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Quality and Cost in Health Care Choice in Developing Countries

Victor Lavy
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No. 62 Kakwani, *Testing for Significance of Poverty Differences: With Application to Côte d'Ivoire*

No. 63 Kakwani, *Poverty and Economic Growth: With Application to Côte d'Ivoire*

No. 64 Moock, Musgrove, and Stelcner, *Education and Earnings in Peru's Informal Nonfarm Family Enterprises*

No. 65 Alderman and Kozel, *Formal and Informal Sector Wage Determination in Urban Low-Income Neighborhoods in Pakistan*

No. 66 Vijverberg and van der Gaag, *Testing for Labor Market Duality: The Private Wage Sector in Côte d'Ivoire*

No. 67 King, *Does Education Pay in the Labor Market? The Labor Force Participation, Occupation, and Earnings of Peruvian Women*

(List continues on the inside back cover)

Quality and Cost in Health Care Choice in Developing Countries

The Living Standards Measurement Study

The Living Standards Measurement Study (LSMS) was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by statistical offices in developing countries. Its goal is to foster increased use of household data as a basis for policy decisionmaking. Specifically, the LSMS is working to develop new methods to monitor progress in raising levels of living, to identify the consequences for households of past and proposed government policies, and to improve communications between survey statisticians, analysts, and policymakers.

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Contents

Foreword vii
Abstract ix
Acknowledgments xi

Introduction 1

Quality and Health Care Choice: Overview of Model 3

Empirical Specification 5
The Health Production Function 5
The Conditional Utility Function 6
Demand Functions and the Distribution of Stochastic Variables 7

The Demand for Medical Care in Ghana 9

Ghanaian Health Care 9
The Data 10
Definition of the Variables Used in the Estimation 11
Price variables 12
Demographic and economic variables 12

Estimation Results 15

Probability of Using Health Care Under Various Policy Assumptions 18

Improvement in Quality of Care 18
Improving Access to Public and/or Private Health Care 20
Raising Price to Improve Quality 23
An Increase in Family Human Capital 23

Willingness to Pay 24

Conclusions 29

References 31

Appendix Table: Comparative Characteristics of the Full Ghana 1988 LSMS Sample and the Sample Used by Lavy and Germain (1993) 35

Tables

Table 1: Descriptive Statistics 13

Table 2: Maximum Likelihood Nested Multinomial Estimates of Choice of Health Care 16

Table 3A: Improved Public Health Care, Predicted Probabilities and Percent Change in Health Care Use 19

Table 3B: Improved Access to Health Care and Predicted Probabilities and Percent Change in Health Care Use 21

Table 3C: Increasing the Cost of Health Care and Predicted Probabilities and Percent Change in Health Care Use 22

Table 4: Willingness to Pay for Improvement of Health Services 25

Table 5: Wiilingness to Pay for Improvement of Health Services 27

Foreword

The effect of quality of health care on demand and choice of treatment is of major interest to concerned policy makers in many developing countries. The lesson to date from experiences in cost recovery is that without visible and fairly immediate improvements in the quality of care provided, increased demand will not support the implementation of user fees. This study contributes to our understanding of the effect of quality improvement on demand, and explores the implications for the use of user fees in the public health sector.

This paper is part of broader research effort in the Policy Research Department (PRD) that examines the effect of the quality of social services on human capital investment outcomes. This work is located in the Poverty and Human Resources Division. The data used are from the Ghana Living Standards Survey, which is one of the Living Standards Measurement Study (LSMS) household surveys which the World Bank has implemented in many developing countries.

Lyn Squire
Director
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Abstract

The definition of health care quality and the impact of improved quality on the demand for health care have not been the subject of rigorous econometric studies. This study models theoretically and empirically the quality of health care in household decision making with respect to demand for health care and presents empirical evidence concerning the impact of various policy options on these decisions. Besides modeling quality explicitly, our model relaxes some of the restrictive assumptions that were common in recent studies of the demand for health care.

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Introduction

The effect of quality of health care on demand and choice of treatment is of major interest to concerned policy makers in many developing countries. The lesson to date from experiences in cost recovery is that without visible and fairly immediate improvements in the quality of care provided, increase demand will not support the implementation of user fees.[1] However most of the studies that examined the impact of user fees on demand are of limited use in understanding the effect of quality improvement on demand, since they did not control effectively for variation in quality of care. Not controlling for quality limit actually even the interpretation of the coefficients on prices as price effects: higher priced options, such as treatment in the private sector, are likely to provide higher quality health care. If quality is not controlled for, the effect of cost on choice will be a combination of negative price effects and positive quality effects

An important focus of the present paper is the simultaneous influence of price and quality on decision making.[2] A unique feature of the present paper is that it controls for the quality of health care when simulating the effect of cost (travel costs and user fees) on the choice between health care options. The definition of health care and the impact of user fees on the use of health care facilities have been the subject of numerous recent econometric studies (Denton *et al.*, 1990; Alderman and Gertler, 1989, Gertler and Van der Gaag, 1990; and Lavy and Quigley, 1991). However, all these studies treat quality of care as an unobservable and discuss the importance of quality-adjusted measures of price effects by designating different options of health care as different levels of quality of care (for example, visiting a doctor versus a nurse, or being treated in a health clinic versus a hospital) without measuring quality directly. The assumption was that a doctor provides higher quality care than a nurse and that a hospital provides better treatment than a clinic. This approach, however, does not allow measuring the sensitivity of consumer demand to various quality characteristics of services, and therefore is not useful in addressing the main relevant policy issue, namely identifying which quality improvements can "pay for themselves" with increased user fees.

Our study, which aims at answering this question, departs from the above literature by directly measuring the quality of the various options available to the consumer.[3] The

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1. The problem of low utilization of modern health care facilities and poor health status in many developing countries was recently aggravated by budget constraints faced by many governments in developing countries. The cut in resources available to the social sectors adds a dimension of urgency to the problem. Cost recovery, a mechanism whereby patients pay part or all of the cost of care in a public facility, is being considered as a means to generate additional resources for the public health sector (see Jimenez 1987).

2. There has been extensive research on the influence of household characteristics on choice of health care. Some studies include cost in the form of the value or opportunity cost of travel time (Akin, Griffin and Popkin, 1986; Gertler and van der Gaag, 1990).

3. Two other recent studies that looked at this issue are Mwabu, Ainsworth and Nyamete (1993) and Akin and Guilkey (May 1993). The first of these two studies have used a very small sample of sick people (251) and facilities (15) from a single district in Kenya. There data on quality was very minimal and their results with regard to quality

objective is to empirically model the quality of health care in household decision making with respect to demand for health care, and to gather and present empirical evidence on the impact of various policy options on these decisions. In order to do so, we first develop and evaluate a model of the underlying preference structure for health care. We then examine how decisions might be affected by changing three factors that affect the choice of each option: access to health care (distance to the nearest health facility), the price of health care, and its quality (all are variable in the short run). We also examine an option for the longer run, that of increasing the level of schooling of heads of households. The decision to choose between forms of health care involves evaluating the cost and quality of care in each of the modes available, given household resources and preferences. Utilizing our estimated model, we simulate the impact on health care choices and demand of improving various dimensions of quality (drugs and services availability, qualified personnel, and adequate equipment), improving accessibility (reducing distance) and increasing or decreasing user fees in the public sector. We also calculate the amount families are willing to pay for improvements in accessibility and quality of public health services, where a household's willingness to pay is measured as a compensating variation. The discrete choice model we specify and estimate allows willingness to pay to vary with income. As a result we are able to consider the distributional effects of improving access and quality in the health care system.

