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THE IMPACT OF DEMAND FACTORS, QUALITY OF CARE AND ACCESS TO FACILITIES ON CONTRACEPTIVE USE IN TANZANIA

MARY ARENDS-KUENNING* AND FLORA L. KESSY†

**Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, USA and †Economic and Social Research Foundation (ESRF), Dar es Salaam, Tanzania*

Summary. The low contraceptive prevalence rate and the existence of unmet demand for family planning services present a challenge for parties involved in family planning research in Tanzania. The observed situation has been explained by the demand-side variables such as socioeconomic characteristics and cultural values that maintain the demand for large families. A small, but growing body of research is examining the effect of supply-side factors such as quality of care of family planning services on the demand for contraceptives. This paper analyses the demand and supply factors determining contraceptive use in Tanzania using the Tanzania Service Availability Survey (1996) and the Tanzania Demographic and Health Survey (1996) data sets. The results show that access to family planning services and quality of care of services are important determinants of contraceptive use in Tanzania even after controlling for demand-side factors.

Introduction

The total fertility rate (TFR) in Tanzania has remained high over the last thirty years at 6·3 children per woman although it dropped to 5·8 in the mid-1990s (Bureau of Statistics & Macro International, 1997). As a result of the high TFR, the population growth rate stands at 2·9% (World Bank, 2003). The average growth in Real Gross Domestic Product (GDP) of 3·2% per year between 1990 and 2001 (World Bank, 2003) has barely kept up with population growth. Rapid population growth and poor economic growth have hindered the ability of the government to improve and expand social services and to strengthen the national economy.

The government recognizes the high population growth rate as an impediment to economic growth and has provided family planning services free of charge in government facilities. With the AIDS crisis, providing family planning information

and services has become increasingly important. However, despite efforts at the national level to promote family planning use, the fertility rate in Tanzania has shown only slight signs of decline, and modern contraceptive prevalence remains very low. The contraceptive prevalence rate in Tanzania in 1996 was 16% (29% and 13% for urban and rural areas respectively), whereas the percentage of married women with an unmet demand for family planning was 24% (TDHS, 1997). With such high unmet demand, unwanted and mistimed pregnancies are rampant. A possible cause of high levels of unmet demand is the lack of high quality family planning services. One important policy question is whether good quality contraceptive services can increase women's use and thereby accelerate the process of fertility decline.

Bruce (1990) pioneered the analysis of quality of services in the context of service delivery. This study separated the inputs (programme efforts), processes (elements of the unit of service received) and outcomes (impacts) and discussion of quality focused on services and processes. Quality of services was defined as six specific elements of the process of service delivery. They include choice of methods, information given to clients, technical competence, interpersonal relations, mechanisms to encourage continuity and appropriate constellation of services. These elements of quality of care are hypothesized to affect contraceptive use. By providing clients with a choice of methods and information about their side-effects in a safe and healthy environment, women will choose to adopt contraceptive methods and to continue to use them.

Bruce's framework has become the defining conceptualization in the discussion of quality of care of family planning services, and it has been used by several other researchers (Mensch *et al.*, 1996, 1997; Speizer & Bollen, 2000; RamaRao *et al.*, 2003). In addition, it is more directly useful for formulating policy than studies that look at the effect of people's perceptions about quality on contraceptive use. For example, knowing that training of providers increases modern contraceptive method use is more useful for policy than knowing that perceptions of quality impact contraceptive use, if policymakers do not know which objective measures of quality affect perceptions. This is currently the situation with research on quality of care in Tanzania. Previous work by Guilkey, Speizer and others in Tanzania (Mroz *et al.*, 1999; Speizer & Bollen, 2000) has found that perceptions significantly impact contraceptive use, but the objective measures they included in their studies do not explain much of the variation in perceptions of quality. Perceptions themselves, even if they have significant impact on contraceptive use, do not give suggestions about where family planning programmes should allocate resources: for instance, on method choice versus increasing privacy.

The success of efforts to lower fertility and promote greater contraceptive use will depend on an understanding of the importance of factors affecting the demand for children and the demand for contraception including individual women's characteristics, access to methods and quality of care of family planning services. Researchers have already devoted much attention to investigating the effect of demand-side characteristics such as individual women's characteristics on contraceptive use (Omari, 1989; Frank, 1990; Bertrand *et al.*, 1993; Ainsworth *et al.*, 1996, among others). However, relatively few studies exist that explore the effect of supply-side characteristics such as facility characteristics on contraceptive use (Mensch *et al.*, 1996, 1997; Mroz *et al.*, 1999; Speizer & Bollen, 2000; Topcuoglu *et al.*, 2000). Therefore, there

might be a large research payoff in studying the role of facility characteristics such as quality of care in the demand for contraceptives.

Previous studies

Although other researchers have examined the impact of the quality of care of contraceptive services on contraceptive use in Tanzania (Beegle, 1994; Mroz *et al.*, 1999; Speizer & Bollen, 2000; Chen & Guilkey, 2003) this study is unique because it examines the impact of a variety of objective measures of quality on women's decisions to use contraceptives. Using the Bruce (1990) framework, six quality-of-care indices are developed. The research questions addressed here are as follows: Which, if any, of the quality indicators affect contraceptive use in Tanzania? What is the magnitude of the impact of quality of care and access relative to the impact of socioeconomic characteristics of women?

Most studies of quality of care focus on describing and improving the quality of services. The assumption is that provision of high quality services will help maintain contraceptive use among initial adopters and generate new users of family planning services (Jain, 1989). Early studies (Schwarts *et al.*, 1989; Beegle, 1994; Feyisetan & Ainsworth, 1994; Oliver, 1994) had access to only limited information about quality, such as access, choice of methods, and the presence of other maternal and child health services besides family planning. Yet, other aspects of quality mentioned by Bruce (1990) might also impact women's decisions to use family planning, such as the information elicited from women and communicated to them, and the nature of the personal treatment given. More recent studies have included these quality variables in the analysis of quality of care of family planning services in developing countries (Mensch *et al.*, 1996, 1997; Mroz *et al.*, 1999; Speizer & Bollen, 2000; Topcuoglu *et al.*, 2000).

The Beegle (1994) study is among the early studies on the impact of quality of care of family planning services in Tanzania. The study used variables like the presence of a trained pharmacist, availability of electricity, hours the facility is open per day, availability of condoms, the pill, injections and spermicides, and availability of penicillin and anti-malarial drugs to measure quality. However, Beegle's study did not use the multiple indicators to measure quality of care proposed in Bruce (1990). Mroz *et al.* (1999) found a positive and significant effect of perceived facility quality on women's decisions to use family planning in Tanzania. Perceived facility quality was measured by asking six community informants to evaluate the quality of the closest family planning facility. The study also found that objective measures of quality of care had little relationship with the perceived quality of care. The authors did not present results indicating whether the objective measures of quality of care had direct impacts on women's contraceptive use.

A study by Speizer & Bollen (2000) looked at which objective measures of quality were related to subjective measures of quality. They found that perceived travel time to the facility and the provision of other maternal and child health services had a significant impact on perceived quality. However, the objective measures explained only a moderate amount of the variation in perceived quality, leaving a non-trivial amount to be explained. As was the case in the Mroz *et al.* study, the Speizer & Bollen study did not directly look at the impact of the direct measures on contraceptive use.

