The Distance-Quality Tradeoff for Women's Choice of Family Planning Provider in Tanzania

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Abstract

Studies of the determinants of family planning use often use distance to nearest health facility offering family planning services as a key explanatory variable. Women, however, may not seek family planning services from the nearest facility, rather opting for a more distant facility with better quality services. We use a new dataset that includes the name of facility where each women (n=3926) obtained her family planning services as well as measures of facility quality and the distance between each woman's home and the 39 potential facilities in the area she might visit. We use a conditional-multinomial logit model to estimate the determinants of woman's decision to use family planning and her choice of which facility to visit for services, and this allows us to estimate how women tradeoff traveling longer distances to use higher quality facilities. We find that only 1% of woman who we can match to facilities use their nearest facility. We find women prefer facilities that: specialize in providing family planning services, provide a large range on methods, do not suffer from stock outs, and that do not charge fees. Our estimates imply that, on average, women are willing to travel an additional 1.7 km for a facility with 1 more method of family planning, 2.6 km for a facility without 1 additional health service, 12 km for a facility without fees for family planning and 12 km for a facility not experiencing stock out of an additional family planning commodities. Our results suggest that quality of services provided are an important driver of facility choice in addition to distance to facility.

Introduction

Uptake of family planning services remains low in Africa, placing millions of women at risk of mistimed and unintended pregnancies which are in turn, associated with increased risk for abortion, infant and maternal health outcomes.[1–3] In Tanzania, contraception prevalence rates are relatively low, as only 27% of married and sexually active women ages 15–49 were using a modern method in 2016. Another 17% of women reported a desire to space or stop childbearing but were not using any method of family planning [4]. Easily accessible and high quality family planning facilities are important to the adequate provision of family planning services, particularly to women who are minors, unmarried and not working [5].

Facility choice for any health service is influenced by a complex set of facility and patient characteristics, such as hours, fees, geographic access facility reputation and quality, and patient socioeconomic status. Proximity to facility has been shown to influence a wide range of health utilization and outcome measures [6–8]. However, women may not necessarily seek health services from the nearest facility   but rather, they might seek care from facilities with better quality [9]. There is increasing evidence to support the notion that high quality family planning services increase contraceptive use. Tumilson et al (2015) found quality measures that captured information given and client-provider relations to be the most significant predictors of current contraceptive use in Kenya [10]. Evidence also shows that quality of care at initiation of contraceptive use is also positively associated with continuation of use [11]. The idea that the emphasis on health provision in low income countries should shift from access to services to improving the quality of services is becoming common [12]. If the quality of health facility, rather than distance, drive women to particular facilities that offer family planning services, then identifying key elements of quality is essential to improve family planning utilization. This paper argues that there is a trade-off women are willing to make between distance and

service quality. That is, women are willing to travel farther to reach a health care facility with better quality.

Previous studies that investigate the effect of health facility quality and distance on health facility choice geographically link individual and facility level data from the Demographic and Health Survey (DHS), to determine the distance to health facility [13]. However, the DHS displaces geographic positioning systems (GPS) coordinates of participants to maintain participant anonymity, creating 'noise'[14]. This noise can seriously bias the estimates of the effect of distance on service utilization [15,16]. In additon, DHS surveys only report the type of facility that a woman reports visiting, such as hospital, health center, or dispensary, rather than the actual name of facility, and studies often assume patients visit the nearest facility type they report [13,17,18].

Our study uses a new dataset in which we collected GPS location of sampled women, as well as the name of the facility each woman choose to visit for her most recent family planning services. We also conducted a census of facilities that provide family planning services in the study area and created quality indicators through a facility questionnaire. This detailed information allow us to address the challenging questions of the relationship between quality and distance to health facilities, and how women choose a facility for obtaining family planning services.

Methods

Data

Data from this study was collected between December 2017 and June 2018 in the urban Arusha region of Tanzania. The study area covered three wards in Arusha district and two wards in Meru district. This study used two primary data sources. The first was a comprehensive reproductive health survey conducted among a representative sample of women living within the study area. This survey

was conducted among women 16-44 years old who were usual residents, could speak English or Swahili and were not mentally incapacitated. A three-stage random sampling procedure was used to select participants. The first stage involved randomly selecting 200 clusters in the study sites. Each cluster contained an average of 60 households. Within each cluster, a random sample of 26 households with eligible women were selected in the second stage of sampling. If there was more than one eligible women in each household, a third stage involved randomly selecting one women from each household. All women who completed the consent form and had geographic positioning system (GPS) coordinates were included in our analysis sample (n=3,926).

