The Role of User Charges and Structural Attributes of Quality on the Use of Maternal Health Services in Morocco

David R. Hotchkiss, Katherine Krasovec, M. Driss Zine-Eddine El-Idrissi, Erin Eckert, Ali Mehryar Karim

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MEASURE *Evaluation*

Carolina Population Center
University of North Carolina
at Chapel Hill
123 W. Franklin Street
Chapel Hill, NC 27516
Phone: 919-966-7482
Fax: 919-966-2391
measure@unc.edu
www.cpc.unc.edu/measure

Collaborating Partners:

Macro International Inc.
11785 Beltsville Drive
Suite 300
Calverton, MD 20705-3119
Phone: 301-572-0200
Fax: 301-572-0999
measure@macroint.com

John Snow Research and Training Institute
1616 N. Ft. Myer Drive
11th Floor
Arlington, VA 22209
Phone: 703-528-7474
Fax: 703-528-7480
measure_project@jsi.com

Tulane University
1440 Canal Street
Suite 2200
New Orleans, LA 70112
Phone: 504-584-3655
Fax: 504-584-3653
measure2@tulane.edu

Funding Agency:

Center for Population, Health and Nutrition
U.S. Agency for International Development
Washington, DC 20523-3600
Phone: 202-712-4959

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David R. Hotchkiss
Tulane University, School of Public Health and Tropical Medicine

Katherine Krasovec
Program for Appropriate Technology in Health

M. Driss Zine-Eddine El-Idrissi
Morocco Ministry of Health, Division of Planning and Studies

Erin Eckert
Macro International, Inc.

Ali Mehryar Karim
Tulane University, School of Public Health and Tropical Medicine

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The Role of User Charges and Structural Attributes of Quality On the Use of Maternal Health Services in Morocco

Abstract

This study examines the role of household out-of-pocket costs and structural attributes of quality on the use of maternity care in Morocco using empirical data collected from both households and health care facilities. The study uses a nested mixed multinomial logit model to estimate the effects of structural attributes of quality, price, distance, and individual characteristics of women on the utilization of skilled and unskilled delivery assistance. The availability of a special DHS supplement on household out-of-pocket health care expenditures, as well as individual-, household-, and facility-specific information, makes this the first study of the demand for maternity care based on DHS data. The Moroccan setting provides substantial variation in the types of assistance available to women, ranging from home delivery aided only by friends and relatives at one extreme, to modern private hospitals at the other end of the spectrum. The reduced-form model specifications contains price, travel time, and different combinations of structural attributes of quality, including the availability of medical equipment, drugs, and infrastructure, the numbers and types of practitioners in the facility, and the availability various types of maternity services, and the interaction of these variables with individual characteristics of Moroccan women. The coefficient estimates are used to carry out policy simulations of the impact of changes in the level of out-of-pocket fees on utilization patterns for maternity care in Morocco.

As of 1995, the majority of Moroccan women still gave birth at home, without the assistance of a skilled birth attendant (55.9 percent). Rural women were five times as likely as urban women to have home births without skilled assistance (78.7 percent vs. 18.8 percent). All forms of maternity care were more economically and geographically accessible to urban compared to rural women. The public sector was the most common source of facility based care (34 percent), as well as a more important source of care for urban (58 percent) than rural (19 percent) women. Rural women from richer households were considerably more likely than poor women to use public providers; while in urban areas, where there is better availability of private practitioners, wealthier women were slightly less likely to use public providers. Facility-based private health care providers assisted 16 percent of urban deliveries, but fewer than one percent of rural deliveries. On the whole, quality of care measures, such as the availability of drugs, equipment and infrastructure, were not substantially better in private facilities than in public facilities.

Our policy simulations showed that increases in out-of-pocket costs for public facilities would be expected to have very little impact on women living in better-off households, but would have a substantial and detrimental effect on the poor. Health reform strategies that involve increases in out-of-pocket payments in the form of co-payments could be implemented without untoward effects on appropriate use of maternity care for better-off women, but would be contra-indicated for poorer and rural households. Among wealthier households, the positive effect of quality improvements was greater than the dampening effect of user fee increases, even if out-of-pocket costs of using public facilities were to be doubled. However, among the poor, the net effect of any strategy that involved increases of more than ten percent in out-of-pocket costs would have a detrimental influence on utilization rates, regardless of quality improvements.

Our findings suggest that in Morocco, unlike countries with stronger traditions of skilled and mobile midwifery services, maternity continues to be a risky proposition, particularly for poor

and rural women. The Moroccan government's emphasis on expanding social health insurance to improve financial access to public sector maternity services for the poor and for rural populations is clearly an urgent priority.

The Role of User Charges and Structural Attributes of Quality On the Use of Maternal Health Services in Morocco

1. Introduction

There is a small but growing body of empirical information on the level of household payments for maternal health services in low- and middle-income countries as well as on how these costs influence use of these services. Studies from countries as diverse as Bangladesh, Pakistan, Nigeria, Indonesia and Bolivia provide some basic information on the level and distribution of the out-of-pocket costs of maternal health care to households. These studies show that household expenditures for maternity services are substantial, even in countries where these services are officially provided free of charge. Additionally, several of these studies reported that expected costs significantly influence household decisions to forgo maternity care altogether or to use specific services only. Costs were also found to directly affect patient satisfaction, perception of quality and the ability of households to pay for services (Nahar S *et al* 1998, Killingsworth J *et al.* 1999, Kadir M *et al.* 2000, Krasovec K *et al.* 1997, and Mothercare 2000).

To date, only two studies have used information collected from households and health care facilities, both from the Philippines, and have investigated how user fees influence the demand for maternal health care services after controlling for other determinants (Hotchkiss 1998, and Schwartz *et al.* 1988). The somewhat limited number of studies is surprising, as there is extensive amount of research that indicates that user fees have a significant role on the use of preventive and curative health care services, and that the magnitude of the effect of user fee increases is particularly large among the poor (Gertler and Hammer 1997).

The aim of this study is to investigate the role of expected costs and structural attributes of health care services on the use of skilled birth assistance in Morocco. Our primary purpose is to provide information to Moroccan decision-makers to assist in on-going health system reforms

and maternal health care efforts. The goal of on-going health reform policies in Morocco is to improve both financial sustainability and equity of service provision. The study is based on data collected from two sources: a 1995 Demographic and Health Survey (DHS) and a survey of the supply environment for reproductive health care services administered in conjunction with the DHS. The availability of a special supplement on out-of-pocket health care costs included in the household survey instrument provides a unique opportunity to use DHS data to estimate the demand for maternal health care services. The study utilizes a nested multinomial logit model to estimate the effects of facility-specific characteristics, consisting of expected costs, distance, and other structural attributes of quality, and individual-, and household-level characteristics on the type of delivery assistance utilized by women. The Morocco country setting provides substantial variation in the type of maternity care chosen, ranging from a home delivery aided only by friends and relatives at one extreme, to deliveries in modern private hospitals at the other end of the spectrum. Of particular interest in this study is the role that expected facility costs play on the utilization patterns among the poor. This is investigated by estimating separate price effects for the poor and better-off women. The results of the statistical model are used to carry out policy simulations of changes in user charges and structural attributes of service quality for both poorer and better-off women.

This paper is organized as follows. After this brief introductory section, Section 2 provides an overview of the magnitude of and underlying reasons for maternal and perinatal mortality in developing countries. It also includes a discussion of the importance of out-of-pocket charges and quality of services on the use of maternal health services. Section 3 describes the Moroccan context for the study, including information on the current supply environment for maternal health care services as well as on-going and planned efforts to reform the financing of the health care system, a key objective of which is to improve the delivery of maternity care services. Section 4 describes the statistical methods used, the data collected from households and

health care providers, and the dependent and independent variables used in the analysis. Section 5 presents the results of the model estimation and the policy simulations. Finally, Section 6 provides a summary of the findings and a discussion of the policy implications.

2. Background and Significance

Worldwide, more than 150 million women become pregnant each year and at least 585,000 of these women die from pregnancy-related causes. Nearly all (99 percent) of these deaths occur in low- and middle-income countries (WHO 1996). About 80 percent of maternal deaths are direct obstetric deaths, which result from complications during pregnancy, delivery or the early postpartum period (WHO 1997). Additionally, another 8 million perinatal deaths occur annually, primarily as a result of the same factors. The number of additional women who suffer from short or long term maternal illness related to pregnancy or childbirth is also high, accounting for 18.5 percent of the burden of disease in women of reproductive age (WHO 1996b). Forty percent or more of the pregnancies in low and middle income countries result in complications, illnesses, or permanent disability for women, and in approximately 15 percent of pregnant women, these complications are life threatening (WHO 1994).