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A recent study by Chen & Guilkey (2003) looks at contraceptive method choice in Tanzania. However, the only quality-of-care variable that they include in their analyses is whether a trained provider was available within 5 km of where the woman lived. Other variables controlled for access to contraceptive methods, including the number of methods in stock at facilities within 5 km and the number of methods available at pharmacies within 5 km of where the woman lived. The study includes more recent data from 1999, but the 1999 facility data only cover two-thirds of the geographic clusters that are examined in this study. In addition, the Chen & Guilkey study only examined the contraceptive choices of women who lived in rural areas, and this study includes women who lived in urban and rural areas.

Previous research about Tanzania suggested the need for further research about the determinants of people's perceptions of the quality of care of family planning services. This study shows that looking at objective measures of quality is informative, even if perceptions of quality are not well understood.

Country setting

According to World Bank estimates, *per capita* Gross National Product (GNP) is approximately US$280, putting Tanzania among the ten poorest countries in the world (World Bank, 2002). Seventy-four per cent of Tanzanian women (World Bank, 2000) live in the rural areas and are engaged in farming, principally at subsistence level. Contraceptive use is especially low in rural areas at 13%.

People are aware that contraceptive methods are available. More than 80% of women and men know at least one modern method for family planning. Among women, the pill is the most widely known method (78%), whereas among men, the condom is the most widely known method (86%).

The evidence in the literature is not conclusive about whether access to methods limits women's contraceptive choices. A study by Mroz *et al.* (1999) using 1991/92 TDHS and Tanzania Service Availability Survey (TAS) 1993 data sets shows that, although more than 40% of rural women in Tanzania had a family planning facility within 30 km of their residence at age 12, only 3·2% reported that they were using a modern contraceptive method. Mroz *et al.* (1999) cited this statistic as evidence that low use of methods could not be due to lack of access. However, 30 km is a long distance to travel in rural Tanzania, and having a facility within 30 km is not necessarily a good indicator of access.

At a time when the public sector is strained, some policymakers have advocated an expansion in the private sector to help meet women's reproductive health needs. In Tanzania, the private sector provided a small percentage of family planning services in 1996. Only 23% of women who used modern contraceptive methods obtained them from private sector providers, including religious organizations, pharmacies and shops. The public sector provided modern methods to 74% of contraceptive users, and an additional 3% of users did not respond to the question (TDHS, 1997). Therefore, in this paper's analysis of quality of care, the focus is on public sector providers.

Abortion is another means by which women might meet their reproductive goals. In Tanzania, abortion is legal only to preserve the physical and mental health of the woman (UNPD, 2005). Although abortion is expensive and restricted by law, researchers have

found evidence that illegal abortion is widespread. A 1987 study in the teaching hospital in Dar es Salaam found that 31% of women who were admitted to the hospital for early pregnancy loss had an illegally induced abortion (Justesen *et al.*, 1992). Another study by Rasch *et al.* (2000) concluded that as many as 60% of allegedly spontaneous abortions in Dar es Salaam were induced abortions. The United Nations Population Division cites studies that indicate that between 17 and 21% of maternal deaths were related to abortion (UNPD, 2005). The major providers of illegally induced abortions are low quality, private hospitals (Rasch *et al.*, 2000). In the Rasch *et al.* study, women who had an induced abortion were more likely to be less than 19, single, living with relatives, and students than women who reported a spontaneous abortion. In Tanzania, women may resort to illegally induced abortions to control their fertility. However, the limited evidence suggests that this means of controlling fertility is less important for married women than for single women (Justesen *et al.*, 1992), and the TDHS data include only married women. It was not possible to include the decision to seek an abortion in this study because of data limitations.

The research puzzle is that although contraceptives were provided free of charge in government facilities (although not necessarily at a reasonable distance from the women's residence) and knowledge of contraceptive use was widespread, use was very low and the discontinuation rate was high, with one study estimating one-year discontinuation rates as high as 70–80% (Mwageni *et al.*, 1998). As mentioned earlier, 24% of married women had an unmet demand for contraception. Unplanned pregnancies were also common, with women reporting in the 1996 TDHS that 24% of their most recent births were unplanned. In the Justesen *et al.* (1992) study, of a sample of women who had a spontaneous abortion and who reported that the pregnancy was unwanted, only 7% of the pregnancies were due to failed contraception. The authors concluded that there were high levels of unmet need among women who had reached their desired family size or were caring for a young child. Although demand for children was high, with women reporting an ideal number of children of 5·5, substantial unmet need existed, and 16% of women reported a number of living children greater than or equal to their ideal number of children. This paper seeks to address to what extent low quality facility characteristics explain why contraceptive use is low in Tanzania.

Estimation approach

Contraceptive use is modelled as a function of women's individual characteristics and various measures of quality of care of family planning services, drawing on work by Schultz (1997) and Feyisetan & Ainsworth (1994). The effects of these variables on the probability of using a modern method of contraception were estimated using equation (1) as follows:

$$\begin{aligned}\text{Log (FP)} = {} & \beta_0 + \beta_1 \text{AgeD} + \beta_2 \text{Edyrs} + \beta_3 \text{Edhus} + \beta_4 \text{Lite} + \beta_5 \text{ReliD} + \beta_6 \text{Urban} \\ & + \beta_7 \text{SonD} + \beta_8 \text{DaughD} + \beta_9 \text{Child} + \beta_{10} \text{Water} + \beta_{11} \text{Floor} + \beta_{12} \text{Meth} + \beta_{13} \text{Info} \\ & + \beta_{14} \text{Tech} + \beta_{15} \text{Inter} + \beta_{16} \text{Mech} + \beta_{17} \text{Const} + \beta_{18} \text{Distance} + \beta_{19} \text{Dmis} + \mu + e \end{aligned} \quad (1)$$

where 'FP' is the current use of modern family planning services; 'AgeD' represents a series of dummy variables to control for women's changing fertility at different ages;

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Table 1. Variables for measuring quality of care of family planning services

Quality indicator	Variables
1. Choice of methods	This was measured by the number of family planning methods available at each facility. The focus was on the following ten methods: pill, IUD, injectables, implants, diaphragm, foaming agents, condom, female sterilization, male sterilization and natural family planning. If a method was available at the facility, one point was assigned. The points were summed over ten methods. The index was then divided by 10 (the maximum score possible) to ensure a range from 0 to 1.
2. Information given to clients[a]	Variables included in this category were availability of educational and promotional outreach programmes in the facility, a sign indicating that family planning is available in the facility, the display of the Green Star Logo, and if the sign indicates what hours family planning services were offered. This variable is a continuous one with 1 indicating complete provision of information and 0 indicating that no information was provided. Four points were given for complete measure of information (that is, all four variables had a score of 1). The total score was divided by 4 so as to have an index measured between 0 and 1.
3. Technical competence	This was measured by three indicators: *Visible technical competence* was measured by two variables: electricity supply and water supply. The sum of these items ranged from 0 to 2. The total score was divided by 2 so as to have a measure between 0 and 1. *Privacy* was measured by the following variables: if other people could not hear what was being said in the counselling room/area; if other people could not see the clients in the counselling room/area; if within the counselling room, there was a curtained area or some other arrangement to provide privacy for the examinations; if other people could not hear what was being said in the examination room; if other people could not see clients in the examination room/area; and if there was a separate room for physical examinations. The sum of these items ranged from 0 to 6. The total score was divided by 6 so as to have an index ranging from 0 to 1. *Staff competence* was measured by the following variables: if the facility had staff trained in family planning[b]; years in total the provider had provided the services; if the provider had attended pre-service training and if so whether the training covered introduction to family planning clinical skills; if the provider had attended additional (in service) training and if so, whether the training included basic family planning clinical skills, comprehensive family planning clinical skills, and contraceptive technology update. The sum of these items ranged from 0 to 6. The total score was divided by 6 so as to have an index ranging from 0 to 1.
4. Interpersonal relations	This was measured by two proxy variables: how comfortable the provider is in discussing sexual behaviour related to STD/HIV with clients, and if the provider routinely asks the patient any questions when a patient reports symptoms that the provider suspects to be a STD. The total sum was divided by 2 so as to obtain an index ranging from 0 to 1.