In addition to the women survey, a facility survey of all health facilities that provide family planning services and products in the study area was conducted (n=39). This survey measured potential variables that reflect service quality through direct observation and employee interviews. Surveys were conducted in hospitals, health centres, and dispensaries and completed by facility administrators who were familiar with the facility activities. Our facility survey did not cover pharmacies or retail stores which are a potential source of some family planning methods.

Measures

The two datasets were combined to construct the primary outcome variable *facility choice*. In the women's survey, participants were asked if they had ever used or were currently using any method of family planning. Those who reported previous or current family planning use were then asked the name of the place and the type of facility they received their last or current method. Facility choice is a binary variable that captures the health facility each woman chose to get her family planning method. To create this variable, each woman was assigned 41 possible choices. She could choose not to use family planning. She could choose to obtain family planning at one of the 39 facility included in our facility

survey. Alternatively she could choose to obtain her family planning method from a facility not covered by our survey. Each possible woman choice is a data point in our analysis giving us an analysis set of 160,966 observations. The outcome variable takes the value zero if that woman did not make that choice and a value 1 if she did.

The explanatory variables for an observation are the women characteristics of each woman and the facility characteristics for the facility in the woman-facility pairing.

Facility Characteristics

Based on the GPS coordinates of the woman's home and the facility, we constructed a distance variable (in km) capturing the distance of each woman to every facility. On average, the accuracy of the GPS measure was 15 meters. Distance was assigned 0 for the choices of no family planning or use of a facility not included in our listing, usually local pharmacies. Several variables were created to capture the quality of family planning services offered at each facility.

1) Type of facility: hospital, health centre, dispensary, other facility and no facility. Other facility includes pharmacies, drug stores, retail shops and any other place women reported receiving a method from that was not included in the facility survey. No facility captures women who were not currently using a method of family planning.

2) A count for the number of family planning methods each facility provides. The family planning methods included were: combined oral contraceptive pills, progestin-only contraceptive pills, combined injectable contraceptives, progestin-only injectable contraceptives, male condoms, female condoms, intrauterine contraceptive device (IUCD), implant, emergency contraceptive pills, cycle beads for standard days method / calendar method, tubal ligation (female sterilization), vasectomy (male sterilization), and other methods (e.g., spermicide or diaphragm).

The range of possible family planning count ranged from 0-13. A score of 2 was assigned to other facility to account for the average numbers of family planning methods (condoms, and oral contraceptive pills) available outside health facilities. A score of 0 was assigned to the choice of no facility.

3) A score for the range of other health services available at each facility in addition to family planning. These services were: vaccination, antenatal care (ANC) services, normal delivery and/or newborn care, cesarean section, surgical abortion, medical abortion, and Comprehensive Post Abortive Care (cPAC) Services. The range of services variable score ranged from 0-8. The score of 0 was assigned to other facility and no facility as these services are not available outside health facilities.

4) The availability of follow up appointments for family planning services (yes or no). Facilities were asked if family planning clients were given appointments for follow-up consultation / examination. Other facility and no facility were assigned no.

5) Stock out of family planning commodities. Facilities were asked if they had ever ran out of stock of each family planning commodity in the past three months. Each facility was given a score based on the number of contraceptive methods that had experienced such stock out. Thirteen family planning methods were considered. The range of stock out score ranged from 0-4 for all facilities in the facility survey meaning that at least one facility experienced a stock out of 4 family planning methods within the last 3 months. A score of 1 was assigned to other facility, assuming that the average number of methods present was 2 and at least one had a stock out in the last three months. A score of 0 was assigned to no facility.

6) Fees charged for family planning services (yes or no). Facilities were asked if they have routine user-fees or charges for family planning client services. Other facility and no facility were assigned no.