Besides modeling quality of care explicitly in the theoretical and empirical framework, our model extend in two other important aspects the theoretical and empirical framework used previously to study the demand for health care. First, we depart from the convention of specifying the conditional utility function as linear in health and quadratic in consumption in order to allow for differential price effect by income. This specification was criticized to be restrictive in many ways and we instead use a more general function that is still consistent with stable utility maximization. Second, the cost of time involved in medical consultation, both travel and queuing in line for treatment, which have been included in past studies in the cost of consultation, are treated in our model as facility specific fixed effects, and are parameterized in the health production technology.

The data used in this study are drawn from the second round (carried out in 1988/89) of the Ghana Living Standard Survey, a household survey conducted by the government of Ghana in collaboration with the Living Standards Unit of the World Bank (see Ainsworth and Munoz, 1986, for a description of the survey methodology). In 1989, a very detailed health facility survey was specially conducted (immediately following the completion of the household survey) in exactly the same communities as those covered by the household survey. We match these facility-level data with the household and individual information to create a very rich multi-level database for our empirical analysis of the impact of quality of health services on health care choice.

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were not statistically significant and very sensitive to specification. The second study have used a richer data set from Nigeria.

Quality and Health Care Choice: Overview of Model

The initial structure of our framework resembles the model used in previous studies of the demand for health care, but the details of the model developed below depart from it in some important aspects. Individuals who take ill must first decide whether or not to seek medical care.[4] Conditioned on this decision, individuals also have to choose the preferred type of medical care. The cost of medical care is a reduction in the consumption of other goods. Decisions are based on maximizing utility which is a function of the individual's health and the consumption of other goods. Individuals have to choose between a finite number of alternatives, including self-treatment and treatment by various care providers. Each provider offers an expected improvement in health for a certain price. Therefore, in a sense, there exists a household health production function, conditional on the quality of the provider and on the characteristics of the household, with health expenditures as inputs.

We define the quality of provider j as the improvement of health status offered at a cost of X_H. This price includes the cost of travel to the health facility, the opportunity cost of travel time and consultation time and the consultation fee.[5] The type of care and provider chosen implies the health technology and quality of care, which in turn determines the full cost of treatment. The improvement in health status therefore depends on the provider chosen. For example, households can expect better treatment in a facility with a modern infrastructure where they will be attended by doctors and nurses and where needed drugs will be available. The expected improvement in health status also depends on the ability of the household to implement the recommended treatment (Gertler and Van der Gaag, 1990). For example, the expected improvement in health from professional care relative to self-care may increase with education, since an individual with better education may be better equipped to implement a recommended treatment.

Formally, the health production function is written as:

$$H_j = H\left(X_H; \psi_j^n, \xi^n\right), \tag{1}$$

where X_H are expenditures on health services, ψ_j^n represents the characteristics of provider j as observed by household n and ξ^n denotes some of household n's is characteristics. From now on, we will drop the superscript n for simplicity. Expected utility conditional on receiving care from provider j is written as:

$$U_j^n(X_H, X_C) = U\left(H(X_H; \psi_j^n, \xi^n), C\right), \tag{2}$$

---

4. We focus on the economic determinants of the choice of the type of medical care when the sample is constraint to individuals who are ill. We do not discuss the determinants of illness itself because of lack in the data (both individual and facility characteristics) set of information on factors that affect morbidity but not the selection of health care provider.

5. The cost of medicine, however, is excluded from the decision process since the demand for medicine is an ex-post decision and individuals do not know ex-ante the type and cost of medicines that they will need and therefore cannot estimate their cost.

where C is the aggregate consumption good and X_C are the expenditures associated with that consumption. We replace consumption C by total consumption expenditures X_C since we are not interested in consumption price effects.

The conditional maximization of the consumer is:

$$\begin{gathered} Max\, U_j(X_H, X_C)\ , \\ X_H + X_C \leq Y \end{gathered} \tag{3}$$

where Y is household income. Letting U_j denote the maximum of (3), and using the convention that j=0 denotes self-treatment, the maximum utility reached using provider j is:

$$U_j = U(Y;\psi_j,\xi)\ . \tag{4}$$

The unconditional maximization of the household is

$$Max\{U_j \,/\, j = 0 \ to\ j\}\ , \tag{5}$$

where j is the number of alternatives available to the household. The solution of the optimization problem yields the provider who maximizes the utility function and the ex-ante amount of resources to be spent on health. This level of expenditures can be written as:

$$X_H = X(Y;\psi_{j^*},\xi) \tag{6}$$

where j^* denotes the provider which maximizes (5).

An important issue here is whether households have discretion over the total resources spent on treatment by a given provider. For example, can an individual choose the type of treatment, medicine (brand and quantity) or number of consultations? If so, then it may be useful to specify a choice model which takes into account both the choice of health provider and health expenditures in a composite discrete-continuous choice model as in King (1980).[6] However, in order to estimate a discrete-continuous choice model, we would require data on expected health expenditures which are not available to us. We could use the ex-post expenditures as a measure of expectations, assuming that they are equal to the ex-ante expenditures. Such an assumption may be appropriate in the case of housing (King, 1980) or education (Gertler and Glewwe, 1990), but in the case of health care this assumption is irrelevant since the information set often changes dramatically when the care provider reveals the type of illness and the recommended treatment, following which the individual may have to modify his choices. Therefore, even if a household behaves ex-ante and ex-post as if they can choose the level of expenditures, we cannot take advantage of this fact in a composite model. The analysis must therefore be divided into two parts: a discrete-choice model for the choice of provider (ex-ante) and an ex-post analysis of expenditures conditioned on choice of provider. In this paper we focus on the discrete choice model.

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6. King (1980) modeled and estimated the choice of type of housing and the level of expenditure on housing in a simultaneous framework.

Empirical Specification

In order to translate this theoretical framework into an empirical model, we specify functional forms for the conditional utility function, the health production function and the distributions of the stochastic variables. We then derive the probability of choosing a given alternative which is equal to the probability that the utility of this choice is the highest among all alternatives. These probabilities will provide the likelihood function which is then used to estimate the utility function through a maximum likelihood estimation procedure.

The Health Production Function

We assume that consumers, given resource level X_H, expect to improve their health status as follows:

$$H\left(X_H;\psi_j^n,\xi^n\right) = Q_j^n x\left(X_h + m_j^n\right) , \tag{7}$$

where Q_j^n is the quality factor of provider j expected by household n (equal to the marginal product of health expenditures) and where m_j^n is the "fixed cost" of being treated by provider j. It includes the cost of travel and the opportunity cost of time, both of which have a negative effect on m_j^n. However, it could also include elements with a positive effect on m_j^n, such as the free provision of health care to government employees in public clinics or hospitals, which would affect the choice of health provider for these consumers.

We can compute the "exact" cost of transportation using the price of transportation and the distance to the facility; likewise, a proxy for the opportunity cost of time can be derived from hourly wages and the time spent in consultation with a doctor (as in Gertler and Van der Gaag, 1990). However, this approach may yield a cost variable measured with error since the opportunity cost of time is not always nonzero. For example, illness may impair the ability of an individual to work and thus reduce his alternative or opportunity cost of time, perhaps even to zero. Moreover, we are not interested in the actual cost of transportation (the ex-post price) but rather in the price as evaluated by the decision maker. These two prices are different as a result of different sets of information. Therefore, instead of calculating these costs, we specify them as parameters in equation (7) and estimate them. Formally, we write the expected fixed cost as:

$$m_j^n = \gamma'\pi_j^n \tag{8}$$

where π_j^n is a vector of fixed cost characteristics (including a constant term as explained above) and γ is the vector of the expected "prices" of these factors, which is to be estimated.