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Table 1. *Continued*

Quality indicator	Variables
5. Mechanism to encourage continuity	This was measured by one proxy variable equal to 1 if the facility makes referrals to other health facilities and 0 otherwise.
6. Appropriate constellation of services	This was measured by the availability of child immunization; TT for pregnant women; antenatal care; maternity/delivery care; post-natal services; HIV/AIDS counselling services; HIV/AIDS education and testing; if family planning is integrated with MCH services; and if the facility offered other health services in addition to family planning. The highest score was 9. The total score was divided by 9 to obtain an index ranging from 0 to 1.

[a]These variables serve the purpose of establishing an index, but more appropriate variables would be variables such as whether the clients were told anything about the methods before they decided to use any method, and whether the clients were told what to do if anything happened when they were using a specific method. These variables are not available in the data sets.

[b]In generating this variable, different weights were given to different providers. Doctors, medical assistants and rural medical aides (RMAs) were assigned 0·5. Nurse midwives, nurses and maternal and child health aides (MCHAs) were assigned 1. The later category was given a larger weight because in Tanzania, this group provides most family planning services. It is also important to note that dispensaries provide 60% of MCH/FP services in Tanzania and the former category of providers is almost not available in the dispensaries (URT, 1997). Studies by Feyisetan & Ainsworth (1994), and Thomas & Maluccio (1995) reported that the number of doctors is associated with a lower probability of use of modern methods in Nigeria and Zimbabwe respectively.

'ReliD' controls for religion, which might affect preferences for children and attitudes towards contraceptives. Past fertility is controlled for by 'Child', which represents the total number of children, and a series of dummy variables representing the number of living sons and daughters, represented by 'SonD' and 'DaughD'. The number of sons and daughters is entered non-linearly to allow the effects of an additional son when the woman has one living son to differ from the effect when she has two living sons.

Women's education and their husbands' education are important variables that represent the opportunity cost of childrearing, the parents' permanent income, and ability to understand information about family planning. 'Edyrs' represents women's total years of schooling, which is a proxy for the cost of an additional child. Women with higher levels of education can earn higher wages and therefore face higher opportunity costs of children than women with lower levels of education. Therefore, women with high levels of education are more likely to use contraceptives than women with no education. 'Lite' represents women's ability to read and write Kiswahili. 'Edyhus' is husbands' level of education, which is a proxy for long-term household resources as well as the value of men's time. If the husband spends time in raising children, or if male and female leisure time is complementary, his education

will, like the wife's, have a positive impact on contraceptive use. The impact of wealth on the demand for contraceptives is represented by 'Water', which is equal to one if the household has piped water, and 'Floor', which is equal to one if the floor is of a durable material.

The facility-level characteristics include distance to the facility and the quality of care of family planning services provided at different facilities. The quality of services is assessed through the six elements of quality proposed by Bruce (1990). How these elements of quality are defined is detailed in Table 1. 'Meth' is defined as choice of methods, 'Info' is the information given to clients, 'Tech' is technical competence, 'Inter' represents an index of interpersonal relations, 'Mech' represents the mechanisms to encourage continuity, and 'Const' is the constellation of services. Distance represents the distance to the nearest health facility with family planning and is a proxy for the cost of obtaining contraceptive methods. 'Dmis' represents the dummy variables for missing observations in the quality-of-care variables and missing facility.

Estimating the impacts of facility characteristics on women's contraceptive use is complicated if governments allocate family planning resources based on the unobserved characteristics of women in the community (Mensch *et al*., 1996; Angeles *et al*., 1998). The variable μ in equation (1) represents community-level unobservable characteristics, whereas e represents individual women's unobserved characteristics. If the unobservable characteristics are correlated with the regressors, such as the quality-of-care variables, estimates of the coefficients will be biased. For example, if the government of Tanzania allocates high-quality resources in areas where fertility is high, a small effect of quality on contraceptive use might be found, even if the high-quality family planning programme is working well. Conversely, a situation where women with a high demand to control their fertility demand better facilities from the government would lead to an overstatement of the impact of quality on women's contraceptive use.

Angeles *et al*. (1998) looked at this issue of endogenous programme placement in Tanzania. Their data included the years when each service delivery point opened. They used these data to estimate the years when the facilities opened jointly with the probability that women conceived. This method controlled for the government's decision to open a family planning clinic, hospital or dispensary in a community. Their strategy was to make the data collected at a point in time into longitudinal data, and identify effects from changes in the service environment over time. After controlling for endogenous programme placement, they found that the impact of hospitals on fertility was overestimated in a simple model, whereas the impact of clinics on fertility was underestimated.

Unfortunately, this method was not available to estimate the impact of the quality of care of family planning services on contraceptive use. Data were available about the quality of care at one point in time. The official government policy was to provide services to areas that lacked them (Angeles *et al*., 1998). Another method to control for endogeneity would be to use an instrumental variable technique. This would require at least one variable that was a significant determinant of the quality of care in a cluster but did not affect contraceptive use directly. In the data set, no such variables were available. As a robustness check, cluster-level variables were added to equation (1) to see whether the inclusion of such variables affected the other

estimates. These cluster-level variables control for some aspects of μ and would affect the other estimated coefficients if the variables were correlated with μ.

Data and variables definition

The study combines quantitative and qualitative analyses. The regression results are compared with results from 24 focus groups conducted in rural and urban Dar es Salaam and rural and urban areas of the central region of Dodoma in 2000 (Kessy, 2001). Dar es Salaam is a wealthy region and Dodoma is one of the five poorest in Tanzania.

Two data sets were combined for the quantitative analyses. The first data set is the 1996 Tanzania Service Availability Survey (TAS) data, collected by the Bureau of Statistics (BOS) of the Government of Tanzania in collaboration with the Family Planning Unit (FPU) of the Ministry of Health. Technical support and funding for the survey were provided by the USAID-funded MEASURE EVALUATION Project of the University of North Carolina at Chapel Hill. The TAS data set contains information on quality and accessibility aspects at the facility level.

The second data set is the 1996 Tanzania Demographic and Health Survey collected by Macro International Inc. and the Tanzania Bureau of Statistics. These two data sets were merged by clusters to form a data file of individual women with community-level data about family planning facilities.

In each cluster, the TAS interviewers identified the nearest hospital, health centre and a dispensary. Those facilities located within 30 km of the cluster were then interviewed. The interviewers collected quality-of-care data in each type of facility. The sample size of this database is determined not by the number of clusters, but rather by the number of unique facilities contained in the final sample. A total of 90 hospitals, 123 health centres and 253 dispensaries were surveyed.

The dispensary is the smallest facility type and is designed to serve a ward with a population of about 6000. Dispensaries are mainly staffed by rural medical aides and auxiliaries, and Maternal and Child Health Aides (MCHAs). They typically have no beds. Health centres are larger and accept referrals from dispensaries. They have between 20 and 30 beds and have at least one medical assistant in addition to rural medical aides, a nurse–midwife, MCH aides and auxiliaries. Hospitals represent either the secondary or tertiary level of care and they provide the most comprehensive care. They are also best equipped in terms of infrastructure and medical staff.