Poor access to basic maternity care is a fundamental reason for the high rates of maternal and perinatal death and disability in low- and middle-income countries. Contributing factors include underlying poor maternal health and nutritional status, inadequate education, lack of income and employment opportunities and the low social and legal status of women (Starrs 1997, World Bank 1987). Increasing the utilization of contraceptive services to prevent unwanted or poorly timed pregnancies and addressing unsafe abortion, while important, are insufficient to resolve the problem of maternal mortality. Also necessary are efforts that reduce the risk of death and morbidity for those women who are or wish to become pregnant, such as programs that improve the availability and quality of antenatal and postnatal care and skilled deliveries, and

additional investments that strengthen the maternal health service supply environment. These program objectives, taken together, have been the emphasis of the Safe Motherhood Initiative, launched at a conference in Nairobi in 1987.

The primary barriers to the use of maternity services include: distance and lack of transport, cost, poor interactions with providers or low perceived quality of services, and gender dimensions or other social and cultural factors, such as multiple demands on women's time and lack of decision making power. Strategies employed to date in low and middle income countries to increase access to maternal health services include: improving the quality of services (i.e., increasing the number, availability and skills of providers; establishing or strengthening referral systems, infrastructure improvements; and establishing standards and quality control mechanisms), information, education and communications efforts to stimulate demand; legal and regulatory reforms (i.e., expanding the roles and responsibilities of paramedical and non-specialist medical providers; removing unnecessary legal barriers to care) and reducing the household costs of using maternity services (AbouZahr 1997).

In terms of this latter strategy-lowering household costs-efforts to date have ranged from reductions in user fees for maternity services to complete elimination of fees; development or restructuring of public and private insurance mechanisms; or development or reinforcement of community based insurance, prepayment schemes or other types of community cost-sharing mechanisms, particularly to offset the high cost of emergency obstetrical referrals and procedures (AbouZahr 1997). While these strategies reduce or eliminate costs to households, they clearly do not eliminate these costs – they simply make it so that these costs must be absorbed elsewhere. Thus, health care policy makers in settings with low levels of utilization of modern maternity services are faced with the additional challenge of balancing the sometimes competing goals of increasing utilization and coverage of maternity services (particularly among the poor) with that of ensuring the financial viability of the health system.

Morocco is a case in point where this policy dilemma is currently being played out. Financial resources for supply side efforts to increase access to maternity care in Morocco are limited. This is primarily due to the fact that the health sector overall has historically operated with inadequate resources. In 1997/98, only 4.5 percent of Morocco's gross domestic product (GDP) was devoted to health, much lower than other countries with a similar level of economic development. For example, total health spending amounts to 5.6 percent of GDP in Tunisia, 5.8 percent in Iran, 9.4 percent in Jordan, and 9.8 percent in Lebanon. More over, in the past two decades, the percent of the government budget allocated to the Ministry of Health (MOH) has actually decreased. For example, the MOH share of the budget dropped from 7 percent in the 1960s (1.7 percent of GDP) to 5 percent in the late 1990s (1.0 percent of GDP). Of further concern is that the proportion of health care expenditures supported by households in Morocco is relatively high (60 percent), and that donors and lenders that have traditionally provided significant resources to support maternity services have recently begun to decrease their levels of assistance (Partners for Health Reform 2001).

At the same time that resources are limited, Morocco is faced with a serious maternal health problem. The most recent estimate of the maternal mortality ratio for Morocco is 228 deaths per 100,000 live births in 1997 (SEIS/DPRF/MS 1998), compared to 170 Egypt and Tunisia and 160 in Algeria (WHO/UNICEF 1996). In rural areas of Morocco the situation is even more dire, with a maternal mortality ratio of 307, two and a half times as high as in urban areas. Part of the difference in mortality rates between these countries and between urban and rural areas in Morocco is likely due to lower levels of modern health care utilization by pregnant women. In 58 percent of pregnancies in the last 5 years in Morocco, the mother never used antenatal care. Only 42 percent of deliveries were assisted by a medically qualified person (SEIS/DPRF/MS 1998). A comparative study of Morocco and Tunisia found that although many of the usual predictors of maternal health care use were similar in both countries (parity,

education, urban/rural residence), Tunisian women were twice as likely to seek antenatal care and six times as likely to give birth in a hospital than were Moroccan woman (Obermeyer 1993).

The reasons for the low levels of maternal health care utilization in Morocco are less clear. Religion and culture play a role as the traditional Muslim society often limits a woman's access to finances and restricts her ability to make her own health care decisions. Levels of education for woman are particularly low in Morocco, which may further exacerbate the issue. The unique geography of the country, with its three high mountain ranges and dispersed population in rural areas, further limits a woman's ability to seek care, particularly in emergencies. An under-supply of facilities and providers and poor quality of obstetrical services in some maternity hospitals, particularly in rural areas, also play a role. However, beyond these obvious limitations, there remains a certain negative attitude towards medical facilities in general, and using those facilities for such a natural process as giving birth, in particular. A 1997 study that compared the effects of the supply environment against individual characteristics found that the individual characteristics of the woman (education, parity, socio-economic status) far outweighed the availability of services as a predictor of maternal care use (Eckert 1997). In other words, even in areas where services were readily available in public facilities, lack of education and economic wherewithal prevented women from using them. This finding emphasizes the importance of investigating cost and quality as determinants of maternal health care use.

3. Study Setting

The primary provider of maternity services in Morocco is the Ministry of Public Health. At the most decentralized level, services are provided through a system of 2,138 primary health care facilities (i.e., dispensaries, health centers and a few local hospitals). These services are equipped for basic preventive and curative maternal and child health services such as prenatal

care, family planning, immunizations, growth monitoring and promotion, and treatment of common illnesses. In addition, most rural health centers also have a mobile unit of some type that visits remote villages to provide family planning, immunizations, and other services. However, these facilities vary in terms of maternity care services. For example, there are two types of health centers in Morocco, those without a delivery ward (module d'accouchement) (747 rural and 568 urban in 1999) and those with birthing facilities (285 rural and 89 urban). Most of both types of health centers have at least one general physician (2,294 total for the country), some paramedical staff (10,081 in total) and between four and eight beds. However, nurse-midwives (or sage femmes—a relatively new cadre of health worker in Morocco with two years of professional midwifery training beyond nursing school) and nurses with some maternity training (infirmieres accoucheuses) are found almost exclusively in health centers with delivery wards. Local hospitals, the majority of which are located in urban areas (41 out of 56), provide all of the same services found at health centers with a delivery ward. In addition, they are equipped with a greater number of beds (25) and offer limited surgical, laboratory and radiology services (SCS/DDPRF/MS 2000). However, they do not have emergency services such as C-section capabilities. These emergency services are only available at secondary and tertiary hospitals.

Tertiary care is provided by a network of 95 provincial and regional hospitals, all of which provide obstetrical services. Additionally, there are 17 specialty hospitals, primarily for psychiatry and tuberculosis care. There are three levels of hospital care in Morocco. The first level consists of public health polyclinics (which are the first line of referral for primary health services) and provincial hospital centers. The next level includes regional hospital centers. The third and highest level consists of the major university hospital centers in Rabat and Casablanca, with two more planned for Marrakech and Fes. Nearly all of these facilities are located in major urban centers. All three levels are equipped to handle patients needing specialized care, including all emergency obstetrical services (SCS/SPRF/Ministère de la Santé 2001). Although the public

sector is responsible for the greatest proportion of health care services in Morocco, there exists a growing system of private doctors and clinics, both for-profit and not-for-profit, that caters to patients on a fee-for-service basis. Other than a small number of General Practitioners, private providers are located exclusively in urban areas where the population has the financial means to afford them. Large cities support a wide variety of specialists, including obstetricians and gynecologists. Private physicians—usually generalists—can be found in most mid-sized towns as well. The most recent figures (1999/2000) show 6,620 private physicians registered by the government, 384 (6 percent) of whom are obstetricians or gynecologists (SCS/DPRF/MS 2001). In addition, nearly 1,000 nurses or nurse midwives (sage femmes) practice in the private sector. Private clinics handle most of the same procedures as public facilities, including MCH and delivery services. These figures do not include unskilled birth attendants or women known as "qabla," who are probably the most common form of birth attendant in Morocco.

