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HEALTH CARE DEMAND IN RURAL MOZAMBIQUE: EVIDENCE FROM THE 1996/97 HOUSEHOLD SURVEY

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ABSTRACT

Despite rapid economic growth in recent years, Mozambique remains a very poor country. Expenditure-based poverty measures are reflected in widespread food insecurity and poor health status. In recognition of these problems, the Government of Mozambique is promoting expanded and improved quality and equity in access to health care as an important component in the global strategy to fight poverty. Given years of colonial neglect and systematic destruction of health facilities during the civil war, recent government policy has focused on expanding the rural health network. However, insofar as the ultimate objective of the provision of curative services is to ensure that those in need of care receive effective treatment, it is also necessary to think beyond supply. Specifically, we need to consider how individuals behave during episodes of illness, and what factors affect this behavior. This paper provides quantitative evidence on the importance of individual, household, and community characteristics on individuals' care-seeking decisions during episodes of illness. The paper estimates a "flexible" multinomial model of health care provider choice conditional on illness using data from the 1996/97 Mozambique National Household Survey on Living Conditions (IAF). The empirical analysis is underpinned by a basic theoretical framework of utility maximization and household production of health. A number of individual and household characteristics, e.g., age, education, and reported symptoms, stand out as highly significant determinants of health seeking behavior. Also, prices, defined in the model as the composite of user fees and time costs associated with consultations at different providers, are found to be important determinants of choice. The results indicate that the eradication of poverty, independent of improvements in physical access to health care and education, will have only a negligible effect on health care choices.

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1. INTRODUCTION

Health is a fundamental dimension of well-being and a key component of human capital. Conversely, poor health and the inability to cope with episodes of illness can be considered important dimensions of deprivation. Health outcomes are affected by a wide range of factors, pertaining both to the individual and the social and environmental context. In addition, preventive and curative health services are direct inputs that affect an individual's health status and ability to cope with ill health. For example, there is evidence that both the distance to clinics and the price of drugs are negatively correlated with health outcomes (Benefo and Schulz 1994). Of course, the link between the provision and health care and health outcomes can be tenuous (e.g., Filmer et al. 1998). Still, the World Bank (1993, 40) reports that "in the 22 countries, roughly one-third of the effect of economic growth on life expectancy came through poverty reduction and the remaining two-thirds through increased public spending on health."

Given the importance of health services, both policymakers and researchers have directed considerable attention to the question of how broad access to health services can be ensured. Early policy and research initiatives focused on the need to improve physical access through an expansion of the network of facilities.[1] A growing literature on health care demand has, however, pointed out that supply is not sufficient. "There is a lack of understanding…of why people might desire to use these new services or, similarly, why

[1] Reflecting this focus, both the UNDP (1991) and the World Bank (1993) define access as the percentage of the population that can reach appropriate local health services on foot or by the local means of transport in no more than an hour.

they might stay away" (Akin et al. 1986b, 756). Actual consumption of health care will differ in accordance with demand factors such as income, cost of care, education, social norms and traditions, and the quality and appropriateness of the services provided.

This paper adopts the notion of access used by Baker and van der Gaag (1993), who define access as the actual use of health services in the event of illness. Following a growing literature on health care demand, the paper seeks to investigate and quantify the determinants of access to publicly provided health care, and of health-seeking behavior more broadly. Specifically, the paper provides descriptive evidence on illness incidence and care-seeking behavior for rural households from a 1996/97 nationwide household survey in Mozambique. However, observed outcomes reflect a complex interaction of numerous factors, and they do not shed light on how different explanatory variables affect outcomes conditional on other variables. Only when we control for these complexities can we make meaningful policy inferences. The paper therefore estimates a behavioral model of health care demand, where demand is understood as the probability of seeking different types of care conditional on illness, given the relevant characteristics of the individual, the household, and the wider community.

Following this introduction, Section 2 provides an overview of issues relating to health and health care provision in Mozambique, providing both a historical perspective and a discussion of the current policy framework. Section 3 describes the data that form the basis for the research reported in this paper. It also provides an overview of evidence on the incidence of illness, the decision to seek care, and the choice of health care provider in the event of illness, and relates this evidence to the relevant literature. Section

4 sets out the theoretical framework and the empirical model that underpin the analysis of the data, drawing extensively on the existing literature on health care demand. Section 5 reports the results of the empirical analysis and investigates policy implications through a few simple policy simulations. Finally, Section 6 discusses the broader implications of the research.

2. HEALTH AND HEALTH CARE IN MOZAMBIQUE

A HISTORICAL PERSPECTIVE

General Background

Mozambique was once a Portuguese colony. The country gained independence in 1975, after more than 10 years of conflict between the Frente de Libertação de Moçambique (Frelimo)[2] and the Portuguese state. After independence, Frelimo adopted an ambitious socialist approach to development. This entailed a broad policy of nationalization, beginning with the health and education sectors, but later extending to the legal and commercial sector, land, rented housing, banking, agriculture, and other sectors.

Notwithstanding some notable successes, particularly in respect of social indicators relating to health and education, Frelimo's policies largely failed to stimulate economic growth. Growing tensions between Mozambique and Rhodesia and South Africa compounded economic woes. In response to Frelimo's support of independence movements in the two neighboring countries, Mozambique became the target of intense

[2] Mozambique Liberation Front.

destabilization campaigns, largely carried out by the Resisténcia Nacional de Moçambique (Renamo).[3] These campaigns sought to undermine the basis of Frelimo popularity and brought large-scale destruction of both physical and social infrastructure.

In recognition of the economic problems facing the country, the 1983 Fourth Frelimo Party Congress heralded a new emphasis on more decentralized and capitalist-oriented development strategy. Mozambique joined the World Bank and the International Monetary Fund (IMF) in 1984, and the first adjustment program—the Economic Rehabilitation Programme (ERP)—was introduced in 1987. In 1990, the ERP was followed by the Economic and Social Rehabilitation Programme (ESRP). In the same year, constitutional revision introduced a multi-party system and a tentative dialogue was initiated between the government and Renamo. A peace agreement was eventually signed in 1992, and the first democratic presidential and parliamentary elections followed in 1994. Frelimo won the elections, but Renamo gained considerable minority representation in parliament. Structural reforms initiated in 1987 brought the deregulation of most goods and service markets, large-scale privatization, and a liberalization of the trade regime. In parallel, an ambitious program of public sector reform was formulated and implementation begun.

In recent years, Mozambique has been considered an African "success story." Inflation has fallen steadily to low levels, growth has been high and stable, and foreign investment is rising. Notwithstanding impressive macroeconomic indicators, the

[3] Mozambique National Resistance.

economy remains highly aid dependent, and there is widespread concern that the gains from economic growth have failed to benefit the poorest segments of the population.

The Health Sector

During colonization, the health status of the majority of the population was very poor.[4] The Portuguese state put very little effort into social development, and with the exception of some vertical health programs,[5] very few or no health services were provided by the state outside the major towns. To the extent that health services were available, they were provided by church groups or traditional medical practitioners (TMPs). Similarly, education received little attention, and skilled and semiskilled employment opportunities were very limited for black Mozambicans; at independence, 90 percent of the population was illiterate (Walt 1983).

Soon after independence, Frelimo put all existing health facilities under government control and banned private practice. It also sought to redress imbalances in the colonial health sector by initiating a dramatic expansion of the rural health network. The number of first-level health posts increased from 326 at independence to 1,195 in 1985 (van Diesen 1999). This entailed an expansion of the physical infrastructure, but also intensive recruitment and training.[6] Frelimo also launched an intensive vaccination

[4] It is estimated that over one-quarter of all children died before age 5 (Walt 1983).

[5] E.g., sleeping sickness.

[6] In the uncertain environment following independence, large segments of the Portuguese population left the country. This exodus had a dramatic impact on the health sector: 85 percent of the country's 550 doctors left and most rural mission hospitals or health posts were abandoned.

campaign in 1976. Despite low population density and poor transport infrastructure, over 10 million people were vaccinated in these early campaigns.[7]

Frelimo's Third Congress in 1977 laid down guidelines for future development and health policy. It brought the "socialization of medicine" (Walt 1983), which sought to improve and broaden access to health care. Although minor charges for outpatient visits were maintained, exemption schemes provided for waivers. All inpatient care was to be free. A referral system was also set up, which established the health post as the first point of contact, while health centers and hospitals dealt with the more complex cases.[8]

Frelimo's health policies suffered severely from the intensification of Renamo's destabilization campaign in the early 1980s, which consistently targeted health facilities and schools. Between 1981 and 1988, 291 health units were destroyed and a further 687 looted and temporarily closed. It is estimated that at the end of the war, almost half of the 1,195 health units that existed in 1985 remained closed (van Diesen 1999). Similarly, 60 percent of all primary schools were destroyed. A crisis in the health sector ensued. Plans for reconstruction and human resource development were formulated in a comprehensive policy review undertaken in 1991/92, which emphasized sustainability and incremental growth (Pavignani and Durão 1997). The conclusions of the policy review were reflected in the gradual reform of the legislative framework, the reintroduction of private practice, and the formulation of the *Health Sector Recovery Programme* (HSRP), a World Bank-

[7] Although the campaign has been hailed as a success, poor follow-up (including second doses of some vaccines) resulted in poor impact (Walt 1983).

[8] Both fee waivers and the referral system were easier to implement on paper than in practice.

supported sector investment program. The HSRP was launched in late 1995 with the aim of decreasing Mozambique's infant, child, and maternal mortality rates to Sub-Saharan average levels by the turn of the century. This was to be achieved by expanding health coverage, particularly primary health care, from an estimated 40 percent of the population to 60 percent by 2000.

The HSRP was implemented with only limited success. Since 1998 work has been under way to develop a long-term health sector financing strategy and strategic plan. Again, financial sustainability is emphasized, and institutional reform initiatives have been proposed with a view to strengthen the regulatory capacity of the Ministry of Health and to separate the functions of financing and regulating the health sector from the provision of services. Implementation is expected to begin in 2001.

THE INSTITUTIONAL AND POLICY FRAMEWORK

The Government of Mozambique is responsible for providing a minimum set of services and for managing the National Health System (NHS). Delivery of care is organized into four levels of facilities: (1) health posts and health centers; (2) rural and general hospitals; (3) provincial hospitals; and (4) central and specialized hospitals. In theory, patients are referred through this system in accordance with their need. Health posts and centers provide only basic preventive and curative services. Health posts typically have only rudimentary facilities and limited staffing, while health centers have a number of auxiliary staff and more sophisticated equipment and facilities (there is, however, considerable variability). Rural and general hospitals constitute the first level of referral and usually have emergency care and perform simple surgeries as well as obstetric and trauma interventions. Patients in need of more specialized care are sometimes referred to provincial or central hospitals.

The Government's health-sector policy emphasizes equity, access, and quality (see, for example, MoH 1999), and is in recognition of its strategic importance. The government (GoM 2000a, 41) recently noted that "expanded and improved quality and equity in access to health care [is] an important component in the global strategy to fight poverty." Specific policies and targets for the health sector have been set out in a range of policy documents, including the conditionality framework for the HIPC Initiative,[9] and form a fundamental building block of the Government's *Interim Poverty Reduction Strategy Paper* (IPRSP) (GoM 2000b).[10] Key objectives are to (1) promote and provide good quality and sustainable health care, equitably and efficiently, making it accessible to the population, especially the less privileged groups; (2) increase access and improve the quality of health care for women; (3) improve infant and under-five health care; and (4) through immunization, prevent the main endemic diseases affecting children.

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[9] Mozambique reached the decision point for the original HIPC Initiative in April 1998; completion point was subsequently reached in June 1999. The IMF and World Bank approved a decision point for the Enhanced HIPC in March 2000, aimed at bringing further debt reduction. Completion point under the enhanced HIPC is conditioned on the completion of a full Poverty Reduction Strategy Paper, continued progress in implementing agreed policy measures, and satisfactory performance under the program supported by the Poverty Reduction and Growth Facility (IMF 2000).

[10] The IPRSP was presented in February 2000 in partial fulfillment of conditions established in the context of the *Enhanced HIPC* Initiative. It is expected that the full PRSP will be finalized in March 2001. The IPRSP defines the reduction of the incidence of absolute poverty from the current level of around 70 percent to around 50 percent in the next 10 years (GoM 2000a, 41).

SOCIOECONOMIC INDICATORS AND EPIDEMIOLOGICAL PROFILE

Despite rapid economic growth in recent years, Mozambique remains a very poor country, with approximately 70 percent of the population living in poverty (GoM et al. 1998).[11] These expenditure-based poverty measures are reflected in widespread food insecurity and poor health indicators. Sixty-four percent of all Mozambicans—over 10 million people—live in food-insecure households (GoM et al. 1998). Prevalence of malnutrition implies higher risk of mortality and morbidity and of retarded physical and cognitive development.[12]

Poor environmental conditions and extremely limited access to water, sanitation, and health services also contribute to poor health status. Sixty-six percent of urban dwellers have access to a generally "safe" water source, like piped water, while only 12 percent of rural dwellers do. A large percentage of the population gets water from a public or private well, but lakes and rivers remain an important source of water, particularly in the central region of the country. Only 21 percent of rural households have latrines. There is, however, considerable regional variation, and latrines are generally more common in urban areas (GoM et al. 1998).

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[11] Poverty benchmarks are provided by the recent poverty assessment (GoM et al. 1998). Average per-capita consumption was estimated to be US$170 per year. There is considerable variation in the incidence of poverty between urban and rural areas as well as across provinces (see Appendix Table 3). The poverty line was constructed as the sum of a food poverty line plus a modest amount for nonfood consumption. For further details, see Datt et al. (2000).

[12] Although poverty is clearly an important factor, evidence suggests that the association between poverty and child malnutrition is fairly weak in Mozambique; environmental conditions and maternal education are important determinants (GoM et al. 1998).

As a consequence of malnutrition and poor living conditions and public services, the presence of endemic diseases, and other poverty related factors, mortality and morbidity indicators are among the worse in Sub-Saharan Africa (Table 1). Forty-one percent of all Mozambican children under age 5 are stunted and 6 percent are wasted (GoM et al. 1998).[13] The main causes of child deaths are diarrheal diseases and respiratory infections, especially pneumonia, but other infectious diseases such as measles, malaria, and whooping cough are also common (Walt 1983). Women also constitute a high-risk group. In particular, maternal mortality related to pregnancy or childbirth complications are common. A recent report estimated maternal mortality at 1,500 per 100,000 live births, which is significantly above the average for Sub-Saharan

Table 1: Selected socioeconomic indicators

Selected indicators	Mozambique 1998	Sub-Saharan Africa, 1990–96 (by income group) Lowest	Low	Middle	All
Population (millions)	16.9	-	-	-	-
GNP per capita (US$)	210.0	-	-	-	500.0
Infant mortality (per 1,000 live births)	147.4	102.0	81.0	55.0	92.0
Under-five mortality (per 1,000 live births)	218.7	173.0	125.0	74.0	151.0
Life expectancy (years)	45.2				
Male	-	48.1	52.4	59.7	55.3
Female	-	51.2	55.1	65.3	53.5
Total fertility rate	5.2	6.3	5.4	3.4	5.8
Maternal mortality (per 100,000 live births)	1,500.0	1,015.0	606.0	277.0	822.0
Childhood stunting (percent)	35.9	44.5	30.6	22.6	38.9

Source: World Bank (2000); Peters et al. (2000); Gwatkin et al. (2000); PRB (2000).

[13] Children are considered stunted (wasted) if they fall <-2 Z-scores from the mean height-for-age (weight-for-height). The IAF estimates of stunting and wasting should be treated as "lower bound" estimates because of the skewed sample of children with adequate age information.

Africa (PRB 2000).[14] Gwatkin et al. (2000) point out that national averages mask considerable inequality in health outcomes.

HEALTH CARE FINANCING AND USER FEES

Total health-sector financing—including government and aid expenditures, documented user fees, and conservative estimates of other household expenditures in the health sector (unofficial fees, pharmacy purchases, and traditional medical practitioners)—was estimated at US$139 million in 1997 (Yates and Zorzi 1999). This gives a total per-capita expenditure on health care and health services of merely $8.84. Beattie and Kraushaar (1999) point out that this is not only low by international standards, but also significantly below the normative standard of $12 for provision of a basic package of preventive and primary care proposed by the World Bank (World Bank 1993). Per-capita expenditures by households are similar to locally financed government expenditures ($1.70 and $1.97, respectively).[15] Only a small proportion of these expenditures are on official declared fees to government health facilities. Fee-for-service payments to private allopathic health facilities and private commercial facilities are important, but the largest components of estimated household spending are unrecorded

[14] Due to lack of data on incidence and causes of mortality, these maternal mortality estimates are based on birth rates and the proportion of births that are attended by a trained person. It is higher than many estimates reported elsewhere, and should probably be considered an upper bound. The reported causes for this high estimate include (1) poor access to health services; (2) large proportion of abortions undertaken by unsafe practitioners; (3) young age of childbirth; and (4) poor awareness of contraceptive measures.

