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Understanding spatial variation in the utilization of health services: does quality matter?

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Abstract
Utilization of health services are an important policy concern in most developing countries, reflecting both efforts to improve health outcomes and to meet international obligations to make health services broadly accessible. Although many policy and research initiatives have focused on the need to improve physical access, not enough is understood about what factors affect health care choices, and why low levels of utilization persists among certain socioeconomic groups or geographic regions despite improved physical access. Reflecting these concerns, this paper focuses on the role of health care quality in understanding spatial variation in the utilization of both curative and preventive health services in Mozambique. The analysis is based on matched household and facility data, where the sample of household was drawn from the catchment area of each facility. The findings show that health care quality is a significant and important factor in women's choice of delivery location. In particular, both the presence of maternity staff and a broader service range make it more likely that women choose a facility-based delivery. Conversely, the analysis suggests that quality is not a significant determinant in decisions about outpatient visits, while physical access, education, and economic variables are important. The findings hence suggest that the impact of quality may be service specific, and that although certain dimensions of quality may have little or no impact on outpatient visits, they may be important determinants of the use of other health services. As developing countries to continue to face difficult trade-offs between quality and physical access in the allocation of resources, it will be important to deepen our understanding of how individuals make health care choices. The results presented in this paper are a step in that direction.

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1. INTRODUCTION

Utilization of health services are an important policy concern in most developing countries, reflecting both efforts to improve health outcomes and to meet international obligations to make health services broadly accessible. Early policy and research initiatives focused on the need to improve physical access through an expansion of the network of facilities. However, a growing literature on health care demand has pointed out that individuals are not passive recipients of health services, but make active choices about whether or not to make use of provided services. Actual utilization of health services will differ in accordance with demand factors such as income, cost of care, education, social norms and traditions, and the quality and appropriateness of the services provided. Hence, if we are interested in not merely providing physical access, but also ensuring that effective and appropriate health services are used by the population, we need to understand what factors affect health care decisions, and why low levels of utilization persists among certain socioeconomic groups or geographic regions.

Reflecting these concerns, this paper focuses on the role of health care quality in understanding spatial variation in the utilization of both curative and preventive health services in Mozambique. The analysis is based on matched household and facility data, where the sample of household was drawn from the catchment area of each facility. This sampling procedure permitted detailed facility data to be collected, and also facilitated the process of matching households with facilities. By design, all households in the sample have physical access to primary health care. Yet, we observe notable differences across catchment areas in the utilization of health services—both outpatient visits and delivery services. What explains these differences? Is variation in health care quality across facilities the primary reason, or do other differences between communities also come into play? The results presented in this paper demonstrate that the impact of quality on utilization of health services may be service specific, making general answers elusive. Health care quality is shown to be a significant and important factor in women's choice of delivery location, such that improvements in health care quality would go a long way towards reducing spatial inequality in utilization. Conversely, quality is not a significant determinant in decisions about outpatient visits. Instead, differences in utilization patterns across provinces and districts seem to be caused by variation in physical access, education, and economic variables.

The paper is organized as follows. The introduction is followed by a brief review of the literature on the measurement and importance of health care quality. Section 3 sets out the analytical framework and the empirical specification for the analysis. This is followed by a description of the institutional context and the data in section 4. Section 5 discusses the estimation results, and, finally, section 6 concludes.

2. HEALTH CARE QUALITY: DEFINITION, MEASUREMENT, AND IMPORTANCE

2.1 The definition of quality

Health care quality is currently receiving increasing attention in both developed and developing countries. It is customary to distinguish two domains of quality: (i) technical or clinical aspects of health care; and, (ii) the psycho-social interaction between patient and provider (Blumenthal 1996; Brook, et al. 2000; Campbell, et al. 2000; Donabedian 1966). The

general premise of health care quality is that a specific set of clinical, ethical, and cultural norms can be established for the effective and appropriate management of a potential or existing health problem, and that departures from these norms or standards result in reduced clinical effectiveness, or a failure to meet the legitimate demands and needs of the client. Along these lines, the Institute of Medicine in the US has defined quality as "the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Institute of Medicine 1990).

In developed countries, quality has become one of the central pillars in efforts to measure and improve health system performance (see, e.g. Ferlie and Shortell 2001; Hoggett 1996; NHS Executive 1999; WHO 2000).[1] The issue of health care quality has also received a considerable amount of attention in developing countries.[2] In this context, debates about health care quality were originally linked to the issue of user fees. In particular, it was argued by some that clients were both willing and able to pay for services, and that low demand in the public sector was primarily due to low quality. Hence, if increased user contributions could be channeled into quality improvements—an idea that was promoted explicitly through the Bamako initiative—the lingering problems of poor quality and low utilization in the public sector could be resolved (de Ferranti 1985; Vogel 1991; World Bank 1987). More recently, as health systems seek to move beyond merely ensuring access, health care quality has become an important policy concern in its own right.

2.2 The measurement of quality

Donabedian (1980) has suggested that the most direct approach to assessing of health care quality is to focus on the "process" of care—i.e. the activities of the health care provider—and evaluate this against established technical, ethical, and cultural norms and criteria. An alternative is to assess quality indirectly, through an analysis of the "structure" and "outcome" of health care. Structural dimensions of health care include the tools and resources that health care providers have at their disposal, the physical and organizational setting in which care is delivered, and the qualifications and characteristics of the providers themselves. These dimensions are relevant through their impact on the probability of a good process and outcome. In contrast, outcome refers to the change in a patient's current or future health status that can be attributed to health care, as well as changes in patient attitudes (including satisfaction), health knowledge, and health-related behavior.

The "structure-process-outcome" trilogy has been influential in guiding both health sector research and operational approaches to assessing and improving the quality of health care. Each of the three approaches to assessing quality has its merits. However, the main problem of the "trilogy" approach lies in the tenuous links between different dimensions of quality. For example, quality of structural inputs by no means assures good process. Similarly, outcomes are only linked to process in a probabilistic sense, and the relationship may only be observable with a considerable lag. For these reasons, assessments and operational monitoring of quality in developed countries have tended to focus explicitly on process—through the evaluation of clinical practice against established norms or criteria (direct observation or administrative records). For example, a recent, large-scale study in the US reveals substantial

[1] Efforts to monitor quality, and to understand the relationship between quality and costs, have been particularly intense in the US health system, where providers are facing increasing incentives to reduce costs (Donabedian 1984; Gertler and Waldman 1992; Miller and Luft 1997; Schuster, et al. 1998; Weisbrod 1991).
[2] For reviews, see De Geyndt (1995) and Wouters (1991)

gaps between agreed upon standards of care and the care actually provided (McGlynn, et al. 2003).[3] The focus on the process of care is however both skill and data intensive. In developing countries, resources and administrative records do not in general permit the same form of detailed assessments of quality. As a consequence, there are only few examples of attempts to measure process quality in developing countries (Gilson, et al. 1993; Leonard and Masatu 2003; Leonard, et al. 2003; Peabody, et al. 1998). These studies have tended to rely on vignettes (tests or hypothetical cases) to perform quick and low-cost assessments of the clinical competence of providers.[4] In contrast, much of the research on health care quality in developing countries has focused on simple structural indicators—e.g. concerning the quantity and characteristics of staff, and the availability of essential inputs.[5]

In both developed and developing countries, efforts to measure health care quality suffer from a general problem of reducing the many dimensions of quality to a manageable number. Quality assessments tend to generate large volumes of highly specific information that cannot be easily summarized into a general assessment of provider quality (McClelland and Steiger 1999). This approach may be sensible in an operational context, where the objective is to design practical interventions aimed at improving outcomes, and to promote comprehensive monitoring. However, this all-encompassing notion of quality is less helpful from an analytical perspective, where the emphasis is on coherent modeling of empirical phenomena, and on valid and reliable measurement.[6]

2.3 The importance of quality

Quality and health outcomes

At a conceptual level, the potential efficacy of preventive and curative health services is well understood. There is also direct evidence that the availability or provision of health services can have a large impact on health outcomes (Bang, et al. 1999; Fiscella 1995; Frankenberg 1995; Frankenberg and Thomas 2001; Jowett 2000; Tinker, et al. 2000; Victora, et al. 2000; Villar and Bergsjo 1997). Beyond mere access, evidence suggests that health care quality can have an impact on health outcomes. Indeed, low quality—in the sense of a

[3] For reviews of this literature, see Brook et al. (2000) and Roland et al. (1998).

[4] More recently, some surveys and evaluation efforts (e.g. DHS Service Provision Assessments and WHO Multi-Country Evaluation of Integrated Management for Childhood Illnesses) have used medically qualified enumerators to evaluate process. These approaches bring their own problems, including potential observation bias and difficulties in controlling for case mix across providers. See Peabody (2000) for a discussion of the merits of alternative approaches to assessing process quality.

[5] Many studies in developing countries have also focused on patient perceptions and satisfaction. There are however considerable problems in interpreting subjective perceptions of health care quality. In part, this is due to "courtesy bias", whereby that individuals may provide responses that they deem socially acceptable, in particular in response to general questions (Atkinson 1993; Williams, et al. 1998). But it is also the case that subjective perceptions of quality are based on client beliefs and views about health care norms and standards. Insofar as there are systematic differences across demographic and socio-economic groups in respect of these views, client perceptions may be poor proxies for objective assessments of different dimensions of quality. Moreover, in certain respects, clients may not be well-informed about their own medical needs, in which case there may be a conflict between technical quality and patient perceptions (Annandale and Hunt 1998; McGlynn 1997).

[6] Narrowing down the definition of health care quality is however far from easy. For example, Bessinger and Bertrand (2001) describe the difficult process of reducing the number of indicators of quality in family planning services from 200 to 25.

departure from "best practice" in diagnosis or treatment—can drive a wedge between the potential and actual effectiveness of health care interventions (Wouters 1991). In developing countries, most studies have focused on the impact of structural dimensions of quality. For example, a number of studies have found a significant association between different measures of structural quality (e.g. health personnel facility infrastructure, and drug availability) and anthropometric outcomes (Lavy, et al. 1996; Strauss 1990; Thomas, et al. 1996).[7] There is less evidence on the link between process dimensions of quality and health outcomes. However, Peabody et al. (1998) find that while structural measures of quality do not have a statistically significant effect on birth weight in Jamaica, process dimensions of quality do. Links between process measures of quality and health outcomes have also been found in the US (Kahn, et al. 1990).