The quality factor depends on the characteristics of the provider and those of the household. We assume that:

$$Q_j^n = \exp\left(\alpha'\psi_j^n + \beta'_j\xi_n\right) , \tag{9}$$

where α and β are vectors of parameters. Note that this functional form leads to a quality factor which is always positive.

The Conditional Utility Function

We assume that the utility function is Cobb-Douglas:

$$U_j(X_H, X_C) = \left(Q_j^{\pi} x (X_H + m_j^{\pi})\right)^{\alpha} X_C^{1-\alpha} \ . \tag{10}$$

The maximization of (5) subject to the budget constraint $X_H + X_C \leq Y$ gives us $\log U_j = \alpha \log Q_j + \log(Y+m_j)$. Assuming that m_j is lower than Y, we can replace the second element of the right-hand side of the equation by its first-order approximation to obtain the following linear form:

$$\log(Y + m_j) = \log(Y) + \log(1 + m_j/Y) \# \log(Y) + m_j/Y \ . \tag{11}$$

With Q_j determined by (9), we finally derive the following:

$$U_j = \alpha\delta'\psi_j + \alpha\beta'_j\xi + \gamma'\frac{\pi_j}{Y} + \log(Y) \ . \tag{12}$$

In this last equation, we have replaced $\log U_j$ by U_j. We see from this equation that the parameters are unidentified. However, it provides us with the form of U_j to be estimated. We will later replace the products $\alpha\delta$ and $\alpha\beta$ by δ and β, respectively.

In fact, the right-hand side of equation (12) is only an approximation of the utility function. This is due to two distinct factors: an error in the utility function (including the first-order approximation error introduced above) and an error in the quality factor. Therefore, we introduce two random terms:

$$U_j = V_j + \varepsilon_j + \eta_j \tag{13}$$

where V_j is equal to the right-hand side of equation (12). The term ε_j is a zero-mean random taste disturbance with finite variance. It is uncorrelated across individuals and alternatives. The term η_j is also a zero-mean random term with finite variance, uncorrelated with ε_j. η_j arises from the fact that we cannot completely explain the quality factor. For example, we do not control for the expected severity of illness. If the illness is expected to be severe, the individual has a strong incentive to seek professional care (whoever the provider), rather than to choose self-treatment. This demonstrates how the η_j terms might be correlated across alternatives. For self-treatment, the expression for utility reduces to $U_0 = \beta_0 + \gamma_0/Y + \log(Y) + \varepsilon_0$ since by normalization, the household attributes no quality to self-treatment (all the coefficients are zero as is the random term η_0) and there are no fixed costs involved in seeking medical care.

The individual chooses the alternative with the highest utility. If a variable is constant between alternatives, it will not influence his choice. Taking the difference between the utility functions of any two alternatives reveals the factors that influence the choice of health care:

$$U_j - U_i = \delta'(\psi_j - \psi_i) + (\beta'_j - \beta'_i)\xi + \gamma'\frac{\pi_j - \pi_i}{Y} + \varepsilon_j - \varepsilon_i + \eta_j - \eta_i \,. \tag{14}$$

Consequently, we can assume that all the coefficients of the provider-specific variables are equal, i.e. we do not need provider-specific parameters γ. If the coefficients of the demographic variables are to be identified, they cannot be constrained to be equal across providers; therefore, we will allow them to vary across alternatives, i.e. β will depend on j. By the same token, the price factor coefficients which do not affect provider-specific parameters must be provider-specific in order to be identified. Therefore, some of the γ, such as the constant term, will be provider-specific.

The form in which income enters the utility function is important. If we had assumed an indirect utility function which is linear with respect to income, the income terms would have canceled out in (14), implying that income has no effect on the choice of provider. This is inconsistent with the idea that health is a normal good. To avoid this drawback, some authors have allowed the parameters to vary across alternatives, as we have done for the individual characteristics. However, this is inconsistent with the hypothesis of the maximization of a stable utility function such as (10). An alternative is to introduce the square of income in the utility function, as in Gertler-Van der Gaag (1990).

We see from the above calculation that the Cobb-Douglas specification of the utility function leads to an indirect utility function in which income does influence the choice of facility. A more general parameterization would have been to start from a second-order translog indirect utility function (which includes a log squared term in (12)), as suggested in Gertler, Locay and Sanderson (1987). The advantage of this function lies in not imposing second-order restrictions on the marginal rate of substitution as we have done implicitly by choosing a Cobb-Douglas utility function. However, rather than introducing a second-order term, we chose to let the data determine the price effect as explained above. Although neither are incompatible, our data did not allow us to estimate a first and second-order income term and price coefficients simultaneously.

Demand Functions and the Distribution of Stochastic Variables

The demand function for a provider is the probability that the utility from that alternative will be higher than that of any other. In our case, since the random terms may be correlated, we use a nested multinomial logit (NMLG) model rather than the simple multinomial logit. The latter assumes that the conditional utilities are uncorrelated and that the cross-price elasticities are the same across alternatives.

In this paper, we examine the choice between self-treatment (j=0), treatment in the private sector (j=1) and treatment in the public sector (j=2). Allowing for correlation between ε_1 and ε_2, the error terms of U_1 and U_2, and assuming that ε_0 is independent from U_1

and U_2, the NMLG determines the following bivariate cumulative distribution function of ε_1 and ε_2:

$$F(\varepsilon_1,\varepsilon_2) = \exp\left\{-\left[\exp(-\varepsilon_1/\sigma) + \exp(-\varepsilon_2/\sigma)\right]^{\sigma}\right\} \tag{15}$$

and the following c.d.f of ε_0:[7]

$$G(\varepsilon_0) = \exp\left[-\exp(-\varepsilon_0)\right] . \tag{16}$$

The probability that self-care is chosen (i.e., the self-care demand function) is then:

$$\pi_0 = \frac{\exp(V_0)}{\exp(V_0) + \left\{\exp(V_1/\sigma) + \exp(V_2/\sigma)\right\}^{\sigma}} \tag{17}$$

and the probability of choosing a public or private health facility is:

$$\pi_j = (1 - \pi_0)\ \frac{\exp(V_j/\sigma)}{\exp(V_1/\sigma) + \exp(V_2/\sigma)} \qquad j=(1,2) . \tag{18}$$

These demand functions can be used to compute the willingness to pay for improved quality of health care (in a public or private facility) or for the reduction of user fees or travel time or for improved access).

7. The correlation coefficient between ε_1 and ε_2 can be shown to be $1-\sigma^2$. McFadden (1981) shows that ε must be between 0 and 1 to be consistent with utility maximization. Note that when $\sigma=1$, the NMNL reduces to the MNL.

The Demand for Medical Care in Ghana

Ghanaian Health Care

In the late 1980s the health system in Ghana was comprised of some 1,220 service facilities. The public sector accounted for 46 hospitals and 250 rural health centers; missions — 35 hospitals and a similar number of clinics; the private sector — for 400 clinics and nearly 300 maternity homes. Little expansion has taken place in the public sector. Ghana has trained an impressive number of medical personnel, but the years of economic decline have led to a mass exodus of qualified people both from the public sector and from Ghana in general.

