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Original Research Article

Modelling the Effect of Consumers' Ignorance on the Market for Health-Care Services (With Examples from Tanzania)

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A b s t r a c t

This paper examines the effect of incomplete information and user fees on household health-care seeking behaviour. A simple theoretical model of individual welfare is developed and used to analyze the effect of user fees and asymmetric information on demand for medical care. Conclusions from theoretical analysis assert that knowledge about the functioning and effectiveness of the health care system increases demand for allopathic health care and reduce consumer's price sensitivity. Data from two regions of Tanzania are then used to carry out empirical verification of the issues raised from the theoretical underpinning. First, as hypothesized, inadequate information was found about the benefits of modern health care reduces the household's probability of consulting modern health-care providers. Relatively low knowledge about the benefits of the allopathic health care increases price sensitivity was also found. Consequently, introduction of user fees reduce consumption of the services by reinforcing the effect of incomplete information. The study finds that the conclusion that user fees are a potential source for financing quality enhancement in health care in income poor countries seems to have neglected two important constraints. The first is in regard to health care as a merit good in emerging economies: an individual perceives less benefit than those around him and those enjoyed by the society. While these benefits remain the same across individuals from the social planner's point of view, they are not necessarily of uniform value from individual own perception. And, the second is that once there are people who are unable to fully perceive the benefits they enjoy from consumption of health care, there will be a relatively higher subjective opportunity cost of access to the services once user fees are imposed on public health services. As a result, cost-sharing fails to achieve both universal access and quality improvement simultaneously.

K e y w o r d s

Allopathy
Consumers
Disease prevention
Health care systems
Information analysis

Introduction

Poor quality, time cost and income poverty have been identified as the major factors behind patients' dropouts in public charging health-care facilities in poor countries (Mwabu et al., 1995; Mushi, 1996; Both et al., 1991; Hongoro and Chandiwana, 1994). Also there are studies which have come up with results that even with improved quality; fees reduce medical consultation (Chalker, 1995). Earlier on, theoretical studies on health care had indicated that individuals are insensitive to money cost of health care even in low-income countries (Heller, 1982; Mwabu et al., 1995). In addition, demand was observed to be decreasing with waiting time (Akin et al., 1985; Heller, 1982).

Meanwhile, Kiyofumi (2000) in Kenya concluded that people's knowledge on causes, treatment and prevention of diseases is limited. People are strongly influenced by traditional beliefs and customs and may seek remedy both in modern and traditional medicine (Kiyofumi, 2000). A number of similar studies in anthropological studies show that there are people who use traditional medicines alongside allopathic health care.

The mixed results from the two blocks of findings on the impact of user fees, and the observed findings from anthropological studies, suggest that the theory underlying the introduction of fees in public health services is not adequately underpinned by the results of empirical studies. This paper goes beyond time cost, quality and income poverty to model the anthropological findings or consumer's ignorance, as one might want to call it, on demand for health care. This is accomplished by developing a simple model of health care demand to first derive theoretical insights, and second to carry out empirical verification with data from the Tanzanian health system.

Materials and methods

Modelling the effect of limited information in health care

To begin the argument, it is asserted that consumers of medical care are not always fully knowledgeable of the benefits they enjoy from modern health-care system; they may perceive fewer benefits as compared to fully informed[1] counterparts. This is because consumers have 'defective' preferences arising from information gaps[2]. Because of incomplete information, a consumer values health-care bundles according to the benefits perceived; and such a perception is essentially a function of knowledge about allopathic health care[3].

Consider the following increasing strictly quasi-concave, twice continuously differentiable utility function (U) of individual h:

$$U = u^h(X_h, Y_h), \quad (1)$$

where X is modern health care, and Y is any consumption other than modern health care. Assuming that individuals value the benefits of X differently from each other, consumer h's welfare can be defined by the function:

$$u^h(X_h, Y_h) = V^h(\phi_h(X_h), Y_h) \quad (2)$$

[1] See information analysis by Folland et al. (1997) and Rice et al. (1989). Misinformation, as used throughout this paper, constitutes the knowledge gap that perpetuates inability to fully internalize or realize the benefit of allopathic health care system.

[2] See Besley (1988) for a discussion of defective preferences.

[3] Leonard and David (1998) puts it as a principal-agent problem, where asymmetry in information between the provider and the recipient over the expected benefits does not induce a Nash equilibrium. While this study appreciates the work by Kenneth, we would also want to point out two main differences with our current study. First, Kenneth's model of asymmetric information considers both ex-ante and ex-post conditions of treatment in contractual arrangements within sources of care. This paper considers the presence and effects of information gaps among households in a 'defective' preferences setting. Second, Kenneth's setting investigates the conditions which are necessary to achieve self-enforcing contracts for both the provider and the patient to induce the attainment of a Nash equilibrium. The current study goes further to investigate the interaction of information, quality, and user fees in determining an equilibrium demand given the effect of a user fee.

The function $\phi_h(X_h)$ converts the benefits of health care (at the full information bench-mark) into those benefits perceived by an individual *h* as follows:

$$\phi_h(X_h) = \sigma_h X_h \quad (3)$$

where $0 \leq \sigma_h \leq 1$[4]. The parameter σ is the proportion of the total benefits of modern care perceived by individual *h*. This is a measure of the extent to which this individual is knowledgeable about the benefits of X. Substituting (3) into (1) we have:

$$U = u^h(\sigma_h X_h, Y_h) \quad (4)$$

The consumer makes a decision using (4) rather than (1) because of the effect of information gaps. Assuming further that consumer preferences are represented by a constant elasticity of substitution (CES) utility function[5], equation (4) becomes:

$$U = u^h(\sigma_h X_h, Y_h) = ((\sigma_h X_h)^\rho + Y_h^\rho)^{\frac{1}{\rho}} \quad (5)$$