The rationale for our assigned measures for other facility was that these offered a small range of methods and no other health services offered but were easily accessible by women. For women who choose no method, we assume that they simply stay home, receive no range of methods, low quality of services, but pay no fee and travel no distance.

Women characteristics

Variables that captured characteristics for each women were also added in the model.

1) Education was categorized as a binary variable with women with no education and primary education (0) and women with higher education (1).

2) Marital status was categorized as a binary variable with women currently married or living with a partner (1) and women formerly married or living with a partner or never married or lived with partner (0).

3) Age was included as a continuous variable.

Analysis

We employed the alternative specific conditional logit model, which has previously been used to predict choice of facility in the fixed choice task [19]. This model assigns a woman a utility for each choice and is based on the assumption that she chooses the facility that gives her the highest utility. The utility for woman i from choosing facility j is given by:

$$u_{ij} = \sum_{m=1}^{M} \beta_m x_{ijm} + \sum_{j=1}^{J} \sum_{p=1}^{P} \lambda_{jp} z_{ip} + \varepsilon_{ij}$$

There are M variables that vary across woman and facility that affect her utility. These may include measures of facility quality and distance to facility. Note that these variables may only vary across

facilities, such as indictors of quality, or may vary across facilities and women, for example distance

from the woman's home to that facility. Each facility related variable m has a utility weight β_m. In

addition to these facility related variables, there are P woman level variables, such as her age and

education level, that affect utility in each facility. Note that the coefficients on the woman level variables

vary with facility. Each woman level variable, p, affects the utility of going to each facility j in a

different way given by the parameter λ_{jp}. This allows each facility to be attractive to different subsets of

women. Finally there is an error term given by ε_{ij} a woman cross facility random utility term with a

Gumbel extreme value distribution. The parameters of the model are fit so as to maximize the

probability of the facility choices women are observed to make. We are particularly interested in the

parameters β_m that describe how measures such as facility quality and distance affect utility and choice of

facility. We used STATA 15 for our analysis using the command, *asclogit*.

Note that the size of estimated β coefficients are not directly interpretable. A positive β

implies that the variable increases utility, and the likelihood a woman chooses the facility, while a

negative value implies lower utility and less likelihood of choosing that facility. However, the scale of

these coefficients depends on an arbitrary normalization – if we multiply all the coefficients the utility

function, and the error term, by an arbitrary positive constant the relative ranking of choices remains the

same and the likelihood of each choice is unchanged. However we constructed a more meaningful

measure of the effect of facility quality on choice for these measures [20]. This measure captured how the

probability that woman i chooses health facility j, given by p_{ij} changes when the predictor x_{ijm}

increases by one unit and is unchanged for the other health facilities. The own effect of changing x_{ijm} on

p_{ij} is given by: $\dfrac{dp_{ij}}{dx_{ijm}} = p_{ij}(1-p_{ij})\beta_m$, where β_m is the estimate coefficient on x_{ijm} in the conditional

logit model. If a facility increases a quality measure that improves utility women are more likely to

choose it. The cross effect of changing x_{ikm}, the value of variable m in facility k, on p_{ij}, the probability

the woman chooses facility j for $k \neq j$, is given by: $\dfrac{dp_{ij}}{dx_{ikm}} = -p_{ij} p_{ik} \beta_m$. As facility k increases a quality

indicator the probability that a woman visits an alternative facility j declines. Finally we can think of the

distance equivalent of a quality measure σ_m , the amount that distance would have to increase to offset

the increased attractiveness of a facility when it increases a quality measure. This is given by the implicit

function $\dfrac{dp_{ij}}{dx_{ijm}} + \sigma_m \dfrac{dp_{ij}}{dx_{ijd}} = 0$ where x_{ijd} is the distance from the home of woman i to facility j. That is

if we increase the quality measure x_{ijm} by one unit and the distance to facility by σ_m kilometers the

utility of woman i, and her likelihood of choosing facility j, remains the same. The extra distance a

woman is willing to travel to a facility for additional unit of quality is therefore $\sigma_m = -\dfrac{\beta_m}{\beta_d}$. While the

absolute value of the coefficients in the utility model are arbitrary, their relative values have an intuitive

interpretation.