Quality and health seeking behavior

One of the conduits through which health care quality affects health outcomes is client behavior, including both care seeking behavior (utilization of health services) and adherence behavior (i.e. compliance with treatment regimes, follow-up visits and referrals). However, concern with quality was limited in early studies of health care demand. To the extent that health care quality was considered at all, it was treated as an unobserved variable, pertaining to the provider type rather than the individual provider (e.g. Gertler, et al. 1987; Gertler and van der Gaag 1990; Lavy and Quigley 1991; Mariko 2003; Mwabu, et al. 1993). In this framework, the concept of quality is simply used to refer to different types of providers—e.g. hospitals, dispensaries, private clinics—but there is no variation in quality between different providers within each type. Moreover, quality differences are not measured directly.

More recently, studies have used cross-section data to examine the effect of a series of structural quality variables on curative and preventive care visits (Akin, et al. 1995; Akin, et al. 1998; Lavy and Germain 1994; Litvack and Bodart 1993; Schwartz, et al. 1988), and on family planning and contraceptive use (see, e.g. Beegle 1995; Feyisetan and Ainsworth 1996; Mroz, et al. 1999; Steele, et al. 1999). Generally, the studies demonstrate a significant and sometimes large statistical effect of health care quality on utilization.[8]

Researchers have also used facility and household data to study the phenomenon of bypassing—i.e. when patients reject a closer facility in favor of a more distant health care provider. There is only a limited literature on this issue, mostly focusing on the case where households bypass public facilities in favor of the private sector (Akin and Hutchinson 1999; Leonard, et al. 2003). This research has shown that care seeking behavior is often a sophisticated response to the type and severity of illness of the client, and that for some illnesses quality is an important consideration in decisions to bypass the local facility.

[7] See Wouters (1991), Frankenberg (1995), and Alderman and Lavy (1996) for a review of the evidence.

[8] As pointed out by Gertler and Hammer (1997), with the exception of the experimental study by Litvack and Bodart (1993), this may reflect the effect of utilization on pricing and quality policy rather than the other way around.

3. ANALYTICAL FRAMEWORK AND EMPIRICAL APPROACH

In a static framework of health care demand (e.g. Gertler, et al. 1987; Gertler and van der Gaag 1990), the choice between use and non-use of health services can be cast in a simple random utility model. The utility of service use (*s*) and non-use (*ns*) are

$$U^s = U(h_s, x_s, \varepsilon_s; \boldsymbol{\varphi}_s) \text{ and } U^{ns} = U(h_{ns}, x_{ns}, \varepsilon_{ns}; \boldsymbol{\varphi}_{ns}),$$

where, h is health status, x is a vector of non-health (residual) consumption, ε is a random error term, and $\boldsymbol{\varphi}$ is a parameter vector. Non-health consumption, x, is a function of exogenous income, y, the total cost of care (including both direct and indirect costs), c. Health status (h_s and h_{ns}), in turn, can be represented as a health production function,

$$h_s = h(\mathbf{z}, \mathbf{q}; \boldsymbol{\beta}_s) \text{ and } h_{ns} = h(\mathbf{z}, \mathbf{q}; \boldsymbol{\beta}_s),$$

where $\mathbf{z}$ is a vector of individual, household, community, and health care provider characteristics, $\mathbf{q}$ is a vector of variables that represent different dimensions of health care quality. The health care choice is represented by the indicator function

$$S = \mathbb{1}[U_s > U_{ns}].$$

The essential feature of the model concerns the trade-off between health and non-health consumption. This trade-off arises so long as $x_s < x_{ns}$ and $h_s > h_{ns}$. Insofar as the costs of care are unaffected by quality, and noting that $\frac{\partial h_s}{\partial q} > 0$, $q \in \mathbf{q}$ and $\frac{\partial U^s}{\partial h_s} > 0$, we would expect better quality of care at the local health facility to lead to a greater probability of utilization.[9]

In order to operationalize this general framework, we must be more specific about functional form. Following the early literature on health care demand in developing countries (e.g. Akin, et al. 1984; 1986; Mwabu 1986), the empirical specification is based on a linear utility and health production function, such that

$$U^s = \varphi_{s1} h_s + \varphi_{s2} x_s + \varepsilon_s \text{ and } U^{ns} = \varphi_{ns1} h_{ns} + \varphi_{ns2} x_{ns} + \varepsilon_{ns}, \text{ and}$$

$$h_s = \boldsymbol{\beta}_s^z{}' \mathbf{z} + \boldsymbol{\beta}_s^q{}' \mathbf{q} \text{ and } h_{ns} = \boldsymbol{\beta}_{ns}^z{}' \mathbf{z} + \boldsymbol{\beta}_{ns}^q{}' \mathbf{q}.$$ [10]

Finally, we assume that non-health consumption is a function of exogenous income and travel time, such that

$$x_s = \gamma_{s1} y - \gamma_{s2} \, Time \text{ and } x_{ns} = \gamma_{ns1} y - \gamma_{ns2} \, Time.$$

Using the linear functions for h and x, and with an appropriate reparametrization, the indirect utility function can be written as

$$U^s = U[\boldsymbol{\alpha}_s' \mathbf{w} + \varepsilon_s] \text{ and } U^{ns} = U[\boldsymbol{\alpha}_{ns}' \mathbf{w} + \varepsilon_{ns}], \text{ where}$$

[9] If health status, h, is interpreted broadly to include not only physical health but also general well-being, the effect of quality would extend beyond strictly clinical criteria, and include aspects such as the attitude of staff, the appearance of the facility, etc.

[10] Gertler and van der Gaag (1990) and Dow (1996) have noted considerable weaknesses with this specification. In particular, it does not permit the price elasticity of demand to be a function of income. However, given the focus of this paper, the simpler specification is adequate.

$$\mathbf{w} = \begin{bmatrix} \mathbf{z} \\ \mathbf{q} \\ y \\ Time \end{bmatrix}.$$

On this basis, the probability that the woman uses the particular health service is

$$\Pr[S = 1|\mathbf{w}] = \Pr[U^S > U^{ns}] = \Pr[(\boldsymbol{\alpha}_s - \boldsymbol{\alpha}_{ns})\mathbf{w} > \varepsilon_{ns} - \varepsilon_s] = \Pr[\boldsymbol{\alpha}\mathbf{w} > \varepsilon], \text{ where}$$

$$(\boldsymbol{\alpha} = \boldsymbol{\alpha}_s - \boldsymbol{\alpha}_{ns} \text{ and } \varepsilon = \varepsilon_{\text{ns}} - \varepsilon_{\text{s}}).$$

Under the assumption that $\varepsilon \sim \text{N}(0,1)$,

$$\Pr[S = 1|\mathbf{w}] = \Pr[\boldsymbol{\alpha}'\mathbf{w} > \varepsilon] = \Pr[\boldsymbol{\alpha}'\mathbf{w} < \varepsilon] = \Phi(\boldsymbol{\alpha}'\mathbf{w}),$$

where Φ is the standard normal distribution. This is the Probit model. Under appropriate regularity conditions, the parameter vector $\boldsymbol{\alpha}$ can be estimated consistently using Maximum Likelihood techniques. This approach will further permit us to perform a series of hypothesis tests concerning single and joint restrictions on the coefficients of interest. Specifically, the empirical section will address whether process and structure measures of health care quality are separately and jointly significant determinants of health service utilization. Moreover, the estimates will provide the basis for an assessment of the relative importance of different factors on the probability of using curative and delivery health services.

In respect of curative health services, it should be noted that, due to a lack of individual-level morbidity data, we estimate the Probit model over the entire sample. The estimation hence refers to the *unconditional* demand for health care. However, it is important to remember that

$$\Pr(care) = \rho \Pr(care \mid ill),$$

where ρ is the probability of falling ill in the respective period. For example, if we find that the unconditional probability of seeking care is the same for individuals in rich and poor households, this may simply reflect the fact that richer households are less likely to be ill. The distinction between the conditional and unconditional probability of seeking care may however be more than an issue of scaling. In particular, we would expect ρ itself to be a function of individual, household, and community characteristics, i.e. $\rho = \rho(\mathbf{z}, \mathbf{q}, y, Time)$. We therefore have

$$\frac{\partial \Pr(care)}{\partial s} = \frac{\partial \rho}{\partial s} \Pr(care \mid ill) + \rho \frac{\partial \Pr(care \mid ill)}{\partial s}, \quad s \in [\mathbf{z}\ \mathbf{q}\ y\ c].$$

In other words, marginal effects from the unconditional model reflect both the effect on illness incidence and on conditional care seeking behavior. In consequence, unconditional estimates of marginal effect are not necessarily good (scaled) proxies for conditional estimates, and the validity should be assessed by considering the expected effect of the variable in question on the probability of illness.[11]

[11] Many studies have estimated conditional models using sub-samples of ill individuals. Selection bias can also arise due to unobserved heterogeneity in morbidity. Moreover, as objective health status is unobservable, sub-samples tend to be defined on the basis of self-reported illness. Insofar as the propensity to report illness given an objective health status varies systematically with the independent variables, this may result in bias.

4. DATA AND VARIABLES

4.1 Context

The empirical analysis is based on facility and household data from four provinces in Mozambique: Nampula (north), Tete (central), Inhambane (south) and Maputo City. Although the survey is not representative for the country as a whole, the four provinces were selected with a view to provide information on the three main regions of the country as well as an urban area. As can be seen from Table 1 below, these provinces include both some of the poorest and richest areas of the country. The considerable variation in per capita expenditure across provinces is also reflected in health indicators. For example, estimated child mortality ranges from 319/1000 in Nampula to 97/1000 in Maputo City (219/1000 national average).

