intimate Partner Violence among Couples in 10 DHS Countries: Predictors and Health Outcomes*.
19. Johnson, Kiersten, Monica Grant, Shane Khan, Zhuzhi Moore, Avril Armstrong, and Zhihong Sa. 2009. *Fieldwork-Related Factors and Data Quality in the Demographic and Health Surveys Program*.
20. Bradley, Sarah E.K., Hilary M. Schwandt, and Shane Khan. 2009. *Levels, Trends, and Reasons for Contraceptive Discontinuation*.
21. Westoff, Charles F. and Dawn Koffman. 2010. *Birth Spacing and Limiting Connections*.
22. Bradley, Sarah E.K., Trevor N. Croft, and Shea O. Rutstein. 2011. *The Impact of Contraceptive Failure on Unintended Births and Induced Abortions: Estimates and Strategies for Reduction*.
23. Johnson, Kiersten, Nouredine Abderrahim, and Shea Rutstein. 2011. *Changes in the Direct and Indirect Determinants of Fertility in Sub-Saharan Africa*.
24. Westoff, Charles F., Dawn A. Koffman and Caroline Moreau. 2011. *The Impact of Television and Radio on Reproductive Behavior and on HIV/AIDS Knowledge and Behavior*.
25. Bradley, Sarah E.K., Trevor N. Croft, Joy D. Fishel, and Charles F. Westoff. 2012. *Revising Unmet Need for Family Planning*.
26. Wang, Wenjuan, Shanxiao Wang, Thomas Pullum, and Paul Ametepi. 2012. *How Family Planning Supply and the Service Environment Affect Contraceptive Use: Findings from Four East African Countries*.