The variables in the merged data file contained several missing observations mostly from the TAS data file. There are several ways to fix the missing observations problem. They can be dropped from the data set, their values can be imputed, or they can be dummied out. In this study, the missing observations problem was handled in two ways. Observations with missing values were dropped from the sample for the variables with only a few missing observations. Otherwise, the variables with missing observations were dummied out. To dummy out the missing variables, the value of the variable was set to 0, and then a dummy variable was created that was equal to one if the variable was missing and 0 if it was available. These dummy variables were used in the regression analysis to control for missing observations in particular variables. Most of the variables from the TDHS data file had very few missing

Table 2. Variable definitions, means and standard deviations

Variable	Definition	Mean and standard deviation		
		Urban (N=1783)	Rural (N=5446)	Total (N=7229)
Use	=1 if woman used contraceptives at the time of the survey	0·24 (0·43)	0·09 (0·29)	0·13 (0·34)
Age1	=1 if the woman's age was 14–20 years; else=0	0·27 (0·44)	0·26 (0·44)	0·26 (0·44)
Age2	=1 if the woman's age was 21–35 years; else=0	0·54 (0·50)	0·49 (0·50)	0·50 (0·50)
Age3	=1 if the woman's age was above 35 years; else=0	0·20 (0·40)	0·25 (0·43)	0·24 (0·45)
Edyrs	Years of schooling a woman has in single years	5·97 (3·06)	4·19 (3·19)	4·63 (3·25)
Edyrh	Husbands years of schooling in single years	4·84 (4·11)	3·74 (3·48)	4·01 (3·68)
Lite	=1 if a woman can read and write Kiswahili easily; else=0	0·75 (0·44)	0·50 (0·50)	0·56 (0·50)
Mos	=1 if woman is Muslim; else=0	0·51 (0·50)	0·29 (0·45)	0·34 (0·48)
Prot	=1 if woman is Protestant; else=0	0·21 (0·41)	0·25 (0·43)	0·24 (0·43)
Cath	=1 if woman is Catholic; else=0	0·27 (0·44)	0·34 (0·47)	0·32 (0·47)
None	=1 if woman follows other religions or none; else=0	0·01 (0·09)	0·12 (0·32)	0·09 (0·29)
Urban	=1 if woman resides in urban area; else=0	—	—	0·25 (0·43)
Child	Total number of living children a woman had	2·02 (2·15)	2·72 (2·55)	2·55 (2·48)
Son0	=1 if number of living sons=0; else=0	0·47 (0·50)	0·39 (0·49)	0·41 (0·49)
Son1	=1 if number of living sons=1; else=0	0·27 (0·44)	0·23 (0·42)	0·24 (0·43)
Son2	=1 if number of living sons=2; else=0	0·14 (0·35)	0·17 (0·38)	0·17 (0·37)
Son3	=1 if number of living sons=3; else=0	0·07 (0·25)	0·10 (0·30)	0·09 (0·29)
Son4	=1 if number of living sons>3; else=0	0·06 (0·24)	0·10 (0·31)	0·09 (0·29)
Daugh0	=1 if number of living daughters=0; else=0	0·49 (0·50)	0·39 (0·49)	0·42 (0·49)
Daugh1	=1 if number of living daughters=1; else=0	0·25 (0·43)	0·24 (0·43)	0·24 (0·43)
Daugh2	=1 if number of living daughters=2; else=0	0·13 (0·33)	0·16 (0·36)	0·15 (0·35)
Daugh3	=1 if number of living daughters=3; else=0	0·09 (0·28)	0·11 (0·31)	0·10 (0·30)
Daugh4	=1 if number of living daughters>3; else=0	0·05 (0·22)	0·11 (0·31)	0·09 (0·29)
Water	=1 if the source of water is piped water; else=0	0·33 (0·47)	0·02 (0·14)	0·10 (0·30)
Floor	=1 if the floor material is wood, parquet, ceramic or cement; else=0	0·69 (0·46)	0·10 (0·31)	0·25 (0·43)
Distance	Distance to nearest facility is 5 km or less	0·97 (0·16)	0·74 (0·44)	0·80 (0·40)
	Distance to nearest facility is 6–10 km	0·03 (0·16)	0·19 (0·40)	0·15 (0·36)
	Distance to nearest facility is greater than 10 km	0·00 (0·00)	0·06 (0·24)	0·05 (0·21)

Table 2. *Continued*

Variable	Definition	Mean and standard deviation		
		Urban (N=1783)	Rural (N=5446)	Total (N=7229)
Meth	Choice of methods	0·66 (0·14)	0·54 (0·19)	0·57 (0·18)
Info	Information given to clients	0·61 (0·17)	0·65 (0·20)	0·64 (0·20)
Tech	Technical competence	0·58 (0·16)	0·46 (0·18)	0·49 (0·18)
Visi1	Visible technical competence	0·66 (0·38)	0·43 (0·36)	0·49 (0·38)
Visa1	Privacy	0·70 (0·15)	0·62 (0·21)	0·64 (0·20)
Staf1	Staff competence	0·38 (0·18)	0·33 (0·18)	0·34 (0·18)
Inter	Interpersonal relations	0·74 (0·28)	0·86 (0·27)	0·83 (0·28)
Mech	Mechanisms to encourage continuity	0·76 (0·43)	0·75 (0·43)	0·75 (0·43)
Const	Constellation of services	0·86 (0·12)	0·84 (0·11)	0·85 (0·12)
Methmis	A dummy variable representing missing observations in the choice of methods variable	0·42 (0·49)	0·40 (0·49)	0·41 (0·49)
Infomis	A dummy variable representing missing observations in the information given to clients variable	0·54 (0·50)	0·52 (0·50)	0·53 (0·50)
Techmis	A dummy variable representing missing observations in the technical competence variable	0·32 (0·47)	0·29 (0·45)	0·30 (0·46)
Intmis	A dummy variable representing missing observations in the interpersonal relations variable	0·31 (0·46)	0·35 (0·48)	0·34 (0·47)
Mechmis	A dummy variable representing missing observations in the mechanisms to encourage continuity variable	0·32 (0·47)	0·29 (0·45)	0·30 (0·46)
Edyrsmis	A dummy variable representing missing observations in the women's total years of schooling variable	0·14 (0·34)	0·32 (0·47)	0·27 (0·45)
Edyrhmis	A dummy variable representing missing observations in the husband's years of schooling variable	0·29 (0·45)	0·22 (0·42)	0·24 (0·43)
Hospmis	A dummy variable representing no hospital within 30 km	0·03 (0·16)	0·09 (0·29)	0·08 (0·26)
Heamis	A dummy variable representing no health centre within 30 km	0·05 (0·22)	0·10 (0·29)	0·08 (0·28)
Dispmis	A dummy variable representing no dispensaries within 30 km	0·02 (0·13)	0·00 (0·00)	0·004 (0·07)

observations, so the observations with the missing values were dropped from the data set. Only the women's education and the husbands' education variables were dummied out from the TDHS data.

In creating the quality indicator variables, no observations were dropped from the analysis. The variables used to create the quality indicators are all from the TAS data files, which were collected at the facility level. It is assumed that the providers are knowledgeable about what is going on at the facility and if the quality indicator for an observation is missing, that facility was assigned a zero value for that indicator. The quality indicator was also assigned a zero value if there was no facility within 30 km of the cluster. This was based on the assumption that if there is no facility in a cluster, quality of that particular facility is not accessible to women. (Of the 357 clusters visited, 24 had no hospital, 26 had no health centre and one had no dispensary within 30 km. Thus, 8%, 8% and 0·004% of the interviewed women lived in the clusters with no hospital, no health centre and no dispensary within 30 km, respectively.)