[15] This is in spite of a considerable increase in government spending in the social sectors since the end of the conflict. The "peace dividend" has resulted in a reversal in budget allocations between defense and health and education (Devereux and Palermo 1999).

payments to government health facilities (unofficial or illegal fees) and payments to the traditional sector (Barbosa 1999; Beattie and Kraushaar 1999). More than half of total per-capita spending is financed by international agencies or NGOs ($2.92 and $1.68, respectively).[16]

User fees for consultations, clinical costs of inpatient services, and co-payment of medicines have been collected at the point of service in Mozambique since 1977. The fees were originally motivated by the need to encourage careful and wise use of health services rather than as a main source of revenue. The user fee schedule has always contained a long list of exemptions, covering both reasons for visits (e.g., preventive care and sexually transmitted diseases [STDs]) and characteristics of the individual seeking care (e.g., children under 5, elderly, handicapped, the poor, and pregnant women). There are, moreover, differences between urban and rural areas. In theory, collected funds are retained by the health facilities. Records and control mechanisms are, however, poor, and it is not clear to what extent this occurs (Barbosa 1999; Beattie and Kraushaar 1999).

Currently, the table of fees for government facilities limits official co-payments for services in public facilities. For rural clinics the charge is a flat rate of 1,000 meticals (MT) for outpatient consultations. Urban health centers charge 5,000MT, while a hospital inpatient day is 10,000MT.[17] The fee schedules for both private practitioners and TMPs are unregulated. Medicines are charged individually but are heavily subsidized. Yet, notwithstanding the existence of regulation, the system of fees for services and

[16] Most of NGO spending in the health sector is financed by international agencies.

[17] 1US$ = 11,000MT (approximately) in 1997.

exemptions remains complex and incoherent, and illegal charges are pervasive (Barbosa 1999). Aside from legally regulated fees, charges are made for (1) faster or better access to “normal” services, (2) service at “special clinics” in government facilities, (3) private drug sales in public facilities, and (4) payment for services of state health workers outside state facilities (Barbosa 1999).

A range of studies has provided ample evidence of inconsistencies in the implementation of the user-fee policy. In part, problems arise from a lack of information. Most facilities do not have clear written and posted information on fee structures and exemption rules, and the majority of users learn about what fees are to be paid verbally (SDC et al. 2000). The Swiss Development Corporation (SDC) study also finds considerable variability in the fees paid by individuals, even for similar services. For example, in Tete, 64 percent of respondents paid more than 1,000MT for child consultations in health posts, compared to only 6 percent in Inhambane. Similarly, on the basis of household- and community-based interviews in three villages, Cabral (1999) found significant variation in the amounts that individuals paid. Moreover, expenditures were higher than would be expected, given the fee structure, and there was evidence of illegal payments.[18] In consequence of these problems, the user fee system was recovering as little as 2.7 percent of government recurrent health care spending in 1996 (Beattie and Kraushaar 1999).

[18] Some types of treatment or care are particularly expensive. In particular, childbirth should be free, but women were often required to provide supplies. Similarly, considerable charges were made for injections to treat STDs. In consequence, many households had to sell animals or produce or go into debt to pay for health services (Cabral 1999).

3. DATA AND DESCRIPTIVE STATISTICS ON ILLNESS AND HEALTH-SEEKING BEHAVIOR

THE DATA

The Household Survey

The main source of data to be used in the research is the Mozambique National Household Survey on Living Conditions, 1996–97 (IAF).[19] The IAF was the first national household living standards survey fielded since the end of the civil war. The survey was designed and implemented by the National Statistics Institute in Mozambique, and was conducted from February 1996 to April 1997. The sample was selected in three stages and geographically stratified to ensure that (1) the entire sample is nationally representative, (2) the urban (rural) sample is representative of urban (rural) households, and (3) each provincial sample is representative at the province level (treating the capital city of Maputo as a separate province). This design allows for analysis at national, provincial, and urban/rural levels. The first stage of sample design entailed selecting *localidades* (rural) or *bairros* (urban) as primary sampling units, with units selected probability proportional to size (pps). Below this level, *aldeias* (rural) or *quarterões* (urban) were selected as secondary clusters. As the third and final stage, households were selected randomly from each *aldeia*/*quarterão*, and covered approximately 43,000 individuals living in 8,250 households. The research in this paper focuses on the rural subsample, which consists of 28,270 individuals.

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[19] Inquérito Nacional aos Agregados Familiares Sobre as Condições de Vida (IAF).

The IAF was collected over 14 months, divided in 24 periods of 10 days each. In each period, the interviewer visited a certain number of households (12 in urban areas, 9 in rural areas) three times. Each visit covered different sections of the questionnaire. The three principal instruments for the household-level interviews were (1) a principal survey questionnaire, (2) a daily household expenditure questionnaire, and (3) a daily personal expenditure questionnaire administered to all income-earning members within the household.

Information collected at the individual level included demographic characteristics, migration history, health, education, and employment status. At the household level, information on landholding size and description, agricultural production, livestock and tree holdings, dwelling characteristics, types of basic services used, asset ownership, major nonfood expenditure during past month, transfers, and sources of income were collected.

In addition to individual and household-level data, a community-level survey was administered and detailed market price information was collected. The community-level survey included questions on local infrastructure, access to services, and general community characteristics. It was collected for each village, but not in any urban areas. Price information was collected in the major market for each sampled *bairro* (urban areas) or *localidade* (rural areas).

The individual-level IAF data were merged with data on public spending on health (current spending and spending on medicines). For this, district-level data were used, and attributed to each observation on the basis of reported residence at the time of the interview. The data on public spending were collected by the respective Provincial Directorates of Health with the support of the SDC (Maputo) as part of the Integrated Provincial Planning initiative. Spending figures refer to execution and include all sources of funding. Current spending includes material, salaries, and medicines.

DESCRIPTIVE STATISTICS: HEALTH AND HEALTH CARE

Reporting of Illness

The IAF contains a series of questions pertaining to the health status of interviewees. Specifically, the questionnaire captures information on whether the interviewee suffered an illness episode or accident in the four weeks preceding the survey, the length and severity of illness, and the symptoms suffered.

In the IAF, approximately 11.4 percent report being ill in the four weeks preceding the survey.[20] The rate of illness reporting is slightly higher in rural (11.6 percent) than in urban (10.5 percent) areas. There is significant variation regionally and across provinces in reporting of illness. It is particularly high in Niassa (25.7 percent), Cabo Delgado (18 percent), Maputo (17 percent), and Manica (15.9 percent) (Table 2). Concentrating on households in rural areas, data suggest that women are more prone to report illness than men (12.8 and 10.3 percent, respectively).[21] Moreover, there is a rather

[20] In what follows, all percentages are calculated using sampling weights, and comprise population estimates.

[21] Descriptive statistics from the IAF refer to the rural subsample unless otherwise specified.

Table 2: Population composition and reporting of illness, by province

Province/region	Population (%)	Pop. comp. by province (%)		Poverty (%)	*se*	Percent of population reporting ill in month prior to survey					
		Urban	Rural			Rural	*se*	Urban	*se*	Total	*se*
Niassa	4.9	23.4	76.6	70.7	*3.8*	25.4	*3.6*	26.8	*2.6*	25.7	*2.8*
Cabo Delgado	8.2	7.6	92.5	57.4	*4.2*	17.8	*1.6*	21.0	*0.2*	18.0	*1.5*
Nampula	19.5	20.1	79.9	68.9	*3.3*	11.1	*0.7*	9.2	*2.4*	10.8	*0.8*
The North	**32.5**	**17.4**	**82.6**	**66.2**	***2.3***	**15.0**	***1.0***	**14.0**	***2.2***	**14.8**	***0.9***
Zambézia	20.4	5.2	94.8	68.1	*2.6*	9.7	*0.8*	12.6	*0.2*	9.9	*0.8*
Tete	7.3	13.0	87.0	82.3	*3.2*	9.6	*1.0*	10.2	*3.7*	9.6	*1.0*
Manica	6.2	17.5	82.5	62.2	*6.0*	15.7	*1.1*	16.6	*2.4*	15.9	*1.0*
Sofala	8.7	21.3	78.7	87.9	*1.5*	10.5	*1.3*	9.6	*1.4*	10.3	*1.1*
The Center	**42.6**	**11.6**	**88.4**	**73.7**	***1.6***	**10.6**	***0.5***	**11.9**	***1.0***	**10.8**	***0.5***
Inhambane	7.1	16.0	84.0	82.1	*2.5*	5.1	*0.5*	7.6	*2.8*	5.5	*0.7*
Gaza	6.6	7.1	92.9	64.2	*3.4*	6.9	*1.2*	7.9	*1.6*	7.0	*1.1*
Maputo Province	5.2	39.2	60.8	65.8	*5.4*	15.4	*1.1*	19.4	*0.8*	17.0	*0.8*
The South (excluding Maputo City)	**18.8**	**19.2**	**80.8**	**71.3**	***2.4***	**8.0**	***0.6***	**14.3**	***1.5***	**9.2**	***0.7***
Maputo City	6.1	100.0	0.0	47.5	*4.1*	100.0	*0.0*	3.8	*0.6*	3.8	*0.6*
Total	**100.0**	**20.3**	**79.7**	**69.2**	***1.1***	**11.6**	***0.4***	**10.5**	***0.9***	**11.4**	***0.4***

large difference between poor and nonpoor households in reporting of illness (10.1 and 15.2 percent, respectively). This difference is quite consistent across provinces (Table 3). Illness reporting is particularly high for children, in particular infants, and elderly (46 years or older) (Table 4).

Self-reported data on the incidence of illness are notoriously problematic due to the subjectivity of responses. Makinen (1999) reviewed household surveys from eight developing countries from the period 1986–1997 and found considerable

Table 3: Reporting of illness in rural households

Province/region	Rural households: Percent reporting illness in 4 weeks prior to survey									
	Total	***se***	**Female**	***se***	**Male**	***se***	**Not poor**	***se***	**Poor**	***se***
Niassa	25.4	*3.6*	27.0	*3.2*	23.6	*4.2*	26.2	*3.2*	25.0	*4.1*
Cabo Delgado	17.8	*1.6*	17.9	*1.8*	17.6	*1.6*	21.0	*2.0*	15.3	*2.1*
Nampula	11.1	*0.7*	13.3	*0.7*	9.0	*1.2*	14.2	*1.9*	9.5	*0.7*
The North	**15.0**	***1.0***	**16.5**	***0.9***	**13.4**	***1.2***	**17.8**	***1.4***	**13.4**	***1.1***
Zambézia	9.7	*0.8*	10.5	*1.1*	8.9	*1.0*	12.1	*1.5*	8.6	*0.8*
Tete	9.6	*1.0*	10.6	*1.1*	8.4	*1.0*	17.7	*2.2*	7.9	*1.0*
Manica	15.7	*1.1*	17.3	*1.9*	14.0	*1.0*	19.9	*2.5*	13.3	*1.5*
Sofala	10.5	*1.3*	12.0	*1.6*	9.1	*1.2*	14.8	*2.4*	10.2	*1.4*
The Center	**10.6**	***0.5***	**11.7**	***0.7***	**9.5**	***0.6***	**14.4**	***1.1***	**9.4**	***0.5***
Inhambane	5.1	*0.5*	5.8	*0.9*	4.2	*0.6*	9.3	*1.7*	4.4	*0.5*
Gaza	6.9	*1.2*	8.2	*1.4*	5.2	*1.0*	6.4	*1.5*	7.2	*1.8*
Maputo Province	15.4	*1.1*	16.9	*1.2*	13.4	*1.3*	23.3	*2.1*	13.0	*1.1*
The South (excluding Maputo City)	**8.0**	***0.6***	**9.2**	***0.7***	**6.4**	***0.6***	**10.3**	***1.0***	**7.2**	***0.7***
Total	**11.6**	***0.4***	**12.8**	***0.5***	**10.3**	***0.5***	**15.2**	***0.8***	**10.1**	***0.5***

Table 4: Reporting of illness, by age category (rural households)

Age	Population	Rural households: Percent of individuals reporting illness in month prior to survey									
		Total	***se***	**Female**	***se***	**Male**	***se***	**not poor**	***se***	**Poor**	***se***
0-1	6.7	22.4	*1.7*	22.6	*2.5*	22.1	*2.2*	29.7	*5.5*	19.9	*1.4*
2-5	11.8	12.5	*1.0*	11.1	*0.9*	13.9	*1.4*	18.4	*2.5*	10.7	*0.9*
6-15	29.7	6.0	*0.5*	5.7	*0.6*	6.2	*0.6*	7.1	*1.0*	5.6	*0.6*
16-30	23.6	10.2	*0.7*	12.0	*0.8*	7.7	*0.7*	13.5	*1.2*	8.3	*0.7*
31-45	13.4	12.9	*0.8*	16.5	*1.3*	9.2	*1.0*	13.6	*1.4*	12.7	*0.9*
46+	14.7	18.8	*1.0*	21.6	*1.2*	15.9	*1.2*	23.4	*1.8*	16.1	*1.0*
Total	**100.0**	**11.6**	***0.4***	**12.8**	***0.5***	**10.3**	***0.5***	**15.2**	***0.8***	**10.1**	***0.5***

differences across countries, both in respect of the overall incidence of illness and the distribution of morbidity across economic groups. The incidence of reported illness ranges from 62 percent in Burkina Faso to 7 percent in Thailand. Similarly, the incidence of illness is higher in poorer quintiles in some countries, whereas the reverse holds in others.[22] These egregious differences cast doubt on the use of self-reported morbidity in research and policy design. Moreover, measurement errors due to incorrect diagnosis and imperfect recall are also likely to be pervasive in data on self-reported health status. These issues will be discussed in further detail below.

On the basis of reported illness episodes, the most common specific ailments are malaria (21.8 percent) and diarrhea (17.5 percent). However, approximately 35 percent of those reporting illness reported none of the listed symptom groups. There is significant regional variation in the pattern of reported illness (e.g., only 7.5 percent reported diarrhea in the South, compared with 17.5 percent national average).[23] Also, the regional aggregation masks some significant variation in reported illness pattern across provinces. There is also a noteworthy variation in the disease pattern across age categories. Diarrhea is a big problem in infants (38.8 percent of those ill suffer from diarrhea, compared to 17.5 for all age groups). Among the elderly, 50.1 percent of those reporting illness suffer from symptoms other than those categories included in questionnaire (Table 5).

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[22] There are differences among the surveys covered in respect of geographical coverage, sampling techniques, recall period, formulation of questions, etc. This limits the scope for generalization across the surveys.

[23] The South includes Maputo Province, Maputo City, Gaza, Inhambane; the Center includes Sofala, Manica, Tete, and Zambézia; and the North includes Nampula, Cabo Delgado, and Niassa.

Table 5: Type of illness of those reporting illness in month prior to survey

	Rural households: Type of illness - percent of those reporting illness in month prior to survey																						
			By region						**By gender**				**By age category**										
Type of illness	**Total**	***se***	**North**	***se***	**Central**	***se***	**South**	***se***	**Male**	***se***	**Female**	***se***	**0-1**	***se***	**2-5**	***se***	**6-15**	***se***	**16-30**	***se***	**31-45**	***se***	**46+**
Diarrhea	17.5	*2.2*	18.0	*1.8*	20.1	*4.6*	7.5	*1.4*	18.0	*2.2*	17.2	*2.5*	38.8	*5.3*	22.4	*3.6*	15.2	*3.3*	13.2	*2.0*	18.7	*3.4*	7.3
Cold, cough, breathing difficulty	7.9	*0.8*	8.2	*1.3*	7.7	*1.1*	8.0	*1.3*	7.5	*1.0*	8.2	*0.9*	6.6	*1.8*	9.2	*2.1*	7.7	*2.2*	4.6	*0.9*	9.7	*1.6*	10.1
Worm	1.4	*0.3*	1.9	*0.4*	1.3	*0.5*	0.3	*0.2*	1.4	*0.5*	1.4	*0.3*	3.8	*1.4*	3.1	*1.1*	1.3	*0.5*	0.7	*0.3*	0.6	*0.3*	0.4
Fever	7.9	*0.7*	7.7	*1.1*	7.5	*1.1*	9.9	*1.9*	7.0	*1.0*	8.6	*0.8*	8.5	*1.6*	11.8	*2.4*	10.0	*1.7*	9.0	*1.4*	5.1	*1.1*	4.8
Persistent cough with vomiting	2.4	*0.4*	2.0	*0.5*	2.7	*0.8*	2.9	*0.7*	2.3	*0.5*	2.5	*0.5*	3.3	*1.1*	3.3	*1.3*	3.8	*1.0*	1.1	*0.4*	2.2	*0.8*	2.0
Persistent cough with blood	1.5	*0.3*	2.1	*0.5*	0.9	*0.5*	1.4	*0.5*	1.9	*0.6*	1.2	*0.3*	0.8	*0.5*	0.9	*0.6*	2.5	*0.8*	1.1	*0.4*	1.6	*0.8*	2.0
Skin eruptions	3.5	*0.6*	6.0	*1.2*	1.4	*0.4*	2.1	*0.7*	4.7	*0.9*	2.6	*0.5*	4.2	*1.4*	6.8	*2.1*	2.9	*1.0*	2.4	*0.8*	3.2	*1.0*	2.8
Malaria	21.8	*1.8*	20.3	*2.9*	20.5	*2.7*	31.0	*4.0*	21.5	*2.0*	21.9	*2.0*	17.7	*3.7*	21.6	*3.2*	25.5	*3.5*	24.3	*2.4*	19.9	*2.5*	20.6
Other	36.0	*1.8*	33.9	*2.4*	38.0	*3.1*	36.9	*3.0*	35.6	*2.0*	36.4	*2.1*	16.4	*2.8*	20.9	*2.9*	31.1	*3.6*	43.6	*2.5*	39.1	*3.1*	50.1
Total	**100.0**		**100.0**		**100.0**		**100.0**		**100.0**		**100.0**		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

The Decision to Seek Care

Individuals who report having suffered an illness episode in the last four weeks were asked follow-up questions relating to the type of treatment sought. There are quite considerable differences across provinces in the proportion of those reporting ill that seek care (from 48.8 percent [Manica] to 67.5 percent [Nampula]).[24] The national average for the rural population is 57.4 percent. A slightly higher proportion of men than women seek care. The percentage of individuals from poor households seeking care (56.3 percent) is slightly lower than for nonpoor individuals (59.2 percent) (Table 6). The percentage of infants (0–1 years) and children that attended a consultation in response to an illness episode is higher than for other age groups (74.4 and 62.0 percent, respectively, compared to 57 percent, on average). For the poor elderly, only 48 percent seek care (Table 7).