Table 1 – Selected socioeconomic and health indicators by province

Province	Mean monthly consumption MT/person[a,c]	Poverty headcount[a]	Infant mortality[b]	Child mortality[b]	Complete child immun.[b]	Maternity care		
						No prenatal consult.[b]	No tetanus injection[b]	Home delivery[b]
Sofala	97,906	87.9	173	242	49.6	54.2	77.8	63.3
Tete	**117,049**	**82.3**	**160**	**283**	**48.0**	**14.6**	**68.9**	**54.8**
Inhambane	**128,219**	**82.6**	**151**	**193**	**71.7**	**7.1**	**45.8**	**42.7**
Niassa	147,841	70.6	134	213	48.2	30.5	68.4	54.8
Zambézia	154,832	68.1	129	183	23.2	49.0	80.9	76.3
Nampula	**161,668**	**68.9**	**216**	**319**	**34.4**	**30.0**	**70.1**	**71.1**
Maputo	177,774	65.6	92	147	61.9	4.4	49.8	24.2
Gaza	183,233	64.7	135	208	63.0	8.3	42.6	30.3
Manica	191,608	62.6	91	159	46.5	24.0	72.1	57.0
Cabo Delgado	194,448	57.4	123	165	25.4	20.4	74.0	66.7
Maputo Cidade	**253,102**	**47.8**	**49**	**97**	**82.0**	**1.4**	**19.9**	**12.4**
Total	**160,780**	**69.4**	**147**	**219**	**47.3**	**27.4**	**64.2**	**55.0**

[a] *Source: 1996/97 Living Standards Survey (IAF)*
[b] *Source: 1997 Demographic and Health Survey*
[c] *Mean total consumption, temporally and spatially deflated, using national average prices as the base*

4.2 The Health Sector Beneficiary Assessment

The Beneficiary Assessment data were collected in the context of a study commissioned by the Ministry of Health in Mozambique and the Swiss Development Cooperation.[12] The purpose of the study was to assess the extent to which people who have access to formal health care in fact use the services, and to identify primary barriers to utilization.

The survey was fielded at 30 sites in the four selected provinces between May and July 1999. Within the chosen provinces, districts were selected randomly, with selection probabilities proportional to district population. Within each district, one health facility was randomly selected from a list provided by the Ministry of Health (MOH). The number of districts and facilities selected in each province roughly correspond to the population weights

[12] The survey was implemented by the Community Agency for Social Enquiry (CASE) and the Centre for Health Policy (CHP), South Africa. Detailed information about the fieldwork and on overview of findings from the quantitative and qualitative analysis can be found in the study report (CASE and CHP 2000).

of the respective provinces, although with some over-sampling in Tete and Inhambane, and under-sampling in Nampula (see Table 2).

At each site, data were collected through four instruments: (i) questionnaires administered to 40 randomly selected households; (ii) a total of 20 focus groups discussions; (iii) facility questionnaire and checklist administered at the selected facility; and (iv) a self-administered questionnaire filled in by workers in the selected facilities.[13] In most cases, the household interview was conducted with the female head of household (or spouse of head). In approximately 20 percent of the selected households, the interview was conducted with a male household member due to the absence of the female head (or spouse of head). For each household, data were collected on household characteristics, perceptions of health services, and on the utilization of certain health services. Limited individual-level data on educational attainment, age, and outpatient visits were also collected through the household interview. The resulting sample covers 30 health facilities, 1,200 households, and 6,144 individuals.

The analysis considers both household- and individual-level service outcomes. Due to the primary sampling of health care facilities, households can be straightforwardly linked to a particular facility. In most of the sampled communities, the facility is the only available source of institutionalized health care.[14] However, in the urban areas, there is a thicker market for health care. As a consequence of overlapping catchment areas, the selected facility was sometimes not the closest source of health care for all the households in the catchment area. In order to analyze the impact of health facility characteristics on health seeking behavior, the following analysis restricts attention to the sub-sample of households for which the surveyed facility is the closest facility. This entails dropping approximately 14 percent of households. A small number of households and individuals are also dropped due to missing data for the variables of interest. In terms of outpatient visits, the relevant sub-sample consists of 5,179 individuals. In the case of delivery care, 369 households were excluded because no child had been born in the twelve months preceding the interview, resulting in a sub-sample of 646 households.

Table 2 – Distribution of the sample by province

Province	Population	Sample size			
	(97 Census)	facilities	households	individuals	Households w. delivery*
Maputo Cidade	966,837	4	101	536	62
Nampula	2,975,747	10	331	1,453	170
Tete	1,144,604	8	286	1,554	235
Inhambane	1,123,079	8	297	1,636	179
Total	**6,210,267**	**30**	**1,015**	**5,179**	**646**

** Questions concerning delivery referred to a period of 12 months preceding the interview*

4.3 The utilization of health services

[13] Household were selected from a study population that consisted of all households within the catchment area of the health facility. The catchment area was defined through interviews with the head of the facility, the local administrator, the local police station, or the principal of the local school.

[14] This paper focuses on the role of public health care facilities. Traditional medical practitioners (TMPs) are however an important sources of care, in particular in rural areas. Approximately a third of the respondents report using TMPs on a regular basis, primarily for spiritual or faith reasons, or because the health facility is either perceived to be unable to cure the disease or has failed to do so. Many of the respondents consider TMPs a complementary rather than rival source of health care.

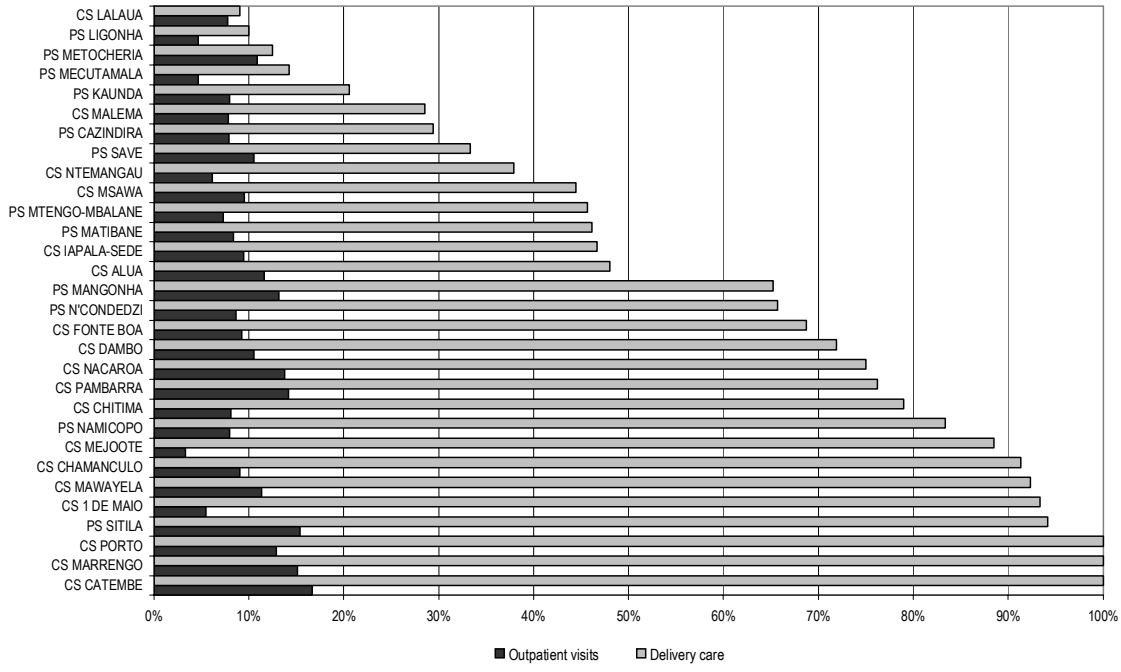
For the relevant sub-sample, 9.6 percent of all individuals made an outpatient visit to a health facility in the two weeks preceding the interview (see Table 3). Most outpatient visits were in response to illness (92.3 percent), while the remaining visits were motivated by preventive care (5.2 percent) or an accident (2.4 percent).[15] Conversely, 57.6 percent of children born in the 12 months preceding the survey were delivered in the local health facility.

There are however a notable spatial differences in utilization rates, both across provinces and catchment areas. For example, as can be seen from Table 3, nearly all households in Maputo report that the youngest child in the household was delivered in a health facility, while this is true for less than 40 percent of households in Nampula.[16] Even more striking, the mean utilization rates for the respective catchment areas range from 9.1 to 100 percent for delivery care, and 4.7 to 16.7 percent for outpatient visits (see Figure 1).[17] The purpose of the following analysis is to investigate what factors explain this striking variation, and, in particular, the extent to which differences in health care quality are important.

Table 3 – Health service use by province

Province	Delivered last child in health facility (%)	*n*	Visit to health facility (%)	*n*
Maputo	95.2%	*62*	11.0%	*536*
Nampula	39.4%	*170*	8.8%	*1,453*
Tete	47.2%	*235*	8.1%	*1,554*
Inhambane	75.4%	*179*	11.2%	*1,636*
Total	**57.6%**	***646***	**9.6%**	***5,179***

Figure 1 – Health service use by facility catchment area



[15] The survey did not include individual questions about illness episodes. As a consequence, the proportion of individuals who make a curative visit, *conditional* on being ill, cannot be computed.
[16] More detailed information on health service use are reported in Table A 1 in Appendix 1
[17] Due to the small sample-sizes at catchment area level, these differences should be considered as merely indicative.

4.4 Health care quality and other explanatory variables

Facility Characteristics

The sampled facilities differ in many dimensions, including staffing, service range, and availability of equipment and material (Table 4). On average, there are approximately 9 medical staff per facility, but there is a notable variation across provinces, both in terms of staff numbers and composition. Overall, only a minority of facilities have running water and electricity (30 and 40 percent respectively). Again, however, this varies across provinces. For example, in Maputo City, all facilities have both electricity and running water. Most of the facilities report having essential equipment, including scales, diagnostic and treatment equipment, and sterilizers. To a lesser extent, facilities are also equipped with fridges and cool-boxes. Facilities in Maputo City tend to be better equipped, in part reflecting the larger size of these facilities. Emergency transport is only available in a minority of facilities.

Differences in size, activity level, staffing, and case mix also influence the supply of drugs through the *Essential Drugs Program* (EDP). There are three types of kits that are distributed to primary health care facilities through the EDP—kit A, B, and C—where kit A contains the greatest variety and largest volume of drugs. Not surprisingly, a greater proportion of facilities in Maputo City receive kits A, in particular compared with Tete and Inhambane. Quantitative data on drug supply or availability were not collected. However, a majority (77 percent) of facility heads report that they receive sufficient quantities drugs. This information can proxy for drug availability in the facility.

In terms of service range, all facilities offer first aid and adult and child screening. A large proportion of facilities offer a more complex range of services, including maternity care and deliveries, pre-natal care, child health services, and family planning. In addition, the larger facilities may offer TB and leprosy related services, laboratory analysis, and some dentistry and oral health services. The service range can be summarized using three categories: *limited*, *intermediate*, and *extensive*.[18] From this perspective, 13 percent of facilities in the sample offer only a limited range. The majority (53 percent) of facilities offer an intermediate range of services, and 33 percent of facilities provide an extensive range of services.

Finally, two process measures of quality were constructed from the data, based on conditions for privacy and reported household perceptions about the attitude and thoroughness of the health workers in the local facility. These measures comprise an important complement to structural measures of quality.