All the variables used to create quality-of-care indices had missing observations. These variables were dummied out. In other words, if a dimension of a quality-of-care index was missing for a service provider, the value for that dimension was set to zero and a dummy variable was created to indicate that the observation had missing information. In cases where there was no hospital, clinic or dispensary available within 30 km of a cluster, the quality variables were set to zero and the appropriate dummy variable was set to one. For example, if no hospital was located within 30 km of a cluster, all quality dimensions for that hospital were set to zero and a dummy variable indicating that there was no hospital was set to one. These cases represented a very small percentage of cases (Table 2). The extent to which the results are biased when some missing scores were assigned zero was explored in an alternative model whereby all the missing observations were dropped from the analysis.

Quality of care of family planning services was defined based on Bruce's 1990 framework. The approach was similar to the approach developed by Mensch *et al.* (1996) and focused on objective measures of quality. Table 1 shows how the quality variables were measured. Quality at the cluster level was defined by adding together the six dimensions of quality for the closest hospital, clinic and dispensary located within 30 km of the cluster. The six dimensions of quality of care were assigned from the service delivery point with the highest total quality of care. The quality of care is assigned from one facility instead of taking an average of quality of care from the three facilities because taking an average quality gives the same weight to the three facilities. In addition, it is preferable to err on the side of overestimating the quality than underestimating it. (Methodologically, if the quality of care is overestimated, one would most likely find no impact on contraceptive use. However, if one finds an impact on contraceptive use, then that is strong evidence that quality of care matters as far as contraceptive use is concerned. Economically, if quality is underestimated, resources could be wasted in improving an otherwise satisfactory quality of care.) Therefore, the quality-of-care score for the cluster was assigned from the facility with the highest score, which was the clinic for 50% of the individual women's observations, the hospital for 26% of the observations and the dispensary for 24% of the observations. Speizer & Bollen (2000) found in some models that people have

significantly higher perceptions of quality of care for hospitals than for other providers, but for this study, in most clusters, the highest quality of care in family planning was obtained in clinics. As a robustness check, this study also includes a discussion of the results from an alternative model, where the average quality-of-care indices were used.

Table 2 presents the definitions, means and standard deviations of the variables used in the analysis. The majority of women live within 5 km or less of a family planning facility. Even rural women have good access, with 75% living 5 km or less from a facility. The lowest quality-of-care indices are obtained for technical competence, with technical competence being lower in rural areas than urban areas. Of the dimensions of technical competence, staff competence is especially low. Visible technical competence varies greatly between rural and urban areas. The quality of care for information given to clients is also low. Method choice is low in rural areas, with the highest quality provider providing only half of the ten possible methods.

Multivariate results

The dependent variable is the current use of modern family planning services. Explanatory variables include characteristics of women and characteristics of facilities. The regression results are presented first in Table 3 for the whole sample, assuming that except for a main effect of urban and rural residence, all the individual-level and cluster-level variables have the same effects on contraceptive use in both rural and urban areas. The Table 4 results are for a fully interacted model, so that the coefficients of all the explanatory variables are allowed to differ between rural and urban areas. In Tanzania, a fully interacted model is appropriate because in urban areas, women have greater access to a variety of providers. Also, policy recommendations might be different for rural and urban areas. By fully interacting the independent variables with urban residence, one can easily test whether the impacts of a variable are the same in urban and rural areas.

Tables 3 and 4 include coefficients, odds ratio and *Z*-values. Odds ratios are calculated by exponentiating the coefficients. The odds ratios represent the factor by which the odds of using contraceptives change when the independent variable increases by one unit. For example, interpreting the odds ratios for the whole sample presented in Table 3, if the technical competence index were raised by one unit from 0 to 1, the odds ratio of 3·66 implies that the probability that a woman will use contraceptives would increase by 266%. To interpret the coefficients for the urban sample, the estimated main effect and the interactive effect were added together. For instance, the total effect based on Table 4 for the technical competence variable is (1·251) + (− 0·061) (Kennedy, 1998). The joint statistical significance of the main effect and interactive effect was tested using likelihood-ratio tests.

The regression analyses included controls for women's individual characteristics, but the discussion focuses in detail upon the results for quality of care to save space. The results for individual characteristics of women are as expected in most cases. For urban women, women's total years of education, husbands' total years of education, and the number of sons and daughters have positive and significant effects on modern contraceptive use. For rural women, literacy, husbands' total years of schooling, being

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Table 3. Logistic regression results of current contraceptive use on facility characteristics (total sample)[a]

Facility characteristics variable[c]	Coefficient	Robust standard error[b]	Odds ratio
Choice of methods	0·223	0·44	1·249
Information given to clients	0·864***	0·30	2·372
Technical competence	1·299***	0·34	3·664
Interpersonal relations	0·101	0·22	1·106
Mechanisms to encourage continuity	0·195	0·16	1·215
Constellation of services	0·307	0·56	1·360
Distance to the nearest facility (0– 5 km)			
6–10 km	− 0·336**	0·17	0·715
11 km or more	− 0·421*	0·23	0·656
Dummy for missing observations in the choice of methods variable	− 0·014	0·14	0·986
Dummy for missing observations in the information given to clients variable	0·128	0·13	1·136
Dummy for missing observations in the interpersonal relations variable	− 0·130	0·20	0·878
Dummy for missing observations in the technical competence variable	0·179	0·23	1·197
Dummy for having no hospital within 30 km of cluster	0·395	0·26	1·484
Dummy for having no health centre within 30 km of cluster	0·330*	0·20	1·391
Dummy for having no dispensary within 30 km of cluster	0·614**	0·26	1·848
Observations = 7229; pseudo R^2 = 0·185; log likelihood = − 2263·59			

[a]The model also includes a series of dummy variables representing women's age and religion, total number of children and a series of dummy variables representing the number of living sons and daughters, years of schooling of women and their husbands, literacy, dummy variables for source of water and type of floor.
[b]If data are clustered, standard errors obtained under the random sample assumption are too low. Therefore, standard errors were adjusted for clustering using the 'robust and cluster' commands in STATA (STATA 7·0 User's Guide, pp. 257).
[c]Dummy variables representing missing observations for the mechanism to encourage continuity and constellation of services were dropped due to collinearity.
* significant at 0·1 level; ** significant at 0·05 level; *** significant at 0·01 level.

a Muslim, Catholic or Protestant, the number of sons and daughters, and living in a house with good floor material have positive, significant effects on contraceptive use.

The effect of supply-side factors on contraceptive use

Two of the six facility characteristics are found to have strong, statistically significant impacts on women's contraceptive use. Information given to clients and technical competence are both statistically significant at the 1% level for the entire sample

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(Table 3). Technical competence is found to be statistically significant at the 1% level in both rural and urban areas (Table 4). Information given to clients is found to have a large, statistically significant impact in rural areas, but no significant effect in urban areas (Table 4).

Increasing the information base is likely to increase the probability of using family planning services for women in rural areas. The situation in Tanzania is such that information provided to women is not enough, especially the non-users. For instance, the 1999 *Tanzania Reproductive and Child Health Survey* (TRCHS) shows that of the 53% of non-users who visited a health facility a year before the survey, only 14% said that someone at the facility spoke to them about family planning. This finding gives insight into the level of missed opportunities by health care workers to talk to non-users about contraceptive use.