Results

Figure 1 shows the distribution of women and health facilities in the study area. Table 1 shows

the distribution of women in our sample by family planning use and the distance to the health facility

where they received their last family planning method. Eighty-three percent of women in our sample had

used a method of family planning. Of these women, only 1% received their last or current contraceptive

method from the health facility nearest to them compared to 44% of the sample who did not go to the

facility nearest to them.

Table 2 shows characteristics of women in our study sample. The average age of women was 29 years. Fifty-eight percent had no education or only had a primary school education while 68% of women were currently married. Table 3 shows the distribution of health facility quality measures by facility type. The average score for family planning commodities offered in health facilities surveyed was 6.5 (range 0-10) while the average score for health services offered was 5.1 (range 1-8). Health centers offered more commodities on average however hospitals offered more health services. Thirty-seven facilities offered follow up services for family planning services while 7 facilities had fees for family planning services. Overall, most facilities surveyed offered follow up consultation for family planning services. Finally, the table shows that stock outs were more prevalent in health centers and dispensaries than in hospitals.

Table 4 shows the results of the alternative specific conditional logit model. Not surprisingly, distance to facility was negatively associated with facility choice meaning the farther away a health facility was from a woman, the less likely it was to have been selected. Health centers, no facility, and other facility were more likely to be chosen compared with hospitals. However, hospitals were more likely to be chosen compared to dispensaries. Four quality measures were significantly associated with facility choice. Health facilities that provided more family planning commodities increased the chances of that facility being chosen controlling for distance to each facility. This was the only quality measure that was positively associated with facility choice. On the other hand, facilities that offered other health services, had fees for family services and had a stock were less likely to have been selected.

Table 5 gives an example of the marginal effects of two health facilities here using the most frequented and median health facilities as examples. Results from the alternative specific conditional logit model were used to calculate the estimated extra distance a woman is willing to travel for a facility with better quality measures (table 6). A woman is willing to travel 1.7 km for a facility with 1 more method of family planning, 2.6 km for a facility without 1 additional health service, 12 km for a facility

without fees for family planning and 12 km for a facility not experiencing stock out of an additional family planning commodities.

Discussion

Very few women in our study received their last method of family planning from the closest facility calling into question the assumption that women are using the closest facility especially when the actual facility chosen is not known. Although existing studies often use the distance to the nearest health facility, our study shows it is not a good predictor to for health facility choice. This adds to results from recent studies showing that individuals, particularly those in urban environments such as our study area, frequently bypass nearby health facilities to obtain higher quality health care (Akin and Hutchinson, 1999; Leonard et al, 2003).

Result also indicate that women have a preference for facilities that offer a greater number of family planning commodities, do not charge a fee for family services, have fewer stock- outs and offer fewer health services (here suggesting a preference for facilities that are more specialized in providing family planning). These preferences imply that in many circumstances, patients are not only willing to bypass the closest facility but are willing to travel fairly long distance to receive family planning services and products from facilities with their desired preferences. In particular, women have strong preferences toward health facilities that do not experience stock-outs and who do not charge fees for services.

Results also suggest that women prefer to receive family planning services at health centers over hospitals but prefer hospitals over dispensaries. Dispensaries are smaller than hospitals and health centers and offer fewer services. This reinforces our finding that women prefer more specialized

facilities. Findings suggest that emphasis should shift from expanding the number of health services provided at each facility to improving the quality of services and products.

This study has a number of limitations. First, we did not have comparable measure of facility quality for the "other facilities". These unobserved facilities largely consisted of pharmacies, drug stores and shops where pills and condoms are readily available without the need to see a clinician. Future extensions to this analysis could include a census of all places that offer and sell family planning products in the study area, including these small pharmacies and shops. Second, it is possible that unobserved quality characteristics such as client-provider interaction are correlated with characteristics that we observe. However patients' perceptions are impacted by their expectations and prior experience hence may not be accurate in their assessment of quality. An extension of this study did include an exit patient survey that captured patients' experiences with family planning providers after receiving a family planning product or service at each facility. However, there was almost universal positive reporting, rendering those outcomes unsuitable to use as quality of service measure. Other patient outcome indicators are available in other data sources and future research could include observations of patient client interactions to better assess quality of health services. Despite these limitations, our use of survey data over hospital records and administrative data, which are typically used, enables us to observe women who did not visit a facility. Samples generated from using individuals who choose to visit a facility is not random and could produce biased parameter estimates if individuals not visiting a facility have preferences that differ from individuals visiting a facility. Our use of survey data, enables us to control for this sample selection problem.