A 1989 World Bank health sector review pointed to two main problems with regard to coverage of health services: (i) poor access: the present health system effectively reaches only 65% of the population; and (ii) inequality of access, both between urban and rural areas (almost 100% of the urban population being covered and only about 50% of the rural population) and even more so between regions (rural coverage varies by region from 11% to 100%). The report raises major concerns about the quality of health care in the public sector: inadequately trained staff, uneven geographical distribution of clinical personnel, widespread shortages of drugs and inadequate and improperly used equipment. With regard to the deterioration in quality in the public health care system, the report cites the dramatic decline in utilization of health services. The number of outpatients fell from 10–11 million in 1973 to approximately 5 million in 1987.

The costs of consultation and medical care are borne by the individual and there is no system of health insurance in Ghana. The only exception is public-sector employees and their families, whose medical expenses are reimbursed by the government if incurred at public health facilities.

The government of Ghana has adopted major reforms since 1989 in an effort to improve the quality of health services and the coverage of the population. These reforms included in-service training of all medical staff, reallocation of personnel to underserved regions, maintenance of drug supplies and replacement of inadequate medical equipment. The World Bank study suggests that in the medium term, most service charges should either be increased or indexed to inflation. Drug prices should be determined by a cost-based formula. The study also recommended setting up a national health insurance scheme to be managed by a new and separate institution which would be independent of the Ministry of Health.

This study is designed to shed light on the efficacy of some of the proposed policy changes. Specifically, it delves into the interrelationship between health care quality and the goals of increased utilization and the possibility of financing quality improvements through increased user fees.

The Data

We use individual, household- and community-level data from the second year (1988) of the Ghana Living Standard Survey (GLSS), which was also conducted in 1987. This was an integrated survey of 15,000 individuals in 3,200 households comprising 200 clusters,[8] randomly drawn from the population (see Scott and Amenuvegbe, 1989, for details). The GLSS collected socio-economic information such as household composition, demographic characteristics, time use, income and consumption, education, and health status. The health statistics provide a detailed description of health care and the incidence of morbidity during the thirty days prior to the survey date including information on the length of illness, choice of treatment (self, nurse, doctor, traditional healer), type of health facility visited (public or private, clinic or hospital), expenditure on consultation and drugs, travel time and cost. Over 5,000 individuals, approximately one third of the sample, experienced a period of illness or were injured during the relevant four weeks; forty percent of them sought some form of modern health care treatment.

The 1988 GLSS was supplemented with a health facility survey. Responses were obtained from 231 facilities over a six week period.[9] Facilities were selected for interviewing on the basis of proximity to a household cluster. The nearest health facility to each cluster of the GLSS was surveyed first; if the nearest facility was private, the nearest public facility was also surveyed.[10] The health facility survey collected information about infrastructure (beds, vehicles, laboratory, operating room, etc.); personnel (number of doctors, nurses, medical assistants, etc); availability of health services and drugs (number of hours open per week, type of services provided, stocks of 16 types of drugs) as well as fees.

The empirical analysis in this paper is based on a sample of 6,000 individuals from 88 clusters for which both the nearest public and private health facilities were surveyed.[11] Approximately 2,150 of the individuals in the sample reported an incidence of illness or injury. We use their revealed choices between self-treatment, a visit to a private clinic or to a public health facility in order to study the demand for health care and the willingness to pay for improved quality. The survey methodology suggests that in each of the clusters the

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8. A cluster is a geographic area such as a village or neighborhoods of a city. Approximately 16 households were interviewed in each cluster.

9. A detailed description of the health facility survey and an analysis of the data is given in Reed (1990).

10. This procedure does not necessarily lead to a representative sample of health facilities. However, as noted in Reed (1990), the distribution of the population and the sample of facilities across Ghana's ten administrative regions do not differ significantly from one another.

11. This sample included 68 profit-oriented health facilities and 20 private mission facilities. The profit-oriented sample included 6 hospitals and 62 clinics. The mission facilities accounted for 10 hospitals and 10 clinics in the private facility sample. The sample of public health facilities included 14 hospitals and 74 clinics.

nearest health facility is a private one and the data confirm this. However, our sample is similar to the one of individuals who live in communities where the nearest health facility is public. This conclusion is based on the comparison of the distributions of various characteristics, such as age, gender, expenditures, income, educational attainment, employment, school enrollment, morbidity and utilization of health care services (see table in the appendix). The geographical distribution of the sample clusters resembles the dispersion of the GLSS sample of clusters as a whole. We therefore assume that there is no sample bias in our results.

Definition of the Variables Used in the Estimation

Provider quality Q_j: The facility survey provided us with a long list of characteristics. Due to the strong multicolinearity among the variables, we have decided to group them according to five measures of quality.[12] The availability of essential drugs is an obvious category.[13] The second measure is the number of medical staff as an indicator of the level of human resources available at the facility which may reflect the sophistication and range of health services provided. The third is the provision of basic adult and child health services measured by the availability of a functioning laboratory, the ability to vaccinate children and the ability to provide prenatal, postnatal and child growth monitoring services (grouped together as 'mother and baby care'). The availability of electricity and running water are good indicators of the quality of infrastructure, since electricity is essential for the refrigerated storage of vaccines[14] and running water is required in order to offer obstetric care.

The variables used are defined as follows:

Drugs - mean availability of ampicillin, chloroquine and paracetemol.[15]

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12. Very few studies in the health economics and bio-medical literature provide useful guidelines for building or constructing health quality indices from facility level data. Garner, Thomason and Donaldson (1990) and Peabody *et al.* (1993) attempted to deal with this problem.

13. Low availability of drugs may actually indicate high demand and intensive utilization of a health facility, signaling higher rather than lower quality of health care. We have no way to deal with this endogeneity of measured stocks of drugs, or, for that matter, any other consumable measure of quality. We expect that the sign of the coefficient in the estimation will indicate the net effect of drugs on the demand and choice of health care. This point is also discussed in the conclusion of Mwabu et al (1993).

14. This statement should be qualified since many developing countries use kerosene-fueled refrigerators when electricity is unavailable.

15. The questionnaire focused on 11 essential drugs (excluding vitamins). Chloroquine in the form of tablets, syrup, or injection and any other anti-malarial drug constituted four of those listed and all are included in the variable drugs.

Personnel - number of doctors and nurses.[16]

Infrastructure - equals 1 if the facility has running water and electricity and 0 otherwise.[17]
Services - mean availability of immunization, laboratory and mother and baby services.[18]
Oprm - equals 1 if the facility includes an operating room and 0 otherwise.[19]

Price variables

Distance - distance of facility from the cluster in kilometers.
Price of consultation - price of a regular consultation.[20]
Government employee - equals 1 if the head of the household is a government employee and 0 otherwise. This status entitles the family to free health care in public health facilities.

Demographic and economic variables

Income - monthly per capita expenditures, deflated by a monthly price index (divided by 10000/12 in the estimations).[21]
Schooling - Own years of schooling.
Male - equals 1 if individual is a male, 0 if female.
Head of household's schooling - years of schooling of head of household.

Table 1 presents the means and standard deviations of the variables. Sixty six percent of the sample chose self-treatment, 20 percent chose to visit a private facility and 14 percent chose a public facility. The sample included roughly the same number of males and females;

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16. Information is also available on the number of administrators and non-medical staff. We decided to focus on medical staff only, since this measure probably has a high correlation with the quality of health care at the facility. The data refer to the actual number of working staff rather than the book value. Recent studies on the impact of health care quality on health outcomes indicate the importance of distinguishing between actual and book value of personnel (Thomas, Lavy and Strauss, 1992; Lavy, Strauss, Thomas and de Vreyer, 1992).

17. Detailed information on the number of refrigerators, fans and air-conditioners are also given, but are highly collinear with the availability of electricity.