There is, moreover, evidence that the decision to seek care is influenced by the type of illness the individual suffers from. In particular, of those suffering from diarrhea and malaria, 66.4 and 58.7 percent, respectively, seek care. This can be compared with 44.8 percent for "cold, cough, and breathing difficulties" and 48.5 percent for "skin eruptions" (Table 8). The major reported reasons for not seeking treatment in the IAF were distance to health facility and lack of money to pay for care.

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[24] The alternative "no consultation" should not necessarily be equated with no treatment. Depending on the type of disease and knowledge of the individual/household there may be considerable scope for self-treatment.

Table 6: The decision to seek care

Province/region	Total	*se*	Female	*se*	Male	*se*	N. poor	*se*	Poor	*se*
	Rural households: Percent of those ill that report seeking care									
Niassa	58.6	*6.9*	53.3	*5.4*	64.9	*8.9*	62.9	*9.9*	56.8	*7.1*
Cabo Delgado	51.0	*3.9*	53.0	*4.7*	49.0	*4.9*	47.6	*5.2*	54.6	*6.5*
Nampula	67.5	*3.8*	62.5	*4.5*	75.0	*4.6*	66.2	*5.7*	68.4	*3.7*
The North	**59.9**	***2.8***	**57.5**	***2.9***	**62.9**	***3.7***	**58.3**	***4.0***	**61.1**	***3.2***
Zambézia	60.3	*4.3*	61.4	*5.7*	59.0	*4.1*	66.5	*6.7*	56.2	*3.9*
Tete	52.2	*8.8*	55.9	*8.8*	47.2	*9.3*	55.3	*12.1*	50.9	*8.9*
Manica	48.8	*3.8*	48.0	*5.0*	49.7	*3.4*	50.2	*6.4*	47.5	*3.8*
Sofala	50.5	*4.9*	48.9	*5.1*	52.7	*5.7*	51.3	*8.1*	50.4	*5.2*
The Center	**55.0**	***2.9***	**55.5**	***3.6***	**54.3**	***2.7***	**59.7**	***4.8***	**52.5**	***2.6***
Inhambane	59.0	*5.5*	59.3	*5.9*	58.5	*6.7*	58.9	*8.6*	59.0	*6.6*
Gaza	63.8	*9.0*	63.0	*9.8*	65.4	*9.3*	76.6	*10.5*	57.5	*9.3*
Maputo Province	50.1	*4.1*	49.2	*4.1*	51.8	*5.3*	50.7	*6.7*	49.8	*4.8*
The South (excluding Maputo City)	**57.1**	***3.8***	**56.6**	***4.2***	**58.1**	***4.1***	**61.8**	***6.4***	**55.0**	***4.0***
Total	**57.4**	***1.8***	**56.5**	***2.0***	**58.6**	***2.2***	**59.2**	***2.8***	**56.3**	***1.9***

Table 7: The decision to seek care, by age category (rural households)

Age	Population	Total	*se*	Female	*se*	Male	*se*	not poor	*se*	poor	*se*
		Rural households: Percent of individuals seeking care									
0-1	6.7	71.5	*3.4*	69.0	*6.1*	74.4	*4.8*	74.9	*7.2*	69.9	*3.7*
2-5	11.8	62.0	*3.8*	61.9	*4.3*	62.0	*5.8*	70.6	*8.2*	57.5	*4.0*
6-15	29.7	55.4	*3.6*	51.9	*5.3*	58.3	*4.0*	57.2	*6.6*	54.7	*3.9*
16-30	23.6	54.2	*3.0*	54.5	*3.3*	53.6	*4.4*	55.7	*4.0*	52.9	*3.8*
31-45	13.4	56.2	*3.0*	58.4	*3.7*	52.0	*4.3*	51.1	*4.6*	58.4	*3.7*
46+	14.7	51.8	*2.8*	50.8	*3.1*	53.2	*4.0*	55.8	*3.8*	48.4	*3.4*
Total	**100.0**	**57.4**	***1.8***	**56.5**	***2.0***	**58.6**	***2.2***	**59.2**	***2.8***	**56.3**	***1.9***

Table 8: Health-seeking behavior, by type of illness

			Rural households: Choice of treatment - prop. by type of illness						No. of days unable to perform basic functions			Cost of consultation		Cost of medicine	
Type of illness	**% seeking care**	***se***	**Hosp.**	**Private**	**H. post**	**Trad. healer**	**Other**	**Total**	**median**	**mean**	**% still w/o function**	**median**	**mean**	**median**	**mean**
Diarrhea	66.4	*5.5*	13.0	2.6	62.2	16.1	6.2	100.0	7	10	29.6	500	2,045	1,000	2,745
Cold, cough, breathing difficulty	44.8	*4.7*	23.0	2.0	51.2	18.2	5.6	100.0	7	15	29.4	500	1,659	2,000	6,490
Worm	58.3	*8.4*	19.2	5.0	65.9	10.0	0.0	100.0	7	7	65.8	500	1,341	1,000	3,525
Fever	53.4	*5.9*	21.6	0.5	59.7	10.8	7.4	100.0	7	9	20.9	500	4,395	1,500	6,564
Persistent cough w. vomiting	49.7	*8.1*	17.4	2.0	57.9	17.5	5.2	100.0	7	9	42.6	500	2,610	2,000	9,578
Persistent cough w. blood	56.8	*10.0*	54.9	0.0	42.5	2.6	0.0	100.0	5	7	78.7	500	676	5,000	6,013
Skin eruptions	48.5	*5.0*	16.3	0.0	63.4	19.4	0.9	100.0	5	17	62.2	500	1,034	3,000	6,684
Malaria	58.7	*3.1*	25.5	0.7	49.6	15.8	8.5	100.0	7	12	19.3	500	1,000	2,400	15,374
Other	57.3	*2.2*	26.7	1.1	43.9	22.8	5.5	100.0	8	15	37.8	500	3,244	1,500	11,045
Total	**57.4**	***0.0***	**22.8**	**1.4**	**51.7**	**18.0**	**6.2**	**100.0**			**31.3**				

Choice of Health Care Provider

The behavioral response to an illness episode reflects the complex nature of health as well as the economic and social context in which health and health care is embedded. Given an individual's perception of an illness episode, physical and financial constraints, previous experiences, and treatment options, a course of action will be chosen. This may entail multiple visits with one or more health care providers.[25] The behavioral response is moreover likely to depend on type of disease. There are theoretical reasons to expect this to be related to observability of symptoms and effects of treatment as well as the type of "contract" offered by different providers (Leonard and Leonard 1998). Moreover, Mwabu (1986) offers empirical evidence of consultation patterns being highly sensitive to patients' illnesses.

In the IAF, those who reported having a consultation were asked to specify whether this consultation was at/with a (1) hospital, (2) private clinic, (3) health post, (4) doctor, (5) nurse, (6) pharmacy, (7) traditional medical practitioner, or (8) other.[26] Choice is limited to one consultation only. If several consultations were made in the last month, answers refer to the last consultation. The survey therefore ignores many of the complexities that are likely to characterize health-seeking behavior. Beattie and

[25] There is indeed evidence that consumers of health care are likely to use more than one provider. In such a context, past experience of treatments may be an important determinant of visit patterns. Mwabu (1986) offers evidence that this is the case.

[26] NGOs have a considerable presence in the health sector in Mozambique. However, they work mainly through the public sector and support the delivery of community-based preventive health care. NGOs' operation of health service facilities is limited to one clinic in Maputo City and a number of health centers and health posts operated by the Catholic church in Niassa, Nampula, and Zambézia. The private sector is very limited in Mozambique, particularly outside the larger cities (Yates and Zorzi 1999).

Kraushaar (1999) report evidence from Mozambique that people use TMPs both before, during, and after consulting government or private clinical services for the same episode of illness. It is known that the payment practices of TMPs are considerably more flexible than for government or private clinics. Indeed, Cabral (1999) finds that many of the poor households choose to seek care from a TMP because they can pay gradually, and that poor households consult with TMPs even when other types of care are available and cheaper.

Turning to recorded consultation patterns, there is a significant difference in provider choice between urban and rural areas. In urban areas, 57.8 percent of those seeking care report attending hospitals. The corresponding percentage for rural areas is 22.8 percent. Mirroring this difference, individuals in rural areas are more likely to attend health posts (51.7 percent) and traditional practitioners (18 percent). This can be compared to 30.4 and 2.4 percent, respectively, in urban areas. There are, moreover, large regional discrepancies in health-seeking behavior. In particular, a higher percentage of those living in the south attend hospitals, and are less likely to seek care at a health post or with a traditional practitioner. Notably, there are no large differences in provider choice according to gender, and individuals in poor households appear to make very similar choices to those in nonpoor. Provider choice is, however, affected by the age of the ill individual. Only 7.3 percent of infants receive treatment at a traditional practitioner (compared with 18 percent, on average, for rural households). Conversely, individuals older than 16 are more likely to seek care at a traditional practitioner and less likely to attend a hospital or a health post.[27] See Table 9 for further details.

There are a host of factors that can contribute to an explanation of both low levels of health care utilization and differences in use patterns across geographical regions and demographic and socioeconomic groups. These will be explored in more detail in the analytical section of this paper. Difference in physical access is clearly an important issue. The IAF contained a community-level section that, among other things, reports distance to health care providers. Only 21.6 percent of individuals live in a village with a health post or a health center. In contrast, 95 percent of individuals live in villages in which a TMP is operating. There is significant variation in these percentages across provinces. Predictably, the median distance to the closest practitioner/facility is highest for doctors (50 percent of individuals in rural households live more than 30 kilometers away from a doctor) and health centers (20 kilometers), and substantially lower for health posts (8 kilometers) and traditional practitioners (0 kilometers).

Distances are also reflected in the time spent traveling in search of care. The data suggest that individuals are prepared to travel longer to attend a private clinic. Conversely, those seeking care from traditional practitioners or "other" practitioners spend less time traveling to receive care; 71 percent and 78 percent of individuals report

[27] Forty-four percent of TMP-rendered services were not for the common infectious diseases. Thirty percent of the patients in this group reported choosing the TMP because the local health facility did not treat the disease. This suggests a sizable unmet demand for adult specialty care (Christie and Ferrara 1999).

Table 9: Choice of health care provider

Practitioner	Total urban	Rural households: Choice of practitioner - percent of those reporting illness in month prior to survey and who sought care														
				By region			By gender		By expenditure		By age category					
		Total rural	se	North	Center	South	Male	Female	Not poor	Poor	0-1	2-5	6-15	16-30	31-45	46+
Hospital	57.8	22.8	2.3	15.5	22.9	47.2	22.3	23.2	21.8	23.4	25.1	20.5	19.4	18.4	24.1	28.2
Private	2.6	1.4	0.3	0.9	1.4	2.6	1.2	1.5	1.9	1.0	1.5	0.3	0.2	1.7	3.0	1.2
Health post	30.4	51.7	2.8	59.4	51.1	27.8	53.0	50.7	53.2	50.8	59.7	58.4	60.7	47.7	45.3	43.0
Traditional healer	2.4	18.0	1.8	19.5	20.3	5.3	17.3	18.5	18.2	17.9	7.3	16.6	15.6	23.5	21.7	21.3
Other	6.9	6.2	1.0	4.7	4.3	17.1	6.3	6.0	5.0	6.9	6.5	4.2	4.1	8.7	6.0	6.4

that it takes less than an hour to reach a TMP or "other" provider, respectively. The IAF also records waiting time. Individuals seeking care in hospitals appear to wait more, with 50 percent waiting more than one hour. At private clinics and health posts, 66 and 68 percent, respectively, wait for less than one hour, while the corresponding number for those seeking care from a TMP is 90 percent (Table 10).

In addition to time costs, individuals that seek care may also incur direct costs associated with travel, consultation, and medicines. Data on travel costs are not available in the IAF, but data on payments for consultation and medicines were collected for individuals who sought care. There is considerable variability in recorded payments. There appears to be only minor differences in payments between hospitals and health posts. The highest average payments are made to traditional practitioners (7,224MT), but this average is driven by a highly skewed distribution of payments, and the median payment is zero. In general, payments vary with the type of provider, the age of the patient, the region of the country, and the number of days of illness. Factors like gender and the economic status of the patient appeared to have little influence on the reported payment (Christie and Ferrara 1999) (see Table 10). However, as it is not clear what services or medicines were received in exchange for the payments made, these data do not provide much insight. Individuals paid varying amounts for medication, depending on age and the type of provider visited. There were numerous cases of nonpayment. However, it is not clear from the data whether medicine was dispensed or payment in kind was made.

Table 10: Payment, travel time, and waiting time. by type of practitioner (rural)

Practitioner	Choice of pract. (percent)	Payment for consultation (meticais)		Time to reach health care provider (percent of those seeking care)					Reported waiting time (percent of those seeking care)				
	Total rural	Median	Mean	0-1 hr	1-2 hrs	2-3 hrs	3-5 hrs	+5 hrs	0-1 hr	1-2 hrs	2-3 hrs	3-5 hrs	5+ hrs
Hospital	22.8	500	1603	41.0	26.4	11.9	16.9	3.7	50.2	18.1	11.9	18.3	1.6
Private	1.4	500	759	31.3	16.9	16.9	22.0	12.9	65.9	13.2	20.9	0.0	0.0
Health post	51.7	500	1357	48.5	23.1	11.6	14.6	2.3	67.9	12.7	12.0	5.6	1.7
Traditional healer	18.0	0	7224	70.5	8.2	8.8	10.4	2.1	89.8	3.2	1.5	1.2	4.4
Other	6.2	0	414	78.0	5.6	11.0	4.8	0.6	94.0	2.5	0.9	2.1	0.4

Finally, poor quality may constrain demand for health services from the public sector. There are many studies demonstrating the importance of different dimensions of quality in health-seeking behavior (see, for example, Akin et al. 1998; Hutchinson 1999; Litvack and Bodart 1993).[28] There is only limited information on quality of health care in Mozambique. A recent survey of health facilities in four provinces documents the poor state of infrastructure, staffing, and drug availability in many rural health facilities (SDC et al. 2000). Another study seeks to measure different dimensions of quality (URC 1998). Following Donabedian (1980), the "structure-process-outcome" trilogy is used to structure the research.[29] The study sampled health facilities in several districts across three provinces (Gaza, Zambézia, and Niassa) and focused on two essential services: antenatal and outpatient consultations. The structural aspects of quality focused on the qualifications of staff and the presence of resources in adequate quantities; process measurement focused on patient-physician interaction and the appropriateness of diagnosis and treatment; outcome related to patient satisfaction and patient information regarding diagnosis and treatment. The study found that most facilities scored well in terms of structural quality, while results on process and outcome were poorer. In other words, the facilities appeared to have the necessary equipment and staff, but the diagnosis and treatment were not always appropriate and were not communicated effectively to

[28] For a review, see Alderman and Lavy (1996) and Wouters (1991).

[29] The problem of the "trilogy" approach lies in the tenuous links between different dimensions of quality. For example, quality of structural inputs by no means assures good care. Similarly, the link between process and outcome is not clear; it is likely to vary by process and may not be visible for a long time. Favorable outcomes are often affected by factors not under direct control of the health worker. This then raises the question of how to weight different dimensions of health care quality.

patients. Moreover, there was considerable variation across provinces in the different quality measures. The quality score appeared to have little relation to the per-capita expenditure in the province, but quality improved somewhat with resources per health worker (Beattie and Kraushaar 1999).

4. METHODOLOGY

THE THEORETICAL FRAMEWORK

The empirical analysis of this paper is underpinned by a basic theoretical framework of utility maximization and household production of health. This is similar to the approach of previous health care demand studies (e.g., Gertler, Locay, and Sanderson 1987; Gertler and van der Gaag 1990). In this framework, utility of individual $i \in [1, I]$ is a function of health status, *h*, and nonhealth consumption, x:

$$U = U(h_i, x_i) .$$

Utility is maximized subject to a health production function and a budget constraint:

$$h = h(C_i, F_i; R_i, M, E, Z)$$

$$x = y - p_C C - p_F F .$$

In the health production function, C represents the quantity and quality of health care; F comprises other health inputs (e.g., sanitation, food consumption); R captures individual attributes (e.g., age and gender); M and E are household and community characteristics, respectively; and Z is a vector of choice or alternative specific attributes. Nonhealth consumption is given by exogenous income, y, minus the cost of health inputs. The prices, p_C and p_F, reflect both direct charges and opportunity cost of time spent seeking care (waiting and travel time).[30] Using the constraints, the utility function can be expressed as[31]

$$U = U(h(C, F; R, M, E), y - p_C C - p_F F) .$$

This equation can be used as the basis for a random utility model for polychotomous choice. Conditional on being ill, an individual faces J options. Each option differs in terms of its impact on health status and total cost. So, for choice j, we can then define V_j^* as the level of indirect utility associated with that alternative:

$$V_j^* = U(h(C_j, F; R, M, E), y - p_{Cj} C - p_F F) .$$

V_j^* contains an error term that reflects imperfect optimization as well as measurement error. The observed variable, V_j, is defined as

[30] A fuller specification would endogenize income. In such a model, the constraints include (1) health production function, (2) time constraint (market work, household care activities, leisure, household production), (3) market wage equation (endogenous and dependent on health and work effort), (4) farm production function, and (5) full income constraint (Pitt 1993).