Since preferences are invariant with respect to monotonic transformations of the utility function, one could just as well choose:

$$U = \log u^h(\sigma_h X_h, Y_h) = \frac{1}{\rho}\ln((\sigma_h X_h)^\rho + Y_h^\rho) \quad (6)$$

Consumer *h* maximizes (6) subject to:

$$P_X X_h + P_Y Y_h = m_h, \quad (7)$$

where m_h is *h's* income and p_{is} are commodity prices for $i = X, Y$. Setting the Lagrangian multiplier and the first-order conditions for (6) and (7) we have:

$$\frac{Y_h}{X_h} = \left(\frac{P_x}{P_Y \sigma_h^\rho}\right)^{\frac{1}{1-\rho}} \quad (8)$$

Using (7) and (8) we solve for the Marshallian demand for X_h as follows:

$$X_h = \frac{m_h P_X^{\frac{1}{\rho-1}}}{P_X^{\frac{\rho}{\rho-1}} + (\sigma_h P_Y)^{\frac{\rho}{\rho-1}}} \quad (9)$$

It is made a plausible assumption that $0 < \rho > 1$ to imply that modern health care and other forms of consumption (including informal care) are substitutes[6]. Hence

$$\frac{\partial X_h}{\partial \sigma_h} > 0 \quad (10)$$

Ceteris paribus, misinformation reduces the consumer's demand for health-care. The effect of misinformation on price elasticity is given by $\frac{\partial \varepsilon_{xx}}{\partial \sigma_h}$, where ε_{xx} is the own-price elasticity of demand[7]. Using (9) we have:

$$\varepsilon_{xx} = \frac{1}{\rho - 1} - \frac{\rho P_X^{\frac{\rho}{1-\rho}}}{(\rho-1)(P_X^{\frac{\rho}{\rho-1}} + (\sigma_h P_Y)^{\frac{\rho}{\rho-1}})} \quad (11)$$

and

$$\frac{\partial \varepsilon_{xx}}{\partial \sigma_h} = \frac{\rho^2 P_X^{\frac{\rho}{1-\rho}} \sigma_h^{\frac{1}{\rho-1}} P_Y^{\frac{\rho}{\rho-1}}}{(\rho-1)^2 (P_X^{\frac{\rho}{\rho-1}} + (\sigma_h P_Y)^{\frac{\rho}{\rho-1}})^2} > 0 \quad (12)$$

[4] By assumption, we restrict the value of σ_h for computational simplicity. We are not ruling out the possibility of σ_h being outside these margins. However, the latter case would produce the same results.

[5] CES allows for different degrees of substitutability according to the value of the substitution parameter. This is more relevant in formal health-care demand versus other forms of consumption, i.e. informal care and non-health care-consumption put together. With the CES function we can also weight the values of one variable independently of the other. Lastly, CES are general functions from which other utility functions (e.g. Cobb-Douglas) can be derived by varying the substitution parameter (ρ).

[6] Though this assumption is strong, it is meant to rule out linear forms of the function and the possibility of the Cobb-Douglas function for which price elasticity of demand is always – 1. The objective is to generate variability in consumers' price sensitivity.

[7] Own price elasticity, ε_{xx}, is defined as $\frac{\partial \ln X}{\partial \ln P_x}$.

Misinformation reduces σ_h and therefore increases price sensitivity of consumers[8].

User fees and re-investment in quality of public health care: Impact on demand

Justification for user fees in public health care is derived from the general argument that quality of health services in poor countries is so low that people would be willing to pay a small fee provided that it is used to improve the services[9]. Quality improvement would depend on people's ability to pay and the efficiency of the delivery system.

Individuals choose to consume public health care to maximize utility (the consumer's problem), whereas a social planner chooses a level of quality (or user fee) such that social welfare is maximized (the social planners problem). In the rest of the paper, we take it for granted that revenue from user fee is reinvested in public health care for quality improvement.

The consumer's problem

Let us define a strictly quasi-concave utility function (U) as in (1) for consumer h as follows:

$$U^h(\sigma_h, Q, X_h, Y_h) \quad (13)$$

where X_h is consumer h's consumption of public health care. Q is quality of the public health care, Y_h is private consumption, and σ is a measure of misinformation as discussed in (3). Think of the price of X_h as being the sum of qx and μ, where qx is the transport and time cost of accessing public care, and is a user fee imposed to finance quality consumption such that

$$Q = f(\mu) \quad (14)$$

The function in (14) converts the user fee into quality of public care in the following way:

$$Q = \mu\beta \quad (15)$$

Using (15) it can be expressed μ as follows:

$$\mu = Q^{\frac{1}{\rho}} \quad (16)$$

where β is the efficiency parameter[10]. The function in (16) gives the user fee required to finance any desired level of quality (Q) given the delivery efficiency of the public services. This is the price of the quality of health care. Using (16), the price of X faced by this consumer is $qx + Q^{\frac{1}{\beta}}$. A household may be denied service irrespective of whether or not qx has been incurred if she fails to pay the user fee. Let us assume further that the price of Y and consumer h's income are given by P_Y and m_h respectively. And improvement of quality of health care can be viewed as more of service depending on the treatment process: implying that quality of health care affects X_h. Hence, it is considered a multiplicative relationship between X_h and Q[11]. Lastly, as in (5), it is also assumed that consumer preferences are described by the function:

$$U^h(\sigma_h, Q, X_h, Y_h) = ((\sigma_h Q X_h)^\rho + Y_h^\rho)^{\frac{1}{\rho}} \quad (17)$$

The consumer's problem is to maximize (17) subject to:

$$(qx + Q^{\frac{1}{\beta}})X_h + P_Y Y_h = m_h \quad (18)$$

Setting up the Lagrangian and first-order conditions for X_h and Y_h, it is solved to obtain the Marshallian demand for X_h:

$$X_h = \frac{m_h (qx + Q^{\frac{1}{\beta}})^{\frac{1}{\rho-1}}}{(qx + Q^{\frac{1}{\beta}})^{\frac{\rho}{\rho-1}} + (\sigma Q P_Y)^{\frac{\rho}{\rho-1}}} \quad (19)$$

and

[8] Note that as $\rho \to 0$, the CES function becomes a Cobb-Douglas function; price elasticity is always -1 and the elasticity of substitution between X and Y is 1. misinformation does not affect the price elasticity of demand although it reduces the Marshallian demand for health care. We ruled out this possibility through the assumption in (10).