In urban areas, information given to clients has no statistically significant impact on women's contraceptive use. The interaction term of living in an urban area with the information given to clients variable was negative and significant at the 5% level. The combined effect of the main rural effect with the interacted urban effect was not statistically significant. Table 2 indicates that the information given by service providers in rural areas is not much different from the information provided in urban areas. Perhaps women who live in urban areas have greater access to information about contraceptives through their social networks and the mass media. The result highlights the different policies that might be needed in rural and urban areas to encourage women to use contraceptive methods to help meet their reproductive needs.

The effect of technical competence on contraceptive use is stronger for rural women than for urban women. The coefficient on technical competence is positive and highly significant for the total (Table 3) and rural samples (Table 4). The variable representing the interaction between technical competence and the urban dummy variable is negative (Table 4) but the combined effect is positive and jointly significant at the 1% level, indicating that increased technical competence has a positive impact on women's contraceptive use in urban areas also. The impacts of technical competence on women's contraceptive use are large, with women in rural areas being 249% more likely and women in urban areas 229% more likely to adopt a method if they live in an area with a value of 1 for technical competence than if they live in an area with a value of 0 for technical competence based on the odds ratios, which give marginal impacts.

Technical competence was broken down into three components: visible technical competence, privacy and staff competence. A regression was run using the three separate components of technical competence instead of the single index. The results showed that visible technical competence was especially important to women in the rural areas with an odds ratio of 1·79 and a statistical significance level of 1%. In urban areas, visible technical competence was also statistically significant at the 1% level, with an odds ratio of 1·61. The estimated coefficients on the other independent variables were not affected when technical competence was broken down into three separate variables.

Jain (1989) argues that programmes can achieve better demographic results when they concentrate on a small number of annual acceptors and provide them with good care to enhance their satisfaction and thus to improve continuation rates, rather than

Table 4. Logistic regression results of current contraceptive use on facility characteristics (urban and rural samples)[a]

Facility characteristics variable[c]	Coefficient	Robust standard error[b]	Odds ratio
Rural sample			
Choice of methods	0·611	0·54	1·842
Information given to clients	1·545***	0·43	4·686
Technical competence	1·251***	0·46	3·493
Interpersonal relations	0·132	0·30	1·141
Mechanisms to encourage continuity	0·163	0·18	1·176
Constellation of services	0·396	0·80	1·486
Distance to the nearest facility (0–5 km)			
6–10 km	− 0·255	0·18	0·775
11 km or more	− 0·312	0·25	0·732
Dummy for missing observations in the choice of methods variable	0·109	0·21	1·115
Dummy for missing observations in the information given to clients variable	0·127	0·19	1·136
Dummy for missing observations in the technical competence variable	0·614**	0·29	1·848
Dummy for missing observations in the interpersonal relations variable	− 0·408*	0·21	0·665
Dummy for having no hospital within 30 km of cluster	0·236	0·30	1·266
Dummy for having no health centre within 30 km of cluster	0·192	0·25	1·212
Dummy for having no dispensary within 30 km of cluster	0·376	0·43	1·456
Urban sample[d]			
Choice of methods	− 1·507	0·94	0·222
Information given to clients	− 1·652**	0·65	0·192
Technical competence	− 0·061	0·65	0·941
Interpersonal relations	− 0·366	0·43	0·693
Mechanisms to encourage continuity	0·028	0·36	1·028
Constellation of services	0·430	1·23	1·538
Distance to the nearest facility (0– 5 km)			
6–10 km	− 0·150	0·47	0·861
11 km or more	na	na	na
Dummy for missing observations in the choice of methods variable	− 0·332	0·28	0·718
Dummy for missing observations in the information given to clients	− 0·198	0·25	0·820
Dummy for missing observations in the technical competence variable	− 0·908**	0·40	0·403
Dummy for missing observations in the interpersonal relations variable	0·829**	0·37	2·291

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Table 4. *Continued*

Facility characteristics variable[c]	Coefficient	Robust standard error[b]	Odds ratio
Urban sample *(Continued)*[d]			
Dummy for having no hospital within 30 km of the cluster	−0·317	0·53	0·728
Dummy for having no health centre within 30 km of the cluster	0·235	0·37	1·264
Observations = 7229; pseudo R^2 = 0·20; log likelihood = −2230·87.			

[a]The model also includes a series of dummy variables representing women's age and religion, total number of children and a series of dummy variables representing the number of living sons and daughters, years of schooling of women and their husbands, literacy, dummy variables for source of water and type of floor.
[b]If data are clustered, standard errors obtained under the random sample assumption are too low. Therefore, standard errors were adjusted for clustering using the 'robust and cluster' commands in STATA (STATA 7·0 User's Guide, pp. 257).
[c]Dummy variables representing missing observations for mechanisms to encourage continuity, constellation of services and having no dispensaries within 30 km of the cluster were dropped due to collinearity.
[d]The variables were interacted with urban dummy variable. Dummy variables representing missing observations for mechanisms to encourage continuity, constellation of services and dummy variable for having no health centres within 30 km of the cluster were dropped due to collinearity.

trying to recruit a large number of acceptors at one time and not take care of them. Interpersonal relations and mechanisms to encourage continuity do not have statistically significant impacts on contraceptive use (Tables 3 and 4). Thus, little evidence was found to support Jain's claim, but perhaps analyses using data focused on contraceptive acceptors would find a different result.

The coefficient on the constellation of services is not significant for either the full sample (Table 3) or the rural or urban samples (Table 4). It was expected that constellation of services might be more important for the urban women workers than for rural women because they would like to get as many services as possible from the facility in order to minimize time used to access the services. If the facility has all other MCH services, the providers would most likely meet with many women and talk about family planning use. Speizer and Bollen's result found that the provision of other MCH services with family planning services had a positive impact on perceptions of quality, but no evidence was found that the constellation of services have a positive, direct effect on women's contraceptive use.

The distance to the facility is negatively associated with family planning use for the total sample. This is not a surprising result because women, especially in the rural areas, have to walk long distances in order to get family planning services. Table 3 shows that women who live 6–10 km from a facility that provides family planning services are 28% less likely to use a contraceptive than women who live within 5 km

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of a family planning facility, and this effect is significant at the 5% level. Women who live 11 or more kilometres from a family planning facility are 34% less likely to use a contraceptive method than women who live within 5 km, and this effect is statistically significant at the 10% level. Table 4 shows weaker effects of distance on women's contraceptive use, and the distance variables do not attain statistical significance in the rural or urban samples.

The dummy variable for missing observations in the technical competence variable was positive and significant for the rural sample (Table 4). For the urban sample, the interaction between technical competence missing and living in an urban area was negative and significant, but the combined effect of technical competence and its interaction with urban area was not significant, indicating that women who lived in clusters with missing observations for the technical competence variable were no more or less likely to use contraceptives than women who lived in clusters with this information. The coefficients for the missing observations in the technical competence variable indicate the effects on women's contraceptive use compared with the effects of living in a cluster with technical competence quality of zero. Therefore, for women living in rural areas, the results indicate that women's contraceptive use is lower when quality is known to be at its lowest level than when quality is unknown.

The dummy variable for missing observations in the interpersonal relations variable was negative and significant in the rural sample. The interaction between living in an urban area and having missing observations for interpersonal relations was positive and significant, but the combined effect of the interpersonal relations variable and its interaction was jointly not significant (Table 4). So, women who lived in rural clusters where there was missing information about interpersonal relations were less likely to use contraceptives than women who lived in rural clusters where the information was available. Perhaps refusing to provide information about interpersonal relations is a sign of poor quality on the interpersonal relations dimension.