The government is advancing rapidly on both the design and implementation of reforms that affect the delivery and financing of maternal health services. In terms of health service delivery, the focus is currently on supply side improvements, such as construction, expansion and renovation of services (i.e. hospital maternities and primary health care services); provision of essential medical equipment; reinforcement of professional competencies in delivery care, obstetrical emergencies and management of quality; institution of routine maternity audits; improvements in the referral system for emergency evacuations; improvements in home delivery care; integration of reproductive health services; and widespread expansion of information, education and communication strategies (IEC) to reduce delays in seeking care once delivery complications arise. Government ministries, non-government organizations, donors and lenders are additionally involved in efforts to improve the policy environment and advocacy efforts to raise awareness on the part of decision-makers to the maternal mortality tragedy in Morocco.

In terms of health financing, the most important efforts currently revolve around strengthening health insurance, in one of two forms: 1) obligatory health insurance coverage (Assurance Maladie Obligatoire [AMO]), which will eventually cover all civil servants, those in the formal private sector covered by social security, self employed and non-salaried workers, and students; and 2) national medical assistance for the poor (Régime d'Assistance Médicale pour les Economiquement Faibles [RAMED in its current form]). Mandates for employer based health insurance are also included as part of these efforts. All of these efforts are premised on the principles of solidarity and equity. Priority preventive and curative services, prenatal and postnatal care and deliveries (both normal and complicated), laboratory tests and certain medicines are covered under these plans, either through reimbursement for services or products rendered or through direct payments to providers. The RAMED and the AMO both also cover inter-hospital evacuations for eligible patients. Persons eventually eligible for RAMED will be covered for a period of a minimum of 3-4 years (renewable if socio-economic status remains the same) and only for services received in the public sector. The reform of health financing is accompanied by related improvements within health services such as: improving the quality of services and management in public hospitals; expanding hospital autonomy for teaching hospitals or university hospitals in Casablanca and Rabat and semi-autonomy in (provincial/regional) hospitals; developing the Ministry of Health's capacity to negotiate and monitor insurance contracts; and determining provider payment methods (i.e., fee for service or by illness episode, capitation, general budgetary support, etc.).

While the design of these health insurance proposals have not been finalized, it's likely that cost sharing between the government, households, and employers will be a necessary feature of any health insurance plan. As such, one key to the success of these reforms is developing a thorough understanding of household health expenditures, use of services and determinants of service use so as to guard against the negative consequences which form a potential risk to any

insurance scheme (i.e., moral hazard, overuse of services, balancing the desire to adequately cover and provide good quality health services to the eligible population with the concern for financial sustainability). This study attempts to provide a greater understanding of the role of price and structural attributes of quality on demand for one of the priority services in Morocco maternity services.

Some of the questions to be addressed include: What types of maternity services are currently used, by whom and at what cost to households? How important are costs—relative to other factors—in influencing decisions to use maternal health services? Do the utilization and expenditure patterns of poor households differ from those of better-off households? To what extent does the public sector currently target services to women who lack the ability to pay? Which structural aspects of quality are most important to women in deciding whether or not to utilize modern services? In deciding to use public or private services, does this differ between poor and better-off households? And, for the future, how can health finance schemes be designed to encourage more effective use of these services? How will lowering or eliminating user fees for maternity services affect utilization rates for the poor compared to women who are better off? How much do these fees (or perhaps co-payments or contributions under insurance mechanisms) need to be reduced in order to avoid discouraging access? Or do they need to be eliminated entirely for certain groups? And if so, for whom? What improvements in structural aspects of quality will encourage more effective use of services? How can policies be designed so that households that have the ability to contribute to their own health care receive quality improvements they value in exchange for increases in user fees, co-payments or reimbursement levels? What is the likely impact of these policies on use of maternity services?

4. Study Design

4.1 Statistical Model

We use the following model to estimate the individual-, household-, and community-level characteristics of the determinants of women's use of birth assistance:

$$V_{ij} = \beta_1 + \beta_{2j}X_{ij} + \beta_3 Z_j + \beta_4 X_{ij} Z_j + \varepsilon_{ij} \qquad (1)$$

where the use of alternative *j* for woman *i* (V_{ij}) is assumed to be a function of the characteristics of the woman and the household (X_{ij}), characteristics of the alternative types birth assistance (Z_j), and a random component (ε_{ij}). The vector Z consists of three groups of characteristics that vary by the type of birth assistance alternative: expected cost, travel time, and structural attributes.

The types of alternatives available to women include a delivery at home with or without the assistance of a trained midwife, a delivery at a public health care facility, and a delivery at a private health care facility. A key assumption of the model is that each woman and her family face uncertainty about whether she will have a normal delivery, or experience a delivery with complications. Because of this uncertainty, we assume that the household considers in the decision-making process the likelihood that she will experience a complicated delivery and its respective costs. We included a dummy variable on whether the women has previously had a C-section or delivered prematurely, since we hypothesize that previous experience of one of these two complications would make a woman more likely to perceive a subsequent birth experience as potentially complicated. The specific procedure used for estimating the expected price of each birth assistance alternative is described later in this section.

Structural attributes of the birth delivery alternatives include: the material resources accessible by the person(s) assisting the delivery, such as the stock of drugs, water, electricity and medical equipment; the number, qualifications, and types of health care personnel; and other

facility attributes, such as medical staff organization, amenities, and methods of reimbursement. The inclusion of these factors in our model is based on the assumption that such structural attributes, along with the medical practices followed by the practitioner and the actual health outcome, are important categories of information from which inferences can be drawn about the quality of health care services (Donabedian 1988). However, we recognize that some attributes might influence service use, but not service quality (e.g., amenities).

The vector X consists of characteristics of individuals or households that do not vary by alternative, such as age, educational attainment and household wealth. In middle-income countries such as Morocco, these characteristics have been found to be important factors that are associated with health status. Notice that these characteristics enter the model as a vector of unconditional variables (Z) and as interactions with a vector of provider characteristics (XZ). For example, an interaction of expected cost and household wealth is included to test whether poor households are more responsive to price differences than higher-income households, and an interaction of structural attributes and education is included to test whether women with higher levels of education value certain structural attributes more than less-educated women.

A woman and her family choose among alternatives based on the well-being, or welfare, derived from each alternative. Utility maximization implies that woman *i* uses alternative *j* if and only if:

$$V_{ij} > V_{im} \text{ for all other } m \neq j \qquad (2)$$

The coefficient vectors β_3 and β_4, which do not vary by alternative, represent the weight of provider characteristics in the individual's decision-making process. The coefficient vector β_2, which varies by alternative, represents the impact of the vector of unconditional variables on the probability of choosing a given alternative relative to another designated alternative.

The error term ε_{ij} represents variables that affect health care utilization that are not captured by the data. This unobserved heterogeneity includes attributes that may be common among modern health care alternatives, and as such, may be correlated across alternatives. The specific statistical model used in the analysis is the nested logit model. The main advantage of the nested logit model is that it partially addresses the well-known Independence of Irrelevant Alternatives (IIA), which is a problem with the multinomial logit model. IIA means that the relative probability of choosing any two health care alternatives is unaffected by the addition or elimination of an option. This restriction could cause biased estimates of parameters if there is significant correlation between the error terms of birth assistance alternatives. The nested logit model partially addresses IIA in that it allows the error terms of one or more subsets of choices to be correlated. In the application presented here, the error terms are allowed to vary within two sets of alternatives: the set of birth assistance alternatives that take place in health care facilities and the set of birth assistance alternatives that take place at the home of either the woman or her friends or relatives. However, the correlations across these two sets of alternatives are restricted to equal zero.

4.2 Data Sources

The data used in this analysis come from two sources: the 1995 Morocco Demographic and Health Survey (DHS) and the 1995 Service Availability Module (SAM). Originally designed to follow women who were interviewed for the 1992 DHS-II, the 1995 DHS included a special supplement on health care utilization and expenditures. In the survey, 107 of the 212 clusters surveyed in the 1992 DHS-II were randomly chosen, and field workers were instructed to revisit the same households chosen for the 1992 survey and interview all women aged 12-46 years in 1992 who had been recorded in the household roster for that survey, along with all new female household members aged 15-40 years. When a household interviewed in 1992 moved within the

sample cluster prior to the 1995 survey, an attempt was made to locate the household. If a household had moved out of the sample cluster, the 1995 interview was conducted with the new household that resided in the same dwelling. No attempt was made to locate either individuals or entire households that had moved outside the sample cluster during the period between the 1992 and 1995 surveys. A total of 18,605 individuals, including 2,481 women of reproductive age, were included in the 1995 survey. Of this number, 1,607 women had at least one birth in the past five years.

The household-level survey includes questions pertaining to a wide array of economic, demographic, and health-related behaviors of woman of childbearing age. The topics covered by the DHS include marriage and maternal history, antenatal health care utilization, the type of place and practitioner for childbirth, demographic characteristics, housing, household assets, and educational attainment. The special supplement on health expenditures includes questions on the costs of childbirth and other types of health care services from women of reproductive age.