[9] See, for example, Smith and Rawal (1992) and Shaw and Griffin (1995).

[10] The efficiency parameter refers to the rate of transformation of the user fee into quality of health care.

[11] So far in our argument, quality and quantity are not necessarily separable.

$$\frac{\partial X_h}{\partial Q} \begin{matrix} > \\ = \\ < \end{matrix} 0, \text{ depending on the value of } \beta \qquad (20)$$

$$\frac{\partial X_h}{\partial \beta} > 0 \qquad (21)$$

$$\frac{\partial X_h}{\partial \sigma_h} > 0 \qquad (22)$$

Misinformation and inefficiency in the delivery system reduce the demand for health care.

Defining the elasticities of user fee and quality with respect to *X* as $\varepsilon_{X\mu}$ and ε_{XQ}, respectively, we have:

$$\varepsilon_{X\mu} = \varepsilon_{XQ} = \frac{(1-\rho)(qx+Q^{\frac{1}{\beta}})^{\frac{\rho}{1-\rho}} + (\sigma_h QP_Y)^{\frac{\rho}{\rho-1}}\left(\frac{Q^{\frac{1}{\rho}}}{\beta(qx+Q^{\frac{1}{\beta}})} - \rho\right)}{(\rho-1)[(qx+Q^{\frac{1}{\beta}})^{\frac{\rho}{\rho-1}} + (\sigma_h QP_Y)^{\frac{\rho}{\rho-1}}][m_h(qx+Q^{\frac{1}{\beta}})^{\frac{1}{\upsilon-1}}} \qquad (23)$$

Hence,

$$\frac{\partial \varepsilon_{XQ}}{\partial \sigma_h} = \frac{[(\frac{\rho}{\rho-1})^2][(QP_Y)^{\frac{\rho}{\rho-1}}\sigma_h^{\frac{1}{\rho-1}}][(qx+Q^{\frac{1}{\beta}})^{\frac{\rho}{\rho-1}}][\frac{Q^{\frac{1}{\beta}}}{\beta(qx+Q^{\frac{1}{\beta}})} - 1]}{[(qx+Q^{\frac{1}{\beta}})^{\frac{\rho}{\rho-1}} + (\sigma_h QP_Y)^{\frac{\rho}{\rho-1}}]^2[m_h(qx+Q^{\frac{1}{\beta}})^{\frac{1}{\rho-1}}} \qquad (24)$$

Earlier on, equation 19 gave us the demand for public healthcare when there is a re-investment of user fee revenue in public health care. In the model, an increase in quality means more of the good purchased at the increased price. A change in quality produces two effects; it increases marginal utility of good *X* on one hand, and increases its price on the other hand. The net effect on demand and welfare for this good depends on which of the two effects dominates. If the delivery system of public care is inefficient (i.e., $\beta < 1$), so that an increase in the user fee leads to a smaller than proportionate increase in the quality of X, demand falls as quality increases.

In equation 23 the quality elasticity of demand for modern health care (ε_{XQ}) decreases with the rate of the user fee. This is shown by the last factor, $\frac{Q^{\frac{1}{\beta}}}{\beta(qx+Q^{\frac{1}{\beta}})} - \rho$ in the numerator of (23). Since $Q^{\frac{1}{\beta}} = \mu$, and $qx + Q^{\frac{1}{\beta}} = P_X$, it can be re-writen as follows:

$$\frac{Q^{\frac{1}{\beta}}}{\beta(qx+Q^{\frac{1}{\beta}})} = \frac{\mu}{\beta P_X} = \frac{\gamma}{\beta} \qquad (25)$$

where γ is the ratio of the user fee to total costs of health care (P_X). As $\frac{\gamma}{\beta}$ decreases, ε_{XQ} increases. If accessing public health care involves substantial private costs, then a small user fee represents a small proportionate increase in these costs; consumers become quality sensitive with changes in the rate of user fee ($\frac{\gamma}{\beta}$) rather than changes in the absolute fee.

Misinformed consumers respond more to quality improvement provided that β is sufficiently large to offset the price effect. The sign of (24) is determined by considering the last factor[12] in the numerator of the right –hand side, which is decreasing in β. If β is small (for example $\beta < 1$), then it can be seen from (25) that as $qx \to 0, \frac{\gamma}{\beta} > 1$; quality elasticity of demand (ε_{XQ}) decreases (demand responds negatively to changes in Q); and in (24), it is found that if $\frac{\gamma}{\beta} = \rho$, then demand increases with quality improvement. And when $\frac{\gamma}{\beta} = 1$, misinformation does not affect quality sensitivity, since this implies more of the good at the same price. The parameter β describes the delivery efficiency of public care; if β is small, higher user fees will be needed to achieve any desired level of quality than would be the case if β is relatively large. This also increases consumers', price sensitivity.

Inefficiency increases the price of quality of public health care, and consumers demand for this care is reduced accordingly. Welfare loss occurs due to inefficient use of resources in the provision of these

[12] That is $[\frac{Q^{\frac{1}{\beta}}}{\beta(qX+Q^{\frac{1}{\beta}})} - 1]$.

services. For example, where decision-making processes over the expenditures from the revenue collected from user fees involve costly bureaucracy, β is likely to be small indicating that quality is expensive. In this case charging consumers in order to improve quality will reduce demand. This implies that for smaller β, (or inefficient health care system) quality will have to be subsidized to avoid a decrease in demand.