If there was no facility within 30 km, a negative sign was expected as well because no facility was accessible to women. The positive and significant coefficients on the dummy variables representing no dispensary within 30 km of the cluster and no health centre within 30 km of the cluster are counterintuitive (Table 3). The result probably represents unobserved heterogeneity across communities. Another interpretation might be that women's contraceptive use is lower when they live in a cluster with poor quality than if they live far away from a facility. Also, it is important to keep in mind that very few women live in communities that are farther away than 30 km from a dispensary (Table 2). Therefore, the communities that are farther away from service delivery points are probably very different from those that are located within 30 km.

Results from alternative models

Equation (1) was re-estimated using average quality-of-care indices instead of the maximum indices. In general, the estimated impacts of the demand-side factors were not affected (results not shown). The signs and significance of some of the supply-side factors changed slightly. The 'information given to clients' variable was significant only at the 10% level. The variable for living 6–10 km from the nearest facility was

significant at the 10% level, and the variable for living 11 km or more from the nearest facility was significant at the 5% level, which was slightly different from the previous results shown in Table 3. The magnitudes of the coefficients were essentially unchanged. The results were substantially the same whether measuring maximum quality of care or average quality of care available in the cluster.

For the rural sample (results not shown) the biggest change in the regressions that included average quality-of-care measures was that the magnitudes of the effects for information given to clients and technical competence increased. Information given to clients had an odds ratio of 8·44, which was an 80% increase compared with the results in Table 4. The odds ratio for technical competence increased to 5·11, which was a 46% increase. The two distance dummy variables became significant, with living 6–10 km significant at the 10% level and living 11 km or more significant at the 5% level. Having missing data about information given to clients became significant at the 5% level and having missing data about interpersonal relations went from being significant at the 10% level to being significant at the 5% level.

For the urban sample (results not shown), when quality of care was measured as the average of the three facilities, the technical competence variable and its interaction with urban residence were no longer jointly significant.

Different results were obtained when using the quality-of-care variables defined as the cluster average of the facilities rather than defined as the quality of care from the highest-valued facility. Thus, it matters how the quality-of-care indices are constructed, and there is no standard way to construct them. Maximum indices were used to avoid giving the same weight to different facilities within the clusters. However, for both models, whether using maximums or using averages, the technical competence and distance variables (for the total sample) and the technical competence and information given to clients variables (for the rural sample) retained their importance. The estimates for these elements of quality of care inspire greater confidence, because the results were robust to both ways of measuring quality of care at the community level.

The results for these variables were also robust to adding cluster-level variables to the regression. Cluster-level measures of quality might be correlated with unobservable cluster-level characteristics, μ (equation (1)). As a robustness check, the means of the literacy rate, availability of piped water, and presence of a good quality floor were calculated at the cluster level and added to the regressions. For the total sample, the cluster-level literacy rate was statistically significant at the 1% level and positive. The information provided to clients and technical competency variables retained their high levels of statistical significance. The magnitude of the effect was essentially the same for information provided to clients. However, the magnitude of the technical competence coefficient fell from an odds ratio of 3·664 to 2·281, a decrease of 38%. When the cluster-level variables were added to the regression that interacted the explanatory variables with urban residence, the average literacy rate in the cluster was statistically significant, and the interaction between this variable and urban residence was not significant. The most important difference when adding the cluster-level variables was that technical competence became statistically insignificant in rural areas. Technical competence remained statistically significant at the 5% level in urban areas. The magnitude of the odds ratio for information given to clients in rural areas

fell from 4·686 to 3·999, a decrease of 14%. The finding that the magnitudes of the effects fell provides evidence that correlation exists between μ and the quality-of-care variables. However, significance levels are essentially unaffected when controls for the unobserved characteristics of clusters are added to the regression.

As another robustness check, the regressions in Tables 3 and 4 were re-run excluding all the observations with missing data for the quality-of-care variables. The total sample decreased from 7229 women to 2695 women, which represented just 37% of the total sample. For the total sample (results not shown) none of the quality-of-care variables was statistically significant. For the rural sample, the only statistically significant variable was method choice, which was negative and marginally significant at the 10% level. None of the interactions between the quality-of-care variables and urban residence was statistically significant. None of the main effects combined with the interactions for urban residence was statistically significant, either. Also, the observable characteristics of women who had no missing data for quality-of-care variables were compared with women who had missing data for these variables. Based on *t* tests, women who had no missing data for the quality-of-care variables were more likely to be Protestant, had more children, had less education, were more likely to live in rural areas, lived farther away from a service delivery point, and were less likely to live in a house with piped water and a good floor than women who had missing data for quality-of-care variables. However, there was no significant difference in contraceptive use between women who had complete data for quality-of-care variables and women who had missing data for these variables. Given that many observations are lost when the observations with missing quality-of-care variables were dropped and that women who had missing quality-of-care variables looked different from women who had complete quality-of-care variables, it is argued that the results using the missing information are more accurate.

The impact of demand-side factors relative to supply-side factors on contraceptive use

In order to compare the magnitude of the impact of various changes in public policy, changes in probabilities of using contraceptives associated with a change in some independent variables are computed and presented. The following variables were chosen for the simulation because they were statistically significant in Table 4 and had policy implications: education, literacy, husbands' education, information given to clients, technical competence, visible competence and distance. The mean probability of using a modern method of contraception was calculated using the estimated coefficients presented in Table 4 with the variable in question set to its minimum value. Then predicted probabilities for the sample were recalculated after increasing the variable in question to its maximum value. Whereas odds ratios give the magnitude of estimated effects at the margin, simulations give average effects across the entire rural and urban samples.

The results from the simulations for urban and rural women are presented in Table 5. Given the results of the model, and keeping in mind the assumption that quality of care in the facilities is not correlated with women's and communities' unobserved characteristics, increasing the information given to clients and facilities' general technical competence will result in a large effect on method use for rural

Table 5. Predicted proportion of women currently practising contraception by low and high values of selected quality-of-care indices and women's characteristics

Variable	Predicted proportion	Percentage change[a]
Rural sample		
Literacy=0	0·071	
Literacy=1	0·108	52
Husband has no schooling	0·057	
Husband has 13 years of schooling	0·187	228
Information given to clients=0	0·038	
Information given to clients=1	0·137	261
Technical competence=0	0·057	
Technical competence=1	0·152	167
Visible technical competence=0	0·074	
Visible technical competence=1	0·120	62
Distance=0–5 km	0·097	
Distance=6–10 km	0·079	− 19
Distance=11 km or more	0·075	− 23
Urban sample		
Woman has no schooling	0·162	
Woman has 13 years of schooling	0·341	110
Husband has no schooling	0·193	
Husband has 13 years of schooling	0·304	57
Technical competence=0	0·145	
Technical competence=1	0·321	121
Visible technical competence=0	0·194	
Visible technical competence=1	0·262	35

[a]Percentage increase is calculated as final predicted probability (when the variable is set at maximum value) minus the initial predicted probability (when the variable is set at zero), divided by the initial predicted probability times 100.

women. Increase of these two quality-of-care variables from zero to their maximum values resulted in an increase in the predicted probabilities of using contraceptives by 261% and 167% respectively. Visible technical competence is also important for rural women. An increase in visible technical competence from zero to the maximum value resulted in an increase in the predicted probabilities of using contraceptives by 62%. These large effects must be interpreted with caution. First, jumping from the minimum to the maximum value of quality of care represents a large change. Second, the results might be biased upwards if quality of care is correlated with unobservable characteristics that dispose women towards using contraceptives.