[18] These categories are defined in Table A 3 in the Appendix.

Table 4 – Facility characteristics

Variable	Maputo	Tete	Nampula	Inhambane	Total
n (facilities)	*4*	*8*	*10*	*8*	***30***
Staffing					
Total number of medical staff	36.3	7.3	3.5	1.6	**8.6**
Facility has maternity care staff (%)	100.0	70.0	50.0	62.5	**66.7**
Infrastructure (% of facilities)					
Running water	100.0	25.0	30.0	0.0	**30.0**
Electricity	100.0	25.0	40.0	25.0	**40.0**
Equipment and material (% of facilities)					
Adult scales	100.0	88.0	78.0	75.0	**83.0**
Child scales	100.0	100.0	78.0	100.0	**93.0**
Stethoscope	100.0	100.0	78.0	100.0	**93.0**
Blood pressure equipment	100.0	88.0	67.0	75.0	**79.0**
Thermometer	100.0	100.0	100.0	100.0	**100.0**
Sterilizers	100.0	75.0	33.0	75.0	**66.0**
Cool box	100.0	88.0	44.0	63.0	**69.0**
Fridge	75.0	100.0	22.0	88.0	**69.0**
Suture material	75.0	75.0	67.0	88.0	**76.0**
Drugs (% of facilities)					
Receives drug kit A	75.0	38.0	60.0	25.0	**47.0**
Receives drug kit B	25.0	63.0	40.0	75.0	**53.0**
Receives drug kit C	0.0	0.0	20.0	0.0	**7.0**
Report sufficient drugs	50.0	75.0	80.0	88.0	**77.0**
Emergency transport (% of facilities)					
No transport	50.0	63.0	50.0	88.0	**63.0**
Service range (% of facilities)					
Limited	0.0	13.0	20.0	13.0	**13.0**
Intermediate	25.0	75.0	40.0	63.0	**53.0**
Extensive	75.0	13.0	40.0	25.0	**33.0**
Privacy (% of facilities)					
Privacy during consultation	75.0	88.0	60.0	88.0	**77.0**
User perceptions					
Nice staff (prop. of households)	0.95	0.89	0.93	0.86	**0.90**

Household and Individual Characteristics

In order to identify the role of health care quality as a determinant of health service use, we control for community and household characteristics (and, in the case of outpatient visits, individual characteristics). The relevant variables are summarized in Table A 2 in Appendix 1. With the exception of Maputo City, most of the households in the sample live in rural settlements. Even though the sample only includes households from the facility catchment area, physical accessibility of health care facilities is considerably more limited in rural areas, and is likely to be an important factor in explaining spatial differences in health service use. In the rural areas, the majority of households live more than half an hour away from the closest health care facility. This can be contrasted with Maputo City, where approximately 80 percent of households live within half an hour of the facility. We also control for whether the household report transport to be an important constraint in accessing the local facility.

The survey did not collect income or consumption data. The economic situation of the household is therefore controlled for through a number of variables relating to household

assets and dwelling characteristics, including the type of building material used, the ratio of household members to rooms, the sources of water and energy (lighting), the type of latrine, and the proportion of household members that is earning some form of income.[19] Given the endogeneity of many of the variables relating to asset ownership or dwelling characteristics, these variables are merely included as controls in the analysis.

Educational attainment is also likely to be an important determinant of health service use. Sixty-two percent of households have at least one member that has begun or finished level 1 primary education, and 14 percent that have completed level 2 primary. In approximately 17 percent of households there is no one with any formal education, whereas in almost 60 percent of the surveyed households, the oldest woman has no formal education.

5. FINDINGS

5.1 Estimation results

This paper is concerned with relative importance of different factors, in particular health care quality, in explaining spatial differences in the utilization of outpatient and delivery care services. For both institutional delivery and outpatient visits, four separate models were estimated: (A) no quality variables included; (B) proxies for structural dimensions of quality included; (C) proxies for process dimensions of quality included; (D) full set of quality variables included. The results from the analysis are reported in Table 5 and Table 6.[20]

A number of conclusions can be drawn in respect of the controls in the analysis. First, distance to the facility is an important factor for the choice of delivery location, but only seems to have a limited effect, if any, on the outpatient care visits.[21] Other community variables do not have a significant effect. Second, household-level education variables seem to be important for health care choices, at least in the case of institutional delivery. In particular, the highest level of female education is significant, while the highest overall level of education in the household is not. The coefficients on the respective proxies for household economic status have the expected signs and are jointly significant. Other included household variables—household size and the number of household members earning some form of income—are not significant determinants of institutional delivery, but do have a significant effect on outpatient visits. Third, while individual level variables are excluded from the household level analysis of institutional delivery, they are significant determinants of outpatient visits. The coefficients on both age and age squared are significant, reflecting the higher frequency of outpatient visits for children and the elderly. Moreover, the female dummy also has a positive and significant effect.

In respect of health care quality, the available measures seem to have only a limited impact on health care choices. Notably, none of the quality variables have a significant impact on outpatient visits. Moreover, the hypothesis of zero coefficients on all quality variables cannot be rejected, either separately for process and structure, or for the all the included

[19] We also experimented with the inclusion of a single control for economic situation, constructed as a weighted sum of the listed asset and dwelling characteristics. The weights assigned to the respective variables were derived from principal components analysis, as proposed by Filmer and Pritchett (1998). The use of a single index rather than the individual controls does not alter the substantive findings of the paper.

[20] All models were estimated with provincial dummies to control for province-level fixed effects.

[21] It is important to remember that the sample only includes households within the catchment area of the health facility. The travel time for households in the sample ranges from 15 minutes to almost 4 hours.

quality variables. This suggests that either differences in quality are not important in explaining patterns of health care visits, or that the included variables do not adequately capture the relevant dimensions of quality.

However, in the case institutional delivery, both the dummy for maternity staff and for extensive service range are significant in the full specification.[22] In addition, the number of staff and the privacy dummy are significant at the 10 percent significance level. However, contrary to expectations, the number of staff has a negative impact on the probability of institutional delivery. The structural measures of quality are also jointly significant, but there is only weak evidence to support the hypothesis that the process measures of quality are jointly significant.

By comparing the results from the respective specifications, we can also say something about the robustness of estimates in restricted models to the inclusion of a wider set of explanatory variables. In particular, many analyses of the determinants of health care utilization are carried out without quality data, or with only a limited set of quality variables. To what extent do such estimates suffer from omitted variable bias? Although it is impossible to draw general conclusions in this regard, the present analysis offers some comforting conclusions. First, the inclusion of the full set of quality variables does not substantively alter the conclusions about the impact of community, household, and individual variables on health care utilization. In other words, the health care quality variables do not appear to be systematically correlated with the other independent variables. Second, the omission of process measures of quality does not appear to result in biased estimates of coefficients on the structural measures of quality. The converse is also true.

[22] Delivery assistance is provided even in facilities that do not have trained maternity staff.

Table 5 – Probit results: Institutional delivery

	Model A		Model B		Model C		Model D	
	Coeff.	**z-value**	**Coeff.**	**z-value**	**Coeff.**	**z-value**	**Coeff.**	**z-value**
Less than half hour travel time	0.508	[3.00]**	0.560	[3.14]**	0.503	[2.96]**	0.573	[3.19]**
Between half and one hour travel time	0.369	[2.56]*	0.413	[2.72]**	0.363	[2.50]*	0.401	[2.63]**
More than 3 hour travel time	-0.252	[1.53]	-0.293	[1.69]	-0.249	[1.50]	-0.296	[1.72]
Urban area	0.450	[1.59]	0.698	[1.66]	0.520	[1.73]	0.943	[1.82]
Transport problems	0.156	[0.86]	0.003	[0.01]	0.155	[0.86]	0.001	[0.01]
Highest level of education in HH	-0.024	[0.76]	-0.023	[0.71]	-0.023	[0.73]	-0.021	[0.65]
Highest level of female education in HH	0.093	[2.67]**	0.096	[2.68]**	0.091	[2.59]**	0.093	[2.60]**
Household size	-0.013	[0.40]	-0.014	[0.44]	-0.013	[0.41]	-0.013	[0.41]
Concrete or brick dwelling	0.164	[0.53]	0.173	[0.58]	0.158	[0.51]	0.203	[0.67]
Rooms per person	-0.057	[0.27]	-0.065	[0.30]	-0.052	[0.24]	-0.053	[0.25]
Water from river	-0.191	[1.36]	-0.032	[0.21]	-0.210	[1.48]	-0.078	[0.51]
Bush as latrine	-0.500	[4.21]**	-0.431	[3.26]**	-0.518	[4.33]**	-0.459	[3.49]**
Electricity from grid	0.059	[0.10]	0.023	[0.04]	0.016	[0.03]	-0.096	[0.16]
Income earners	0.305	[0.62]	0.290	[0.58]	0.298	[0.59]	0.248	[0.50]
Number of medical staff			**-0.334**	**[2.02]***			**-0.338**	**[1.79]**
Maternity staff			**0.688**	**[3.49]****			**0.570**	**[2.64]****
Electricity			**0.027**	**[0.11]**			**-0.084**	**[0.32]**
Transport available			**0.153**	**[1.02]**			**0.204**	**[1.24]**
Equipment index			**-0.027**	**[0.42]**			**0.017**	**[0.23]**
Adequate drug supply			**-0.121**	**[0.65]**			**-0.087**	**[0.45]**
Open all days			**0.071**	**[0.57]**			**0.063**	**[0.50]**
Limited service range			**-0.488**	**[1.57]**			**-0.427**	**[1.28]**
Extensive service range			**0.457**	**[1.52]**			**0.706**	**[2.06]***
Privacy					**0.214**	**[1.50]**	**0.364**	**[1.96]**
Staff are "nice"					**0.631**	**[0.76]**	**1.431**	**[1.25]**
Observations	*646*		*646*		*646*		*646*	
Wald tests of joint significance (prob > chi2)								
All independent variables	*0.000*		*0.000*		*0.000*		*0.000*	
Structure variables			*0.000*				*0.000*	
Process variables					*0.245*		*0.083*	
All quality variables							*0.000*	

Note: Robust t statistics in brackets (significant at 5%; ** significant at 1%); constant and coefficients for provincial fixed effects are not reported.*