The social planner's problem

It has been assumed that public provision of health care is financed by revenue from tax and user fees. The user fee depends on the level of quality set by the social planner with the form given in equation 16. And in 13, it is defined quality as "more of the good"; improvement in quality means increasing the volume of services per episode of treatment. Such a setting is consistent with the problem of shortages in the supply of inputs in public health care in developing countries, where public care is deteriorating and many health facilities lack basic drugs, equipment, and medical personnel. In this case, quality improvement means more of the service per episode of treatment in the first place.

The objective of a social planner is to improve the quality of public health care in order to enhance social welfare. She needs to raise additional revenue to finance this improvement. This can be achieved by either fiscal measures and/or direct payments by users. In designing and implementing these payment schemes, the social planner considers the following indirect utility function (obtained from equations 13-19) for individual *h*:

$$V^h(\sigma_h, qx, \mu, P_Y, m_h), \qquad (26)$$

and postulates the following social welfare function;

$$\Omega(V^1(\sigma_h, q_1, \mu, P_Y, m_1),...,V^H(\sigma_H, qx, \mu, P_Y, m_H) \qquad (26)$$

for $h = 1,\ldots, H$, and $\Omega(.)$ is the social welfare function.

Policy implications

Earlier on, in equations (10) and (12), it is set that misinformation reduces welfare and demand for modern health care; and in equations (20) and (23) it is noted further that if the delivery efficiency of public health care is low, user fees will reduce demand for health care. In (17) quality increases welfare, and in equation (18) it increases the cost of accessing public health care. Therefore, a welfare-improving user charge is one whose quality effect more than offsets its price effect. The social planner's problem is to set a user fee or quality which maximizes the social welfare function. The concern here as shown in equations (10), (12), (15), (18) and (19), is misinformation and low purchasing power, which have counter effects on demand as quality improves. Quality improvement increases the price of public health care and hence becomes less affordable. The crowding-out effect implies reduced consumption of public health care by the poor, leaving the government-subsidized health care to the well-to-do social groups. In essence, the government would be subsidizing the rich rather than the poor.

User fees will also reduce demand if the delivery of public health care is inefficient. This is true for most sub-Saharan countries whose public health care is characterized by management, corruption and high transaction costs.

In principle, health care is socially more valued than most non-health-care private consumption. If quality improvement increases households' consumption of modern health care there would be a potential increase in social welfare. Quality of health care, in this context, shifts resources from non-health care private consumption to a more socially valued good. Analogously, a decrease in the demand for modern health care would reduce social welfare. In addition, if the fee is coupled with decentralization in the management and expenditure of the revenue from the user fee, efficiency and consequently welfare might increase.

However, corruption and inefficiencies in taxation impose dead-weight losses in an economy. Partial privatization or commercialization of public health care may channel resources directly from consumers to providers' agents and reduce the loss. If the delivery system is too inefficient, the attempt to improve quality by charging consumers may reduce demand and welfare. If households are well-informed and β (the efficiency of the delivery system) is sufficiently large, the lower will be the

unit cost of providing any desired level of quality, and the higher will be the willingness-to-pay the implied fees.

Empirical verification

Hypotheses

Misinformed households place smaller values on modern public health care relative to the more informed counterparts. This follows from equations (1) to (4):

$$V^h(X_h, Y_h) \geq G^h(\sigma_h X_h, Y_h) \text{ since } \sigma_h \leq 1.$$

Demand for modern health care is more price-elastic for less-informed than for the relatively more-informed households. This is a re-statement of equations (9) – (26) to show that misinformation:

(a) decreases consumption of modern health care, i.e.

$$\frac{\partial X_h}{\partial \sigma_h} > 0;$$

(b) increases price elasticity, i.e.

$$\frac{\partial \varepsilon_{x_h x_h}}{\partial \sigma_h} > 0;$$

(c) A quality-improving user fee decreases demand, i.e.

$$\frac{\partial X_h}{\partial Q} < 0, \text{ if } \beta \leq 1.$$

(d) A user fee with re-investment in publicly-provided health care is welfare improving if it does not reduce access by the poor (it is assumed away cases of frivolous consumption), i.e.

$$\frac{\partial X_h}{\partial Q} > 0 \quad \text{for the low income groups, and}$$

$$\frac{\partial X_h}{\partial Q \partial m} \text{ can take any sign.}$$

Setting the model for econometric estimation Issues and Procedures

In studying the effects of consumers' knowledge and user charges on decision-making for medical consultation, it is needed to model both the basic behavioural relationships and practitioner attributes. In particular, one would say that the decision to seek care is an outcome of both the individual characteristics and the provider attributes. For example, a patient selects to seek medical care from a certain provider with an *ex-ante* belief that the care will be effective. The *ex-ante* effectiveness conceived by the patient is influenced by the consumers' knowledge about the causes of illness and the treatment process. Another way of looking at these relationships is to view the patient's rational expectation as being an outcome of his perception about quality and the actual quality available, given his attributes and the illness in question. Ultimately, it is perceived quality which matters in the decision to seek medical care. Thus, the decision to seek medical diagnosis depends on, among other things, information about medical care and providers available to the consumer. The decisions regarding medication and hospitalization involve the professional practice of the provider.

The analysis of price effects in medical care is more complex than in other forms of goods for two main reasons. First, the treatment process involves various episodes which are priced and decided upon separately. Second, the pricing involves different types of care across illness categories, level of facility, and grade of service. In effect, these could be considered as different goods. Attaching a single price to medical care can produce misleading conclusions. To include and analyse the effect of user charges in public care in our setting, it is assumed that public facilities are either available as basic or alternative source of care. This means that if public facilities were offering free medical diagnosis, then no individuals would be denied access due to income poverty.