Information on the supply environment for maternal health care services was obtained from the SAM, which was implemented in conjunction with the household survey. For each sample cluster, information was gathered on the number and types of facilities offering health and family planning services located within 30 km. of each cluster. The nearest of each type of facility (hospital, public clinic, private clinic, and pharmacy) and the nearest three private doctors were visited and information on these facilities/providers and their service delivery operations obtained.

4.3 Variables Included in Multivariate Analysis

Dependent Variable:

The dependent variable is a discrete variable that captures the birth assistance settings available to sample women. The variable consists of the following four categories: a public

facility delivery, a private facility delivery, a home delivery assisted by a skilled attendant, and a home delivery assisted by a traditional birth attendant (TBA), a friend or a relative. It should be noted that, among public clients, women in the household survey reported the specific type of public facility utilized. Unfortunately, the classification of public facilities was somewhat different than the one used in the facility survey, and as a result, we aggregated public facilities into one group in order to facilitate the linking of each woman to information on facility attributes.

Independent facility-level variables on user fees, travel time, and structural attributes:

Three types of facility-specific characteristics were measured: user fees, distance, and structural attributes of quality.

Expected costs. Ideally, information on user fees necessary to use birth assistance should come from health care providers and not women who utilize maternal services. In this way, the level of expected cost is a characteristic to which the woman and her family responds, "not a variable whose value is partly or wholly determined by the behavior of the health care demander" (Akin *et al.* 1995). Unfortunately, the Morocco SAM did not collect information on user fees from representatives of health care facilities. However, information on the total out-of-pocket costs of the most recent birth was collected via the household survey.

In order to account for the uncertainty facing each woman about whether she will have a normal delivery, or a delivery in which she experiences complications, we used the following equation to calculate the alternative-specific indicators of expected cost, a proxy for user fees:

$$E(P_j) = (Prob_N)\, P_{Nj} + (1 - Prob_N)\, P_{Cjj} \qquad (3)$$

where $E(P_j)$ is the expected cost of a birth using alternative j, P_{Nj} is the expected costs of a normal delivery using alternative j, P_{Cj} is the cost of a complicated delivery using alternative j,

$Prob_N$ is the probability of having a normal delivery, and (1 - $Prob_N$) is the probability of having a complicated delivery. We carried out the following steps to estimate $E(P_j)$. First, communities were aggregated into four broad geographic areas based on the community's degree of urbanization. Second, for each aggregate area, alternative-specific average out-of-pocket costs of deliveries with and without complications were computed. These average costs serve as estimates of P_{Nj} and P_{Cj}. Third, the probability of experiencing a normal delivery was derived by calculating the proportion of women in the entire sample who report a vaginal delivery without birth complications. Fourth, $E(P_j)$ was then calculated for each woman in the sample using the formula shown above. It is important to note that $E(P_j)$ does not vary among women within the same community.

Distance. To proxy the time costs of traveling to receive birth assistance, we included as an independent variable the reported distance in kilometers from the center of the community to the closest of each type of birth assistance alternative. For home deliveries, a woman may deliver in her own home, or in the home of a friend, relative, or professional midwife. Unfortunately, the DHS did not include information on where the home delivery took place. For each of the two home delivery alternatives, we set the distance as "zero."

Structural Attributes. The SAM included questions on a variety of attributes of health care facilities that could potentially influence the quality of health care services and/or health care utilization. Like the measure of distance, information obtained from the closest public and private facility of each type was used to measure these attributes. To measure the availability of health care practitioners, two types of variables were created. First, a series of continuous variables measuring the numbers of physicians, nurses, and skilled midwives were created. Second, a series of dummy variables was created that measured whether one or more physicians, nurses, and skilled midwives were available at the closest facility of each type. Unfortunately, the SAM did not include questions on the type of medical training obtained by these types of

practitioners. To measure the availability of medical equipment and infrastructure, Cronbach's alpha index was used to measure the availability of the following items/attributes: an operation theater, electricity, water, and a telephone. The index computes the inter-item correlation for all pairs of attributes and Cronbach's α statistic for the scale formed by them (Cronbach 1951). In addition, a series of dummy variables were created to measure the availability of a hemoglobinometer, and each type of equipment and infrastructure listed above. To measure the availability of drugs, an index was created that measured the availability of steroids, tetanus toxoid, and penicillin. A series of dummy variables measuring the availability of each of these drugs was also created. To measure the availability of services other than obstetric care, an index was created of the number of the following services usually offered at the closest facility: family planning, prenatal care, postnatal care, and immunizations.

Independent household- and individual-level variable:

A number of individual- and household-level characteristics were included in the model, including age, educational attainment, and marital status. Age is measured by a series of dummy variables that indicate whether the woman belongs to one of the following age groups: 15-19 years (reference group), 20-24 years, 25-29 years, 30-39 years, and 40 years and older. To measure women's education, a dummy variable was created that indicates whether the woman had one or more years of formal schooling at the time of the survey. Women's education is included in the model because this variable has been shown to be among the most important determinant of the use of maternity services.

Two sets of variables were included to measure birth history. A set of dummy variables on the birth order of the most recent birth was included using the following categories: first birth (reference group), the second birth, the third birth, and the fourth or higher birth. In addition, a dummy variable on whether any of the previous live births was premature or was delivered via a cesarean section was created. It is hypothesized that women who have had premature births or

experienced cesarean sections are more likely to seek out a skilled attendant for their birth. Because these indicators of maternal history are likely to be endogenous and may result in bias to the parameter estimates, models were estimated both with and without these variables.

The household-level indicators included in the model measure household size, the number of adult females in the household, and household wealth. To measure household wealth, we constructed an index based on information on household assets and dwelling conditions. To construct the index, we included the following seven assets/conditions: the presence of electricity, a telephone, a refrigerator, a satellite dish, the presence of a good floor in the household (cement, wood, etc.), the presence of a well-constructed roof, and a car. Each household was assigned a '1' if they had an item and a '0' if they did not. Thus, the total score ranged from 0 to 7. This scale was centered with a '0' mean, and Cronbach's alpha for the scale was 0.84. This asset index was entered into the model as a main effect, and was also interacted with the measure of expected cost of a delivery in the following way. Households were grouped into two categories: households below the 50^{th} percentile were assigned to the low-income group, and those above the 50^{th} percentile were assigned to the higher-income group. Two dummy variables indicating whether the household's wealth ranked in the bottom or the top half of the sample were interacted with the alternative-specific cost variables to test whether poorer women are more responsive to price increases than better-off women.

5. Results

In this section, we present the results of the analysis. Section 5.1 provides descriptive information on the variables included in the multivariate model, Section 5.2 describes the results of the model estimation, and Section 5.3 presents a series of policy simulations that predict the impact of increases in public facility user fees and structural attributes that are likely to influence service quality.

5.1 Descriptive Results

Reproductive behavior, utilization of skilled birth assistance. Table 1 shows the prevalence of women 15-49 years of age at the time of the survey reporting a birth in the five years prior to the survey. Of the 2,736 women interviewed, 58.8 percent reported having a birth in the past five years. As expected, rural women were more likely to report a birth than were urban women (66.7 percent vs. 49.3 percent, respectively). Table 2 provides a percent distribution of sample women by the reported year of their most recent birth. Of the 1,609 women who reported a live birth, well over half (57.2 percent) reported giving birth in 1993, 1994, or 1995. It should be noted that the DHS survey was administered during the summer of 1995.

Table 1: Percent of women who report at least one birth in the previous five years, by current age and by urban/rural status.

		Urban/Rural Status	
Current Age	**Total**	**Urban**	**Rural**
Total	58.8	49.3	66.7
15-19 years	42.3	41.9	42.5
20-24 years	73.0	73.0	73.1
25-29 years	76.1	69.2	81.7
30-39 years	66.2	57.0	75.2
40-49 years	33.8	19.3	47.0
Number	2,736	1,242	1,494

Table 2: Percent distribution of women who gave birth in the previous five years, by year of most recent birth, and by urban/rural status.

		Urban/Rural Status	
Year of birth	**Total**	**Urban**	**Rural**
Total	100.0	100.0	100.0
1990	11.1	12.9	9.9
1991	12.6	14.2	11.5
1992	19.2	20.4	18.5
1993	22.8	21.1	23.8
1994	25.2	23.9	26.1
1995	9.2	7.5	10.2
Number	1,609	612	997

Table 3: Percent distribution of women by place of delivery and by urban/ rural status.