Table 6 – Probit results: Outpatient visit by household member

	Model A		Model B		Model C		Model D	
	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value	Coeff.	z-value
Less than half hour travel time	0.131	[1.80]	0.137	[1.84]	0.122	[1.68]	0.133	[1.79]
Between half and one hour travel time	0.002	[0.04]	-0.005	[0.08]	-0.006	[0.09]	-0.012	[0.17]
More than 3 hour travel time	-0.029	[0.36]	-0.053	[0.65]	-0.022	[0.26]	-0.047	[0.57]
Urban area	-0.240	[1.84]	-0.147	[0.89]	-0.186	[1.36]	-0.073	[0.41]
Transport problems	-0.146	[1.62]	-0.139	[1.52]	-0.151	[1.67]	-0.143	[1.56]
Highest level of education in HH	-0.006	[0.43]	-0.009	[0.56]	-0.006	[0.41]	-0.007	[0.47]
Highest level of female education in HH	0.030	[1.92]	0.030	[1.94]	0.027	[1.75]	0.028	[1.80]
Household size	-0.043	[3.54]**	-0.042	[3.45]**	-0.044	[3.55]**	-0.042	[3.45]**
Concrete or brick dwelling	0.016	[0.18]	0.018	[0.19]	0.018	[0.19]	0.019	[0.20]
Rooms per person	0.002	[0.02]	0.013	[0.17]	-0.003	[0.04]	0.012	[0.16]
Water from river	-0.038	[0.52]	-0.027	[0.35]	-0.036	[0.49]	-0.030	[0.38]
Bush as latrine	-0.087	[1.50]	-0.078	[1.24]	-0.087	[1.50]	-0.081	[1.28]
Electricity from grid	0.163	[1.09]	0.179	[1.20]	0.179	[1.19]	0.182	[1.20]
Income earners	0.674	[3.80]**	0.634	[3.56]**	0.668	[3.75]**	0.623	[3.49]**
Age	-0.024	[4.86]**	-0.024	[4.89]**	-0.024	[4.82]**	-0.024	[4.89]**
Age squared	0.000	[4.61]**	0.000	[4.67]**	0.000	[4.58]**	0.000	[4.67]**
Female	0.180	[3.56]**	0.178	[3.52]**	0.180	[3.56]**	0.179	[3.53]**
Years of schooling	-0.015	[1.04]	-0.015	[1.06]	-0.016	[1.08]	-0.016	[1.09]
Number of medical staff			**0.023**	**[0.40]**			**0.001**	**[0.02]**
Maternity staff			**-0.021**	**[0.24]**			**-0.011**	**[0.12]**
Electricity			**0.026**	**[0.23]**			**0.047**	**[0.41]**
Transport available			**-0.045**	**[0.64]**			**-0.024**	**[0.32]**
Equipment index			**-0.006**	**[0.22]**			**-0.010**	**[0.34]**
Adequate drug supply			**0.101**	**[1.11]**			**0.097**	**[1.04]**
Open all days			**-0.010**	**[0.19]**			**-0.009**	**[0.16]**
Limited service range			**-0.028**	**[0.21]**			**-0.026**	**[0.20]**
Extensive service range			**0.111**	**[0.94]**			**0.126**	**[1.03]**
Privacy					**0.059**	**[0.87]**	**0.084**	**[1.16]**
Staff are "nice"					**-0.357**	**[1.01]**	**-0.198**	**[0.45]**
Observations	*5179*		*5179*		*5179*		*5179*	
Wald tests of joint significance (prob > chi2)								
All independent variables	*0.000*		*0.000*		*0.000*		*0.000*	
Process variables					*0.420*		*0.476*	
Structure variables			*0.724*				*0.775*	
All quality variables							*0.746*	

Note: Robust t statistics in brackets (significant at 5%; ** significant at 1%); constant and coefficients for provincial fixed effects are not reported.*

5.2 The relative importance of different determinants of health service use

While the Probit analysis sheds light on which factors are significant determinants of health service use, the interpretation of the estimated coefficients is complicated by the fact that the model is non-linear in the explanatory variables. This means that the impact of independent variables on the probability of seeking a particular type of care will depend on the value of that and other independent variables. Moreover, it is difficult to assess the relative importance of different determinants of health service use. These issues are best addressed by looking at predicted probabilities.

Predicted probabilities can be analyzed in two ways. First, predicted probabilities can be calculated for each individual, given the values of the independent variables of that individual. The predicted probability that individual *i* will choose alternative *k* is given by

$$\hat{\Pr}_i[S=1 \mid \mathbf{w}_i] = \Pr[\hat{\boldsymbol{\alpha}}'\mathbf{w}_i < \varepsilon_i] = \Phi(\hat{\boldsymbol{\alpha}}'\mathbf{w}_i) .$$

In other words, the predicted probability is simply the normal distribution, with the index calculated on the basis of the estimated coefficients and the values of the explanatory variables of individual *i*. In this case, predicted probabilities vary across observations in the sample. As an alternative, we can assess the importance of different explanatory variables by looking at marginal changes in predicted probabilities for a "representative individual". In this case, we control for variation in all independent variables except the one of interest. The predicted probability under scenario *m* is

$$\tilde{\Pr}_i[S=1 \mid \tilde{\mathbf{w}}^m] = \tilde{\Pr}[\hat{\boldsymbol{\alpha}}'\tilde{\mathbf{w}}^m < \varepsilon] = \Phi(\hat{\boldsymbol{\alpha}}'\tilde{\mathbf{w}}^m) .$$

The predicted probability under scenario *m* can be compared with an alternative scenario, *m'*, where the value of one independent variable is changed while the rest remain constant (typically at mean or median). This approach provides a useful perspective on how predicted probabilities depend on specific variables of interest. However, it is important to remember that because of the non-linearities in the mapping between independent variables into probability space, predicted probabilities at averages are not in general equal to average predicted probabilities. The same holds true for marginal effects; depending on the distribution of the independent variables across the observations in the sample, marginal effects evaluated at means may be considerably different from mean marginal effects.[23]

Institutional delivery

We first explore the relative importance of different variables on the probability of institutional delivery by looking at predicted probabilities for a "representative individual". As can be seen from Table 2 (see also Figure A 1 in Appendix 2), the significant quality variables all have a large impact on the predicted probability of institutional delivery. For example, for a woman in a household with mean values for the relevant explanatory variables, the probability of institutional delivery increases from 0.38 to 0.80 if she has access to a facility with extensive rather than limited service range, controlling for other factors. The presence of maternity staff in the facility also has a large impact on predicted probability, independently from service range and other facility characteristics. However, the results also make it clear that accessibility and household characteristics, in particular education, are important determinants of health service use.

[23] On this basis, Train (1986) warns against using responses for an average representative individual as a proxy for average response across observations in the sample.

Table 7 – Institutional delivery: Effect of different variables on predicted probability, evaluated at population means

	Predicted probability	95% Confidence Interval	
Travel time to facility			
< ½hr	**0.748**	0.651	0.829
½hr to 1hr	**0.690**	0.601	0.769
1hr to 3hrs	**0.538**	0.461	0.614
> 3hrs	**0.420**	0.305	0.543
Highest female education in household			
No education	**0.517**	0.430	0.602
Level 1 primary (5 years)	**0.694**	0.616	0.764
Level 2 primary (7 years)	**0.756**	0.639	0.849
Level 2 secondary (12 years)	**0.877**	0.685	0.967
Maternity staff			
No	**0.462**	0.337	0.591
Yes	**0.682**	0.618	0.742
Service range			
Limited	**0.384**	0.203	0.595
Middle	**0.553**	0.452	0.650
Extensive	**0.799**	0.641	0.906
Privacy			
No	**0.503**	0.388	0.617
Yes	**0.644**	0.584	0.702

n=646

Note: Predicted probabilities are calculated for different values of the specific variables of interest, with the remaining explanatory variables kept at population means.

The focus on predicted probabilities at means is restrictive in that it sheds no light on the distribution of health service use. As an alternative, we look at the mean and distribution of predicted probabilities under different scenarios. This goes some way towards addressing the question of the extent to which different policy interventions can explain the observed spatial variation in health service use.

In Table 8, six different scenarios are compared against the base case of probabilities of institutional delivery calculated at the observed values of the explanatory variables.[24] The results make it clear that while single interventions can have an important impact on the level and distribution of health service use, the more notable shifts in the distribution result from combined interventions. For example, under the simulation where all households can access a facility with maternity staff within half an hour, the mean predicted probability increases from 0.57 to 0.87, and the 25th percentile increases from 0.32 to 0.69. The shift in the distribution of predicted probabilities under different scenarios is also reflected in Figure 2.

[24] The distributions of predicted probabilities under different scenarios are also presented graphically in Figure A 2 in Appendix 2.

Table 8 – Institutional delivery: Mean and distribution of predicted probabilities under different scenarios

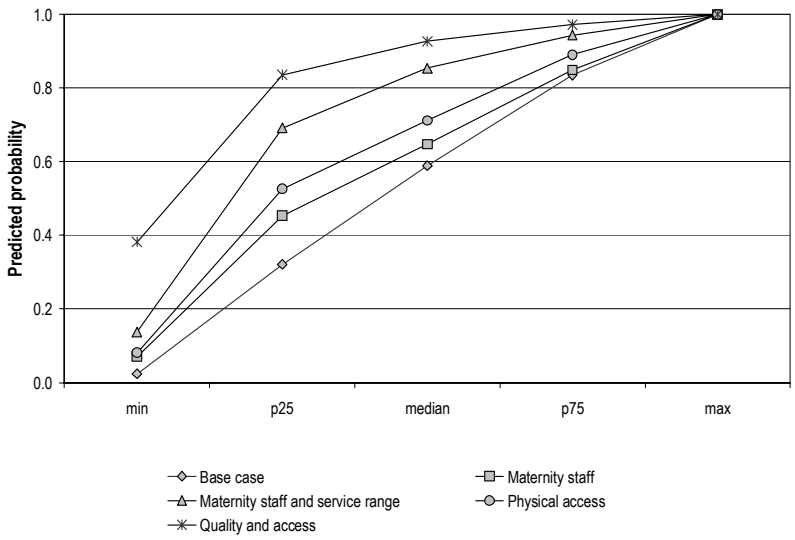
	mean	sd	Min	p25	median	p75	max
Base case	**0.57**	0.27	0.02	0.32	0.59	0.83	1.00
Maternity staff	**0.63**	0.24	0.07	0.45	0.65	0.85	1.00
Maternity staff and service range	**0.78**	0.21	0.14	0.69	0.85	0.94	1.00
Physical access	**0.70**	0.22	0.08	0.53	0.71	0.89	1.00
Quality and access	**0.87**	0.14	0.38	0.84	0.93	0.97	1.00
Female education	**0.65**	0.24	0.06	0.44	0.70	0.87	0.99
All	**0.91**	0.11	0.51	0.90	0.96	0.98	1.00

n=646

Note: Base case refers to predicted probabilities at the observed values for the explanatory variables for each households. The remaining simulations are based on discrete changes in specific variables for all households, with the remaining variables kept at observed values.