[31] The superscript i is dropped for simplicity. Throughout we refer to the utility function of a representative individual i.

$$V_j = 1 \ if \ V_j^* = Max(V_1^*, V_2^*, ..., V_J^*)$$
$$V_j = 0 \ otherwise \quad .$$

V_j is, however, observed *conditional* on an individual being ill, giving rise to a potential selection problem. This issue will be discussed further below.

EMPIRICAL SPECIFICATION OF HEALTH CARE DEMAND

To operationalize this general framework, it is necessary to define a functional form for the indirect utility function and to select a mapping from continuous utility into [0,1] space. The most common empirical specification of this general framework is the linear model (see, for example, Akin et al. 1984; 1986b; Mwabu 1986):

$$V_j^* = b_{1j}x_j + b_{2j}h_j + e_j \ .$$

Here, utility is a function of nonhealth consumption, x_j, and health, h_j, conditional on receiving care from a health care provider of type j. The constraints are given by

$$x_j = y - p_j$$
$$h_j = g_{0j} + g_{1j}R + g_{2j}M + g_{3j}E + g_{4j}Z_j + h_j \quad .$$

Again, nonhealth consumption is the difference between exogenous income, y, and the unit cost of care (where *unit* represents a visit, and it is assumed that an individual only has one consultation) from provider j, p_j. Health is a function of individual characteristics, R, household characteristics, M, community characteristics, E, and provider/choice attributes, Z_j. An estimable equation is achieved by using the budget constraint and a health production function in the utility function

$$V_j^* = b_{1j}(y - p_j) + b_{2j}(g_{0j} + g_{1j}R + g_{2j}M + g_{3j}E + g_{4j}Z_j + h_j) + e_j .$$

However, in this specification, it is assumed that responsiveness to prices is independent of income.[32] This fact was pointed out by Gertler, Locay, and Sanderson (1987), and Gertler and van der Gaag (1990).[33] In response to this perceived weakness, they proposed an empirical specification based on a semiquadratic utility function that is linear in health but quadratic in consumption. In this specification,

$$V_j^* = b_0 h_j + b_1 x_j + b_2 x_j^2 + e_j ,$$

where

$$h_j = h_0 + q_j ,$$
$$b_0 q_j = g_{0j} + g_{1j}R + g_{2j}M + g_{3j}E + g_{4j}Z_j + h_j ,$$
$$x_j = y - p_j ,$$
$$p_j = f_j + wt_j .$$

Quality, q_j, represents the expected health improvement resulting from treatment from a provider of type j (expected efficacy of each alternative). Thus, the expected health state, conditional on care from provider j, h_j, is the sum of the health state from no

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[32] To see this, it suffices to note that the difference in utility between two choices does not depend on income, and hence income does not affect choice.

[33] Gertler, Locay, and Sanderson (1987) also note that under the linear model, the marginal rate of substitution of consumption for health is constant, which is inconsistent with health being a normal good.

care, h_0, and expected health improvement, q_j. As quality is unobserved, q_j is specified as a parametric function of its observable determinants, where the expected improvements in health can be viewed as being produced through a household production function. The relevant arguments include individual (R), household (M), community (E) and provider (Z) characteristics.[34] Gertler, Locay, and Sanderson (1987) note that since both marginal utility of an individual's health and the production of health depend on demographic variables, the effects cannot be identified separately (see Pollak and Wachter 1975). They therefore propose a reduced form model where utility is derived from quality. The cost of care from provider j is given by the user fee f_j and the opportunity cost of time (t_j) spent seeking care. Combining these equations, we get

$$V_j^* = b_0 h_0 + g_{0j} + g_{1j} R + g_{2j} M + g_{3j} E + g_{4j} Z_j + h_j + b_1 (y - p_j) + b_2 (y - p_j)^2 + e_j \,.$$

There are a number of terms in this equation that do not vary with j. Because they therefore do not influence choice, they can be dropped. The estimated equation hence becomes

$$V_j^* = g_{0j} + g_{1j} R + g_{2j} M + g_{3j} E + g_{4j} Z_j - b_1 p_j + b_2 p_j^2 - 2 b_2 p_j y + h_j + e_j \;\;.$$

[34] Gertler, Locay, and Sanderson (1987) and Gertler and van der Gaag (1990) do not explicitly include vectors of household and community characteristics in the health production function. They are included here for completeness.

Although this specification permits interaction between price and income, Dow (1996a) raises a number of concerns in respect of the implicit restrictions that the model embodies. As an alternative, he proposes a “flexible behavioral model”:

$$V_j^* = a_{0j} + a_{1j}R + a_{2j}M + a_{3j}E + a_{4j}Z_j + a_{5j}p_j + a_{6j}p_j^2 + a_{7j}p_j y + a_{8j}y \\ + a_{9j}p_k + a_{10j}t_j + a_{11j}w + e_j \quad .$$

This specification introduces a number of changes and has been favored in some recent studies of health care demand (see, for example, Akin et al. 1998). First, in this flexible specification, coefficients on price and price/income variables are allowed to vary across alternatives. This arises from a relaxation of the assumption of additive separability in the utility function. Dow (1996b) notes that although additive separability has been strongly rejected in continuous demand models (see, for example, Deaton and Muellbauer 1983), this assumption is maintained in most empirical models of health care demand.[35] The assumption can be relaxed in a number of ways. Dow proposes the inclusion of an interaction term between consumption and health improvements in the utility function; rich and poor may place different values on improvement in health status. In practical terms, this implies that both income and price terms may be estimated with

[35] That is, conditional utility is represented as an additively separable function of health and nonhealth consumption.

separate alternative-specific coefficients.[36] Dow (1996b) finds that in data from Côte d'Ivoire, the inclusion or exclusion of alternative-specific income variables is not a serious source of misspecification, but that constraints across price coefficients do appear important.

Second, Dow seeks to add flexibility to the basic model through the parameterization of the budget period. The idea is based on Gertler, Locay, and Sanderson (1987). They note that the appropriate measure of income depends on the functioning of credit markets. If capital markets are perfect, the relevant income constraint is the present value of income. At the other extreme, the income constraint is the current income. They propose a specification that permits this issue being resolved by the data. Income was measured as total family income in the month prior to the survey. Gertler, Locay, and Sanderson find that the hypothesis that budgeting is restricted to one period is accepted, and hence data on current income are applicable. On this basis, Dow (1996b) specifies residual consumption as

$$x_{j,t} = ly - p_j ,$$

[36] In other words, we have

$$V_j = b_0 Q_j - b_1 p_j + b_2 p_j^2 - 2b_2 p_j Y + b_3 (Y - p_j) Q_j^c + b_4 (Y - p_j)^2 Q_j^c + h_j + e_j ,$$

where Q_j^c refers to the relevant health improvement that affects the marginal utility of nonhealth consumption. Clearly, Q_j^c is not observed, and it operates as multiplicatively with the coefficients to generate choice-specific coefficients. That is, dropping terms that do not vary across alternatives, we get

$$V_j = b_0 Q_j - (b_1 + b_3) Q_j^c p_j + (b_2 + b_4) Q_j^c p_j^2 - 2(b_2 + b_4) p_j Y + b_3 Q_j^c Y + b_4 Q_j^c Y^2 + h_j + e_j .$$

where lambda is an unknown parameter representing the budgeting period for the income y from which the health care price p_j is subtracted. In practical terms, the inclusion of an unobserved coefficient means that the coefficient on quadratic consumption can differ between price and income in the estimation. This, in turn, means that the restriction on the coefficients on a_6 and a_7 is relaxed.[37] Lambda may not be recoverable but will still improve estimates. Dow (1996b) moreover argues for the inclusion of cross-prices in the utility from choice j, providing theoretical justification for this by assuming forward-looking behavior.

Finally, Dow (1996a) notes that the market wage may systematically overestimate the value of time because of presence of unemployment or underemployment. Similarly, the travel time variable is problematic, because the costs of travel may, in many instances, be shared with other activities, such as a visit to the market. For this reason, full cost of care from j may be specified as

$$p_j = f_j + dwt_j \ .$$

This implies that the coefficient on wt can differ from that on the user fee. Dow also proposes that separate coefficients are estimated for travel time (travel may enter the health production function, and long travel times may further worsen the health status of an ill individual) and wages (which affect the cost of remaining ill). This can be justified

[37] From above we had $a_6 = -2a_7$.

on theoretical grounds, and Dow (1996b) also finds that travel time has an effect independent of opportunity cost of time.

ISSUES IN ESTIMATION OF HEALTH CARE DEMAND

Sample Selection

Most studies of health care demand in developing countries are based on household survey data. In these surveys, information relating to health care decisions is only reported conditional on previous reporting of illness (typically within a two- or four-week recall period). It is generally expected that the frequency and severity of illness is inversely related to income, or at least that poor individuals are more at risk of poor health. It is further conventionally claimed that individuals in richer households are more likely to report illness, given their objective clinical health status.[38] This may be because richer households have a lower tolerance threshold for their definition of "ill" than do poorer households. Also, recall of illness episodes may be related to education and formal treatment episodes. Both of these factors would make illness reporting by wealthier households more likely for a given health status.[39]

Due to these features of the data, estimation of models of health-seeking behavior using as a sample those who report an illness episode is likely to result in selectivity bias.

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[38] Wolfe and Behrman (1984) provide some evidence of this.

[39] Although some forms of self-reported morbidity data are more reliable as indicators of true health status—for example, self-reported functional activity limitations, responses to whether one is healthy enough to perform normal duties is also likely to be endogenous, because an individual with a given objective health status is more likely to perform his or her normal activities if he or she is from a relatively poorer household, due to diminishing marginal utility of consumption goods (Behrman and Deolalikar 1988).

It should be noted that there are really two selection processes operating simultaneously. Even in the absence of reporting bias, the process of illness determination may comprise a selection process that biases estimates. However, because it is not possible to establish objectively verifiable criteria for illness, these two sources of bias cannot be distinguished. Sample selection bias arises if unobserved individual characteristics simultaneously determine illness reporting and choice of treatment, that is, if factors associated with seeking care when sick also influence the reporting of health status.[40] In light of the policy-related use of estimates of coefficients in health care demand functions, the potential presence of bias is important.

Although the selection issue is recognized in a number of studies of health-seeking behavior (such as Akin, Guilkey, and Denton 1995; Dor and van der Gaag 1993; Pitt 1993; Schultz and Tansel 1997), most studies have ignored the problem, treating those individuals that report an illness episode as a subsample.[41] More recently, a range of approaches has been proposed to address the problem. Some contributors have sought to correct for selection bias, either through a two-step process or through a FIML procedure. Unbiased estimates of conditional demand can be found using a two-step

[40] Correlation between error terms in selection and health care choice can be due to a range of factors: the presence of unobservables such as perception of illness or health endowment. Akin et al. (1998) further suggest that bias may arise due to self-selection into the sample of self-perceived ill who are, on average, more severely ill. It is reasonable to expect that the severely ill are likely to be less responsive to prices and other factors constraining use of health care facilities. In this case, the bias is due to the omission of severity of illness from the estimation of health care demand. It should be noted that insofar as the reporting bias is correlated only with observables, conditional estimates would not be biased.

[41] Some studies recognize the selection issue but dismiss it as unimportant. For example, Akin, Guilkey, and Denton (1995) omit the determination of illness on the assumption that economic variables are more important in the decision of what to do after the onset of illness than the actual process of getting sick.

method similar to that proposed in Heckman (1976). A procedure for the discrete choice setting is provided by Van de Ven and Van Praag (1981), who control for selection bias in probit estimation.

This approach is often difficult to implement; estimation of the determinants of illness is problematic in the absence of very large samples, and identification of illness instruments is made difficult by the reduced nature of the demand equation and the absence in most data sets of information on factors that affect (reporting of) illness but not choice of care. In view of these problems, some contributors have opted to use the entire sample and treat the reporting of no illness as one of a range of choices. For example, Pitt (1993) proposes that the appropriate procedure to deal with selectivity bias is to estimate a polychotomous variable model having as dependent variable a set of indicators for choice of provider if ill (or pregnant) but also for the outcome "not ill" (or not pregnant). Similarly, Dow (1996b) addresses the issue of bias from self-reported health status through a four-choice model in which individuals choose between "well"; "ill, no care"; "ill, clinic care"; and "ill, hospital care."[42] For this model, different estimation procedures and nesting structures are considered, where each specification permits a different covariance structure of the unobserved variables. In order to deal with the selection issue in a satisfactory manner through this procedure, it is necessary to estimate the model using a multinomial probit specification. Due to the greater

[42] The idea here is that "not ill" can be considered another discrete choice, alongside different types of care or "self-care" in the event of illness. Dow (1996b) justifies this interpretation with reference to a dynamic model where individuals choose the probability of illness in previous periods by adjusting previous health inputs. This permits Dow to define joint health and health care demand error distributions on the entire population, thereby avoiding difficulty of sequential selection rules.

computational requirements in probit estimation, this restricts the number of alternatives to four.

Unfortunately, there are no clear conclusions, either in respect of the seriousness of the selection problem, or the appropriate way to deal with it. Dor and van der Gaag (1993) use a two-step approach and find no selection bias in health care demand estimated conditional on being ill. Using a different methodology, Dow (1996b) finds that in data from Côte d'Ivoire, health demand estimates conditioned on health status do not suffer from statistical selection bias. Akin et al. (1998), on the other hand, estimate an illness equation jointly with the choice of care equation[43] and find that failure to control for sample selectivity of the reported illness does reduce the estimated price coefficient in the demand equation. In light of the inconclusive evidence and the computational restrictions of probit estimation, the model is estimated without controlling for selection bias.

Under the hypothesis that individuals in poor households underreport illness relative to individuals in richer households, using the self-reported ill subsample entails the exclusion of a number of poor individuals, who, if it were possible to apply objective criteria of health status, would have been considered ill. Further, on the assumption that they would have reported themselves ill if they had consulted a medical practitioner, we can presume that all these individuals would have reported "no consultation" to a

[43] This is possible, in part, due to the size of the sample, but also because it contains a number of variables that permit identification, such as kind of housing, type of water supply, sanitation, and other household assets.

question about response to illness. We would therefore expect that the effect of income, and possibly other covariates with income, on the probability of not seeking care, would be biased. Specifically, we would expect our estimates to comprise lower bounds (in absolute terms) on the marginal effect of income on the probability of seeking no care in the event of illness. There would, of course, be a corresponding effect on marginal effect of income associated with the other alternatives.

Functional Form

We have specified a general model of utility maximization using a random utility model based on McFadden (1973). McFadden (1981) shows that the Multinomial Logit Model (MNLM) can, under certain conditions, be derived from the latent variable model by specifying the distribution of error terms as IID with type I extreme value distribution. The basic multinomial logit model is

$$\Pr(y=j)=\frac{e^{xb^{(j)}}}{e^{xb^{(1)}}+\ldots+e^{xb^{(j)}}+\ldots+e^{xb^{(J)}}}$$

for all j, where X and β are vectors. In order to achieve identification, one of the coefficient vectors is set to zero. The independence from irrelevant alternatives (IIA) is a well-known feature of the MNLM. By construction, the relative probability of choosing two alternatives is unaffected by the presence of additional alternatives. One way around this problem is to model choice as a sequential process. This gives rise to the Nested

Multinomial Logit model (NMLM). The NMLM may work well in cases where the alternatives are dissimilar.

The previous literature offers no clear guidance on the appropriateness of the MNLM. Mwabu, Ainsworth, and Nyamete (1993) note that a priori there is no way of determining the decision structure of health care choice. They therefore opt for standard Multinomial Logit estimation. Gertler, Locay, and Sanderson (1987), on the other hand, test for difference between the nested and the standard multinomial logit and reject the hypothesis that MNL is not different from NMNL. Similarly, Dor, Gertler, and van der Gaag (1987) reject MNL in favor of NMNL. Akin, Guilkey, and Denton (1995) are the first to use the Multinomial Probit estimation method. In this way, they are not required to make a priori assumptions about the covariance of error terms, and hence do not suffer from the IIA problem. The study (Akin, Guilkey, and Denton 1995) rejects the restrictions imposed by the IIA assumption.[44]

In light of this evidence, and given the seemingly natural structure of the choice situation at hand, the NMNL may appear preferable. However, there is no well-defined testing procedure for discriminating among tree structures. Insofar as results differ across different specifications of the choice structure, this feature of the model is problematic. Moreover, McFadden (1984, 1414) points out that "empirical experience is that the MNL is relatively robust, as measured by goodness of fit or prediction accuracy, in many cases where the IIA property is theoretically implausible." The nonnested MNLM is also easier

[44] The multinomial probit model is, however, computationally cumbersome, as multiple (one less than number of categories) integrals must be calculated.

to deal with computationally. For this reason, the model is estimated on the basis of a standard MNLM.