This study used health facility data linked to women's survey data to examine the association of indicators of facility quality and women's choice of family planning facility. Our findings contributes to the literature on facility choice by having data on the precise facility chosen and removing the bias in parameter estimates due to masking of precise location information to protect subject confidentiality.

There is little consensus in the literature on the most valued quality indicators and how to precisely measure them [21,22]. Our analysis used various facility quality measures using the asclogit model. However due to the model specifications, only a handful of measures could be included at a time in these analyses. As such, this study highlights four facility quality measures that women in this study area consider important and value when they choose a facility for family planning. Our quality measures may be correlated with other quality related factors that we do not observe and the coefficients reflect the effect of broader notions of quality, not just the components we measure.

Figures and tables

Figure 1: Map showing distribution of women and health facilities in the Tanzania study area
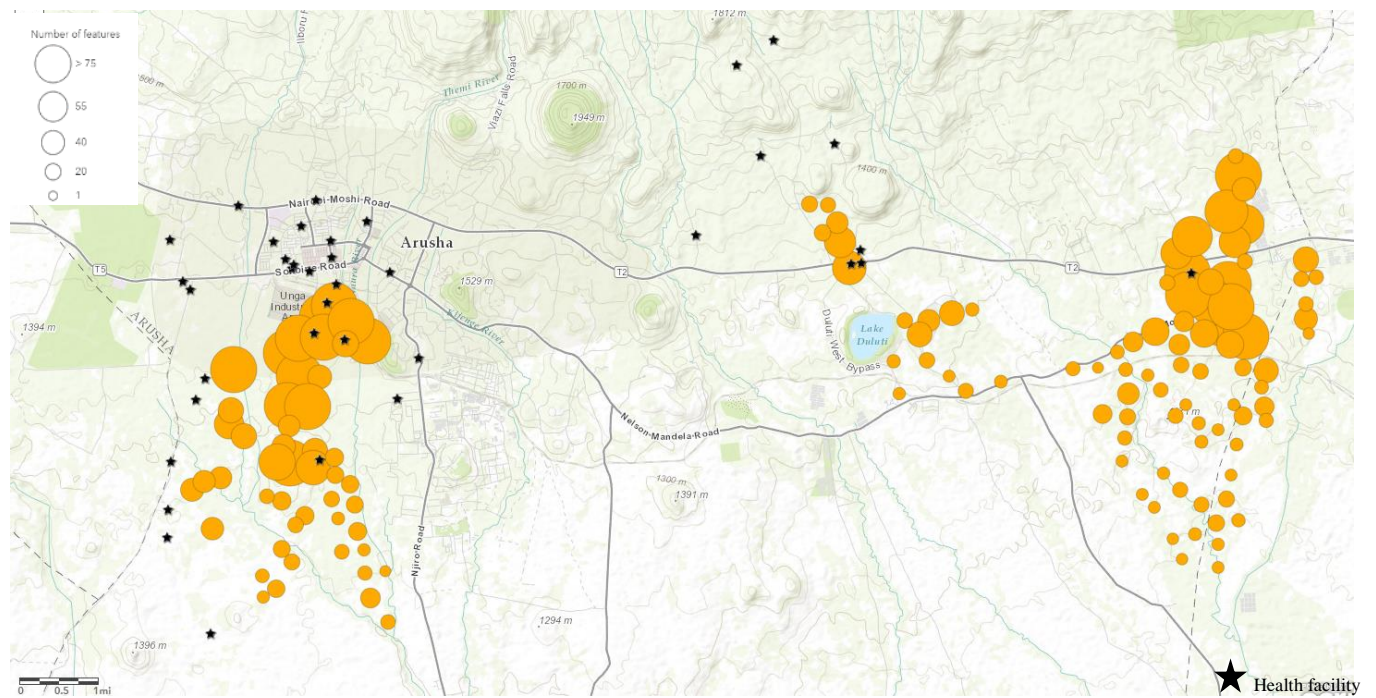
Note: Individual locations are clustered to maintain participant anonymity. Women's actual GPS locations were used in the analysis