Place of Delivery	**Total**	**Urban**	**Rural**
Total	100.0	158.5	119.5
Away from home: public facility	34.3	58.5	19.5
Hospital	20.5	37.1	10.2
Maternity clinic	6.3	11.1	3.3
Maternity home	7.6	10.3	5.9
Away from home: private facility	6.5	15.8	0.8
Home: trained assistance	3.2	6.9	1.0
Home: traditional delivery	55.9	18.8	78.7
Number	1608	612	996

Table 3 shows a percent distribution of women by place of delivery and by urban/rural status. The public sector was the most common choice for a facility-based delivery among sample women (34.3 percent of all women). Most births assisted by public practitioners were delivered either in a hospital (20.5 percent), with a smaller percentage of deliveries taking place either in a maternity clinic (6.3 percent) or in a maternity home (7.6 percent). Government facilities were found to be a more important source of care in urban areas (58.5 percent) than in rural areas (19.5 percent). In rural areas, women residing in richer households were considerably more likely to use the assistance of a public provider than poorer women (43 vs. 17 percent). However, in urban areas, where there was better availability of private practitioners, wealthier women were less likely to use public providers (54 percent to 62 percent). Facility-based private health care providers assisted the delivery of 15.8 percent of urban deliveries, and less than one percent of rural deliveries.

As expected, most sample women reported that their births took place at home without the assistance of a skilled birth attendant (55.9 percent). Rural woman were found to be about five times as likely to give birth in this type of setting as urban woman (78.7 percent vs. 18.8 percent). A small proportion of women (3.2 percent) also reported delivering at home with skilled birth assistance. While the DHS did not include questions on whether the practitioner was public or private, the high level of reported out-of-pocket costs—discussed in the section below—suggests that private providers assisted most of these deliveries.

Alternative-specific characteristics. Table 4 shows descriptive statistics (means and standard deviations) for the three types of alternative-specific variables tested in the model: expected costs, distance, and the structural attributes of health care facilities. The unit of analysis for the statistics presented in Table 4 is the community.

Table 4: Descriptive characteristics: facility-level variables.

	Total		Urban		Rural	
Variable	**Mean**	**Stan. Dev.**	**Mean**	**Stan. Dev.**	**Mean**	**Stan. Dev.**
Cost						
Away from home: public facility	76.49	26.57	98.81	32.44	62.79	NA
Away from home: private facility	2,174.86	396.41	1,912.57	549.85	2,335.87	NA
Home: trained assistance	227.68	226.05	417.86	275.71	110.95	NA
Home: traditional delivery	27.75	27.58	49.57	35.10	14.36	NA
Distance (km.)						
Away from home: public facility	2.63	4.69	0.24	0.77	7.53	5.53
Away from home: private facility	31.68	36.56	17.29	29.69	61.24	31.43
Number of doctors						
Away from home: public facility	7.85	28.42	9.88	33.37	3.69	12.89
Away from home: private facility	9.40	12.08	11.51	13.58	5.06	6.41
Drug Index*						
Away from home: public facility	1.41	0.82	1.32	0.85	1.58	0.73
Away from home: private facility	0.37	0.57	0.38	0.59	0.36	0.54
Penicillin in stock (percent)						
Away from home: public facility	75.45	43.23	77.03	42.35	72.22	45.43
Away from home: private facility	97.27	16.36	97.30	16.33	97.22	16.67
Equipment/infrastructure index**						
Away from home: public facility	4.29	1.04	4.66	0.58	3.53	1.34
Away from home: private facility	4.82	0.39	4.82	0.38	4.81	0.40
Hemoglobinometer (percent)						
Away from home: public facility	14.55	35.42	14.86	35.82	13.89	35.07
Away from home: private facility	17.27	37.97	21.62	41.45	8.33	28.03
Number	110		74		36	

NA: not applicable as there is no variance of price within facilities in rural areas

* Index is based on the availability of two items: steroids and tetanus toxoid. The alpha coefficient 0.73, and the range 0-2.

**Index is based on the availability of five items: an operation theater, a delivery room, electricity, a telephone and water.

The alpha is 0.57, and the range is 0-5.

With respect to the estimated expected cost in Moroccan Dirhams (DH) necessary to use each of the four birth assistance alternatives, private facilities were found to be the most expensive option (DH 2,174.9), followed by home deliveries by skilled attendant (DH 227.7), public facilities (DH 76.5), and home deliveries by traditional midwives (DH 27.8). At the time of the survey, the exchange rate between the dollar and the Dirham was $1= DH 8.3. Unfortunately, the 1995 DHS did not include itemized questions on the various types of out-of-pocket costs for deliveries (e.g., consultations, delivery assistance, drugs, tests, and travel), nor on in-kind payments to providers. As expected, costs were found to be substantially higher in urban areas than in rural areas for each alternative with the exception of private facility deliveries, the average cost of which was based on reported out-of-pocket costs of 84 women in urban areas and only eight women in rural areas. Also as expected, there was found to be a substantial rural vs. urban difference in the distance to the closest public and private facilities, as the average distance to the closest public facility offering maternity services was reported to be 0.24 km. in urban areas and 7.53 in rural areas, and the average distance to the closest private facility was 17.3 in urban areas and 61.24 in rural areas.

With respect to the structural attributes of health care facilities, the results in Table 4 suggest that, on the whole, the availability of drugs, equipment and infrastructure was not substantially greater in private facilities than in public facilities. For example, private facilities were found to have more stocks of penicillin on hand, but fewer stocks of steroids and tetanus toxoid than public facilities. There were only minor differences between the two types of facilities in the availability of equipment and infrastructure, as measured by the Cronbach index, but private facilities were found to be more likely to have a hemoglobinometer on hand, particularly in rural areas.

Individual- and household-level characteristics. Table 5 provides descriptive statistics for the individual- and household-level characteristics thought to influence the use of birth

assistance. Of particular interest is the finding that only 10 percent of rural women were exposed to formal schooling, compared to 54 percent of women in urban areas. As expected, urban households were found to be wealthier than rural households, as measured by the indicators of household processions and infrastructure. With respect to maternal birth history, more than 80 percent of women reported having at least one prior birth, and four percent reported having a caesarian section or a complication during a prior birth.

5.2 Multivariate Results

We estimated many models that included expected delivery costs, distance, and different combinations of structural attributes of quality and their interaction with individual- and household characteristics. Table 6 provides the results of two models: model (1) excludes measures of parity and a history of birth complications and/or caesarian section—indicators that are likely to be endogenous—and model (2), which includes these indicators. The results of both models were obtained by estimating the full-information maximum likelihood nested logit procedure.

Test of the independence of irrelevant alternatives (IIA). As mentioned in Section 4, we used a nested logit model in order to reduce the problem of IIA that results from estimating a non-nested multinomial logit model. An example of IIA in this application is that the log odds of using public facilities vs. a traditional birth attendant in the home would not be affected by the presence of the other two types of childbirth settings. If there are attributes of childbirth alternatives that were not captured by our data set, this assumption may not hold. Ignoring this problem could possibly result in biased estimates of the impact of health reform initiatives that involve changes in user fees or the quality of health care services. In order to assess the appropriateness of the nested logit model, a Likelihood Ratio (LR) test was used. The LR test reported at the bottom of Table 6 is a test for the nesting (homoskedasticity) against the null

Table 5: Descriptive characteristics: individual- and household-level variables.

Variable	Total	Urban	Rural
Individual-Level Characteristics			
Age (percent)			
15-19 years (reference group)	2.9	2.1	3.4
20-24 years	16.2	14.5	17.2
25-29 years	22.0	23.5	21.1
30-39 years	43.0	48.4	39.6
40-49 years	16.0	11.4	18.8
Education			
Ever attended school (percent)	26.8	53.6	10.3
Marital status			
Two or more times (percent)	11.3	8.1	13.2
Parity (percent)			
First birth (reference group)	18.8	25.2	14.9
Second birth	17.7	23.5	14.0
Third birth	13.9	16.0	12.5
Fourth or higher birth	49.7	35.3	58.5
Had caesarian/premature birth (percent)	4.0	8.0	1.5
Household-Level Characteristics			
Household wealth index (alpha=0.84)	0.0	-0.4	0.6
Electricity	51.4	90.7	27.3
Telephone	66.2	93.6	49.4
Refrigerator	12.5	31.0	1.1
Parabole (satellite dish)	31.8	72.9	6.6
Good floor	7.3	18.1	0.6
Good roof	67.3	98.5	48.1
Automobile	51.4	86.6	29.8
Household size	8.5	7.1	9.4
Number of females age 15-49 in household	2.1	1.9	2.2
Number	1609	612	997