Sample Design and Estimation Technique

As noted above, the IAF is a three-stage sample characterized by stratification and clustering. Due to these features of sample design, households in the population do not have an equal probability of inclusion in the sample. Moreover, both stratification and clustering affect the variance of estimates.[45] Differential selection probabilities render the unweighted sample mean a biased and inconsistent estimator of the population mean. An analogous problem arises in unweighted regression analysis.

As is pointed out by Deaton (1997), the central issue of concern is heterogeneity, not sample design. If "groups" or "sectors" in the sample are, in fact, homogeneous in the sense that parameter coefficients of the "true" model are the same across the groups or sectors, both unweighted and weighted estimation will generate unbiased estimators. In this case, unweighted estimation would be preferred as it is more efficient. However, matters are more complicated in the presence of heterogeneity. If this is a feature of the data, the problem of recovering sensible parameters is independent of the issue of weighting, and a case can be made for weighted regression where regression analysis is

[45] Stratification can reduce the variance of estimates by the use of prior information on about the population to avoid between-sector variation in replication of the sample. Conversely, clustering of a sample will typically reduce the precision of sampling estimates because households in any given cluster are likely to display similarities. Hence, less information about the population is gained by sampling a given number of households from a cluster than if households from many clusters were sampled (Deaton 1997).

seen as a device for summarizing characteristics of the population (Deaton 1997). In other words, in contrast to the unweighted regression, the weighted regression provides a consistent estimate of the "population regression function."

Following Doumochel and Duncan (1983) and Deaton (1997), both weighted and unweighted estimators were estimated. Insofar as there is homogeneity across groups or sectors, point estimates would be similar. This permits an informal test of whether the null of homogeneity across sectors is valid. In the IAF, there is a considerable difference between weighted and unweighted estimates. This suggests that there is heterogeneity across groups with different weights in the sample. With this in mind, the model was estimated using weights in the regression.

Although this issue will not be analyzed further, it is noteworthy that Nampula and Zambézia Provinces have very high average weights relative to the other provinces, indicating that these provinces were undersampled. To the extent that the parameters of the "true model" of health-seeking behavior are different in these provinces, this can help explain the differences in parameter estimates between weighted and unweighted regression. Of course, provinces only provide one potential breakdown through which under- and oversampling can be analyzed, and these findings should only be seen as suggestive.

In order to account for sample design effects on the standard errors of coefficient standard errors, the MNLM was estimated without assuming that observations within the same cluster are independent. As expected, this results in larger standard errors. Contrary to what would be expected, standard errors are generally larger in the estimation with strata specified, although this is not true in all cases. However, in light of the small effect of stratification on standard errors, it is not taken into account in estimation. In this way, procedures for testing and interpretation of results are facilitated.

VARIABLES IN ESTIMATION[46]

The Dependent Variable: Provider Choice

As noted above, individuals who report having been ill in the previous four weeks were asked to specify whether they had a consultation and, if so, with what type of health care provider. The alternatives offered were (1) hospital, (2) private clinic, (3) health post, (4) doctor, (5) nurse, (6) pharmacy, (7) traditional medical practitioner, or (8) other. For the purpose of estimation, these can usefully be grouped, in particular, as the number of observation for some choices are small.

As a result of this grouping, there are five possible outcomes or alternatives considered in estimation: (1) no care/self-care, (2) traditional medical practitioner, (3) hospital *or* doctor, (4) health post *or* nurse, and (5) pharmacy, private clinic, *or* other.

Independent Variables

Individual characteristics. There are three sets of explanatory variables in the Model. The individual characteristics include age, gender, education, income, wage rate, and health status (symptoms). Age is a continuous variable, while gender enters as a

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[46] All the variables in the estimation are defined in Appendix Table 12 and described in Appendix Tables 13 and 14.

dummy variable taking the value one for women. The effect of education is captured through four dummy variables: no education, level 1 primary education, level 2 primary education, and higher than level 2 primary education. For observations where the individual is less than 16 years old, the education variables refer to the education of the mother. The education dummies are defined such that more than one of the variables can take the value one. Specifically, dummies for lower levels of education do not revert to zero when higher levels are attained. In this way, the coefficient on dummies for higher levels of education reflects the marginal effect of that level of education on provider choice (Collier, Radwan, and Wangwe 1986; Simler 1994).

Income is proxied by estimates of total monthly per-capita household consumption, deflated by a spatial price index.[47] This is broadly consistent with other specifications in the literature. The most common approach is to use total household monthly income proxied by household consumption (see, for example, Gertler, Locay, and Sanderson 1987 or Gertler and van der Gaag 1990) or per-capita monthly expenditure (Lavy and Germain 1994; Litvack and Bodart 1993). In some studies, income has been proxied by assets (Akin et al. 1986b) or income category dummies (Akin, Guilkey, and Denton 1995). Acton (1975) notes that it would be desirable to distinguish between earned and unearned income, as the former has both income effect and effect from raising the opportunity cost of time. However, due to data limitations, most studies do not make this distinction.

[47] Data on personal expenditure are available, but of dubious quality, due to low and uneven response rate. For this reason, it is not used in this analysis.

The wage rate enters both on its own, and as a determinant of the opportunity cost of time. Many studies have used community-level data on wage rates (often gender specific wage rate for agricultural labor) (see, for example, Gertler, Locay, and Sanderson 1987 and Gertler and van der Gaag 1990). Because a large number of missing values for community wage rate in IAF, wage is proxied here by per-capita daily household consumption (deflated by a spatial price index and divided by 12 for hourly "wage"). This definition of the wage rate has the advantage that it captures within-community differences in wages, and it may provide a truer measure of "productivity of time." Consumption is, however, endogenous, and to the extent that illness episodes result in reductions in consumption, this may lead to bias.

Many studies of health care demand include a measure of health status as an explanatory variable. Akin, Guilkey, and Denton (1995) include symptoms and seriousness of illness (proxied by number of days not able to carry out tasks) in regression. Similarly, Gertler, Locay, and Sanderson (1987) and Gertler and van der Gaag (1990) include the number of days healthy in the last four weeks in the health production function. Lavy and Quigley (1991) use the number of days individuals report being unable to perform tasks. As many of these studies note, these variables are problematic in that they are endogenous to the health care choice. Here, symptoms are included as explanatory variables. There are good theoretical reasons to suspect that symptoms are an important determinant of whether and where individuals choose to consult, and the descriptive statistics confirmed this effect.[48] Symptoms enter as nine dummy variables, operating as indicators for symptoms as reported by the interviewees. Categories of symptoms in the survey are (1) diarrhea; (2) cold, cough, breathing difficulty; (3) worms; (4) fever; (5) persistent cough with vomiting; (6) persistent cough with blood; (7) skin eruptions; (8) malaria; and (9) other. For some of these categories, the number of observations is small. The most frequently reported symptom category is the heterogeneous group "other."

Household characteristics. Two features of the household are captured through the household variables. First, wealth is proxied by the number of rooms of the dwelling, and an indicator variable for ownership of a radio. A range of other wealth proxies was tried, including landholdings and vehicle (including bicycle) ownership, but they did not appear significant in exploratory regressions and were excluded from the model. Other characteristics of the dwelling, such as presence of latrine or water closet and water source, were not considered on the grounds that these variables not only proxy for wealth, but also are determinants of health status and illness incidence. Second, the number of members in the household was included as an explanatory variable.

Community characteristics. Three types of community variables are included as explanatory variables. First, an indicator variable for whether there is a rural hospital in

[48] Reporting of symptoms may be endogenous in the sense that knowledge and understanding of symptoms is affected by if and where an individuals chooses to consult.

the district proxies for distance to hospital. As will be seen below, the community survey offers no information on distance to nearest hospital. This distance is proxied by distance to nearest doctor, and the dummy variable on whether there is a rural hospital in the province serves as a control for effects not captured by this proxy.

Second, two indicator variables relating to the availability of transport to and from the village on a regular basis and the passability of roads throughout the year are included. They capture dimensions of access not necessarily reflected in the reported travel time to different types of health care providers.

Third, two variables on public spending—annual current spending per attendance unit[49] and annual spending on medicines per capita—were included as proxies for health service quality. In both cases, spending data refers to district-level spending. A range of variables has been used in the literature to proxy for quality.[50] Akin, Guilkey, and Denton (1995) suggest that the best proxy for quality is operational cost per capita (based on reported expenditure by facility). They, note, however, that this is not a perfect measure due to differences in efficiency. They therefore use as additional measures observed physical conditions of facilities; percentage of the year drugs are available. Many other

[49] Attendance units is a weighted index of (weights in parenthesis): days/bed occupied (9); institutional deliveries (12); vaccinations (0.5); maternal and infant health contacts (1); outpatient contacts (1); stomatology contacts (2). Current spending includes spending on salaries, goods and services, and medical supplies from all sources of financing (state budget, external financing, special funds). By looking at current spending per attendance unit, differences in operational efficiency are partly controlled for.

[50] The usage of the term quality sometimes gets confusing. Gertler, Locay, and Sanderson (1987) and Gertler and van der Gaag (1990) do not derive quality from any observable characteristics of facilities. Quality is a provider, rather than a facility characteristic, and refers to the expected improvement in health status from using a particular provider. Lavy and Quigley (1991) use the term in an even more general sense, as simply the type of health care provider.

studies have used only structural and staffing characteristics of facilities as proxies for quality. Akin et al. (1986a) use usual attendant (and for traditional practitioners, a dummy for whether they treat any of five common illnesses). In contrast, Lavy and Germain (1994) measure quality through drug availability, staffing, and infrastructure characteristics. In Litvack and Bodart (1993), quality is limited to drug availability. In general, there is likely to be considerable collinearity between different structural quality variables, and Mwabu, Ainsworth, and Nyamete (1993) find that this feature of the data prevents them from examining the independent impact of different quality characteristics.

Efforts to estimate the price effect without controlling for quality are problematic (Akin et al. 1984; 1986b; Alderman and Lavy 1996). Specifically, if higher prices are associated with better quality, and patients are willing to pay more for that improved quality, it is likely that the estimated price response will be understated. Unfortunately, data on infrastructural characteristics of facilities or spending by facility were not available for Mozambique in a form that permitted linking with household-level data. For this reason, quality of care only enters as a proxy (public spending) at the district level.

Attributes of alternatives. The choice attributes included in the model accord with the empirical specification set out above. The relevant explanatory variables are (1) price of care from provider j, (2) price squared, (3) a price/income interaction term, and (4) travel time associated with different forms of care. Price of health care from provider j is defined as

$$p_j = f_j + wt_j,$$

that is, the sum of the fee f_j and the opportunity cost of time (t_j) spent seeking care. Opportunity cost of time is proxied by the wage as defined above. The time spent seeking care includes both travel time and time spent waiting to receive care. Due to data limitations, only travel time is used as an explanatory variable. It is proxied by travel time as reported in the community-level survey. This refers to estimated time between a central point in each cluster to the respective health care provider. This is then attributed to households, thus imposing a measurement error[51]

Because health care providers have been grouped for the purpose of empirical estimation, and because the categories of health care providers used in the community survey do not correspond exactly with the categories used in the health section of the household survey, the travel time variable used in estimation rests on a number of assumptions. Travel time associated with no care/self-care is assumed to be zero. There is no information in the community survey on travel time to the nearest hospital, even though hospital consultation is one of the options specified in the health section of the household survey. Travel time to hospital is proxied by reported travel time to nearest doctor. The community survey contains information on distance to both nearest health post and nearest health center, while the health section of the household survey groups

[51] Travel time and waiting time are also reported by users of health care providers. While these data suffer from less measurement error, travel time is only available for those who actually chose to consult with a particular health care provider. This endogeneity is a potential source of bias. Moreover, in the IAF, individual-level travel time and waiting time variables are characterized by high numbers of missing values. Community-level variables were therefore chosen as more reliable.

these two categories. It is assumed here that travel time can be proxied by the lowest value of travel time to health post and health center, respectively. For the group “other,” travel time to the nearest pharmacy is used as a proxy.[52]

Actual expenditure on health care consultations are only recorded for individuals seeking care and for the provider actually chosen, leading to a possible endogeneity problem if these data were used. In response to this problem, some studies have estimated hedonic price equations for private doctors and/or TMPs, and imputed prices for all individuals (see, for example, Gertler, Locay, and Sanderson 1987, Gertler and van der Gaag 1990, and Lavy and Quigley 1991). However, most studies opt to use official fees as proxies for prices. Of course, user fees often vary by form of treatment, and in most surveys, the form of treatment actually received is not observed. Akin, Guilkey, and Denton (1995) suggest that the official outpatient registration fee be used as best proxy for ranking of overall facility price. This procedure is followed here.

It is assumed that the fee associated with no care/self care is zero. Similarly, it is assumed that the cost of a consultation with a traditional medical practitioner is zero. This is motivated by the observation that mode payment for consultation with a TMP is zero in the IAF data; more than 50 percent of the sample have not paid anything for their consultation at the time of the interview. Of course, TMPs often permit postponed payment, payment in installations, or outcome contingent payments. This casts some

[52] Some values for travel time were corrected. This was done in two cases: (1) where the travel time was egregiously high relative to distance to facilities (this was the case for two villages) and (2) where reported travel time to a particular health care provider was zero, even though reported distance to the same type of health care provider was non-zero. These corrections were based on predicted values for travel time from a regression of travel time on distance.

doubt on this assumption. For hospitals and clinics, it is assumed that official fees are used. As noted above, there is a long range of exemptions from payments, and in-patient charges are considerably different from outpatient fees.[53] However, the IAF data offer no guidance on what type of care was sought by the patient. In other words, we only know if the interviewee had a consultation at a hospital or health post, and not whether he or she was an outpatient or inpatient or if any special procedures were required. The fee for medical consultations for outpatients is 1,000MT in urban areas and 500MT in rural areas. Finally, it assumed that the user fee associated with a consultation with a practitioner from the group "other" is zero. This is consistent with the observation that more than 60 percent of those who report seeking care from this group report not having paid anything at the time of the interview. Following the empirical specification, price/income interaction terms and price squared terms are calculated and included as explanatory variables.

5. RESULTS

MODEL SPECIFICATION

Full results for the estimation are reported in the Appendix. Appendix Table 15 presents the regression outputs and Appendix Table 16 contains the marginal effects for

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[53] Individuals officially exempt from payment include those without the means to pay, women, for childbirth and related care, minors, combatants in the armed struggle for national liberation, blood donors, the disabled who cannot work, retired persons, pensioners and invalids, beneficiaries of allowances for blood or for other relevant services to the state, domestic servants, the unemployed, and any other persons who do not have means of subsistence (Barbosa 1999). There does not appear to be a systematic difference in actual payments for consultation at a hospital or health center according to age (child status) and gender.

each variable in the regression, calculated at the mean of each of the variables. These results and their interpretation are discussed below. Results from tests of the hypothesis that all coefficients associated with that variable are zero are provided in Appendix Table 17.[54] These tests were carried out for each of the independent variables.

In addition to tests of coefficients on specific variables, two diagnostic tests were performed. First, a Wald test was performed to investigate the hypothesis that the coefficients associated with two outcomes, *m* and *n*, are equal. If this hypothesis is true, the two outcomes are indistinguishable with respect to the variables in the model, and can be combined. This is equivalent to the null hypothesis that all the coefficients associated with a particular outcome *m* are equal to zero when the base outcome is *n*. This test was performed for all possible combinations of outcomes, and the hypothesis that there is no difference between coefficients was rejected in all cases.

Second, the validity of the IIA assumption was tested. As noted above, the IIA assumption implies that the odds for any pair of outcomes are determined without reference to the other outcomes that may be available. Hausman and McFadden (1984) offer a Hausman-type test for testing IIA assumption. It is based on the idea that a consistent but inefficient estimator can be obtained by estimating the model on a restricted set of outcomes. The Hausman statistic measures the difference between the coefficients in a restricted model (with some outcomes eliminated), and those of the

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[54] Given that the model is estimated without assuming that observations within clusters are independent, the Wald test is appropriate. The "likelihood" for weighted or clustered MLEs should only be used for the computation of the point estimates and should not for variance estimation using standard formulas. This is because estimates produced by probit or logit commands with the cluster option are not true maximum likelihood estimates (StataCorp 1999).

original model. An alternative test is provided by Small and Hsiao (1985). The Small-Hsiao statistic is calculated by dividing the sample into two random subsamples, calculating average estimates from unrestricted estimates from the two subsamples, estimating coefficients for a restricted model, and comparing the likelihoods of the two models. For the model at hand, the results from the two tests are inconsistent. The Hausman tests accepts the hypothesis that outcome "TMP" is independent from other alternatives, and rejects the hypothesis for the other alternatives. The Small-Hsiao test, on the other hand, rejects the hypothesis for all alternatives. In view of the inconclusiveness of these results, we are not able to confirm the validity of the IIA assumption.

INTERPRETATION OF RESULTS

The interpretation of the estimated coefficients is complicated by the fact that the model is nonlinear in the explanatory variables. This means that the impact of independent variables on the probability of seeking a particular type of care will depend on the value of that and other independent variables. For this reason, results are best interpreted through the analysis of marginal effects and predicted probabilities.