Increasing the rural women's literacy from illiterate to literate would increase the predicted probability of using modern contraceptives by 52%. Husbands' education has a large impact on women's contraceptive use in rural areas. Increasing husbands' education from no schooling to 13 years of schooling increases the probability that a rural woman will use contraceptives by 228%. Decreasing the distance to the rural

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facilities from more than 11 km to 0 km resulted in an increase in the predicted probability of using contraceptives by 19%. The magnitude of the effect of distance on women's contraceptive use is not large. In Table 4, distance was found to not have a statistically significant impact on women's contraceptive use, so the statistical significance is low and the magnitude is small. Therefore, lack of access cannot explain much of Tanzanian women's low levels of contraceptive use.

The impact of changing the quality of care of family planning services is smaller in urban areas than in rural areas. Increasing the technical competence in urban areas resulted in an increase in the predicted probability of using contraceptives by 121%. Increasing visible competence in urban areas from 0 to 1 would increase contraceptive method prevalence by 35%. An increase in the total years of schooling for urban women from zero to its maximum value increases the probability of using contraceptives by 110%. Women's education has a stronger impact in the urban areas than in the rural areas, whereas husbands' education has a smaller impact in urban areas than in the rural areas.

The results presented in Table 5 show large changes in the probability of modern family planning services use when the variables are changed from zero to the maximum value possible. They indicate potential for large changes in the use of contraceptives, if the assumptions used to estimate the models are true. However, change of these variables from their minimum to maximum values would require substantial resources. To give a more realistic notion of policy choices, the government could change the variables from the minimum of zero technical competence to average technical competence in the rural areas. The simulation indicated that this policy change would increase the predicted probability of contraceptive use by 61%. The strategy of increasing the number of clinics so that all women live less than 5 km from a family planning service provider would be a costly one. Providing more information to family planning clients would require more provider time. Perhaps a system of peer education might be used.

Discussion

How do Tanzanian women view the quality of care of family planning that is available to them? Do the results of focus groups conducted in Tanzania support the quantitative evidence presented here?

Qualitative work carried out by Kessy (2001) in rural and urban Dar es Salaam and rural and urban areas of the district of Dodoma provided support for the quantitative results. The focus groups brought up some issues that were not found to be statistically significant in the regressions.

The quantitative results found that lack of information was a barrier to contraceptive use in rural areas. This finding was consistent with the focus group findings. Women in rural Dodoma mentioned that they were not provided with enough information because providers did not have time to talk to them. Specifically, the women mentioned that they did not have adequate information about Depo Provera, including side-effects and what to do if the women could not get to a clinic at the appointed time for the next injection. Disinformation and rumours about contraceptives were common. In the focus group discussions, women expressed beliefs

that pills and condoms caused cancer and that Depo Provera caused sterility and birth defects. One woman believed a Depo Provera injection would provide protection against pregnancy for 5 years. The majority of Tanzanian men and women had heard about family planning use. However, knowledge of proper use, risks and benefits of contraceptives was lacking, especially in the rural areas. Lack of information and belief in rumours discourage contraceptive use (Kessy, 2001). There is a need to increase the knowledge base by extending the daily education sessions or by introducing education sessions in clinics where these sessions are not conducted.

Technical competence was another quality-of-care index that had impact on contraceptive use for both urban and rural women. Visible technical competence as defined for this study could easily be judged by the clients. In one focus group, women highlighted the importance of visible technical competence when they gave an example of a time when providers did not provide proper equipment – a sling for weighing children. Instead, the providers used a piece of the mothers' clothing, and children fell out of the improvised sling when they were weighed. In another focus group, family planning providers pointed out that their dispensary in urban Dodoma did not have a water system or power supply.

Although privacy was not statistically significant in the quantitative analysis, women mentioned it as an important component of quality of care in focus group discussions. Tanzanian women perceived that family planning use was a private issue. Qualitative data indicated that some women were using family planning services secretly, without the consent of their husbands, and they wanted to see their privacy guaranteed (Kessy, 2001). In some rural villages, no building was available. Providers had to use tents, offer services under a tree or use government offices in the village. In rural outdoor clinics, women who required family planning services were told to wait until all other patients had been seen, and only then were they seen by providers. Therefore, other women could easily identify women who were at the clinic to obtain contraceptive methods. In urban Dodoma, women mentioned their lack of comfort with attending clinics in busy government offices, where many people enter and exit.

Provider's competence is necessary so as to be able to clear up women's fears or misunderstandings about certain family planning methods. Well-informed providers can access the latest scientific information on health risks and benefits associated with certain methods and can help couples to make informed choices. For example, some providers believed incorrectly that Norplant and injectables lead to permanently reduced fertility. Access to the latest developments and information is necessary for providers to be able to inform clients accurately. It is important for clients to be informed about the risks and benefits of each method before making a decision regarding contraception. The qualitative and quantitative data both point to the same conclusion (Kessy, 2001).

An important dimension of quality of care that arose in the focus group discussions was whether providers treated women with respect. It was not possible to quantify this dimension of interpersonal relations in the quantitative analyses. For example, one woman who had fourteen children, told of her shame when providers brought her up as a negative example on clinic day. Women in rural Dodoma were scolded if they travelled to dispensary for contraceptive methods and were told to wait until the providers visited their villages.

Finally, method choice came up as an issue in rural areas. A focus group of women in Dodoma said that the choice of methods was poor because only Depo Provera and pills were promoted. Women had to travel far away to get desired methods. Method availability was not cited as a problem in urban Dodoma and Dar es Salaam. Method choice was not a significant determinant of women's contraceptive use in the regression analyses.

Conclusion

This paper examined the impacts of quality of care of family planning services and access to services on current contraceptive use in Tanzania while controlling for individual women's characteristics. The results presented above underline the importance of supply-side factors and access in contraceptive use for different population groups. Some of the facility characteristics are associated with higher probability of contraceptive use for urban and rural women. The quality-of-care variables that have positive and significant impacts on contraceptive use for urban and rural women are the information given to the clients and technical competence. Decreasing the distance to the nearest rural health facility with family planning services is weakly associated with higher contraceptive use.

The results were robust to the inclusion of cluster-level variables meant to control for unobserved characteristics of clusters that may be correlated with the quality of services provided in a cluster. For example, community leaders in clusters with more literate women may be more effective at getting high quality family planning services in their community than leaders in clusters with few literate women. Adding the cluster-level variables did not affect the quality-of-care results very much, with the exception of technical competence in rural areas, which became statistically insignificant. The results give some confidence that the quality-of-care findings are not driven by endogenous programme placement.

Interventions on demand-side and supply-side factors would result in increased modern contraceptive use. As the results in Table 5 suggest, different interventions are required for rural and urban women. While increasing women's total years of schooling would increase contraceptive use for urban women, increasing the literacy rate would increase contraceptive use for rural women. Policies to raise female schooling and literacy would result in greater contraceptive use in urban and rural Tanzania. A decrease in the average distance to the facility would increase contraceptive use, but at a high cost. Giving women enough information would also result in increased contraceptive use. Policies should aim at having enough providers at the facility so that they could have enough time to run the education sessions. Display of information about family planning use at the facilities was also important, but the displayed information should also be discussed at the education sessions so as to benefit women who cannot read. Technical competence, especially the visibility component, was another quality-of-care aspect that should be improved for rural women. Qualitative data indicated that lack of privacy was an important barrier to women's contraceptive use in Tanzania, although the quantitative data did not show that privacy was an important determinant of women's contraceptive use. However, privacy could be provided at a relatively low cost by seeing patients as they arrive

instead of making family planning clients wait until all other patients are seen before they are attended and also by providing curtained areas for consultations. As difficult as it would be for the government to have a facility at every village, providers could visit villages more frequently in order to reduce the congestion and increase privacy.

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