It is more plausible, however, to construct a dummy variable for user charges rather than using the prices, given the complexities which have been discussed. In view of these problems, we can consider the nearest public facility as charging or not. This specification is more valid and useful in countries like Tanzania, our case study for empirical

verification, where there are different types and levels of public providers. The charging public facilities in Tanzania are of three levels; referral, regional and district hospitals. Each category of public facility has its own pricing structure depending on illness type and grade of service. Parallel to public facilities are private modern facilities. In addition, differences in prices in private facilities is not likely to be a strong determinant of household decision to seek medical care from modern facilities for the reason that households' concern is about charging and non-charging facilities rather than differences in prices. This is because the differences in consultation price in private clinics in Tanzania, and between charging public facilities and private clinics, are marginally small.

Bulk of the cost is borne from prescriptions. To capture the effect of private health facilities on household health-care decision, we consider whether the nearest health facility is private or not[13]. The distribution of public facilities in Tanzania is such that most households in our sample would recommend them as their nearest source of care. Intuitively, we can argue that if private facilities are charging, and that they co-exist with public facilities which are either free or charging a lower rate, they do not constitute any barrier to households who are just seeking medical consultation from modern facilities. This is because both charging facilities constitute the choice set as far as quality of health care would not an issue.

Explaining the information index

Misinformation as defined in this study is not easily observable, let alone problems of measurement. The key concern is whether the effect of information can be distinguished from that of education. The best proxy for information would be patterns of past usage of health-care facilities, but this coincides with the dependent variable, which we intend to use in estimating demand functions. However, we know that beliefs about effectiveness or benefits of medical care are formed from perceived general causes of illness and accumulated experience specific to each type of illness. For example, if people think that illness is caused by factors beyond those addressed by modern practitioners, the chances of consulting modern facilities are reduced. In sub-Saharan Africa, it is common to think of illness as being caused by jealousy people or enemies (witchery), or bad devils, or punishment resulting from wrong doing to God or society (Kiyofumi, 2000). In this case, modern medical care may be thought to be less effective than other sources. In view of this, people are asked to describe what they think is the general cause of illness. The answers fall under five categories of views.

The first group (arbitrarily labelled as A-views) consists of those who think that illness is caused by natural factors. The second group (B-views) are those who think that illness is intentionally caused by people (e.g. because of jealousy). Between the two groups, there are two sub-groups who believe in both types of causes of illness, but one is more inclined to natural causes (C-views) and the other to man-processed causes (D-views). The last group (E-views) consists of those who are indifferent between natural and man-made causes. Making a further assumption that answering 'natural causes' implies more informed (regarding the true causes of illnesses), the following transitive ordering of the five groups of the views can be generated as follows:

$$A \succ C \succ E \succ D \succ B.$$

The views are then numeralized with weights between 0.1 and 0.9[14].

Accumulated household past experience with modern health care was difficult to measure because of differences in medical problems, usage of health-care facilities, and long time recall information is both difficult to get and less reliable. While controlling for illness type in our estimation, we asked questions about a specific illness common to all regarding what measures they would take in the event of the illness in question. The answers were also categorized and weighted as in the first question.

The index of information is then constructed from the average of the scores from the two sets of

[13] Note that for public facilities we look at whether the nearest public facility is charging or not. This implies that the nearest charging public facility is not necessarily the nearest health facility for the same household.

[14] We tried to avoid the two extreme cases of 0 and 1 for perfect ignorance and information respectively.

equations[15]. It is worth noting that there are several problems regarding this index of information. First is that self reporting or assessment by respondents is inclined to bias against the true household behaviour. Respondents may be giving what they think are the correct answers rather than their true behaviour. This is likely to bias the index towards the upper limit with most respondents turning out to be some how well informed. This problem was addressed right away from the design of the questionnaire and training of the enumerators. Second is that our index fails to specify the information, which is being referred to here. The information set argued in the previous chapters varies from biological knowledge to the scientific knowledge of the functioning of medicines are known. The collection of this information needs more time and a different approach. Third is a numeralisation problem. The values are imputed on the respondent's answers to suit our econometric estimation. There is a potential over or under estimation of the views regarding their true variations, but since the ranking rather than the true unit values are concerned, there is no need to worry too much so long as perceived benefit is a monotonic function of the information index.

Lastly, there is potential endogeneity regarding the measurement of our information index. Information is likely to be determined within income and education interface and it's likely that knowing the causes of illness depends on which provider you normally consult. However, this concern is minimized by involving two more procedures: one is by using the head of the household information index as the variable to be regressed on the health choices of the household members, and second is to test for weak exogeneity (Vellar, 1993). The latter involved estimating an information function using the variable in the demand equation. Since the coefficient on the residuals was not statistically different from zero, it could not be rejected the null hypothesis of weak exogeneity (Vellar, 1993) for the information index.

[15] The index is useful as means of ranking households with regard to information about modern health care. The exact value of the index is not so important, it is only a way of comparing households in terms of more or less informed on the benefits of modern health care system. The index needs to satisfy our property: that it is a monotonic function of information about the benefits of modern health-care system.

Following Heller (1982), Mwabu and Mwangi (1986), and Adams (1999); both logit and multiple logit models for health care demand to verify our hypotheses is estimated.