18. Availability of mother and baby services, prenatal and postnatal care and programs for the malnourished child are highly correlated and we therefore decided to include only the former in 'services'.

19. All the hospitals in the sample had an operating room as compared to only 28 percent of the clinics. Similar proportions were found for the presence of a laboratory.

20. In cedis (divided by 100). The official exchange rate in 1988 was 200 cedis per U.S dollar. The 'free' market rate was close to 300 cedis per dollar.

21. Per capita expenditure includes all expenditure except that on health care. It also includes imputed rent for home owners. Since the survey was conducted over 12 months, we computed real values by deflating with the monthly price index.

Table 1: Descriptive Statistics

Sample Size 2,126

Variable	Mean	Standard deviation
Characteristics of private facilities		
Drugs	0.88	0.70
Personnel	0.92	1.90
Infrastructure	0.59	0.50
Services	0.37	0.36
Operating room	0.36	0.48
Price factors		
Distance to facility	3.42	5.64
Price of consultation	1.06	1.43
Characteristics of public facilities		
Drugs	0.66	0.28
Personnel	2.00	3.10
Infrastructure	0.50	0.50
Services	0.76	0.24
Operating room	0.35	0.48
Price factors		
Distance of facility	8.33	8.12
Price of consultation	0.44	0.35
Household characteristics		
Monthly per capita expenditure	5853.00	4949.00
Age (Divided by 10)	2.38	2.10
Schooling	3.26	4.41
Male	0.48	0.50
Head of household education	4.42	4.93
Government employee	0.07	0.25
Private facility chosen	0.20	0.39
Public facility chosen	0.14	0.35
Self-treatment chosen	0.66	0.47

the average age in the sample was 24 years with the mean years of schooling at just over 3. The private health sector is, on average, better stocked with drugs and possesses better infrastructure and equipment. The public health facilities have, however, a greater number of medical personnel and provide more diversified services. As discussed above, the average distance to the nearest public health facility is more than twice the average to the nearest private facility. However, the mean consultation fee in the private sector is more than twice that in the public sector.

Estimation Results

The NMNL model was estimated with full information maximum likelihood using two different specifications. The first is the model described above, which includes the various characteristics of the care provider; the second is similar to the first except that it excludes the quality variables. The results are presented in Table 2. Sigma is equal to 0.50 in the first model and 0.48 in the second model. Both are significantly different from zero and from one. Therefore, the model is consistent with utility maximization ($0 < \sigma < 1$) and the correlation between the private and public alternative is different from zero ($\sigma < 1$).[22]

Analyzing the individual coefficients, we are able to conclude that the individual's sex and own education level do not affect the choice of health care (both variables have coefficients equal to zero).[23] Age has a significant negative effect both in the private alternative (-0.19) and the public (-0.21), suggesting that the probability (conditional on illness) of seeking medical care decreases with age. Better educated heads of households tend to favor health care at private facilities.

In discussing "price factors", recall that they are divided by household per capita expenditure. The effect of distance is negative, large, and significantly different than zero, suggesting that the probability of seeking professional care would significantly increase if health care were more accessible. This result is similar to the one reported in Lavy and Quigley (1991) who used the 1987 (first year) GLSS data. Similarly, the price of consultation has a significant negative effect. An increase in a facility's user fees will lower both the probability of that facility being chosen and that of choosing modern health care. The "constant" term (constant/income) is negative and quite large for the private alternative and is significant. Recall that this term arises from the fixed cost of health production. It could be an indication that households consider the government subsidization of treatment in a public facility as better 'quality' (getting more 'service' for the actual fee paid), which, *ceteris paribus*, enhances the probability of choosing public health care. Finally, the government-employee dummy variable has no effect on the probability of the private alternative being chosen, but has a significantly large positive effect on the public alternative being chosen. This could, of course, be a reflection of the policy which entitles government employees and their families to free health care at public facilities which significantly increases the probability of their choosing a public facility. This suggests that the dummy variable should be interpreted as a price effect rather than a quality effect.

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22. Note that σ is slightly lower in the specification which excludes the quality variables. This could be due to the fact that the random term in this model includes the random term of model one *plus* the quality terms, and consequently, the residual terms should be less correlated. However, this difference is very small, indicating that the correlation between the private and public alternative is not due primarily to the quality of the provider. This result is not surprising since the correlation was interpreted as capturing the severity of illness and therefore, should not be influenced by the quality of the facility.

23. Similar results, of no effect of gender and own education on choice of health care, are reported in Mwabu, Ainsworth and Nyamete (1993), who used 1981 household and facility level data from Kenya.

Table 2: Maximum Likelihood Nested Multinomial Estimates of Choice of Health Care

	Without quality		With quality	
Variable	**Coefficient** (1)	**T-Values** (2)	**Coefficient** (3)	**T-Values** (4)
σ	0.50	5.47	0.48	5.05
Quality of facility				
Drugs available	0.64	2.39	-	-
Personnel	0.10	3.03	-	-
Infrastructure	0.34	2.30	-	-
Services	0.55	2.55	-	-
Operating room	-0.19	1.05	-	-
Price factors				
Distance/Income	-0.07	8.15	-0.07	-8.52
Price of consult./Income[a]	-0.11	4.36	-0.08	-3.50
Private alternative				
Constant	-1.68	-4.57	-0.68	-2.29
Age	-0.18	-2.94	-0.19	-2.97
Schooling	-0.00	-0.07	-0.00	-0.08
Male	0.03	0.16	0.06	0.27
Head of household education	0.07	2.48	0.07	2.57
Specific price factor				
Constant/Income	-0.22	-0.13	-0.26	-1.75
Member of government?/Income	-0.00	-0.20	-0.00	-0.01
Public Alternative				
Constant	-2.14	-5.65	-0.75	-2.31
Age	-0.21	-3.I	-0.20	-2.84
Schooling	0.04	1.36	0.04	1.24
Male	0.05	0.26	0.11	0.49
Head of household education	0.02	0.69	0.02	0.57
Specific price factor				
Constant/Income	-0.07	-0.53	-0.20	-1.41
Member of government?/Income	0.55	2.53	0.57	2.54

[a] **Income was multiplied by 12/100000 for the estimation.**

All the quality factors have significant and large positive effects. The individual and joint statistical significance of these variables indicates that households *take into account the various dimensions of the quality of the health provider in making their choice*. Households prefer facilities with better infrastructure and are more likely to visit a facility where drugs and diversified services are available. They also attach importance to the probability of being treated by a doctor or nurse. The only quality variable not correlated with choice is the dummy variable 'operating room' which is negative, although not significantly different from zero at the 5% level. These results emphasize the importance of including quality variables in a health demand choice model.[24]

In order to clearly demonstrate this fact, we re-estimated the model without the quality factors (columns 3-4 in Table 2). In comparing our two models, we see that the coefficient of the variables included in both models are very similar. However, note that the price coefficient fell from -0.11 to -0.08, suggesting that omitting quality from the demand equation leads to a downward bias in the price elasticity. The distance coefficient, on the other hand, does not change following the exclusion of the quality variables, perhaps indicating low correlation between distance and quality.[25]

The distance variable was interpreted as a price factor arising from the cost of travel and opportunity cost of travel time. This variable is therefore divided by income as is the other price factor. As a result, the distance price effect declines in importance as income rises. However, it can also be argued that the opportunity cost of time is the more important of the two costs incurred in travelling to the facility. This cost is equal to the time lost during travel (proportional to distance) multiplied by the hourly wage of the individual (which, on average, is proportional to income). Therefore, although distance is a price factor, it could have been introduced without being divided by income. When we estimated such a model, the value of σ jumped to 0.65, indicating that the private and public alternatives are less correlated in the latter model. This correlation might be due to the distance factor, which was underestimated for wealthier households.