Table 6: Nested logit models predicting place of delivery

	Model 1			Model 2		
Independent Variables	**Coef.**		**S.E.**	**Coef.**		**S.E.**
	Predicting type of delivery chosen					
Alternative-level characteristics						
Average cost: Higher SES households	-0.00045	***	0.000	-0.00046	***	0.000
Average cost: Lower SES households	-0.02916	***	0.007	-0.02930	***	0.007
Distance to facility	-0.03275	***	0.006	-0.03246	***	0.006
Number of doctors	0.00513		0.004	0.00532		0.004
Penicillin in stock (binary variable)	0.30187		0.462	0.37701		0.467
Hemoglobinometer (binary variable)	0.33206	*	0.182	0.30993	*	0.190
	Predicting facility vs. home delivery					
Individual-level characteristics						
Age group (reference group = 15-19 years of age)						
20-24 years	0.25609		0.724	0.88472		0.630
25-29 years	0.08869		0.716	1.26668	**	0.641
30-39 years	-0.20221		0.720	1.27421	**	0.640
40-49 years	-0.09680		0.727	1.56273	**	0.641
Ever attended primary school	1.05267	***	0.175	0.92862	***	0.180
Married two or more times	-0.10786		0.211	-0.18168		0.217
Complications during delivery				1.13043	**	0.468
Parity (reference group = One birth)						
Two				-1.45439	***	0.262
Three				-1.65575	***	0.277
Four or more				-1.94348	***	0.295
Household-level characteristics						
Household size	-0.10056	***	0.026	-0.04068	*	0.025
No. females aged 15-45 years	0.20353	***	0.079	0.03468		0.084
Socio economic status: Highest 50 percent	1.10487	*	0.389	1.07917	***	0.367
Community-level characteristics						
Urban	0.66051	**	0.298	0.75586	***	0.290
Number	1586			1586		
Log likelihood	-1264.250			-1232.221		
LR test of homoskedasticity (iv = 1): chi-sq (2) =	27.31			25.32		
Prob > chi-sq	0.0000			0.0000		

***P<0.01, **P<0.05, *p<0.10

assumption of homoskedasticty). The Chi-Square statistics and associated p-values for each of the two models support the use of the nested logit model over the non-nested logit model.

Alternative-level parameter estimates. The results of the model estimation of the alternative-specific effects were largely as anticipated: First, increasing the expected cost of any given type of birth assistance would be expected to reduce the probability of using that alternative not only for poorer women, but for better-off women as well. We used the parameter estimates to calculate elasticities of demand with respect to an increase in the price of public facilities. (A key assumption of these calculations, and of the policy simulations presented in the next section, is that our average facility-specific cost measures are reasonable proxies of user fees.) The results, presented in Table 7, indicate that demand for public facility deliveries, and for trained deliveries using any type of facility, is inelastic for both the poorest and the richest 50 percent of sample women. However, for the demand for public facility deliveries, rural women were found to be slightly price elastic, an indication that user fee increases would lead to more than proportional reductions in the use of public facility deliveries. The magnitude of these effects, which were found to be highly statistically significant for both socio-economic groups,

Table 7: Arc elasticities of demand with respect to public facility price

Policy Change	Any Trained Assistance	Public Facility
Total	0.18	0.26
Poorest 50 percent	0.62	0.80
Richest 50 percent	0.00	0.00
Rural	0.68	1.01
Urban	0.00	0.00

will be further discussed later in the policy simulation section. Second, decreased physical accessibility to any given alternative, as measured by the distance in kilometers to the facility, decreased the likelihood of using that alternative. Third, the effects of the parameters of structural attributes of quality indicated that improving the readiness of facilities that offer birth assistance would be expected to raise utilization rates.

Three types of structural attributes of quality were tested in various specifications of the model: the availability of midwives, nurses and physicians; the availability of drugs; and the availability of equipment and infrastructure. The model presented in Table 6 includes three variables as proxies for these three types of structural attributes: the numbers of doctors, the availability of penicillin, and the availability of a hemoglobinometer. Each of these factors is positively associated with the demand for birth assistance, but only the latter effect was found to be statistically significant. However, we performed a chi-square test of the joint effect of all three factors. The results suggest that all three factors, when considered jointly, do have a statistically significant effect on using any given alternative (chi-square(3)= 6.91; prob > chi2 = 0.0749). We also estimated many models that included different combinations of facility attributes, including continuous indicators of the number of midwives and nurses, an index of all three types of health care workers, an index of drug availability, and dummy indicators of the availability of other types of health care services, but the parameter estimates were never statistically significant. We also tested interactions between the woman's reported exposure to formal schooling and two types of attributes: the availability of drugs and the availability of equipment and infrastructure. Again, the parameter estimates that emerged from these models were not found to be statistically significant.

Individual-, household-, and community-level parameter estimates. The parameter estimates for the remaining independent variables, also presented in Table 6, show the effect of each indicator on the log odds that the woman delivered in a health care facility vs. at home. Of

the individual-level variables, having been exposed to formal schooling has a highly significant and positive influence on the probability of delivering in a health care facility. With respect to the effects of birth history (Model 2), the results suggest that women who have experienced a complication or a caesarian section during a previous birth and women who are giving birth for the first time would be more likely to deliver in a health care facility vs. at home. Both effects are highly statistically significant.

It should be noted that while the alternative-level parameter estimates change very little with the inclusion of the birth history indicators, some of the individual-level parameter estimates change dramatically. Consider the difference in the age parameter estimates between Model (1) and Model (2). In Model (1), women 30 years of age and older would be less likely to deliver in health facilities relative to younger women, but in Model (2), which controls for birth history, these same women would be significantly more likely to deliver in facilities relative to younger women. This difference is likely due to correlation between age and birth history, and to the presence of unobserved factors that are correlated both with the demand for birth assistance and with birth history (i.e., biological factors, and factors affecting ideal family size).

Of the household-level variables, women who live in wealthier households were found to be significantly more likely than poorer women to deliver in a health facility vs. at home, and women in larger households were found to be significantly less likely to deliver in a facility relative vs. at home. The presence of other adult women in the household had a positive and statistically significant effect on the probability of delivering in a health facility, after controlling for household size and other factors.

The only community-level variable included in the model, other than the characteristics of the maternal health care supply environment, was a dummy indicator of urban/rural status. As expected, urban women were found to be significantly more likely than rural women to have delivered in a health care facility vs. at home.

5.3 Policy Simulations

Because the magnitude of the effects of increasing alternative-specific costs and structural attributes cannot be determined from the estimates of the nested logit model, policy simulations were conducted in order to aid in the interpretation of the results. The model results were used to simulate the effect of a number of different cost/quality policies for both poor and non-poor women. Table 8 provides estimated probabilities of selecting each of the four delivery alternatives for the total sample, the poorest 50 percent of households, the better-off 50 percent of households, urban households and rural households. The results of the simulated changes in user fee increases on utilization rates are interesting. As an example of how to read Table 8, consider the following. Suppose women were not charged any fees for using public facilities for maternal health care services. Table 7 show that the use of public facilities would be predicted to have increased from the baseline level of 34 percent to 47 percent, an increase of 38 percent, and that the total use of trained assistance for deliveries would be predicted to have increased from 50 percent to 62 percent, an increase of 24 percent.

While it is not surprising that women in poor households would be considerably more price-responsive than women in better-off households, the differences between these two groups was much larger than anticipated. For example, suppose women were charged fees in public facilities such that out of pocket costs were 50 percent higher than the median out-of-pocket public facility cost. Under this scenario, the use of public facilities among richer women would be predicted to have decreased by less than one percent—almost no change at all. However, for women in the poorest half of the sample, the use of public facilities would have decreased by 33 percent, and more importantly, the percent of women who were assisted by skilled providers would have decreased by 26 percent. While it is not possible to predict how many of those women who would have shifted from skilled birth attendants to unskilled attendants would have

Table 8: Policy Simulations of the Impact of Changes in User Charges and Facility Attributes