Measurement of variables and data

A priori list of variables

Patients' characteristics
age = age in years
edtny = education of the patient (years of schooling)
sex = sex, 1 = male, 0 = female
Household characteristics
edhed57 = household head with education from 5-7 years (dummy)
edhed811 = household head with education from 8-11 years (dummy)
hycons = household consumption during last twelve months
hinform = household head's level of knowledge about benefits of modern medical care
Indices for perception (satisfaction by the head of household)
drugs = assessment of drugs available in formal facilities
staff = assessment of staff availability in formal facilities
laborato = assessment of laboratories in formal facilities
Dummies for illness and geographical location
ruseloc = household geographical location
malaria = malaria
diavomit = diarrhea and vomiting
weakness = weakness
headache = headache
stomach = stomach pain
wound = wound
bacpains = back pains
coughing = coughing
childbir = child-birth cases
mendisor = mental disorder
chronic = chronic disease
Attributes of providers
pubpay = dummy for user fees in public facilities: = 1 if the nearest public facility is charging, and 0 if not.
privpay = dummy for private facility: = if the nearest health facility is private or not.
distance = distance to the provider
time = waiting and treatment time

Data

The data used for the empirical investigation in this study are drawn from a survey carried out in Tanzania in 1999. These are recall information about health care behaviour for the last twelve months from two regions of Kilimanjaro and Coast. Disease episodes constitute our observations rather

than individual household members. How each event of illness was attended to is investigated. This will cast light on whether type of illness and knowledge about effectiveness of alternative sources of health care influence the health-care seeking behaviour of the patient. From a sample of 675 households, 3,271 individuals, 1,646 sick persons and 2,202 events of illness are found. These were faced with several options of sources of medical care.

Results and discussion

Multiple logit modelling involves more than two categories in the regressand. Any results based on this approach are inclined to fail the IIA (independence of irrelevant alternatives) test. Although the data at hand do not meet the asymptotic properties specified for the Hausman test of IIA in STATA, initial results show a negative chi^2 in our tests indicating that the null hypothesis should be accepted that the coefficients are not systematically different.

The results of the econometric estimation of the model are organized in three tables. First, it is looked at the determinants of the household decision to consult a modern health-care facility (formal or modern care) versus other alternatives (i.e. informal). Second, sub-sample estimation for 'informed' versus 'misinformed' to demonstrate differences in price sensitivity is performed. Lastly a multinomial model for the choice of the provider of health care to verify the results is estimated. Marginal probabilities are computed to aid interpretation of the results accordingly.

The results are presented in Tables 1, 2 and 3. In general the results support many of the findings by previous studies on demand for health care. Since this paper has a particular focus on the effect of misinformation, the findings of the study that are pertinent to our earlier theoretical formulations are discussed and leave out the obvious general discussions. In order to bring out clearly the effect of ignorance and user charges on health care demand, the sample is split into two categories in Table 2; the 'misinformed' (with knowledge index less than or equal to 0.5)[16] and the 'informed' (with knowledge index greater than 0.5). Marginal effects for each group are also computed.

The effect of misinformation

Earlier on, it is set a simple model and hypothesized that misinformation does not only reduce demand for medical care, but also increases price sensitivity of the consumer. The results of the econometric estimation in Tables 1, 2 and 3 provide evidence that consumer's ignorance in demand for health care matters. In Appendix 1, the coefficient of hiform (household information about effectiveness of health care) is significant at the 1% level. If household knowledge about benefits of modern health care increases, in the event of illness, they will seek to consult modern facilities more often than elsewhere. The use of imperfect substitutes, as it will be shown later, is mainly attributed to lack of adequate proper information on the functioning and benefits of modern health care[17].

Information in this context weakens the substitution and income effects of demand in modern medical care, and thus making it less price elastic in demand. Analogously, misinformation produces the opposite effects. An increase in consumer's knowledge will increase her consumption of modern care by reducing that of imperfect substitutes. This is an empirical verification of Stanton and Clemence (1989) contention that a profound limitation in understanding of health and disease raises the concern that the value of allopathic medicine is not understood. They argued that with this constraint, imposition of user fees might be a serious deterrent to consumption of proper health care.

Most communities in Tanzania can be regarded as 'land locked' information wise. Traditional beliefs and cultural practices have been the major obstacles for the penetration and effective use of modern health facilities. Primary education has done too little to transform these communities. They have remained both income and information poor, but probably time-rich. Education is a tool for utilizing information, and in the absence of the latter, the effect of education is felt less.

[16] This is set arbitrarily by considering observations with scores equal to or below 50%

[17] We use 'mainly' to show that we are not ruling out the weaknesses in modern providers.

Table 1. Probability of an episode of disease being sent for consultation in formal medical care facilities. Logit estimates (N= 2,202).

Explanatory variable	The log of the probability of seeking disease diagnosis relative to not seeking (odds ratio).		Marginal probabilities (from 0 to 1 for discrete variables and evaluated at the mean elsewhere)	
	Coefficient	Significance (*p*-values)	Coefficient	Significance (p-values)
Patient's attributes				
Age	0.002671	(0.375)	0.000435	(0.38)
Sex	-0.06822	(0.566)	-0.0111	(0.56)
Edtny	-0.00091	(0.958)	-0.00015	(0.958)
Household attributes				
edhed57	0.335584***	(0.015)	0.054601**	(0.027)
edhed811	0.593195***	(0.002)	0.096516***	(0.005)
Hycons	2.64E-08	(0.682)	4.29E-09	(0.683)
Hinform	0.818783***	(0.006)	0.133221***	(0.01)
Perceptions				
drugs	0.098862	(0.175)	0.016086	(0.176)
staff	0.237664***	(0.011)	0.038669***	(0.014)
laboratory	0.29412***	(0.000)	0.047855***	(0.000)
Illness type				
malaria	0.397721**	(0.029)	0.064712*	(0.065)
diavomit	0.435689	(0.115)	0.070889	(0.15)
weakness	-0.7097**	(0.021)	-0.11547***	(0.012)
headache	0.489994	(0.143)	0.079725	(0.174)
stomach	0.353983	(0.191)	0.057595	(0.227)
wound	0.486047	(0.224)	0.079083	(0.248)
bacpains	-0.72747***	(0.009)	-0.11836***	(0.003)
coughing	0.812582***	(0.005)	0.132212***	(0.016)
childbir	0.901962*	(0.072)	0.146754*	(0.093)
mendisor	-1.26179***	(0.012)	-0.2053***	(0.009)
chronic	-0.1508	(0.721)	-0.02454	(0.718)
Provider attributes				
pubpay	-0.49006***	(0.000)	-0.07974***	(0.000)
privpay	-0.117388	(0.465)	-0.015388	(0.458)
distance	0.000901	(0.686)	0.000147	(0.686)
time	0.063858	(0.330)	0.01039	(0.327)
constant	-1.30855***	(0.006)	-0.21291***	(0.016)
Key: * = significance				

Table 2. Probability of an episode of disease being sent for consultation in formal medical care facilities. Logit estimates (Sub samples).