Table 1: Distribution of women by family planning use and distance to health facility chosen

Sample women	Percent
Women never used family planning/did not visit a health facility/missing	17.2
Women visited an unobserved facility for last or current method	38.2
Women visited an observed facility for last or current method	44.6
Woman visited the nearest health facility	*1.1*
Woman did not visit the nearest facility	*43.5*
Total	100

Table 2: Characteristics of women in the sample

	Mean	Standard Deviation
Total sample		
Age (years)	29	7.52
No education or primary school education	0.58	0.49
Currently married	0.68	0.47

Table 3: Distribution of quality indicators by facility type

	Hospital	Health Center	Dispensary	Total
Frequency	6	10	23	39
Number of family planning methods provided				
Mean	7	7.9	6.1	6.5
SD	3.37	2.95	1.74	2.67
Min	0	0	3	0
Max	10	10	10	10
(Other facility mean=2; no facility mean= 0)				
Number of health services provided				
Mean	7.2	7	3.7	5.1
SD	0.37	1	1.2	2.25
Min	7	6	1	1
Max	8	8	6	8
(Other facility mean=0; no facility mean= 0)				
Follow up for family planning services				
Yes	5	9	13	37
No	1	1	0	2
(Not provided in other facility mean and no facility)				
Fees for family planning services				
Yes	1	3	3	7
No	5	7	20	32
(No service fee in other facility mean and no facility)				
Stock out of family planning commodities				
Mean	0.17	0.6	0.61	0.52
SD	0.37	1.2	0.87	0.91
Min	0	0	0	0
Max	1	4	3	4
(Other facility mean=1; no facility mean= 0)				

Table 4: Alternative specific logistic regression output

	Outcome: Facility Choice	t statistics
Distance to facility (km)	-0.200***	-26.25
Nearest facility to women	1.132***	-15.15
Quality indicator 1: Facility type (ref=Hospital)		
Health center	1.029***	-12.93
Dispensaries	-2.616***	-16.28
Other facility selected	5.239**	-19.62
No facility selected	1.551***	-4.98
Quality indicator 2:		
Range of family planning commodities available at facility	0.335***	-12.8
Quality indicator 3:		
Range of other health services offered at facility	-0.519***	-14.87
Quality indicator 4: (ref=no)		
Follow up for family planning services offered at facility	0.396	-1.42
Quality indicator 5: (ref=no)		
Fees for family planning services at facility	-2.395***	-14.91
Quality indicator 6:		
Stock out of family planning commodities	-2.247***	-14.05
*p<0.05, ** p<0.01, *** p<0.001*		

Table 5: Average marginal effect of the probability of choosing the largest facility j when repressor increases by one unit for median facility k at the average of other covariates.

	Largest Facility j	Median Facility k
Probability of choosing each facility	0.028	0.018
Distance to facility		
Marginal effect of increasing the distance to own facility by 1km, reduces the probability of choosing that health facility (own effect) by	-0.0055	-0.0035
Marginal effect of increasing the distance to cross facility by 1km, increases probability of choosing the other health facility (cross effect) by	0.000099	0.000099
Range of family planning commodities available at facility		
Marginal effect of increasing the range of family planning by 1 method, increases the probability of choosing the health facility (own effect) by	0.0083	0.0053
Marginal effect of increasing the range of family planning by 1 method, decreases the probability of choosing the other health facility (cross effect) by	-0.00015	-0.00015
Fees for family planning services at facility		
Marginal effect of having fees for family planning, decreases the probability of choosing the health facility (own effect) by	-0.068	- 0.043
Marginal effect of having fees for family planning, increases the probability of choosing the other health facility (cross effect) by	0.0012	0.0012

Table 6: Estimated extra distances in km women are willing to travel for an increased quality indicator, at the average values of other covariates.

Estimated extra distance a woman is willing to travel for:	
Facility with 1 additional family planning method	1.7 km
Facility without 1 additional health service	2.6 km
Facility without fees for family planning	12.0 km
Facility not experiencing stocked out of 1 additional family planning methods	12.2 km

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