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24. In a recent study, Mwabu, Ainsworth and Nyamete (1993), the authors also analyzed the effect of quality of medical care on choice of medical treatment. With somewhat limited data (only fifteen facilities with only two quality indicators in the analysis: the number of different types of drugs available in a health facility and number of health workers in the facility) they report no significant effect of any of the quality indicators on the choice of health care in Kenya. The number of staff at the facility was included as a control for the size of the facility. The coefficient on the total number of drugs at the facility was positive and insignificant. In another specification the authors replaced this variable was replaced by variables on the availability of two specific drugs- aspirin and antimalarials. the coefficient on absence of aspirin was negative at a 0.1 level of significance and on absence of antimalarials was positive and significant at a 0.02 level of significance. In an attempt to explain these counterintuitive results, the authors discuss the possible endogeneity of the quality variables they have used.

25. Some of the private health facilities are 'missions' facilities. We estimated our two models once more including a dummy for 'mission' health facilities. This dummy was not statistically significant in the specification that included the quality variables but became significant when these variables were dropped. This is an indication that mission health centers provide high quality health care which is measured adequately by the quality indices.

Probability of Using Health Care Under Various Policy Assumptions

Using the multinomial logit model, we simulated the impact of several hypothetical policy decisions on health care demand and the choice between private and public care based on the average characteristics of the individuals and facilities in the sample. Tables 3A-3C present several simulations involving improvements in quality: easier access (reducing the distance to the nearest public and/or private facility) and changes in user fees for the public and/or private facilities. In each scenario we calculated the probability of each choice and the percentage change relative to a referenced baseline, which in most cases was the choice at the mean of the sample characteristics.

Improvement in Quality of Care

In the first scenario the public health care system emphasizes the quality of health care. The first three rows of the top panel in Table 3A present the outcomes of single complete improvements in each of the three dimensions of quality in public facilities.[26] Relative to the baseline rates, these improvements reflect an increase of 51, 100 and 31 percent, respectively, in drug availability, infrastructure and services. The corresponding changes in the predicted probabilities of using a public facility are quite large: e.g., the improvement in drug availability leads to a 44 percent increase in utilization. A similar response (elasticity of 0.8) is obtained from an increase in the variety of services available at the public facility. Improving infrastructure by 100 percent leads to an increase of only 25 percent in the predicted probability of choosing treatment at a public facility. The implementation of all these improvements simultaneously (row 5 in the table) increased the probability of an individual choosing a public facility to 0.1 (from a baseline of 0.04). Similarly, a total collapse of these three dimensions of quality (from their mean value to zero) leads to a 75 percent decline in the predicted probability of using public health care (row 6 in Table 3A). This result could explain part of the fall in utilization rates of public health facilities in Ghana during the early 1980s. Ministry of Health data suggest that public health facilities experienced a 40 percent decline in utilization from 1979 to 1983. During the same period the quality of public health services deteriorated dramatically due to inadequate staffing, shortages of medication, cancellation or lapses in immunization programs and an overall breakdown in health facility physical infrastructure.[27]

Increasing the number of doctors and nurses in public facilities is also effective in inducing an increase in the utilization of public health care. Increasing the number of doctors and nurses to three (a 50 percent increase from the sample mean) leads to a 20 percent

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26. By complete improvements we mean a rise in the quality indicator from its sample mean value to a value of 1.0.

27. The years of economic decline have led to a mass exodus of qualified people both from the public health sector and from Ghana in general. The depletion and expiry of drug stocks became an all-pervasive problem in the public sector. See Ghana (1989) for more detail.

Table 3A: Improved Public Health Care, Predicted Probabilities and Percent Change in Health Care Use

	Self-care	Public Facility	Private Facility
Probabilities at the mean	**0.82**	**0.04**	**0.14**
Improve Quality of Public Facilities from Sample Mean to 1.00			
Drug = 1.00	**0.81** (1.2)	**0.06** (43.7)	**0.13** (-7.0)
Infrastructure = 1.00	**0.81** (-0.9)	**0.06** (33.0)	**0.13** (-5.3)
Service = 1.00	**0.81** (-0.6)	**0.06** (24.9)	**0.13** (-4.0)
Personnel = 3.00	**0.81** (-0.5)	**0.05** (18.9)	**0.14** (-3.1)
Drug=Infr.=Serv.=1	**0.79** (-3.5)	**0.10** (127.6)	**0.11** (-19.5)
Drug=Infr.=Serv.=0 (a total collapse of public health care)	**0.83** (1.2)	**0.01** (-75.0)	**0.16** (14.3)
Improving All Quality Factors Simultaneously in the Private and Public Sectors			
Drug=Infr.=serv.=1	**0.70** (-14.0)	**0.07** (61.0)	**0.23** (60.0)

Note: The percent changes are given in parentheses.

increase in the predicted probability of choosing public health care.

Another interesting simulation (last row of table 3A) involves a complete improvement of all the quality factors in the public and the private sector simultaneously. Such changes lead to a 0.30 predicted probability of consultation — 0.07 in the public sector and 0.23 in the private sector. The relative change in the predicted probabilities is almost identical for the two sectors, 61 percent in the public sector and 60 percent in the private sector.

Improving Access to Public and/or Private Health Care

A second scenario involves the construction of additional public health facilities in order to reduce the distance to the nearest clinic in each community. The top panel in Table 3B suggests that such a government program would have an immediate payoff by dramatically increasing the utilization rate of health facilities. Halving the mean distance to the nearest public clinic would increase the probability of utilization by 250 percent, from 0.04 to 0.15, and would increase the overall probability of seeking professional care from 0.19 to 0.24. The results are almost identical if the distance to the nearest private facility is halved (middle panel in Table 3B). Obviously, if the distance to both the nearest public and private health facility were halved simultaneously, the impact on the probability of seeking health care would be much larger. The bottom panel in Table 3B simulates the predicted probabilities following such a simultaneous reduction in distance. The predicted probability of consultation is increased to 0.28 (from 0.18), but most of the change is in the demand for the public health care, which rises from 0.04 to 0.13 (the private probability is almost unchanged, increasing from 0.14 to 0.15). This result reflects the unique feature of our data — that the nearest facility is always private; thus, halving the distance to the nearest public facility is always a larger absolute change. At the mean, for example, the change implies a 4.2 km reduction in distance to a public facility, compared to only 1.7 km in the case of a private facility.

Table 3C suggests that the impact of increasing user fees in the public sector is fairly modest: doubling fees would reduce demand for public health care by only 11.3 percent, while tripling them would result in a 21.5 percent decline in predicted use (implying an arc own price elasticity of 0.12). Note that in this simulation we allow individuals to substitute private care and self-care for public care, which became relatively more expensive. However, the cross-price effect on the demand for private and self-care is very modest, leaving their predicted demand probabilities almost unchanged. On the other hand, changes in the price of private health care lead to larger own and cross effects: the own-price elasticity is -0.17 and the cross-price elasticity is 0.15 (see middle panel in Table 3C). Increasing user fees simultaneously for public and private health care leads to a relatively large decline in demand for private care (an elasticity of about 0.1) and a very modest increase in the demand for public care: when the set of all modern health care opportunities becomes more expensive, consumers tend to resort more to public care.