	The log of the probability of seeking disease diagnosis relative to not seeking (odds ratio).				Marginal probabilities (from 0 to 1 for discrete variables and evaluated at the mean elsewhere)			
	hinform ≤ 0.5 (n= 478)		hinform > 0.5 (n= 1874)		hinform ≤ 0.5		hinform > 0.5	
Explanatory variable	Coefficient	Significance (*p*-values)	Coefficient	Significance (*p*-values)	Coefficient	Significance (*p*-values)	Coefficient	Significance (*p*-values)
Patient's attributes								
age	-0.00873	(0.170)	0.007741**	(0.028)	-0.00154	(0.17)	0.00115**	(0.033)
sex	0.127279	(0.643)	-0.10508	(0.426)	0.022503	(0.652)	-0.01561	(0.415)
edtny	-0.03248	(0.458)	-0.00788	(0.678)	-0.00574	(0.458)	-0.00117	(0.677)
Household attributes								
edhed57	0.701915**	(0.038)	0.230508	(0.126)	0.124101*	(0.07)	0.034241	(0.152)
edhed811	1.288871	(0.251)	0.582796***	(0.006)	0.227876**	(0.038)	0.086572***	(0.015)
hycons	1.31E-06***	(0.000)	-5.43E-08	(0.396)	2.32E-07***	(0.005)	-8.06E-09	(0.40)
Perceptions								
drugs	-0.04335	(0.803)	0.143815*	(0.082)	-0.00766	(0.804)	0.021363*	(0.089)
staff	0.457912**	(0.028)	0.242054**	(0.020)	0.08096*	(0.061)	0.035956**	(0.025)
laboratory	0.683215***	(0.000)	0.253344***	(0.000)	0.120795***	(0.000)	0.037633***	(0.000)
Illness type								
malaria	0.265741	(0.540)	0.531195***	(0.008)	0.046984	(0.578)	0.078907**	(0.036)
diavomit	-0.37892	(0.476)	0.845305***	(0.013)	-0.06699	(0.441)	0.125567**	(0.036)
weakness	-1.19881*	(0.069)	-0.56292*	(0.101)	-0.21195**	(0.042)	-0.08362*	(0.075)
headache	0.545796	(0.449)	0.670696*	(0.082)	0.096498	(0.484)	0.099629	(0.118)
stomach	0.316143	(0.581)	0.567758*	(0.066)	0.055895	(0.607)	0.084338*	(0.107)
wound	0.695688	(0.450)	0.418917	(0.326)	0.123	(0.481)	0.062228	(0.351)
bacpains	-1.19432**	(0.033)	0.898362**	(0.004)	-0.21116***	(0.008)	-0.08308*	(0.075)
coughing	1.011765	(0.116)	0.867881*	(0.09)	0.178883	(0.194)	0.133448***	(0.019)
mendisor	-2.11019*	(0.061)	-0.91574*	(0.104)	-0.37309**	(0.057)	-0.13603*	(0.092)
chronic	-0.58442	(0.623)	-0.02258	(0.961)	-0.10333	(0.615)	-0.00335	(0.961)
Provider attributes								
pubpay	-2.09013***	(0.000)	-0.33392**	(0.024)	-0.36954***	(0.000)	-0.0496***	(0.013)
privpay	-0.22777	(0.96)	-0.2900215	(0.123)	-0.0031708	(0.961)	-0.315605	(0.111)
distance	-0.00019	(0.968)	0.002866	(0.343)	-3.3E-05	(0.968)	0.000426	(0.347)
time	-0.00604	(0.967)	0.032005	(0.662)	-0.00107	(0.967)	0.004754	(0.659)
constant	-1.71019*	(0.094)	-1.45363*	(0.035)	-0.30237	(0.168)	-0.21593**	(0.054)
Key: * = significance								

Table 3. Demand for medical diagnosis in health facilities. Multiple logits results.