Maternity staff:	*All households have access to facility with maternity staff*
Maternity staff and service range:	*All households have access to facility with maternity staff and extensive service range*
Physical access:	*All households live within half hour to facility*
Quality and access:	*All households have access to facility with maternity staff, extensive range, and within half hour*
Female education:	*Highest level of female education is five years in all households*
All:	*Maternity staff, extensive range, within half hour, and highest female education five years*

Figure 2 – Institutional delivery: Distribution of predicted probabilities under different scenarios



Outpatient visits

In the case of outpatient visits, the quality variables were not significant determinants of outpatient visits. Rather, travel time and highest level of female education were the most important factors. The quantitative impact of these respective variables on the (unconditional) probability of an outpatient visit is illustrated in Table 9, which reports predicted probabilities for a "representative" individual with all variables except travel time and female education respectively kept at population means (see also Figure A 3). As can be seen, both variables, in particular education, has a substantial and significant impact on the predicted probability of outpatient visits.

Table 9 – Outpatient visits: Effect of selected variables on predicted probability, evaluated at population means

	Predicted probability	95% Confidence Interval	
Travel time			
< 1/2hr	**0.106**	0.087	0.127
1/2hr to 1hr	**0.082**	0.067	0.098
1hr to 3hrs	**0.083**	0.071	0.097
> 3hrs	**0.076**	0.058	0.099
Highest female education in household			
No education	**0.075**	0.061	0.091
Level 1 primary (5 years)	**0.097**	0.084	0.111
Level 2 primary (7 years)	**0.107**	0.084	0.133
Level 2 secondary (12 years)	**0.135**	0.083	0.205

n=646

Note: Predicted probabilities are calculated for different values of the specific variables of interest, with the remaining explanatory variables kept at population means.

In interpreting these results, it is important to remember that the estimated effects on outpatient visits relate to unconditional demand. Hence, insofar as we believe that better quality at the local facility is associated with better health status in the community, there is a tendency to underestimate the effect of quality on the conditional probability of seeking care. Conversely, it is possible that quality is endogenous to utilization, such that health sector resources are specifically targeted to areas where utilization is high. This would lead to a positive bias of the estimates.

In respect of the distribution of predicted probabilities, the simulations presented in Table 10 and Figure 3 show that both improvement in access and increased female education is likely to have a very limited impact on the distribution of outpatient visits across households.

Table 10 – Outpatient visits: Mean and distribution of predicted probabilities under different scenarios

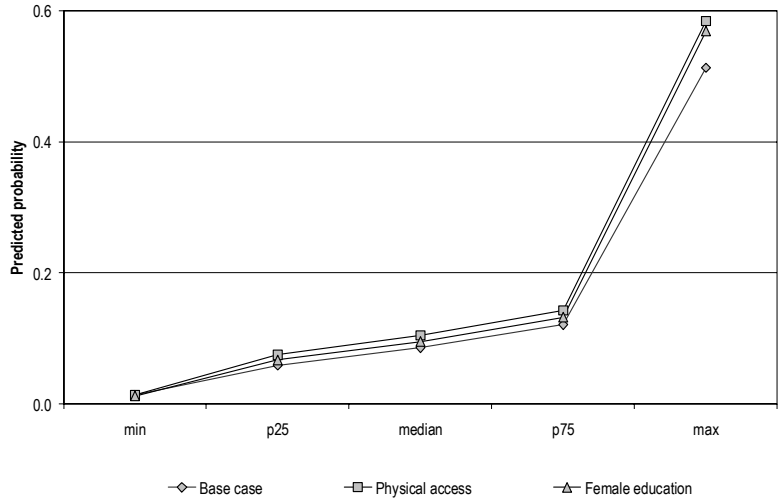
	mean	sd	min	p25	Median	p75	max
Base case	**0.10**	0.05	0.01	0.06	0.09	0.12	0.51
Physical access	**0.11**	0.06	0.01	0.08	0.10	0.14	0.58
Female education	**0.11**	0.05	0.01	0.07	0.10	0.13	0.57

n=5179

Note: Base case refers to predicted probabilities at the observed values for the explanatory variables for each households. The remaining simulations are based on discrete changes in specific variables for all households, with the remaining variables kept at observed values.

Physical access:	*All households live within half hour to facility*
Female education:	*Highest level of female education is five years in all households*

Figure 3 - Outpatient visits: Distribution of predicted probabilities under different scenarios



6. DISCUSSION AND CONCLUSIONS

This paper has analyzed how different dimensions of health care quality affects decisions about outpatient visits and delivery care. Given the many approaches to defining and measuring quality, general conclusions about its importance as a determinant of health service use are elusive. That said, the study has demonstrated that health care quality is a significant and important factor in women's choice of delivery location. In particular, both the presence of maternity staff and a broader service range make it more likely that women choose a facility-based delivery. The analysis also confirmed the importance of physical access and education for decisions about delivery care. Conversely, the analysis suggested that quality is not a significant determinant in decisions about outpatient visits, while physical access, education, and economic variables remain important.

The findings hence suggest that the impact of quality may be service specific, and that although certain dimensions of quality may have little or no impact on outpatient visits, they may be important determinants of the use of other health services. For maternity care, the analysis makes it clear that ensuring physical coverage of households is not sufficient to ensure that women make use of delivery services—staffing and service characteristics of facilities are also important considerations in women's decisions. Moreover, even within the catchment areas of primary level facilities, distance has a large and significant impact on the utilization of delivery services. While it is unrealistic to bring basic facilities close to the home of every member of the population, this finding points at the importance of outreach activities and transport services. Overall, the results indicate that improvements in certain dimensions of measured quality can substantially reduce spatial differences in utilization of maternity services, although it will also be important to address differences in physical access and educational attainment.

As developing countries to continue to face difficult trade-offs between quality and physical access in the allocation of resources, it will be important to deepen our understanding of how individuals make health care choices. The results presented in this paper are a step in that direction. They provide us with a better understanding of what factors determine different

dimensions of care seeking behavior, and demonstrate the value of matched facility and household data in analyzing health care choices.

APPENDIX 1: TABLES

Table A 1 – Health service use

Variable	Maputo	Nampula	Tete	Inhambane	Sample
HOUSEHOLD LEVEL					
n (households: child was born in last 12 months)	*65*	*167*	*235*	*179*	*646*
Where was the last child delivered? (%)					
At health facility	95.2	39.5	47.2	75.4	57.7
At home with assistance	0	55.1	36.6	20.1	33.3
At home without assistance	1.6	4.8	16.2	3.9	8.4
other	3.2	0.6	0.0	0.6	0.6
INDIVIDUAL LEVEL					
n (individuals: sampled facility is closest facility)	*523*	*1430*	*1554*	*1636*	*5179*
Outpatient visit (%)					
Visited health facility in last 2 weeks	11.0	8.9	8.1	11.2	9.6
Visits by age category					
0-1	4.0	19.8	27.2	28.4	23.9
2-4	14.9	16.2	12.4	17.8	15.3
5-15	9.1	5.9	5.1	6.2	5.9
16-45	10.8	7.4	6.2	10.2	8.4
46+	14.6	11.5	5.7	13.0	11.3
Visits by gender					
Male	7.1	7.1	8.4	8.8	8.0
Female	14.9	10.5	7.8	13.2	11.0
Reason for seeking care?					
illness	96.6	93.7	87.3	93.5	92.3
accident	0.0	2.4	1.6	3.8	2.4
preventive care	3.4	3.9	11.1	2.7	5.2
Location for health care					
To closest facility	66.1	88.2	93.6	85.9	86.1
To other facility	33.9	9.4	4.8	12.5	12.3
Elsewhere	0.0	2.4	1.6	1.6	1.6

Table A 2 – Household characteristics

Variable	Maputo City	Nampula	Tete	Inhambane	Total
n (households)	*101*	*331*	*286*	*297*	*1015*
Type of settlement (%)					
Urban formal (city-cement)	18.8	0.6	0.0	0.0	2.1
Urban informal (city-reeds)	58.4	10.0	0.0	0.0	9.1
Rural village	18.8	7.6	0.0	0.3	4.4
Rural scattered	4.0	81.8	100.0	99.7	84.4
Travel time to closest health care facility (%)					
Less than ½ hour	80.2	17.5	15.0	22.1	24.7
Between ½ and 1 hour	11.7	27.2	26.7	24.4	24.5
Between 1 and 3 hours	6.0	42.4	40.7	38.6	36.9
More than 3 hours	2.0	12.9	17.6	14.9	13.8
Dwelling type (%)					
Cement and bricks	65.4	3.3	2.1	13.5	12.1
Wood and zinc	13.9	0.9	0.4	3.0	2.7
Reeds and/or mud	19.8	31.0	79.0	59.6	51.8
Other	1.0	64.7	18.5	23.9	33.4
Dwelling size (mean)					
Number of rooms (excl. Bathroom)	3.2	2.9	2.2	3.7	3.0
Source of water (%)					
Running water	41.6	0.6	0.4	0.0	4.4
Water from well, borehole or other	58.4	86.6	73.1	81.8	78.6
River or stream	0.0	12.8	26.6	18.2	17.0
Type of latrine (%)					
Toilet	42.6	0.3	0.0	0.0	4.3
Latrine or bucket	57.4	43.5	37.8	56.2	47.0
Bush or other	0.0	56.2	62.2	43.8	48.7
Source of power (%)					
Electricity from grid	49.5	2.1	0.4	0.3	5.9
Lighting from paraffin, candle or other source	50.5	97.9	99.6	99.7	94.1
Income earners (mean)					
Number of income earners	1.4	1.1	0.8	1.6	1.2
Highest level of education in household(%)					
No education	2.0	21.3	18.9	17.2	17.5
Less than Primary 1	18.8	44.7	52.5	39.7	42.8
Primary 1 (5 years)	21.8	21.6	19.2	24.6	21.8
Primary 2 (7 years)	33.7	10.9	7.3	14.8	13.3
Secondary school	13.9	1.5	2.1	2.7	3.3
Higher than secondary	9.9	0.0	0.0	1.0	1.3
Education of oldest woman (%)					
No education	27.7	53.2	73.1	70.7	61.4
Less than Primary 1	32.7	38.9	20.3	22.2	28.1
Primary 1 (5 years)	18.8	6.4	4.6	6.1	7.0
Primary 2 (7 years)	11.9	1.5	1.8	0.7	2.4
Secondary school	7.9	0.0	0.4	0.0	0.9
Higher than secondary	1.0	0.0	0.0	0.3	0.2