Table 3B: Improved Access to Health Care and Predicted Probabilities and Percent Change in Health Care Use

	Self-care	Public Facility	Private Facility
Improving Access to Public Health Facilities			
Reduce distance by 25%	**0.81** (-1.1)	**0.06** (41.5)	**0.13** (-6.7)
Reduce distance by 50%	**0.79** (-2.6)	**0.09** (95.9)	**0.12** (-14.9)
Reduce distance by 100%	**0.76** (-7.2)	**0.15** (244.9)	**0.09** (-34.8)
Improving Access to Private Health Facilities			
Reduce distance by 25%	**0.81** (-1.1)	**0.04** (-8.0)	**0.15** (10.0)
Reduce distance by 50%	**0.79** (-3.0)	**0.03** (-15.0)	**0.17** (20.0)
Reduce distance by 100%	**0.77** (-6.0)	**0.03** (-28.0)	**0.20** (-41.0)
Improving Access to Public and Private Health Facilities			
Reduce distance by 25%	**0.79** (-2.0)	**0.06** (32.0)	**0.15** (3.0)
Reduce distance by 50%	**0.77** (-5.0)	**0.08** (72.0)	**0.15** (5.0)
Reduce distance by 100%	**0.72** (-11.0)	**0.13** (182.0)	**0.15** (6.0)

Note: The percent changes are given in parentheses.

Table 3C: Increasing the Cost of Health Care and Predicted Probabilities and Percent Change in Health Care Use

	Self-care	Public Facility	Private Facility
Reducing the Subsidy on Public Health Facilities			
Increasing user fees by 50%	**0.82** (0.1)	**0.04** (-5.8)	**0.14** (1.0)
Increasing user fees by 100%	**0.82** (0.3)	**0.04** (-11.3)	**0.14** (1.9)
Increasing user fees by 200%	**0.82** (0.5)	**0.03** (-21.5)	**0.15** (3.6)
Increasing User Fees in Private Health Facilities			
Increasing user fees by 50%	**0.81** (1.0)	**0.05** (7.0)	**0.13** (-9.0)
Increasing user fees by 100%	**0.83** (2.0)	**0.05** (15.0)	**0.12** (-17.0)
Increasing user fees by 200%	**0.85** (5.0)	**0.10** (31.0)	**0.06** (-33.0)
Increasing User Fees in Public and Private Health Facilities			
Increasing user fees by 50%	**0.83** (1.0)	**0.04** (2.0)	**0.14** (-8.0)
Increasing user fees by 100%	**0.84** (2.0)	**0.05** (3.0)	**0.12** (-15.0)
Increasing user fees by 200%	**0.85** (5.0)	**0.05** (5.0)	**0.10** (-29.0)

Note: The percent changes are given in parentheses.

Raising Price to Improve Quality

What is the tradeoff between the price and quality of health care? What would be the result of public care providers raising their fees in order to improve the quality of the care they provide? The price simulations clearly indicate that given the low price responsiveness of demand, prices would have to increase drastically in order to offset the effect of improving quality. For example, if the availability of drugs, services and infrastructure in public health care were improved by 100 percent, user fees would have to increase by more than 1,200 percent to offset the increased predicted probability of choosing a public facility. Given that many individuals in the sample report being treated at public facilities for no fee, this result should be interpreted with some caution. If the distance demand elasticity is interpreted as a price effect, then the tradeoff between distance and quality is a relevant simulation as well. The government could build fewer facilities, increasing the mean distance to the nearest public facility, but offset this effect by improving quality. Improving quality by 100 percent is equivalent to doubling the mean distance to the nearest pubic health provider in terms of the impact on the predicted choice probability. These simulations clearly indicate that there is large scope for quality improvements to be financed, at least partially, by an increase in user fees.

An Increase in Family Human Capital

The level of household human capital, as measured by the years of schooling of the head of household, has a strong positive effect on the preference for modern health care, especially in the private health sector. It is interesting to look at the elasticity of demand for modern health care in response to an increase in the level of completed schooling in the economy. The last row of Table 3B suggests that if the mean years of schooling were to double from 4 to 8, utilization of modern health care would increase by 30 percent. Such a magnitude suggests large cross-sectoral benefits from investments in the education sector.

Willingness to Pay

In this section we calculate the welfare-neutral price changes under various scenarios.[28] The compensating variation can be computed using equations (19) and (20).[29] We calculated the welfare-neutral price changes under several different scenarios. The first set of scenarios focuses on the distance effect: how much is an individual willing to pay to have his travel costs reduced by one km (we will refer to this scenario as "Minus1km"), by two km (scenario "Minus2km"), halved ("Dist/2") and reduced to zero ("Dist-zero"). The second set of scenarios looks at the welfare-neutral price change from two different angles: the price being halved ("Price/2") and the price equal to zero ("Px=Zero"). Finally, we analyze the willingness to pay for improved quality in existing public facilities: starting from a state in which the public facility has the lowest quality rating, we successively increase each of the quality factors. More precisely, let us denote the personnel, drug, service and infrastructure quality variables by P, D, S and I, respectively. We assume for initial values P=2 and D=S=I=0, and then successively compute the willingness-to-pay for D=1, S=1, I=1, P=4, D=S=1, D=I=1, S=I=1, D=S=I=1. The results are presented in Table 4. Each simulation is computed using the mean individual characteristics for three different values of income: the sample mean income (I2), I2 *minus* the sample standard deviation (I1)

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28. Willingness to pay is measured by the compensating variation of income necessary to keep the individual at least as well off after the improvement as before. Small and Rosen (1981) have shown that in discrete models, this compensating variation can easily be expressed using the demand function. In the case of the NMNL, the amount of resources that an individual must be given to be as well off after a change as before the change is:

$$CV = \frac{1}{\lambda}\ln\left[\exp(V_0) + (\exp(V_1/\sigma) + \exp(V_2/\sigma))^{\sigma}\right] - \ln\left[\exp(V'_0)) + (\exp(V'_1/\sigma) + \exp(V'_2/\sigma))^{\sigma}\right], \tag{19}$$

where V_j and V'_j are the utilities before and after the change and λ is the marginal utility of income. With the functional form of the utility given by (10), we find that:

$$\lambda = \frac{\partial U}{\partial Y} = \frac{1}{Y+m_j} = \frac{1}{Y}. \tag{20}$$

29. Note that combining these two equations gives us the compensating variation as a percentage of income:

$$\frac{CV}{Y} = \ln\left(\exp(V_0) + \left(\exp(V_1/\sigma) + \exp(V_2/\sigma)\right)^{\sigma}\right) - \ln\left(\exp(V'_0)\right) + \left(\exp(V'_1/\sigma) + \exp(V'_2/\sigma))\sigma)\right),$$

where V_j is the initial level of utility and v'_i is the level of utility following the improvement in social services.

Table 4: Willingness to Pay for Improvement of Health Services
(Prices in cedis; 175 cedis = 1$)

		I1	*I2*	*I3*	*I2WQ*
	Scenario	*40000*	*70242*	*100000*	*70242*
Distance	Minus1	14	26	34	34
	Minus2	34	58	72	74
	Dist/2	375	422	436	526
	Dist-Zero	375	422	436	526
Price	Px/2	4	9	12	8
	Px=zero	9	18	23	16
Quality	D=1	13	53	117	-
	S=1	10	42	68	-
	I=1	3	20	33	-
	P=4	3	11	17	-
	D=1 & S=1	47	186	305	-
	D=1 & I=1	30	120	197	-
	S=1 & I=1	23	98	161	-
	S=1 & I=1	23	98	161	-
	D & S & I =1	91	353	580	-

and I2 *plus* the sample standard deviation (I3). For comparison purposes, we also computed willingness to pay in the model without quality variables, again using the mean individual characteristics. These results are presented in the last column of Table 4 (I2WQ).