The log of the probability of consulting 'A' relative to 'B'						
Explanatory variables	**Private vs Public**		**Public vs Not consulting**		**Private vs Not consulting**	
	Coefficient	**Significance (*p*-values)**	**Coefficient**	**Significance (*p*-values)**	**Coefficient**	**Significance (*p*-values)**
Patient's attributes						
age	0.005701 **	(0.057)	0.001909	(0.534)	0.00761 **	(0.046)
sex	0.121013	(0.311)	-0.08986	(0.46)	0.031148	(0.838)
Household attributes						
edhed57	0.148949	(0.285)	0.326911 ***	(0.019)	0.47586 ***	(0.007)
edhed811	0.714102 ***	(0.000)	0.395344	(0.041)	1.109446 ***	(0.000)
hycons	1.60E-07 ***	(0.005)	-2.91E-08	(0.667)	1.31E-07 *	(0.071)
hinform	0.295545	(0.375)	0.830899 ***	(0.007)	1.126443 ***	(0.005)
Perceptions						
drugs	0.934949 ***	(0.000)	-0.0844	(0.266)	0.850551 ***	(0.000)
staff	0.213311 **	(0.024)	0.180564 **	(0.057)	0.393875 ***	(0.001)
laboratory	0.313753 ***	(0.000)	0.225958 ***	(0.000)	0.539711 ***	(0.000)
Illness type						
malaria	0.523257 ***	(0.007)	0.269294	(0.152)	0.792551 ***	(0.001)
diavomit	0.479736 *	(0.096)	0.311948	(0.272)	0.791683 **	(0.027)
weakness	-0.86948 *	(0.088)	-0.66291 **	(0.034)	-1.53239 ***	(0.005)
headache	0.214545	(0.52)	0.427755	(0.213)	0.642301	(0.134)
stomach	-0.42562	(0.176)	0.383545	(0.162)	-0.04207	(0.912)
wound	0.232231	(0.537)	0.405193	(0.319)	0.637424	(0.201)
bacpains	0.02369	(0.951)	-0.76726 ***	(0.008)	-0.74357 *	(0.077)
coughing	0.184171	(0.471)	0.773344 ***	(0.008)	0.957516 ***	(0.006)
childbir	-0.21815	(0.599)	0.938893 *	(0.064)	0.720739	(0.235)
mendisor	-1.74654	(0.129)	-1.09079 **	(0.03)	-2.83734 ***	(0.015)
chronic	-0.33858	(0.504)	-0.13063	(0.761)	-0.46921	(0.424)
Provider attributes						
pubpay	0.301059 ***	(0.019)	-0.54711 ***	(0.000)	-0.24605	(0.145)
pripay	0.511709	(0.000)	0.281814	(0.137)	0.229895	(0.226)
distance	0.010382	(0.128)	0.002749	(0.713)	0.013131	(0.141)
time	0.178855 **	(0.002)	-0.00657	(0.924)	0.1722839 **	(0.028)
constant	-7.49184 ***	(0.000)	-0.36328	(0.473)	-7.85511	(0.000)
Loglikelihood Ratio = **555.45**; * = significance						

The effect of quality of health care

Using drugs, staff availability and laboratory services as our proxies for subjective quality of medical care; it can be distinguished between objective and subjective quality of medical care. Objective quality in this context refers to the actual quality available from providers, ceteris paribus. Subjective quality refers to the quality conceived by households to be available in health facilities. This distinction is useful to capture variations in staff and drug s availability in public health-care facilities. Subjective quality of medical care is built from objective quality, but where information gaps and misconception persist, it is likely that the consumer will base her decision on what she knows or conceives, and not necessarily on the actual quality surrounding her. It is from this view that people's knowledge of these simple indicators of quality at the level of consultation is gathered.

In Appendix 1, the coefficients of these variables are all significant except for drugs. This is not surprising because medical consultation requires availability of doctors and laboratory (especially malaria cases). Availability of drugs does not influence the overall decision to consult, but matters in the choice of provider of the care. In fact most public facilities in Tanzania run short of drugs frequently, and hence give their clients prescriptions to buy drugs from shops. However, drugs availability increases the probability of consulting private relative to public facilities. This is because public facilities suffer from drug shortages more often than private ones (Table 3). In Table 2, the chances of an informed household to consult a medical doctor are higher than those of a less informed one. It is also noted that, the coefficients for the variables labelled diavomit and headache are positive and significant for informed households, implying that information increases the chances of a less-life threatening illness being attended by a medical doctor. On the other hand, general weakness is unlikely to be sent for diagnosis in both more and less informed households. This may be either initial symptom of an illness or HIV/Aids cases, which have bad implications on the patient's social status if exposed.

The multiple logit results in Table 3 show that malaria and diarrhoea or vomiting cases increase the relative probability of consulting private medical doctors. This is probably explained by the feelings that private facilities have better services than public ones and therefore face higher probability of being consulted in the event of life-threatening episodes.

Effects of user fees

There are indications from the results that user charges reduce demand for medical consultation. The coefficient of the dummy variable for user charges in the results is negative and significant. In Table 1 for example, user charges reduce the probability of consulting a modern provide by about 0.08; and further in Table 2 the probability is reduced by 0.37 if the household is less informed and only by 0.05 for informed households. This implies that misinformation increases price sensitivity. Further in Table 3, user charges reduce probability of consultation in formal medical facilities relative to private ones. If households are adequately knowledgeable of the causes of illness and benefits of modern health-care, user charges plus poor quality medical care reinforce the substitution effect in favour of private medical care. Analogously, if households are inadequately informed, the substitution effect is reinforced in favour of imperfect substitutes. This is an indication that a combination of misinformation, user charges and income poverty are likely to make formal and informal care substitutes to each other, implying that poor misinformed households substitute between formal and informal care more often than the relatively informed households, if the nearest public facility is charging. However, the impact is reduced for the relatively rich-misinformed households.

Emerging conclusions and policy implications

The conclusion that user fees are a potential source for financing quality enhancement in health care in developing countries seems to have neglected two important concerns. The first is in regard to health care as a merit good: an individual perceives less benefit than those around him and the society enjoys (Besley, 1988). While these benefits remain the same across individuals from the social planner's point of view, they are not necessarily uniform from the individual point of view. The role of a subsidy, therefore, should among other things alleviate gaps in health-care consumption by providing more subsidized health care to the relatively less-informed members of the community. Members

with relatively low valuation of benefits of modern health care could face relatively lower user fees. Besley (1991) describes this preferential treatment as the first best option. A lump-sum user fee treats individuals as having the same utility function and welfare from health care. There is a potential weakness with this approach as people who are unable to perceive all benefits they enjoy from health care may face a higher subjective opportunity cost than their counterparts. In this way, cost-sharing may fail to achieve both universal access and quality improvement simultaneously.

The second concern is potential inefficiencies that are inherent in public health-care delivery systems in emerging economies. User fee with re-investment, as explained in our setting, does not solve the inefficiencies originating from providers of public health-care. The fee scheme lacks incentive compatibility in solving problems of mismanagement, corruption and other inefficiencies on the side of the providers.

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