The marginal effect of variable x on alternative k refers to the change in the probability of individual i choosing alternative k in response to a change in x. Using the MNLM functional form for $\Pr(V_k = 1)$, it can be shown (Long 1997) that

$$\frac{\partial \Pr(V_k = 1)}{\partial x} = \Pr(V_k = 1)\left[a_{k,x} - \sum_{j=1}^{J} a_{j,x} \Pr(V_j = 1) \right],$$

where $a_{j,x}$ are alternative specific coefficients associated with the variable x. As can be seen, the marginal effect depends on the values of all independent variables, and the coefficients for each outcome. Marginal effects associated with the different variables are reported for each of the alternatives in Appendix Table 16, and will be discussed later. These marginal effects are calculated at the means of all the explanatory variables.

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

$$\Pr(V_k = 1) = \frac{\exp(\hat{V}_k^*)}{\sum_{j=1}^{J} \exp(\hat{V}_j^*)},$$

where $\hat{V}^*$ is evaluated is the predicted conditional utility evaluated at the values of the explanatory variables of individual *i*.

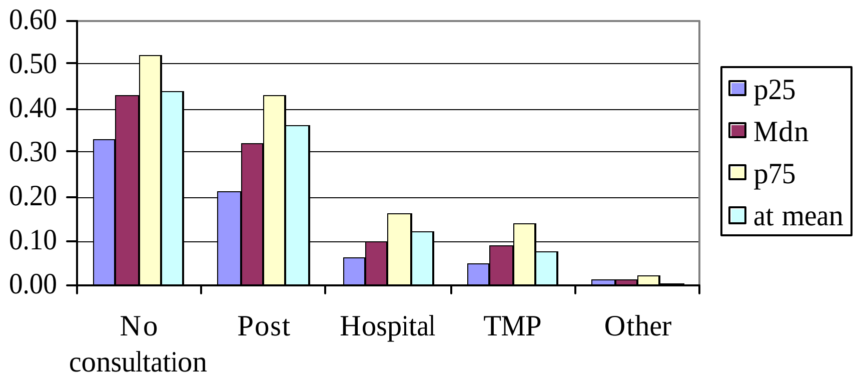
Predicted probabilities vary across observations in the sample, and the mean, median, and spread of these predicted probabilities (for the sample or groups within the sample) can usefully be analyzed. However, insofar as we are interested in differences across different subgroups of the population, predicted probabilities do not shed any light on what feature of the subgroup is causing observed differences. In other words, without controlling for variation in the independent variables across subgroups, the effect of a particular variable cannot be distinguished. For example, if we want to look at differences in probabilities of seeking different types of care across gender, we want to distinguish between the effect from differences in individual, household, and community characteristics of men and women, and the effect from the gender dummy in the estimated equation. If we compare mean predicted probabilities for men and women, we are confounding these effects. A second approach to looking at predicted probabilities therefore controls for variation in all the independent variables except the one of interest. Predicted probabilities are calculated for a representative individuals, for which the values of the independent values are fixed at specific levels—such as minimum, maximum, mean, or median—for the sample or subsamples.

These two ways of analyzing the regression results are illustrated in Figure 1. The chart shows the twenty-fifth, fiftieth, and seventy-fifth percentiles of predicted probabilities. As a point of comparison, the predicted probabilities evaluated at the mean of the independent variables are included.[55] There are two main points to note in respect of these results. First, although much of the discussion to follow will focus on mean predicted probabilities, there is a significant variation in predicted probabilities across different members of the sample. Second, because of the nonlinearities in the mapping between independent variables into probability space, predicted probabilities at averages are not, in general, equal to average predicted probabilities. The same holds true for marginal effects; depending on the distribution of the independent variables across the observations in the sample, marginal effects evaluated at means may be considerably different from mean marginal effects. With this in mind, Train (1986) warns against

[55] More specifically, all variables are at weighted means for the rural subsample (ill and non-ill), except age and wage, for which medians are used.

using responses for an average representative individual as a proxy for average response across observations in the sample.

Figure 1: Mean predicted probabilities and probabilities at means

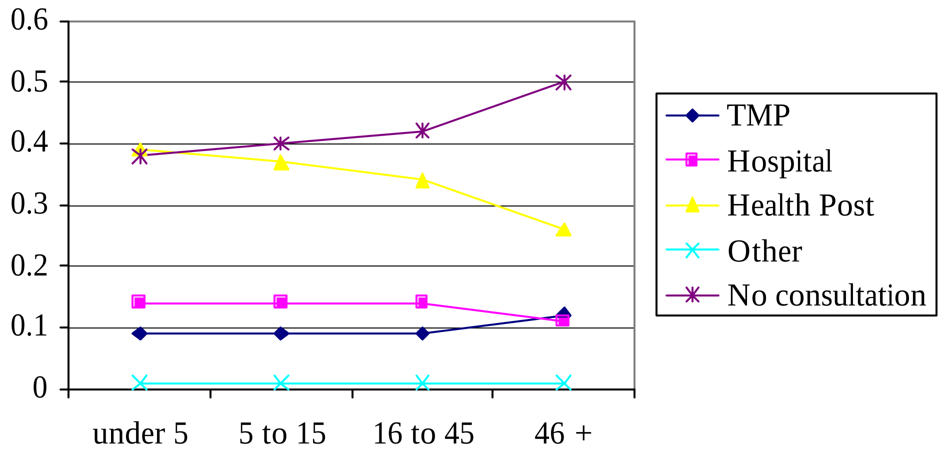


THE EFFECT OF INDIVIDUAL AND HOUSEHOLD CHARACTERISTICS

Age

Higher age tends to be associated with an increase in the probability of seeking care from a TMP and a decrease in the probability of care being sought at a hospital or health post. Evaluated at the means of the explanatory variables, this effect is only significant for the alternatives “hospital” and “health post.” This effect is illustrated in Figure 2, which shows the mean predicted probabilities for different age groups. As can be seen, the most important effect is a shift away from consultation at a health post to no consultation as age increases.

Figure 2: Mean predicted probabilities, by age



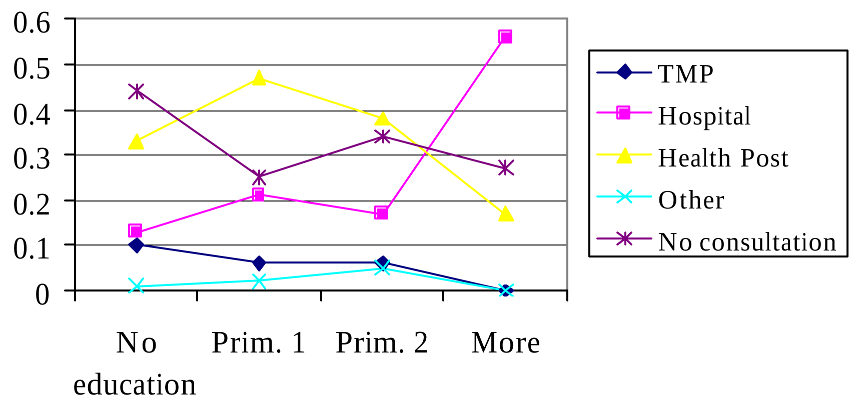
Gender

In the discussion of descriptive statistics, it was noted that both reporting of and the response to illness was similar for men and women. This is confirmed by the regression results, and the hypothesis that all coefficients on gender are equal to zero cannot be rejected. Looking at the marginal effect of gender at means, the only significant (10 percent significance level) effect is on the alternative "hospital," which indicates that, ceteris paribus, women are more likely to seek care at a hospital relative to the alternative "no care."

Education and Literacy

The effect of education enters through three indicator variables in the regression, each respectively capturing the marginal effect of having level 1 primary education, level 2 primary education, and more education, relative to the case of no education. For all three variables, the hypothesis that all the coefficients associated with the respective variable are simultaneously zero is rejected. Level 1 primary education has the expected effect of making it more likely that an individual seeks care at a hospital or health post relative to the alternative "no care." As can be seen in Appendix Table 16, the marginal effect at means is large and significant (10 percent significance level for hospital, 5 percent for health post). The marginal effect of acquiring education over and above level 1 primary is less clear. The results suggest that level 2 primary education tends to reduce the probability of having a consultation in a hospital or health post in the event of illness, though the effect is only significant for the alternative "hospital" (10 percent significance level). Conversely, the probability of seeking care from a TMP or "other" health care provider increases (not significant). This counterintuitive finding may be explained in part by the small number of observations with more than level 1 primary education There are only a few observations of individuals with more than level 1 primary education who report illness (84 and 14, respectively, for level 2 primary and higher). Still, although the negative effect of education beyond level 1 primary on the probability of seeking care in the public sector may be due to anomalies in the data, the findings do suggest that the first years of schooling are most important in shaping health-seeking behavior. The marginal effect at means of acquiring "more education" is, however, as expected; the probability of consulting with a TMP decreases while the probability of seeking care at a hospital or health center increases (significant at 5 percent level in all cases). The effects of education are illustrated in Figure 3, where mean predicted probabilities for health-seeking behavior are plotted against the level of education achieved. The effects of education do not change substantially if variation in other explanatory variables is controlled for.

Figure 3: Mean predicted probabilities, by level of education



Literacy does not have an effect on health-seeking behavior independently from the effect of education. The hypothesis that all coefficients associated with literacy are simultaneously zero is rejected (10 percent significance level). However, looking at the marginal effect of literacy at means, the effect is only significant for the TMP alternative, where literacy lowers the probability of having a consultation with a TMP relative to the alternative "no consultation." Notably, even though the pattern of health-seeking behavior is different for the literate and illiterate subsample, these differences do not persist if variation in the other explanatory variables across these groups is controlled for.

Income

One of the surprising features of the descriptive statistics was that health-seeking behavior did not appear to be significantly different between poor and nonpoor segments of the sample. This finding is confirmed by the regression results; the marginal effect of income at means is significant only for the alternative “other.” However, the coefficients on the income variable offer only a partial perspective on the effect of income. Analyzing the full effect of income on health-seeking behavior is complicated by the complex way through which income enters the estimated model. As can be seen from the variable definitions in Appendix Table 12, income, proxied by monthly consumption, enters directly, but also through the income-price interaction term, and, at the community level, through the opportunity cost of time. As was discussed in Section 4, the interaction term arises from the inclusion of quadratic residual consumption in the indirect utility function, and is there to permit the demand effect of price to vary with income. This feature of the model is discussed further below.

Figure 4 graphs mean predicted probabilities by income quintile. As can be seen, the effect of income is in the expected direction, with higher income making it more likely that individuals will consult at a hospital or health post, but the effect is quite small.

Figure 5 contrasts the mean predicted probabilities for the different income quintiles with the case where variation in other explanatory variables are controlled for.

In the latter case, all the explanatory variables are held at the sample mean, except income, for which the quintile mean is used.

Figure 4: Mean predicted probabilities, by income quintile

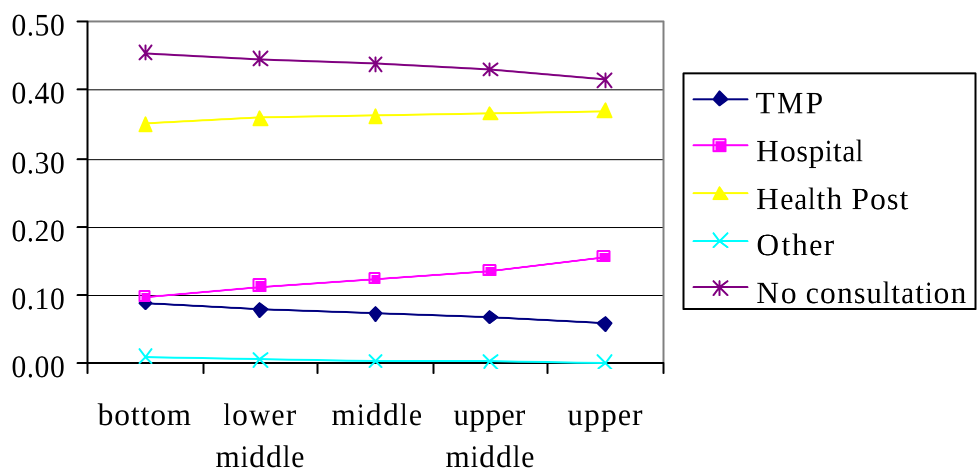
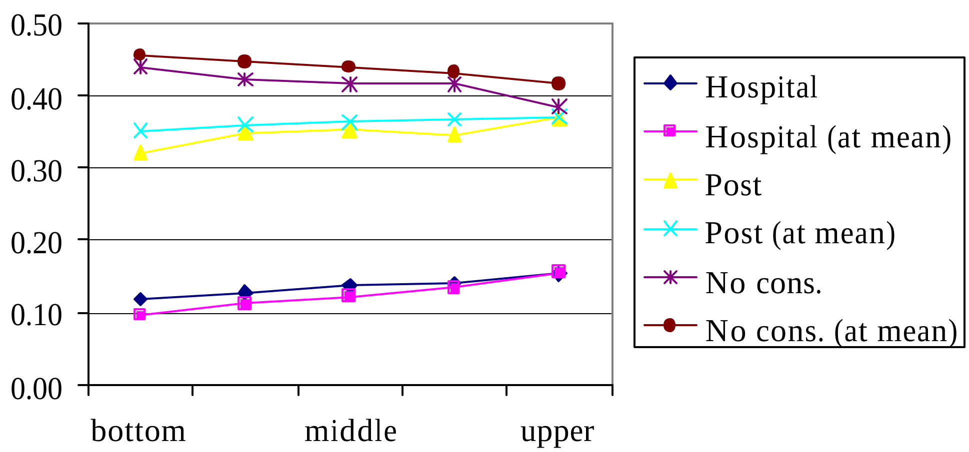


Figure 5: Mean predicted probabilities and probabilities at means, by income



Symptoms

Reported symptoms appear to be important determinants of health-seeking behavior. For all symptoms except "worm" and "malaria," the hypothesis that all the coefficients associated with the indicator variable for the respective symptom are zero is rejected (10 percent significance). As expected, the effects differ between the symptoms and can be illustrated by the marginal effects at means (Appendix Table 16). Focusing on significant effects, we find that the probability of seeking care from a TMP falls in the case where reported symptom is “cold, cough, or breathing difficulty,” “fever,” or “persistent cough with blood” relative to the case where “other” symptoms are reported. Similarly, the marginal effect of “diarrhea,” “cold, cough and breathing difficulty,” “fever,” “persistent cough with vomiting,” and “skin eruptions” on the probability of having a consultation in a hospital is negative and significant relative to the case where “other” symptoms are suffered. In contrast, the marginal effect at means of the symptom “diarrhea” on seeking care from a health post is positive, large, and significant.

Dwelling and Household Characteristics

The number of rooms of the household dwelling and an indicator variable for ownership of a radio are used to proxy for household wealth. In the case of radio ownership, the hypothesis that all the coefficients associated with the variable are simultaneously zero cannot be rejected, whereas the equivalent hypothesis is rejected (10 percent significance) for the number of rooms. Considering marginal effects at means, the effect of an increase in the number of rooms of the dwelling is positive and significant on the probability of having a consultation at a hospital in the event of an illness. For the other alternatives, the marginal effect is not significant.

The number of members of the household is a significant determinant of health-seeking behavior. However, although the hypothesis that all the coefficients associated with this variable are simultaneously zero is rejected, there is only a significant marginal effect at means for the alternative "health post," whereby a larger household is associated with a higher probability of having a consultation at a health post.

THE EFFECT OF COMMUNITY CHARACTERISTICS

The estimated equation includes variables capturing a number of community characteristics. First, indicator variables for passability of roads and the availability of transport to and from the village capture dimensions of physical access beyond distance. The hypothesis that the coefficients associated the variable of road passability are zero cannot be rejected. Conversely, the availability of transport is a significant determinant of health-seeking behavior. Considering the marginal effect at means of transport availability, there is a significant positive effect on the probability of seeking care from a TMP, and a significant negative effect on the probability of having a consultation at a hospital. This counterintuitive effect is most likely an artifact of the data. The presence of a rural hospital in the district does not appear to be a significant determinant.

In the estimated equation, public spending per attendance unit and spending on medicines per capita proxies for quality of public health care (by district). As has been noted, expenditure is an imperfect proxy, and it captures both supply and demand factors.[56] Both variables are significant determinants of health-seeking behavior in the data, but the effects are not those expected. Higher current spending per attendance unit is associated with a higher probability of seeking care from a TMP and lower probability of having a consultation at a health post or of having no consultation. To investigate whether these results were driven by outliers in the data, the model was estimated using a sample from which extreme values had been dropped. This largely eliminates the strong positive effect of current spending per attendance unit on the probability of seeking care from a TMP, and the salient effect becomes a tendency to shift from health post to hospital care as spending increases. More reasonably, higher spending on medicines per capita tends to be associated with a higher probability of having a consultation at a hospital and, conversely, a lower probability of seeking care at a health post. These patterns are similar if we look at the marginal effects at means of public spending (Appendix Table 16).

These results should not be interpreted as suggesting that a given percentage increase in current spending per capita per attendance units and spending on medicines per capita in health posts and hospitals would result in a shift in the health-seeking behavior of individuals away from health posts towards hospitals. The spending data for hospitals and health posts used in estimation are aggregated. Given the different composition of services provided at hospitals and health posts, and higher overheads and

[56] That is, higher spending per attendance unit per capita not only reflects the unit cost (and presumably quality) of services provided, but also the composition of services provided. In this way, the pattern of demand influences the variable that we use as a determinant of demand.

personnel costs at health posts, we would expect unit costs to be higher at hospitals, and spending per attendance unit or per capita to be higher in districts where hospitals are located. In this way, we confound the effect of spending at different levels of health care provision. Moreover, because of a combination of measurement error in the spending data and the small number of observations at the district level, these results may represent anomalies in the data rather than "true" effects.