Table A 3 – Variable definitions

	Description
Independent variables	
Outpatient visit to facility	Individual made outpatient visit to health facility in last 2 weeks in response to illness
Youngest child delivered in facility	Indicator variable for whether the youngest child in the household (0-5 years old) was delivered in the facility
Community variables	
Less than half hour travel time	Indicator variable for whether household is located less than half an hour away from health facility (as reported by household)
Between half and one hour travel time	Indicator variable for whether household is located between half and one hour away from health facility (as reported by household)
More than 3 hour travel time	Indicator variable for whether household is located more than three hours away from health facility (as reported by household)
Urban area	Indicator variable for whether household is in an urban area
Transport problems	Proportion of samled households in catchment area that report transport problems in accessing the local facility
Household variables	
Highest level of education in HH	The highest grade of schooling completed by anyone in the household
Highest level of female education in HH	The highest grade of schooling completed by any woman in the household
Household size	The number of household members
Concrete or brick dwelling	Indicator variable for whether household dwelling is constructed from concrete or brick
Rooms per person	The number of rooms in the household dwelling divided by the number of household members
Water from river	Indicator variable for whether household primarily uses untreated water from river or lake
Bush as latrine	Indicator variable for whether household uses bush as latrine
Electricity from grid	Indicator variable for whether household has access to electricity from the grid
Income earners	The number of household members that receive some form of income at the time of the interview
Individual variables	
Age	The age of the individual
Age squared	The age of the individual squared
Female	Indicator variable for whether the individual is a woman
Years of schooling	The highest grade of schooling attained by the individaul
Quality indicators - structure	
Number of medical staff	The number of staff in the facility with clinical responsibilities
Maternity staff	Indicator variable for whether facility has staff with training in midwifery or maternity care
Electricity	Indicator variable for whether facility has access to some form of electricity
Transport available	Indicator variable for whether facility has access to some means of transport
Equipment index	Index for the amount of equipment in the facility, constructed as the sum of indicator variables for whether facility has different types of equipment (adult scales, child scales, stethoscope, blood pressure meter, thermometor, sterilization equipment, coolbox, fridge, sutuer equipment)
Adequate drug supply	Proxy for drug availabilty basedon staff assessments
Open all days	Indicator variable for whether the facility is open 7 days a week.
Limited service range	Indicator variable for whether facility is classified as providing a "limited" range of servies
Extensive service range	Indicator variable for whether facility is classified as providing an "extensive" range of servies
Quality indicators - process	
Privacy	Indicator variable for whether clients have privacy during consultations
Staff are "nice"	Proportion of sampled respondents in catchment area that consider staff in the local facility to be "nice"

Table A 4 – Variable summaries (individual)

	n	Mean	S.D.	Min	0.25	Mdn	0.75	Max
Independent variable								
Outpatient visit to facility	5179	0.10	0.29	0.00	0.00	0.00	0.00	1.00
Community variables								
Less than half hour travel time	5179	0.25	0.43	0.00	0.00	0.00	0.00	1.00
Between half and one hour travel time	5179	0.25	0.43	0.00	0.00	0.00	0.00	1.00
More than 3 hour travel time	5179	0.14	0.34	0.00	0.00	0.00	0.00	1.00
Urban area	5179	0.12	0.33	0.00	0.00	0.00	0.00	1.00
Transport problems	5179	0.10	0.12	0.00	0.00	0.05	0.18	0.42
Household variables								
Highest level of education in HH	5179	4.49	2.94	0.00	3.00	4.00	6.00	13.00
Highest level of female education in HH	5179	2.95	2.77	0.00	0.00	3.00	5.00	13.00
Household size	5179	6.36	2.93	1.00	4.00	6.00	8.00	16.00
Concrete or brick dwelling	5179	0.14	0.35	0.00	0.00	0.00	0.00	1.00
Rooms per person	5179	0.58	0.37	0.11	0.33	0.50	0.71	7.00
Water from river	5179	0.17	0.38	0.00	0.00	0.00	0.00	1.00
Bush as latrine	5179	0.46	0.50	0.00	0.00	0.00	1.00	1.00
Electricity from grid	5179	0.06	0.24	0.00	0.00	0.00	0.00	1.00
Income earners	5179	0.23	0.16	0.00	0.14	0.20	0.29	1.00
Individual variables								
Age	5179	21.23	17.62	1.00	7.00	16.00	32.00	90.00
Age squared	5179	761.03	1119.38	1.00	49.00	256.00	1024.00	8100.00
Female	5179	0.53	0.50	0.00	0.00	1.00	1.00	1.00
Years of schooling	5179	1.81	2.49	0.00	0.00	0.00	3.00	13.00
Quality indicators - structure								
Number of medical staff	5179	1.14	1.19	0.00	0.00	0.69	2.30	4.53
Maternity staff	5179	0.69	0.46	0.00	0.00	1.00	1.00	1.00
Electricity	5179	0.36	0.48	0.00	0.00	0.00	1.00	1.00
Transport available	5179	0.34	0.48	0.00	0.00	0.00	1.00	1.00
Equipment index	5179	7.54	1.62	2.00	7.00	8.00	9.00	9.00
Adequate drug supply	5179	0.78	0.41	0.00	1.00	1.00	1.00	1.00
Open all days	5179	0.38	0.49	0.00	0.00	0.00	1.00	1.00
Limited service range	5179	0.11	0.31	0.00	0.00	0.00	0.00	1.00
Extensive service range	5179	0.30	0.46	0.00	0.00	0.00	1.00	1.00
Quality indicators - process								
Privacy	5179	0.79	0.41	0.00	1.00	1.00	1.00	1.00
Staff are "nice"	5179	0.90	0.08	0.69	0.85	0.90	0.96	1.00

Table A 5 – Variable summaries (household)

	n	Mean	S.D.	Min	0.25	Mdn	0.75	Max
Independent variable								
Youngest child delivered in facility	646	0.58	0.49	0.00	0.00	1.00	1.00	1.00
Community variables								
Less than half hour travel time	646	0.24	0.43	0.00	0.00	0.00	0.00	1.00
Between half and one hour travel time	646	0.25	0.43	0.00	0.00	0.00	0.00	1.00
More than 3 hour travel time	646	0.14	0.35	0.00	0.00	0.00	0.00	1.00
Urban area	646	0.11	0.31	0.00	0.00	0.00	0.00	1.00
Transport problems	646	0.10	0.12	0.00	0.00	0.05	0.18	0.42
Household variables								
Highest level of education in HH	646	4.22	2.92	0.00	2.00	4.00	6.00	13.00
Highest level of female education in HH	646	2.70	2.65	0.00	0.00	2.00	4.00	12.00
Household size	646	5.93	2.46	2.00	4.00	5.00	7.00	16.00
Concrete or brick dwelling	646	0.12	0.33	0.00	0.00	0.00	0.00	1.00
Rooms per person	646	0.54	0.29	0.11	0.33	0.50	0.67	2.67
Water from river	646	0.18	0.39	0.00	0.00	0.00	0.00	1.00
Bush as latrine	646	0.48	0.50	0.00	0.00	0.00	1.00	1.00
Electricity from grid	646	0.06	0.23	0.00	0.00	0.00	0.00	1.00
Income earners	646	0.22	0.13	0.00	0.14	0.20	0.29	0.75
Quality indicators - structure								
Number of medical staff	646	1.14	1.19	0.00	0.00	0.69	2.30	4.53
Maternity staff	646	0.68	0.47	0.00	0.00	1.00	1.00	1.00
Electricity	646	0.36	0.48	0.00	0.00	0.00	1.00	1.00
Transport available	646	0.37	0.48	0.00	0.00	0.00	1.00	1.00
Equipment index	646	7.61	1.59	2.00	7.00	8.00	9.00	9.00
Adequate drug supply	646	0.78	0.42	0.00	1.00	1.00	1.00	1.00
Open all days	646	0.39	0.49	0.00	0.00	0.00	1.00	1.00
Limited service range	646	0.10	0.30	0.00	0.00	0.00	0.00	1.00
Extensive service range	646	0.29	0.45	0.00	0.00	0.00	1.00	1.00
Quality indicators - process								
Privacy	646	0.79	0.41	0.00	1.00	1.00	1.00	1.00
Staff are "nice"	646	0.90	0.08	0.69	0.85	0.90	0.97	1.00

APPENDIX 2: FIGURES

Figure A 1 – Institutional delivery: Effect of key variables on predicted probabilities evaluated at population means of other explanatory variables