Reading the table across rows shows the change in willingness to pay as a percentage of income as income increases. Reading down a column shows, first, the change in welfare-neutral price effects as the distance to the nearest public facility decreases; then, as the price of consultation decreases; and finally, as quality increases.

First, we note that the welfare-neutral price change increases with income, no matter what the scenario. However, the income effect is more important for the quality variables (infrastructure, drug availability, services and personnel) than for distance or price. In fact, examining willingness to pay as a percentage of income, we note that for the price of consultation, this percentage decreases as income increases, while for the quality factors it increases as income increases. Not surprisingly, the richest households are more concerned with quality of health services than with its cost (price or distance).

Next, we compare the willingness-to-pay for each of the simulated changes. The most important factor for households seems to be distance to the health facility: the representative household is willing to pay 7.2 percent (i.e., 422 cedis) of their monthly income to have their travel distance (or travel time) to the nearest public facility reduced to zero. The second most important factor is drug availability: households are willing to pay 117 cedis to have a facility stocked with the basic drugs. The importance of access and drug availability to consumers can also be seen from a simulation in which public and private facilities were both the same distance from the cluster and had the same level of drug availability. In this case, the probability of consulting would be slightly higher in the public sector (11.6 percent in the public sector and 10.6 percent in the private sector). The willingness to pay for such a change was no less than 4.75 percent of monthly income.

Households are also concerned with the services provided by the health facility. Households in the higher income category of our sample are willing to pay 68 cedis (0.8 percent of monthly income) to insure the availability of child services, immunization services and a laboratory in the nearest public health facility. The lowest level of compensating variation is the one required following an increase in quality of infrastructure and number of qualified personnel: households are willing to pay a third of a percent of their monthly income to insure infrastructure quality in the nearest public health facility or to pay 17 cedis (0.2 percent of income) to double the number of doctors and nurses.

Are the welfare-neutral prices consistent with the level of user fees in public facilities? To answer this question, we examined the 'willingness to pay' for free public health care in Table 5. The welfare-neutral price is about 20 cedis which is not far from the average price of consultation (40 cedis), especially since about 50% of those who choose a public facility do not pay for consultation. Therefore, our estimate of the 'welfare-neutral price' for free consultation is approximately equal to the sample mean price of consultation.

Table 5: Willingness to Pay for Improvement of Health Services (Percent of monthly income)

		I1	I2	I3	I2WQ
Distance	Minus1	0,43	0,45	0,40	0,58
	Minus2	1,01	0,99	0,86	1,27
	Dist/2	3,19	2,65	2,14	3,37
	Dist-zero	11,25	7,21	5,23	8,89
Price	Px/2	0,13	0,15	0,14	0,14
	Px=zero	0,28	0,31	0,27	0,28
Quality	D=1	0,39	0,91	1,04	-
	S=1	0,31	0,71	0,81	-
	I=1	0,09	0,35	0,40	-
	P=4	0,08	0,18	0,20	-
	D=1 & S=1	1,40	3,18	3,66	-
	S=1 & I=1	0,90	2,05	2,36	-
	S=1 & I=1	0,69	1,68	1,93	-
	D & S & I=1	2,72	6,03	6,95	-

We did not compare the amounts households are willing to pay for quality improvements to the cost of these improvements which would have provided a complete cost-benefit evaluation of quality improvements. However, the comparison of public health care with the private sector does provide an opportunity to simulate a "complete" cost-benefit analysis, assuming that the private sector maximizes profit and that user fees are set at levels appropriate to recover both fixed and marginal costs. The relevant simulation set the public sector quality factors equal to those in the private sector. Note that since average values for the personnel and service variables are higher in the public sector than in the private sector, we did not adjust them down to the private mean values. Thus, the simulation consisted of adjusting 'Drugs' and 'Infrastructure' in the public sector to their mean values in the private sector (0.87 and 0.56, respectively). In the first simulation, the price of consultation was kept constant; in the second, user fees in the public sector were set to equal the mean private sector fees. Willingness to pay in the first simulation amounted to almost one percent of monthly income (60 cedis), which is almost two thirds of the mean private sector user fee. The second simulation, which increased public-sector user fees, suggests that households are willing to pay non-zero values for improved quality which is accompanied by increased fees (about 20 cedis per month). These results indicate that quality improvements in the public sector could be financed by increased user fees.

Conclusions

The design of policy reforms in the public health care sector requires reliable estimates of the effects of improvement in quality and access and the extent to which these improvements can be financed by raising user fees for health services. We have utilized household data from Ghana in order to estimate the effect of these policy changes.

The use of distance to health care facilities and user fees as measures of cost has appeared in previous studies and the results suggest a strong negative effect of distance and travel cost on health- care utilization. But the direct price effect of user fees is of lower magnitude. Our results confirm this pattern: distance is an important factor in deterring individuals from seeking modern health care while prices are less important in the demand for and choice of the care provider.

This paper's main contribution is in its attempt to rigorously evaluate the effect of quality of service and assess the likely outcome of various policy scenarios involving improvements in the quality of public health services. Improving basic services such as vaccinations, child care and the availability of drugs is likely to have a significant effect on demand for health care. The estimated effects of improvements in facility infrastructure and staff are positive, but have lower elasticities. The tradeoff between improvements in quality and an increase in cost, measured either by user fees or by distance, suggests that there is a wide scope for financing quality improvements in the public health sector through raising fees or by increasing distance (building fewer facilities).

The results of the policy simulations are supported by the outcome of the willingness-to-pay computations. Households are willing to pay almost one percent of their monthly income for improvements in drug and service availability. They are willing to pay even more for improving their access to the public facility: the willingness to pay for a reduction in distance of two kilometers is as high as that for having drugs available on demand. To gauge the welfare implications of increasing user fees to finance improvements in the quality of health care or, alternatively, to finance the improvements through increased travel time (i.e., trading quality for access or for travel time and cost requires comparing willingness-to-pay estimates with the capital and operating costs of the various investment scenarios. This difficult task is left for future work.

However, as an alternative, we compare the willingness to pay for equalizing the quality of public and private health care to the level of user fees in the private sector. Presuming that fees in the private sector are set to cover costs, we find that quality improvements in the health sector in Ghana can be financed by increasing user fees.

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Appendix Table

Comparative Characteristics of the Full Ghana 1988 LSMS Sample and the Sample Used by Lavy and Germain (1993)

	All Sample	Lavy and Germain Sample
Age	24.1	24.1
Proportion of age < 14	0.43	0.43
Rural	0.52	0.51
Sex	0.48	0.48
Head of household schooling	0.42	4.49
Own schooling	3.26	3.28
Size of household	5.89	6.06
Log per capita expenditure	9.83	9.76
Government employee	0.07	0.07
Proportion who chose self treatment	0.62	0.58
Number of days ill	7.56	7.59
Number of days inactive	3.15	2.93
Cost of consultations	201.7	209.3
Cost of medicine	608.5	594.1
Cost of transportation	117.8	94.6
Total cost of treatment	981.1	936.2
Cost of preventive care	494.8	551.8
Number of observations	5965	2291

The two samples include all the people who reported being ill in the last 30 days. The list of variables is just a select group of variables that suggest that the two samples are drawn from the same population. In other words, it implies that the sub-sample used in Lavy and Germain (1993) is not a selective sample in any way. The means of other economic and demographic characteristics support the same conclusion.

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