Policy Change	Traditonal Home	With Assistance of Trained Provider: Home	Public Facility	Private Facility	Total
Total Sample					
Baseline	0.498	0.094	0.343	0.066	0.502
A. User charge simulations for public facilities					
No cost	0.382	0.087	0.467	0.064	0.618
50 percent decrease in median cost	0.444	0.091	0.401	0.064	0.556
10 percent decrease in median cost	0.485	0.094	0.357	0.065	0.515
Median cost	0.493	0.094	0.348	0.065	0.507
10 percent increase in median cost	0.502	0.095	0.339	0.065	0.499
50 percent increase in median cost	0.529	0.096	0.310	0.065	0.471
100 percent increase in median cost	0.553	0.098	0.284	0.066	0.448
B. Equipment availability simulations for public facilities					
No public facilities have hemoglobinometer	0.500	0.095	0.337	0.067	0.500
All public facilities have hemoglobinometer	0.476	0.088	0.382	0.055	0.524
C.Drug availability simulations for public facilities					
No public facilities have penicillin in stock	0.513	0.100	0.312	0.075	0.487
All public facilities have penicillin in stock	0.493	0.093	0.352	0.063	0.507
D. Overall quality simulations for public facilities					
No public facilities have hemoglobinometer, penicillin in stock	0.516	0.101	0.307	0.077	0.484
All public facilities have hemoglobinometer, penicillin in stock	0.471	0.086	0.391	0.052	0.529
E. Combination of cost and quality changes					
10 percent cost increase, all facilites have hemo., penicillin	0.477	0.087	0.385	0.051	0.523
50 percent cost increase, all facilites have hemo., penicillin	0.508	0.089	0.351	0.052	0.492
100 percent cost increase, all facilities have hemo., penicillin	0.537	0.091	0.321	0.052	0.464

Table 8: Policy Simulations of the Impact of Changes in User Fees and Facility Attributes (Continued)

Policy Change	Traditonal Home	With Assistance of Trained Provider: Home	Public Facility	Private Facility	Total
Poorest 50 Percent of Sample					
Baseline	0.764	0.044	0.192	0.000	0.236
A. User charge simulations for public facilities					
No cost	0.555	0.033	0.413	0.000	0.445
50 percent decrease in median cost	0.668	0.039	0.293	0.000	0.332
10 percent decrease in median cost	0.741	0.043	0.216	0.000	0.259
Median cost	0.756	0.044	0.200	0.000	0.244
10 percent increase in median cost	0.771	0.045	0.184	0.000	0.229
50 percent increase in median cost	0.820	0.047	0.133	0.000	0.180
100 percent increase in median cost	0.863	0.050	0.088	0.000	0.138
B. Equipment availability simulations for public facilities					
No public facilities have hemoglobinometer	0.766	0.044	0.190	0.000	0.234
All public facilities have hemoglobinometer	0.737	0.043	0.221	0.000	0.264
C.Drug availability simulations for public facilities					
No public facilities have penicillin in stock	0.782	0.045	0.173	0.000	0.218
All public facilities have penicillin in stock	0.757	0.044	0.199	0.000	0.243
D. Overall quality simulations for public facilities					
No public facilities have hemoglobinometer, penicillin in stock	0.785	0.045	0.171	0.000	0.216
All public facilities have hemoglobinometer, penicillin in stock	0.729	0.042	0.229	0.000	0.271
E. Combination of cost and quality changes					
10 percent cost increase, all facilites have hemo., penicillin	0.740	0.043	0.217	0.000	0.260
50 percent cost increase, all facilites have hemo., penicillin	0.797	0.046	0.157	0.000	0.203
100 percent cost increase, all facilities have hemo., penicillin	0.847	0.049	0.104	0.000	0.153

Table 8: Policy Simulations of the Impact of Changes in User Fees and Facility Attributes (Continued)

Policy Change	Traditonal Home	With Assistance of Trained Provider: Home	Public Facility	Private Facility	Total
Richest 50 Percent of Sample					
Baseline	0.171	0.156	0.527	0.146	0.829
A. User charge simulations for public facilities					
No cost	0.169	0.154	0.535	0.142	0.831
50 percent decrease in median cost	0.170	0.155	0.532	0.143	0.830
10 percent decrease in median cost	0.170	0.156	0.530	0.144	0.830
Median cost	0.171	0.156	0.529	0.144	0.829
10 percent increase in median cost	0.171	0.156	0.529	0.145	0.829
50 percent increase in median cost	0.171	0.156	0.527	0.146	0.829
100 percent increase in median cost	0.172	0.157	0.524	0.147	0.828
B. Equipment availability simulations for public facilities					
No public facilities have hemoglobinometer	0.173	0.158	0.519	0.150	0.827
All public facilities have hemoglobinometer	0.157	0.143	0.579	0.122	0.843
C.Drug availability simulations for public facilities					
No public facilities have penicillin in stock	0.184	0.167	0.482	0.167	0.816
All public facilities have penicillin in stock	0.169	0.154	0.538	0.139	0.832
D. Overall quality simulations for public facilities					
No public facilities have hemoglobinometer, penicillin in stock	0.186	0.169	0.474	0.171	0.814
All public facilities have hemoglobinometer, penicillin in stock	0.154	0.141	0.590	0.115	0.846
E. Combination of cost and quality changes					
10 percent cost increase, all facilites have hemo., penicillin	0.154	0.141	0.591	0.114	0.846
50 percent cost increase, all facilites have hemo., penicillin	0.154	0.141	0.590	0.115	0.846
100 percent cost increase, all facilities have hemo., penicillin	0.155	0.142	0.587	0.116	0.845

Table 8: Policy Simulations of the Impact of Changes in User Fees and Facility Attributes (Continued)

		With Assistance of Trained Provider			
Policy Change	**Traditonal Home**	**Home**	**Public Facility**	**Private Facility**	**Total**
Rural Sample					
Baseline	0.706	0.091	0.198	0.006	0.294
A. User charge simulations for public facilities					
No cost	0.537	0.081	0.376	0.006	0.463
50 percent decrease in median cost	0.633	0.087	0.275	0.006	0.368
10 percent decrease in median cost	0.693	0.090	0.211	0.006	0.307
Median cost	0.706	0.091	0.198	0.006	0.295
10 percent increase in median cost	0.717	0.092	0.185	0.006	0.283
50 percent increase in median cost	0.756	0.094	0.144	0.006	0.244
100 percent increase in median cost	0.788	0.096	0.110	0.006	0.212
B. Equipment availability simulations for public facilities					
No public facilities have hemoglobinometer	0.708	0.092	0.194	0.006	0.292
All public facilities have hemoglobinometer	0.681	0.086	0.228	0.005	0.319
C.Drug availability simulations for public facilities					
No public facilities have penicillin in stock	0.723	0.095	0.176	0.006	0.277
All public facilities have penicillin in stock	0.7	0.09	0.204	0.005	0.299
D. Overall quality simulations for public facilities					
No public facilities have hemoglobinometer, penicillin in stock	0.725	0.095	0.173	0.007	0.275
All public facilities have hemoglobinometer, penicillin in stock	0.674	0.086	0.235	0.005	0.326
E. Combination of cost and quality changes					
10 percent cost increase, all facilites have hemo., penicillin	0.688	0.087	0.221	0.005	0.313
50 percent cost increase, all facilites have hemo., penicillin	0.734	0.089	0.172	0.005	0.266
100 percent cost increase, all facilities have hemo., penicillin	0.113	0.099	0.643	0.145	0.887

Table 8: Policy Simulations of the Impact of Changes in User Fees and Facility Attributes (Continued)

Policy Change	Traditonal Home	With Assistance of Trained Provider: Home	Public Facility	Private Facility	Total
Urban Sample					
Baseline	0.160	0.099	0.578	0.163	0.840
A. User charge simulations for public facilities					
No cost	0.129	0.098	0.615	0.158	0.871
50 percent decrease in median cost	0.139	0.098	0.604	0.159	0.861
10 percent decrease in median cost	0.147	0.099	0.594	0.161	0.854
Median cost	0.149	0.099	0.591	0.161	0.851
10 percent increase in median cost	0.151	0.099	0.589	0.161	0.849
50 percent increase in median cost	0.160	0.099	0.578	0.162	0.839
100 percent increase in median cost	0.171	0.100	0.565	0.164	0.829
B. Equipment availability simulations for public facilities					
No public facilities have hemoglobinometer	0.163	0.101	0.569	0.167	0.837
All public facilities have hemoglobinometer	0.145	0.089	0.631	0.135	0.855
C.Drug availability simulations for public facilities					
No public facilities have penicillin in stock	0.174	0.108	0.532	0.186	0.826
All public facilities have penicillin in stock	0.157	0.097	0.590	0.155	0.842
D. Overall quality simulations for public facilities					
No public facilities have hemoglobinometer, penicillin in stock	0.176	0.110	0.524	0.190	0.824
All public facilities have hemoglobinometer, penicillin in stock	0.142	0.087	0.643	0.128	0.858
E. Combination of cost and quality changes					
10 percent cost increase, all facilites have hemo., penicillin	0.134	0.087	0.652	0.127	0.866
50 percent cost increase, all facilites have hemo., penicillin	0.143	0.088	0.642	0.128	0.858
100 percent cost increase, all facilities have hemo., penicillin	0.154	0.088	0.629	0.129	0.846

experienced birth complications, those that do would be likely to have had an increased risk of dying. Similar differences in the price responsiveness between poorer and better-off women are evident from the other simulations of user fee increases shown in Table 7.