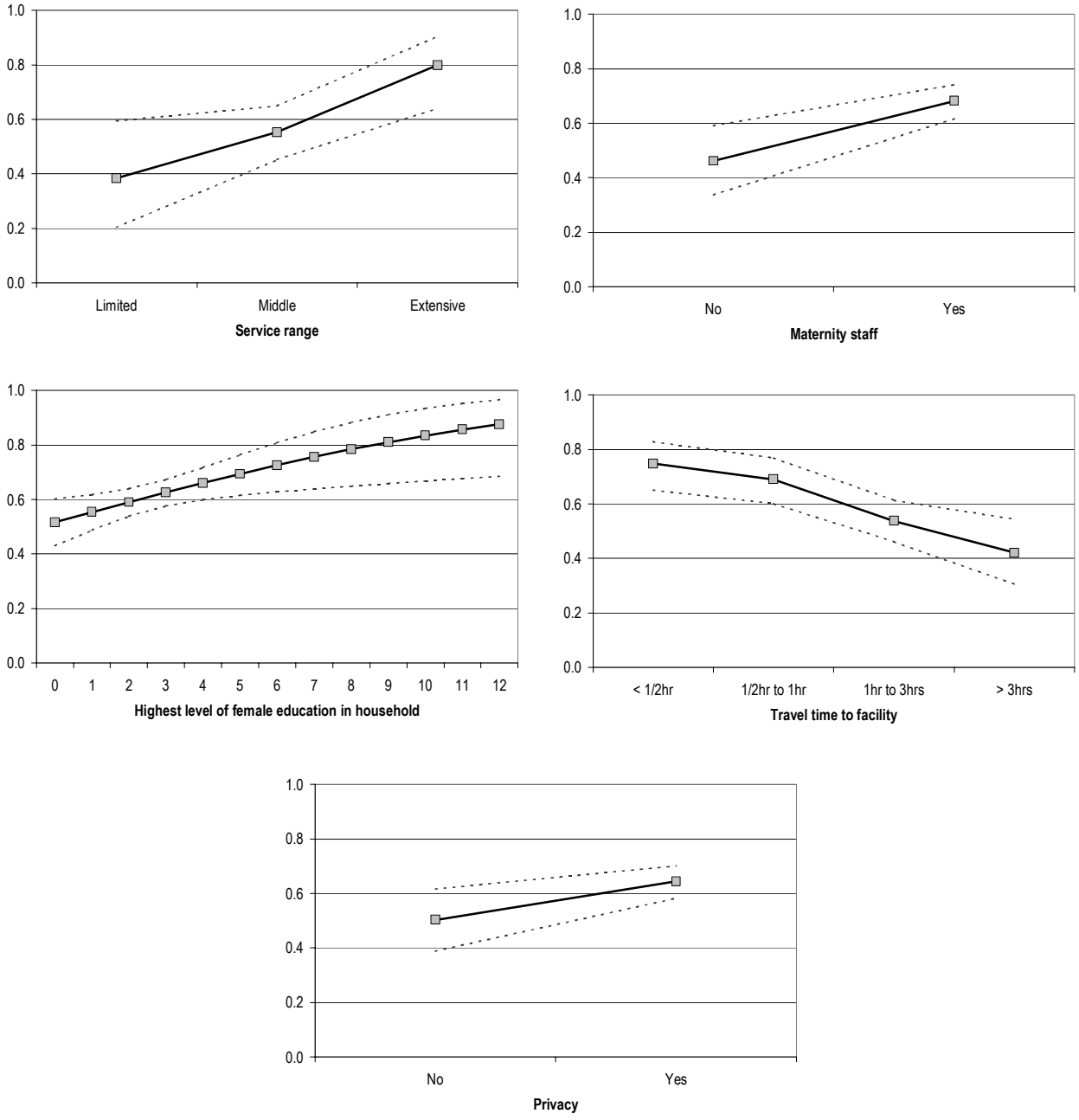
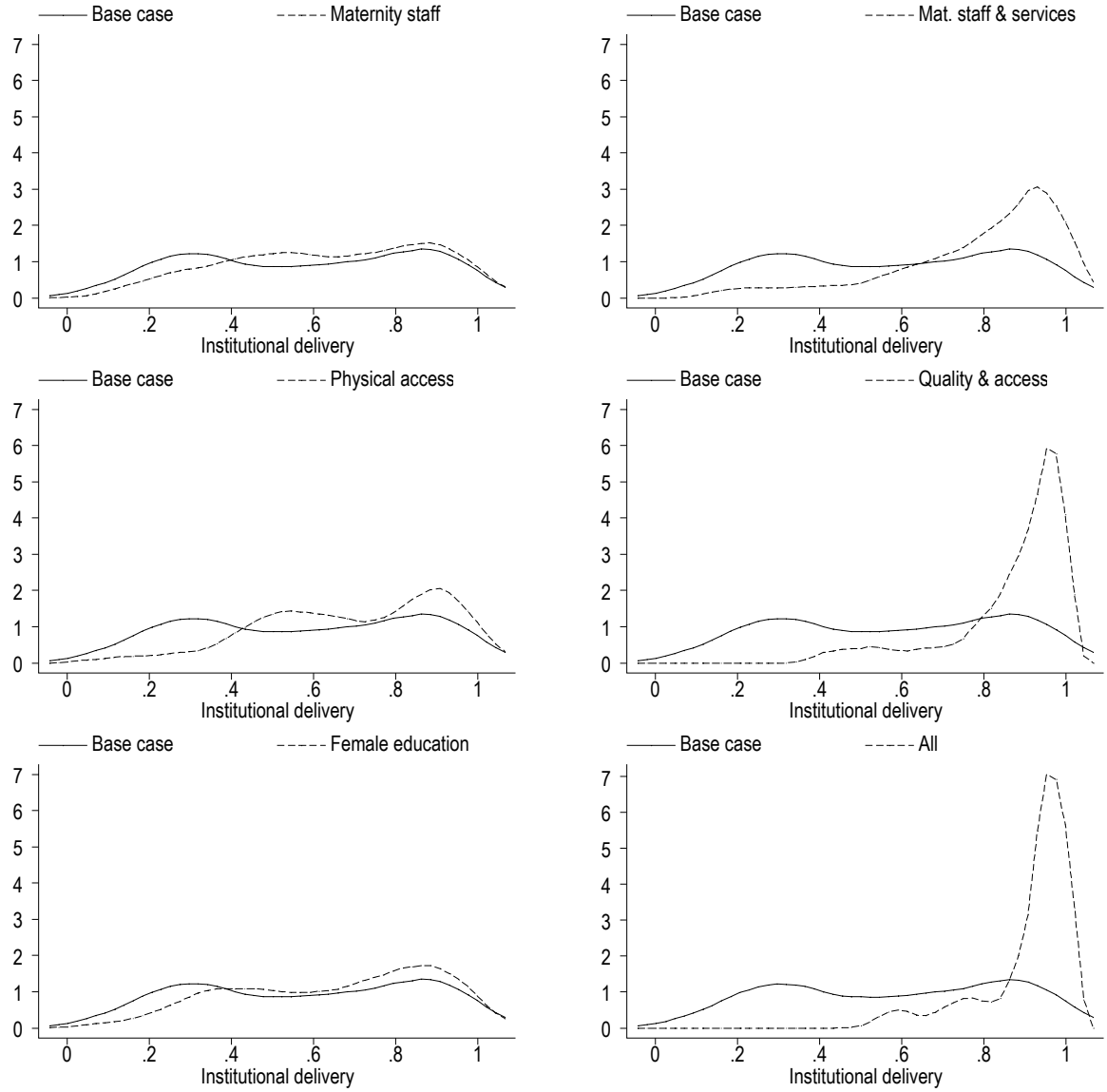


Figure A 2 – Institutional delivery: Kernel densities for predicted probability under different scenarios



Note: Base case refers to predicted probabilities at the observed values for the explanatory variables for each households. The remaining simulations are based on discrete changes in specific variables for all households, with the remaining variables kept at observed values.

Maternity staff:	*All households have access to facility with maternity staff*
Maternity staff and service range:	*All households have access to facility with maternity staff and extensive service range*
Physical access:	*All households live within half hour to facility*
Quality and access:	*All households have access to facility with maternity staff, extensive range, and within half hour*
Female education:	*Highest level of female education is five years in all households*
All:	*Maternity staff, extensive range, within half hour, and highest female education five years*

Figure A 3 – Outpatient visits: Effect of key variables on predicted probabilities evaluated at population means of other explanatory variables

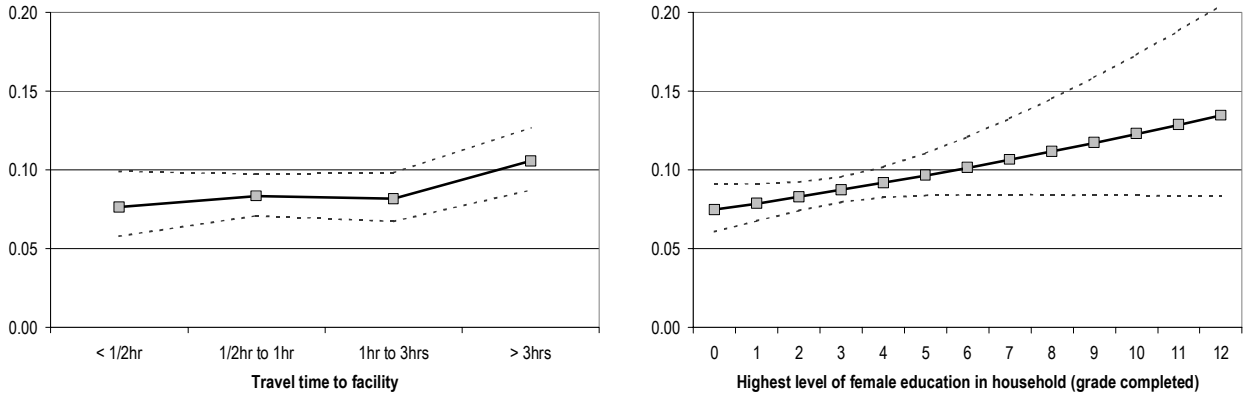
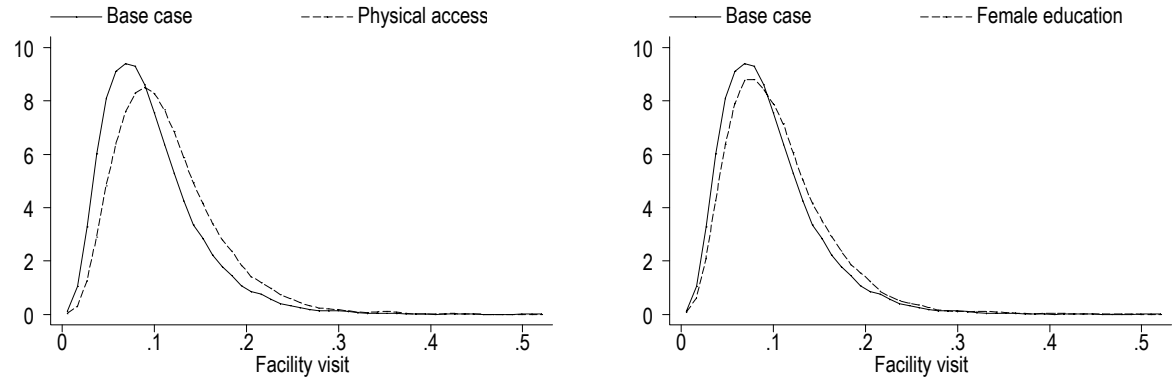


Figure A 4 – Outpatient visits: Kernel densities for predicted probability under different scenarios



Note: Base case refers to predicted probabilities at the observed values for the explanatory variables for each households. The remaining simulations are based on discrete changes in specific variables for all households, with the remaining variables kept at observed values.

Physical access: *All households live within half hour to facility*

Female education: *Highest level of female education is five years in all households*

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