THE EFFECT OF TRAVEL TIME AND PRICE

As with income, price enters the estimated equation in complex ways. First, looking at the coefficients on the simple price variables (*price*_2-*price*_5), we find that they are significantly different from zero only for the alternatives "health post" and "other." Conversely, the coefficients on the squared price variables (*price*2_2-*price*2_5) are significant determinants of choice only for "hospital" and "health post," while the price-income interaction terms (*cspr_ia*1-*cspr_ia*5) are significantly different from zero for all alternatives except TMP. Finally, travel time does not appear significant independently of its effect through the time variables. Due to the relaxation of the assumption of additive separability through the introduction of an interaction term between income and health improvements in the utility function, the restriction that coefficients on the respective price variables are equal across alternatives is relaxed. Similarly, the introduction of flexibility in the parameterization of the budget constraint results in the restriction on the coefficients on a_6 and a_7 being relaxed. Both of these dimensions of flexibility are important in the model.

Given the different channels through which price affects health-seeking behavior, the coefficients on the respective variables are difficult to interpret. It facilitates interpretation to look at the price elasticities of demand. Following Train (1986), the elasticity of the choice probability $\Pr(V_k = 1)$ with respect to the a change in the price p_k is defined as

$$E_{kx} = \left(\frac{\partial \Pr(V_k = 1)}{\partial p_k} \right) \left(\frac{p_k}{\Pr(V_k = 1)} \right) = \left(\frac{\partial V_k^*}{\partial p_k} \right) p_k (1 - \Pr(V_k = 1)) .$$

Analogous to the case of continuous demand, the elasticity represents the percentage change in the probability of having a consultation with provider k due to a percentage change in price of consultation with provider k, where the percentage change in price is infinitesimal. Own price elasticities were calculated for “hospital” and “health post” for all the observations in the sample. The results are reported by income quintile in Table 11. Given the semi-quadratic specification of the utility function, the elasticity is a function of income. The results are similar to those found in other studies.[57]

Two features of the reported demand elasticities are particularly noteworthy. First, there is considerable variation in the elasticity of demand within income quintiles, particularly in the case of “health post.” Second, the elasticity of demand varies

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[57] See Gertler and Hammer (1997) for a review of findings.

Table 11: Own price elasticities, by income quintile

Income quintile	P25	Mean	p75
	Health post		
1	-0.92	-0.74	-0.47
2	-0.86	-0.64	-0.42
3	-0.84	-0.63	-0.41
4	-0.82	-0.59	-0.39
5	-0.69	-0.47	-0.32
	Hospital		
1	-0.39	-0.34	-0.21
2	-0.46	-0.42	-0.26
3	-0.59	-0.58	-0.32
4	-0.73	-0.70	-0.35
5	-1.00	-0.95	-0.41

substantially with income. In the case on demand for care at a "health post," the elasticity is higher for households with lower incomes, indicating that an increase in prices is likely to reduce access to care particularly for poorer households. Conversely, the own price elasticity of demand for hospital care increases with income. This suggests that the demand response to price increases would be strongest among richer households.

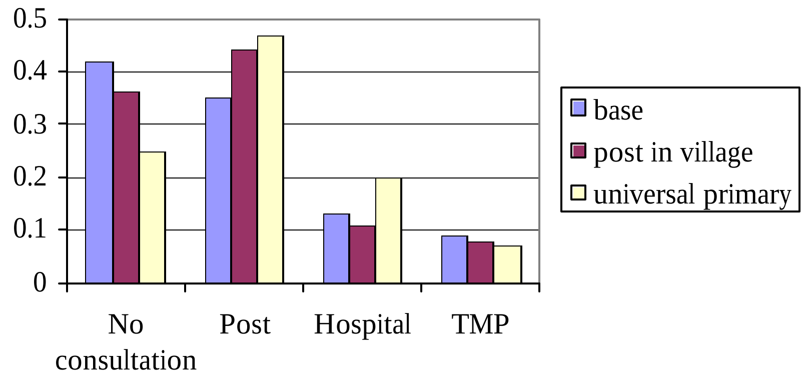
POLICY SIMULATIONS

As was noted in the introduction, many policy initiatives in the health sector in developing countries have been aimed at increasing the access to or utilization of basic health services, particularly by poor segments of the population. With this objective in mind, the regression results were used to simulate the impact of a range of policy changes. Clearly, there is an infinite number of permutations of policy changes that can be considered, and the presentation of results is limited to a few indicative cases.

It should be noted that these simulations only consider one round of effects. In other words, they should be regarded as representing only a partial equilibrium. The effects of a policy change are simulated by changing the values of one or more of the explanatory variables in accord with the policy in question. The changes in the explanatory variables result in changes in the predicted probabilities, and these are taken to be the effect of the policy. However, second and higher order effects, that is, endogenous effects on other explanatory variables or preferences in response to the policy change, are not considered. For example, we can simulate a change in user charges for consultations at a health post by changing the value of this variable and compute a new set of predicted probabilities. Higher user charges may, however, result in an improvement in quality or a response by private sector providers that may have a considerable effect on health-seeking behavior. This limitation should be kept in mind in the discussion that follows.

The effect of universal primary education and complete physical access to health care are two policies on health-seeking behavior examined in Figure 6. Specifically, mean predicted probabilities are computed for two alternative scenarios. In the first case, physical access to basic care is extended to all individuals, in the sense that the distance to nearest health post is reduced to zero; in the second scenario, all individuals are assumed to have level 1 primary education. Under both scenarios, the desired results of reducing the number of individuals who receive no treatment or self-treat is achieved. However, the effect is larger in the case of universal primary education, in part because

Figure 6: Primary education, physical access to care, and health-seeking behavior

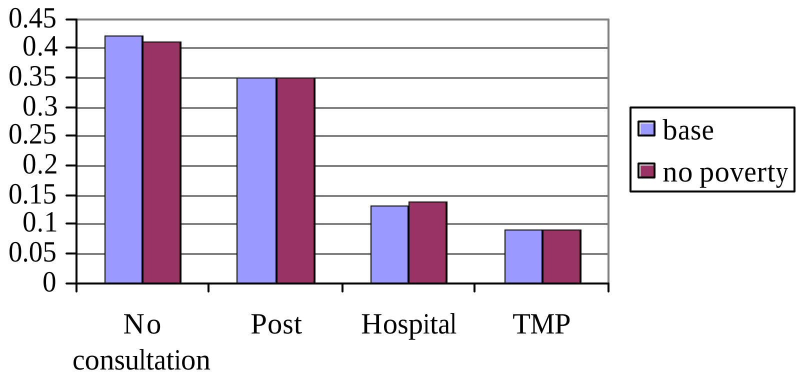


under this scenario, the probability of consultation at a hospital and a health post both increase, whereas under universal access to primary care, there is a substitution away from hospitals.

A second simulation considers the effect of complete eradication of income poverty (Figure 7). Under this scenario, the income of all individuals who fall below the poverty line is raised to the poverty line. Aside from the income variable itself, this has an impact on the price-income interaction term and the opportunity cost of time. In keeping with the finding that income is not an important determinant of health-seeking behavior, the mean predicted probabilities are virtually unchanged under this scenario. In other words, it appears that, ceteris paribus, the eradication of income poverty would not resolve low access to public health care.

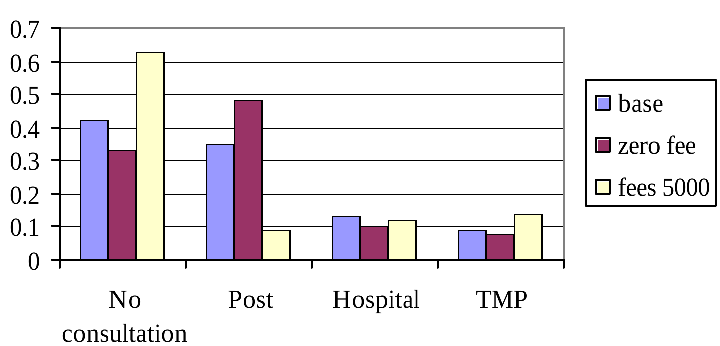
Finally, the effect of changes in user charges is examined (Figure 8). Specifically, two scenarios are considered, one in which the fee for care at health posts is reduced to

Figure 7: The effect of eradication of poverty on health-seeking behavior



zero, and a second in which the fees associated with a consultation at health post or hospital are both set to 5,000MT. Though these are large percentage changes relative to the current level of 1,000MT, the absolute amounts involved are quite small. Still, the simulated changes in predicted probabilities are substantial. The elimination of user charges at health posts increases the mean predicted probability of seeking care at a health post by more than 10 percent and concomitantly reduces the probability that the individual receives no care or self-treats. Conversely, in the simulation, even a relatively

Figure 8: The effect of changes in user fees on health-seeking behavior



modest increase in user fees at public facilities results in a large reduction in health care demand, and an increase in the probability that individuals do not consult with a medical practitioner in the event of illness.

6. DISCUSSION AND CONCLUSIONS

This paper has sought to investigate the determinants of access to public health care facilities in Mozambique, and to provide some quantitative evidence on the importance of individual, household, and community characteristics on individuals' care-seeking decisions during episodes of illness. Through the application of rigorous economic methodology in the analysis of this issue, the research provides new empirical evidence on how different factors affect health-seeking behavior.

The health sector in Mozambique has long suffered from adverse conditions, low levels of financing, and limited technical capacity. Still, recent years have seen a dramatic expansion of the rural health network aimed at increasing access to health services for the population. Given years of colonial neglect, and systematic destruction of health facilities during the civil war, the need for an expansion of physical access is apparent. However, insofar as the ultimate objective of the provision of curative services is to ensure that those in need of care receive effective treatment, it is also necessary to think beyond supply. Specifically, we need to consider how individuals behave during episodes of illness, and what factors affect this behavior. There are likely to be a range of policy trade-offs—for example, between physical access to care and quality, or between investments in the health network and policy initiatives in related sectors—that are likely to be overlooked if demand issues are ignored.

With this perspective in mind, the paper has reported descriptive statistics and results from empirical analysis based on the 1996/97 Mozambican household survey. As was noted, the data suffer from many weaknesses, particularly on health variables, and offers a very limited perspective on complex individual and household responses during illness episodes. Still, the IAF was the first national household living standards survey fielded since the end of the civil war, and due to the size of the sample and the fact that it is representative at both national and provincial levels, it constitutes the most relevant source of data at this point in time.

The descriptive statistics in Section 3 look at evidence on illness prevalence, the decision to seek care, and the choice of health care provider. Consistent with evidence on demographic and socioeconomic characteristics (see, e.g., GoM et al. 1998), the data suggest that illness prevalence and health-seeking behavior vary considerably across provinces. More surprisingly, reporting of illness and illness response varies little with income, or between men and women.

In order to shed more light on the importance of individual, household, and community factors on health care demand, an empirical model to estimate a multinomial model of health care provider choice conditional on illness was specified in Section 4. The model is consistent with the “flexible” specification proposed by Dow (1996a). A number of individual and household characteristics—e.g., age, education, and reported symptoms—stand out as highly significant determinants of health-seeking behavior. For lack of suitable quality characteristics of health care providers, data on current public spending and spending on medicines by district were used as a proxy. However, these data failed to disaggregate spending in hospitals from spending at health centers and health posts, and results appear to reflect the location of hospitals and different composition of services at hospitals and health posts, rather than endogenous behavior, given some exogenous allocation of public resources. Finally, prices, defined in the model as the composite of user fees and time costs associated with consultations at different providers, were found to be important determinants of choice. Specifically, average own price elasticities ranging from 0.47 and 0.74 (health post), and 0.34 and 0.95 (hospital) were found, where elasticities decreased with income for the alternative health post and increased with income for the alternative hospital.

A number of weaknesses pertaining to the data and the methodology should be kept in mind when the results in this paper are considered. First, it was noted that the household survey fails to capture many of the complexities that characterize individual and household responses to illness episodes. Also, we are required to treat income as exogenous, thereby ignoring the possibly deleterious effect of income loss on households, and the data do not permit an analysis of household strategies to deal with income loss and the cost of care. Second, poor quality of health care may be an important constraint on demand for health services from the public sector. Differences in quality across facilities are not controlled for in the estimation, and we are unable to determine the extent to which different quality characteristics—such as drug availability, structural characteristics, and staffing—are important determinants of health-seeking behavior.

Finally, the empirical model is based on the assumption of utility maximization. In other words, we are assuming that the observed patterns of behavior represent optima, given the values of the explanatory variables, and, consequently, that individuals would, on average, respond to changes in the explanatory variables in a manner consistent with the estimated results. However, insofar as the assumptions are not correct, the findings may also be misleading.

Notwithstanding these qualifications, some strong results emerge from the research. In particular, the data suggest that even relatively small price changes would have a substantial impact on access to public health care, in particular for poorer households. We also find that level 1 primary education has a very strong positive effect on the probability of individuals seeking care at a health post or hospital in the event of illness. Conversely, the results indicate that the eradication of income poverty, independent of improvements in physical access to health care or education, has only a negligible effect on health care choices. In the absence of information on costs of different policies aimed at improving access to health care, their relative merits cannot be evaluated. Nonetheless, the results in this paper offer some strong indicative results that can inform and motivate future research.

APPENDIX TABLES

Table 12: Definition of variables in estimation

DEPENDENT VARIABLE	
Provider choice	
prv_ch=1	no consultation
prv_ch=2	TMP
prv_ch=3	hospital
prv_ch=4	health post/center
prv_ch=5	other
INDEPENDENT VARIABLES	
Individual characteristics	
idd	age (years)
female	gender (prop. women)
edu_no	no education (0/1)[a]
edu_pr1	primary, level 1 (0/1)[a]
edu_pr2	primary, level 2 (0/1)[a]
edu_more	secondary or higher (0/1)[a]
mnth_cns	log monthly consumption (MT)[b]
wage	hourly wage rate based on HH income
Symptoms	
sint_1	diarrhea
sint_2	cold, cough, breathing difficulty
sint_3	worm
sint_4	fever
sint_5	persistent cough w. vomiting
sint_6	persistent cough w. blood
sint_7	skin eruptions
sint_8	malaria
sint_9	other
Household characteristics	
divis	number of rooms in dwelling
d_rad	household owns a radio (% yes)
no_memb	household size
Community characteristics	
HRinDis	rural hospital in district (prop. yes)
transit	roads to/from village passable t/o year (0/1)
transp	there is regular transport to/from village (0/1)
Annual district spending	
csp_ua	current spending/attendance unit (MT)[c,d]
msp_pop	spending on medicines per capita (MT)
Price (j) (user fee (j) + wage * time_j)	
price_1	no care
price_2	TMP
price_3	hospital
price_4	health center/post
price_5	other
Price^2 (j)	
price2_1	no care
price2_2	TMP
price2_3	hospital
price2_4	health center/post
price2_5	other
Income / price interaction term	
cspr_ia1	mnth_cns*price_1
cspr_ia2	mnth_cns*price_2
cspr_ia3	mnth_cns*price_3
cspr_ia4	mnth_cns*price_4
cspr_ia5	mnth_cns*price_5
Travel time to health care provider	
time_1	no care
time_2	TMP
time_3	hospital
time_4	health center/post
time_5	other

[a] education (variable refers to education of mother if less than 16 years old).

[b] based on estimate of total daily per capita household consumption, deflated by a spatial price index and multiplied by 30.

[c] attendance units are a weighted (by average time spent by staff - weights in parenthesis) index of days/bed occupied (9); institutional deliveries (12); vaccinations (0.5); maternal and infant health contacts (1); outpatient contacts (1); stomatology contacts (2).

[d] current spending including spending on salaries, goods and services, and medical supplies (including medicines) from all sources of financing (state budget, external financing, special funds).