The policy simulations involving changes in the structural attributes of quality are also of interest. We carried out three sets of policy simulations based on changes in facility attributes without user fee increases. To save space, we discuss the results of last of these simulations—that of increasing the percent of public facilities with both a hemoglobinometer and a supply of penicillin in stock (Block D in Table 7). Suppose all public facilities have both a hemoglobinometer and a supply of penicillin in stock. The percent of women who would have delivered at public facilities would have increased from the baseline level of 34 percent to 39 percent, an increase of 14 percent. It should be pointed out, however, that this policy simulation is based on the estimated effects of having a hemoglobinometer and penicillin, only the latter of which was statistically significant. Among households in the poorer- and better-off-halves of the sample, the use of public facilities would be expected increase by 19 and 12 percent, respectively, over the baseline values.

Finally, we also carried out a number of simulations that combined increases in user fees with improvements in structural quality (Block E). Among women in the wealthiest half of the sample, the positive effect of quality improvements was greater than the dampening effect of user fee increases, even if out-of-pocket costs of using public facilities were to be doubled. However, among women in the poorest half of the sample, the results suggest that the net effect of any health sector reform strategy that involved increases of more than 10 percent in out-of-pocket costs would have a detrimental influence on utilization rates.

6. Discussion and Conclusion

The aim of this study is to investigate the role of expected costs and structural attributes of health care services on the use of skilled birth assistance in Morocco. Our primary purpose is to provide information to Moroccan decision-makers who are responsible for the design of on-going health reform policies. Of particular interest is the potential cost-sharing role that households might play in the design of proposed social health insurance plans. A key challenge in these efforts is to balance the desire to improve access to health care services vs. the need for the health system to be more financially sustainable.

As of 1995, the majority of Moroccan women (nearly 56 percent) still gave birth at home, without the assistance of a skilled birth attendant. Rural woman were five times as likely as urban women to have home births without skilled assistance (79 percent vs. 19 percent). Only a very small proportion of women (3 percent) reported delivering at home with skilled birth assistance. Together, these findings suggest that in Morocco, unlike countries with stronger traditions of skilled and mobile midwifery services, birthing services for women are far from adequate. The current situation poses particularly high risk for complicated pregnancies and deliveries.

For those women who had a facility-based delivery, the public sector was the most common source of care. Government facilities were a much more important source of care in urban areas (58 percent) than in rural areas (19 percent). Births assisted by a public provider took place most often in a hospital; although public providers also assisted in women's homes and in maternity clinics. In rural areas, women from richer households were considerably more likely to use public providers than poorer women (43 vs. 17 percent). However, in urban areas, where there is better availability of private practitioners, wealthier women were slightly less likely to use public providers. Facility-based private health care providers assisted 16 percent of urban deliveries, but fewer than one percent of rural deliveries. In addition, all forms of childbirth

assistance were considerably more geographically and economically accessible to urban women than rural women. With respect to the structural attributes of quality of care, our results suggest that, on the whole, the availability of drugs, equipment and infrastructure was not substantially greater in private facilities than in public facilities. These findings suggests that the government's current emphasis on expanding access to public sector health care in rural areas is, for maternity services at least, clearly an urgent priority.

However, several of our findings suggest that some positive changes in attitudes and practices around appropriate utilization of maternity services may already be occurring. Women who experienced a complication or a caesarian section during a previous birth and women who are giving birth for the first time were more likely to deliver in a health care facility than at home. Therefore, previous experience of complication does seem to make women more likely to seek care for a subsequent pregnancy. A new generation of young women and first time mothers may more likely than their mothers or grandmothers to use skilled attendants and facilities for childbirth. Educated women, as well as women from wealthier households, were significantly more likely than poorer women to deliver in a health facility than at home, suggesting that health facility deliveries are a more desirable alternative than home births for those who can afford them. Although women in larger households were found to be significantly less likely to deliver in a facility than at home, an interesting finding was that presence of other adult women in the household had a positive and statistically significant effect on the probability of delivering in a health facility, after controlling for household size and other factors. There are a number of possible explanations for this finding. Other adult females may be a source of information regarding the benefits of delivering in a health care facility. They may also play a useful role in accompanying the pregnant women to the facility or in providing care to the pregnant woman's family while she is at the facility.

Potential supply side solutions to increasing utilization to maternity services include: decreasing user fees so as to make care more affordable; increasing physical access by constructing new facilities and/or increasing staffing levels in more remote areas; and improving the quality of care so that women are more likely to value, and thus use, available services. Our model estimation results showed that the influence of expected cost had a significant and negative effect both for poorer and better off households. Not surprisingly, decreased physical accessibility to a health facility decreased the likelihood of using that alternative. The estimates of the parameters of structural attributes of quality indicated that improving the readiness of facilities that offer birth assistance would be expected to raise utilization rates.

Three types of structural attributes of quality were tested: the availability of midwives, nurses and physicians; the availability of drugs; and the availability of equipment and infrastructure. Each of these factors was found to be positively associated with the demand for birth assistance, but only the availability of equipment and infrastructure was found to be statistically significant. The joint effect of all three factors taken together, however, did have a statistically significant effect on the demand for trained delivery assistance. Thus, improvements in the structural quality of care are likely to improve utilization of maternity care in Morocco.

The results of our policy simulations of increases in user fees show that women in poor households are considerably more price-responsive than women in better-off households, and to a much greater extent than anticipated. Increases in out-of-pocket costs necessary to use public facilities would be expected to have very little impact on women living in better-off households, but would have a substantial and detrimental effect on women who reside in poorer households. Health insurance strategies that involve increases in out-of-pocket payments in the form of co-payments would be possible and unlikely to lead to untoward effects on appropriate use of delivery care for better off women, but would be contra-indicated for poorer and rural households.

Utilization of public facilities for births would be much less affected by improvements in the structural indicators of quality of care than by changes in user fees. As with user fee changes, the wealthier would be more likely to alter their utilization in a positive fashion in response to quality improvements than the poor. Taken together, attempts to offset user fee increases by increasing quality would not adversely affect utilization by the wealthier, but could seriously harm the poorest. Among women in the wealthiest half of the sample, the positive effect of quality improvements was greater than the dampening effect of user fee increases, even if out-of-pocket costs of using public facilities were to be doubled. However, among women in the poorest half of the sample, the results suggest that the net effect of any health sector reform strategy that involved increases of more than 10 percent in out-of-pocket costs would have a detrimental influence on already low utilization rates.

Although insurance coverage does not figure into the analysis, our results have a number of implications on the design of social health insurance programs currently under discussion in Morocco. The main implication is that the government has some options in how social insurance is designed. With respect to the AMO program, which is intended to cover formal sector workers and students, incorporating provisions that increase the out-of-pocket costs incurred by households would not greatly deter women's use of skilled delivery assistance. This is encouraging. Assuming that these co-payments are retained by public facilities and that the costs of collecting co-payments are not excessive, co-payments could potentially be an important source of additional resources to the public health care system. With respect to maternal health care services, they could be used to improve the supply of medical goods and equipment, and the availability of emergency transportation, and emergency obstetrical care services—all essential components of safe motherhood strategies. If the cost sharing component of the health insurance program leads to improvements in service quality, our results suggest that the net proportion of

women who use skilled delivery assistance will actually increase, thereby reducing the risk of maternal mortality, especially in rural areas.

However, the results of this study also provide a note of caution to those decision makers responsible for programs that are designed to reach the poor. That women living in the poorest fifty percent of households were found to be much more price responsive then better off women suggests that policies that do not protect the poor from cost recovery measures are likely to be detrimental. On the other side of the coin, given that the poor are currently paying substantial amounts for health care services (Hotchkiss and Gordillo 1999), the finding that the poor are more price responsive can be viewed as encouraging, as it provides decision makers with a policy instrument that can be tapped to raise utilization rates. By increasing subsidies to the poor for the use of skilled delivery assistance, our results suggest that a much greater proportion of women would use facility-based delivery services. The most obvious mechanism to do this is through RAMED, the health insurance program that has been proposed to protect the poor. The RAMED proposal currently being considered calls for a basic package of services, including prenatal care and delivery services, to be provided by the public sector, and the eligibility of the poor being re-certified using objective eligibility criteria every three to four years. If program participation rates are high, the results of this study suggest that the RAMED program could potentially have a great impact, particularly for low-income women living in rural areas. By reducing the household out-of-pocket costs of delivering in public facilities, RAMED could significantly improve the maternal mortality situation in Morocco because program participants would be more likely to use facility-based practitioners for their deliveries.

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