Table 13: Description of variables in estimation (rural subsample)

Variable	Description	n	Mean	*S.D.*	Min	0.25	Mdn	0.75	Max
idd	age	25,030	22.34	18.42	0	7.76	16.53	33.54	95.99
female	gender	25,030	0.52	0.5	0	0	1	1	1
edu_no	no education	25,030	0.88	0.32	0	1	1	1	1
edu_pr1	primary lvl. 1	25,030	0.12	0.32	0	0	0	0	1
edu_pr2	primary lvl. 2	25,030	0.03	0.16	0	0	0	0	1
edu_more	secondary or higher	25,030	0	0.06	0	0	0	0	1
mnth_cns	ln monthly consumption	25,030	11.67	0.65	9.1	11.26	11.65	12.07	15.16
wage	wage	2,907	0.17	0.38	0	0	0	0	1
sint_1	diarrhea	2,907	0.08	0.27	0	0	0	0	1
sint_2	cold, etc.	2,907	0.01	0.12	0	0	0	0	1
sint_3	worm	2,907	0.08	0.27	0	0	0	0	1
sint_4	fever	2,907	0.03	0.16	0	0	0	0	1
sint_5	cough, vomiting	2,907	0.01	0.12	0	0	0	0	1
sint_6	cough, blood	2,907	0.04	0.19	0	0	0	0	1
sint_7	skin eruptions	2,907	0.22	0.41	0	0	0	0	1
sint_8	malaria	2,907	0.37	0.48	0	0	0	1	1
sint_9	other	25,030	409.25	209.48	77.09	266.21	367.03	496.98	1553.54
divis	number rooms	25,030	2.79	1.35	0	2	3	4	11
d_rad	radio	25,030	0.27	0.45	0	0	0	1	1
no_memb	household size	25,030	5.98	2.79	1	4	6	7	20
HRinDis	rural hospital in dist.	25,030	0.36	0.48	0	0	0	1	1
transit	road passable	25,030	0.31	0.46	0	0	0	1	1
transp	regular transport	25,030	0.77	0.42	0	1	1	1	1
csp_ua	curr. spend./attend. unit	25,030	4.92	2.73	1.12	3.31	4.77	5.68	22.27
msp_pop	drugs spend. per cap.	25,030	3.85	4.19	0.46	1.47	2.41	4.44	25.94
price_1	no care	25,030	0	0	0	0	0	0	0
price_2	TMP	25,030	0.07	0.56	0	0	0	0	11.03
price_3	hospital	25,030	3.03	3.1	1	1.45	2.12	3.17	27.56
price_4	health center/post	25,030	1.98	1.56	1	1.09	1.45	2.23	13.78
price_5	other	25,030	0.72	0.99	0	0.18	0.44	0.88	10.32
price2_1	no care	25,030	0	0	0	0	0	0	0
price2_2	TMP	25,030	0.31	4.29	0	0	0	0	121.71
price2_3	hospital	25,030	18.77	59.91	1	2.09	4.49	10.04	759.37
price2_4	health center/post	25,030	6.35	17.19	1	1.19	2.09	4.97	189.85
price2_5	other	25,030	1.5	6.51	0	0.03	0.19	0.77	106.46
cspr_ia1	no care	25,030	0	0	0	0	0	0	0
cspr_ia2	TMP	25,030	0.85	6.7	0	0	0	0	133.98
cspr_ia3	hospital	25,030	35.58	37.12	10.43	16.85	24.28	37.46	373.29
cspr_ia4	health center/post	25,030	23.13	18.56	9.1	12.79	16.88	26.21	178.07
cspr_ia5	other	25,030	8.5	11.8	0	2.14	5.21	10.09	144.6
time_1	no care	25,030	0	0	0	0	0	0	0
time_2	TMP	25,030	0.17	2.11	0	0	0	0	72
time_3	hospital	25,030	5.51	8.08	0	1.33	3	5.55	96
time_4	health center/post	25,030	2.76	4.67	0	0.25	1.33	3.5	72
time_5	other	25,030	2.05	2.93	0	0.5	1.25	2.5	36

Table 14: Description of variables in estimation (subsample of rural and ill)

Variable	Description	n	Mean	*S.D.*	Min	0.25	Mdn	0.75	Max
idd	age	2,907	26.12	21.62	0.05	5.51	22.52	42.83	87.45
female	gender	2,907	0.57	0.49	0	0	1	1	1
edu_no	no education	2,907	0.9	0.3	0	1	1	1	1
edu_pr1	primary lvl. 1	2,907	0.1	0.3	0	0	0	0	1
edu_pr2	primary lvl. 2	2,907	0.02	0.15	0	0	0	0	1
edu_more	secondary or higher	2,907	0	0.04	0	0	0	0	1
mnth_cns	ln monthly consumption	2,907	11.78	0.65	9.33	11.36	11.78	12.19	14.95
wage	wage	2,907	0.17	0.38	0	0	0	0	1
sint_1	diarrhea	2,907	0.08	0.27	0	0	0	0	1
sint_2	cold, etc.	2,907	0.01	0.12	0	0	0	0	1
sint_3	worm	2,907	0.08	0.27	0	0	0	0	1
sint_4	fever	2,907	0.03	0.16	0	0	0	0	1
sint_5	cough, vomiting	2,907	0.01	0.12	0	0	0	0	1
sint_6	cough, blood	2,907	0.04	0.19	0	0	0	0	1
sint_7	skin eruptions	2,907	0.22	0.41	0	0	0	0	1
sint_8	malaria	2,907	0.37	0.48	0	0	0	1	1
sint_9	other	2,907	423.13	209.97	77.09	285.38	381.88	518.61	1553.54
divis	number rooms	2,907	2.69	1.32	0	2	3	3	10
d_rad	radio	2,907	0.26	0.44	0	0	0	1	1
no_memb	household size	2,907	5.15	2.66	1	3	5	7	19
HRinDis	rural hospital in dist.	2,907	0.3	0.46	0	0	0	1	1
transit	road passable	2,907	0.3	0.46	0	0	0	1	1
transp	regular transport	2,907	0.8	0.4	0	1	1	1	1
csp_ua	curr. spend./attend. unit	2,907	4.89	2.82	1.12	3.24	4.77	5.87	22.27
msp_pop	drugs spend. per cap.	2,907	3.8	4.51	0.46	1.49	2.04	3.84	25.94
price_1	no care	2,907	0	0	0	0	0	0	0
price_2	TMP	2,907	0.1	0.61	0	0	0	0	11.03
price_3	hospital	2,907	3.31	3.47	1	1.55	2.18	3.39	25.35
price_4	health center/post	2,907	1.97	1.71	1	1.06	1.44	2.2	13.78
price_5	other	2,907	0.72	0.99	0	0.2	0.44	0.84	10.32
price2_1	no care	2,907	0	0	0	0	0	0	0
price2_2	TMP	2,907	0.39	4.74	0	0	0	0	121.71
price2_3	hospital	2,907	22.96	67.11	1	2.41	4.74	11.46	642.56
price2_4	health center/post	2,907	6.81	21.11	1	1.13	2.06	4.82	189.85
price2_5	other	2,907	1.5	6.06	0	0.04	0.2	0.7	106.46
cspr_ia1	no care	2,907	0	0	0	0	0	0	0
cspr_ia2	TMP	2,907	1.19	7.29	0	0	0	0	124.66
cspr_ia3	hospital	2,907	39.14	41.62	10.66	18.03	25.87	39.36	315.08
cspr_ia4	health center/post	2,907	23.22	20.39	9.84	12.81	16.89	26.14	173.69
cspr_ia5	other	2,907	8.51	11.89	0	2.33	5.24	9.58	131.46
time_1	no care	2,907	0	0	0	0	0	0	0
time_2	TMP	2,907	0.25	2.54	0	0	0	0	72
time_3	hospital	2,907	6.06	8.65	0	1.5	3	6.17	72
time_4	health center/post	2,907	2.69	4.96	0	0.17	1.17	3	72
time_5	other	2,907	1.98	2.82	0	0.5	1.25	2.25	36

Table 15: Estimation results (standard coefficients)

	TMP		Hospital		Post		Other	
Variable	**coef.**	***s.e.***	**coef.**	***s.e.***	**coef.**	***s.e.***	**coef.**	***s.e.***
idd	0.002	*0.324*	-0.011	*(2.837)***	-0.012	*(3.623)***	-0.002	*-0.321*
female	-0.179	*-0.893*	0.220	*1.375*	-0.036	*-0.269*	-0.055	*-0.170*
edu_pr1	0.631	*1.354*	0.877	*(3.128)***	0.865	*(3.134)***	1.203	*(1.76)**
edu_pr2	-0.300	*-0.320*	-1.190	*(2.299)***	-0.727	*-1.333*	1.565	*1.589*
edu_more	-30.202	*(22.324)***	1.742	*1.622*	-0.721	*-0.522*	-31.254	*(20.185)***
mnth_cns	-0.172	*-0.730*	0.300	*1.479*	0.076	*0.429*	-1.195	*(1.798)**
wage	0.001	*1.028*	0.001	*(1.706)**	0.000	*0.824*	0.002	*1.486*
sint_1	-0.071	*-0.183*	-0.412	*(1.806)**	0.681	*(2.15)***	1.283	*(2.299)***
sint_2	-1.228	*(3.577)***	-0.806	*(2.598)***	-0.454	*(1.835)**	0.211	*0.410*
sint_3	-0.927	*-1.622*	-0.747	*-1.139*	-0.058	*-0.104*	0.382	*0.329*
sint_4	-0.811	*(2.1)***	-0.733	*(1.95)**	-0.072	*-0.198*	0.519	*1.048*
sint_5	-0.609	*-1.147*	-1.262	*(2.45)***	-0.020	*-0.055*	-0.240	*-0.240*
sint_6	-2.126	*(2.067)***	-0.046	*-0.088*	-0.115	*-0.219*	-28.955	*(55.607)***
sint_7	-0.552	*-1.141*	-1.360	*(2.122)***	-0.282	*-1.024*	-29.141	*(53.621)***
sint_8	-0.208	*-0.852*	-0.110	*-0.476*	0.044	*0.237*	-0.053	*-0.105*
divis	-0.099	*-1.306*	0.134	*(2.496)***	-0.006	*-0.099*	0.095	*0.759*
d_rad	0.176	*0.553*	0.211	*1.110*	-0.164	*-1.057*	0.498	*1.002*
lit	-0.547	*(1.877)**	0.309	*1.273*	0.153	*0.727*	-0.496	*-1.019*
no_memb	-0.013	*-0.330*	0.043	*1.175*	0.091	*(3.111)***	0.109	*1.287*
HRinDis	-0.196	*-0.623*	0.071	*0.284*	0.347	*1.605*	0.490	*1.056*
transit	0.045	*0.216*	-0.116	*-0.470*	-0.125	*-0.707*	-0.091	*-0.180*
transp	0.777	*(2.776)***	-0.408	*(1.816)**	-0.008	*-0.035*	0.268	*0.531*
csp_ua	0.106	*(2.426)***	0.027	*0.541*	-0.071	*-1.468*	-0.262	*(2.331)***
msp_pop	-0.081	*(2.724)***	0.043	*1.557*	-0.029	*-0.773*	0.114	*(2.075)***
price_2	-3.971	*-1.508*	(dropped)		(dropped)		(dropped)	
price_3	(dropped)		0.690	*1.321*	(dropped)		(dropped)	
price_4	(dropped)		(dropped)		-1.835	*(3.014)***	(dropped)	
price_5	(dropped)		(dropped)		(dropped)		-12.797	*(2.117)***
price2_2	-0.015	*-0.197*	(dropped)		(dropped)		(dropped)	
price2_3	(dropped)		0.016	*(2.546)***	(dropped)		(dropped)	
price2_4	(dropped)		(dropped)		0.039	*(3.472)***	(dropped)	
price2_5	(dropped)		(dropped)		(dropped)		-0.065	*-0.619*
cspr_ia2	0.299	*1.452*	(dropped)		(dropped)		(dropped)	
cspr_ia3	(dropped)		-0.085	*(2.264)***	(dropped)		(dropped)	
cspr_ia4	(dropped)		(dropped)		0.095	*(2.034)***	(dropped)	
cspr_ia5	(dropped)		(dropped)		(dropped)		0.972	*(1.985)***
time_2	0.128	*1.017*	(dropped)		(dropped)		(dropped)	
time_3	(dropped)		-0.039	*-0.720*	(dropped)		(dropped)	
time_4	(dropped)		(dropped)		0.013	*0.323*	(dropped)	
time_5	(dropped)		(dropped)		(dropped)		0.378	*(2.366)***
_cons	0.017	*0.007*	-4.792	*(2.025)***	-0.128	*-0.062*	9.345	*1.222*

Robust z -statistics in parentheses.
* significant at 10% level; ** significant at 5% level.

Table 16: Estimation results (marginal effects)

	TMP		Hospital		Post		Other	
Variable	**coef.**	***s.e.***	**coef.**	***s.e.***	**coef.**	***s.e.***	**coef.**	***s.e.***
idd	0.001	*1.525*	-0.001	*(1.653)**	-0.002	*(3.064)***	0.000	*0.392*
female	-0.016	*-1.016*	0.025	*(1.65)**	-0.011	*-0.407*	0.000	*-0.158*
edu_pr1	0.016	*0.453*	0.048	*(1.952)**	0.139	*(2.556)***	0.002	*1.153*
edu_pr2	0.009	*0.118*	-0.089	*(1.667)**	-0.110	*-0.957*	0.006	*(1.989)***
edu_more	-2.420	*(9.739)***	0.510	*(4.396)***	0.691	*(2.416)***	-0.085	*(3.971)***
mnth_cns	-0.019	*-0.955*	0.029	*1.484*	0.012	*0.300*	-0.004	*(2.014)***
wage	0.000	*0.682*	0.000	*1.438*	0.000	*0.086*	0.000	*1.237*
sint_1	-0.022	*-0.899*	-0.066	*(2.598)***	0.167	*(2.646)***	0.003	*(2.206)***
sint_2	-0.078	*(2.86)***	-0.051	*(1.796)**	-0.035	*-0.658*	0.002	*1.066*
sint_3	-0.066	*-1.500*	-0.063	*-1.113*	0.042	*0.385*	0.002	*0.477*
sint_4	-0.056	*(1.872)**	-0.062	*(2.011)***	0.035	*0.495*	0.002	*1.641*
sint_5	-0.036	*-0.940*	-0.119	*(2.367)***	0.060	*0.860*	0.000	*-0.038*
sint_6	-0.160	*(1.979)***	0.031	*0.683*	0.067	*0.625*	-0.086	*(3.898)***
sint_7	-0.015	*-0.394*	-0.110	*(1.793)**	0.033	*0.525*	-0.086	*(3.96)***
sint_8	-0.017	*-0.937*	-0.010	*-0.497*	0.020	*0.536*	0.000	*-0.078*
divis	-0.009	*-1.462*	0.015	*(2.707)***	-0.004	*-0.256*	0.000	*0.766*
d_rad	0.017	*0.651*	0.025	*1.407*	-0.050	*-1.473*	0.002	*1.070*
lit	-0.051	*(2.429)***	0.031	*1.410*	0.039	*0.910*	-0.002	*-1.042*
no_memb	-0.004	*-1.438*	0.001	*0.298*	0.019	*(3.074)***	0.000	*0.884*
HRinDis	-0.027	*-1.131*	-0.004	*-0.165*	0.080	*(1.696)**	0.001	*0.883*
transit	0.008	*0.538*	-0.007	*-0.301*	-0.025	*-0.647*	0.000	*-0.080*
transp	0.067	*(2.906)***	-0.048	*(2.091)***	-0.010	*-0.203*	0.001	*0.506*
csp_ua	0.010	*(3.312)***	0.004	*0.830*	-0.019	*(1.963)**	-0.001	*(2.626)***
msp_pop	-0.006	*(2.338)***	0.006	*(1.83)**	-0.006	*-0.673*	0.000	*(2.283)***
price_2	-0.320	*-1.475*	0.039	.	0.116	.	0.001	.
price_3	-0.007	.	0.069	*1.308*	-0.026	.	0.000	.
price_4	0.054	.	0.068	.	-0.406	*(2.988)***	0.002	.
price_5	0.003	.	0.004	.	0.013	.	-0.038	*(2.164)***
price2_2	-0.001	*-0.198*	0.000	.	0.000	.	0.000	.
price2_3	0.000	.	0.002	*(2.536)***	-0.001	.	0.000	.
price2_4	-0.001	.	-0.001	.	0.009	*(3.426)***	0.000	.
price2_5	0.000	.	0.000	.	0.000	.	0.000	*-0.600*
cspr_ia2	0.024	*1.422*	-0.003	.	-0.009	.	0.000	.
cspr_ia3	0.001	.	-0.009	*(2.209)***	0.003	.	0.000	.
cspr_ia4	-0.003	.	-0.004	.	0.021	*(2.029)***	0.000	.
cspr_ia5	0.000	.	0.000	.	-0.001	.	0.003	*(2.022)***
time_2	0.010	*1.012*	-0.001	.	-0.004	.	0.000	.
time_3	0.000	.	-0.004	*-0.724*	0.001	.	0.000	.
time_4	0.000	.	0.000	.	0.003	*0.323*	0.000	.
time_5	0.000	.	0.000	.	0.000	.	0.001	*(2.245)***
_cons	0.050	*0.238*	-0.475	*(2.037)***	0.140	*0.305*	0.030	*1.395*

Robust z -statistics in parentheses.
* significant at 10% level; ** significant at 5% level.

Table 17: Results: Wald test

Variable	chi2	df	P>chi2
idd	18.584	4	0.001
female	3.072	4	0.546
edu_pr1	13.349	4	0.010
edu_pr2	16.197	4	0.003
edu_more	1782.272	4	0.000
mnth_cns	8.456	4	0.076
wage	5.142	4	0.273
sint_1	23.295	4	0.000
sint_2	19.801	4	0.001
sint_3	4.431	4	0.351
sint_4	12.065	4	0.017
sint_5	7.929	4	0.094
sint_6	4337.187	4	0.000
sint_7	3411.601	4	0.000
sint_8	1.229	4	0.873
divis	9.227	4	0.056
d_rad	4.729	4	0.316
lit	8.642	4	0.071
no_memb	11.506	4	0.021
HRinDis	4.310	4	0.366
transit	0.897	4	0.925
transp	12.356	4	0.015
csp_ua	17.962	4	0.001
msp_pop	18.223	4	0.001
price_2	2.275	1	0.131
price_3	1.744	1	0.187
price_4	9.082	1	0.003
price_5	4.483	1	0.034
price2_2	0.039	1	0.843
price2_3	6.484	1	0.011
price2_4	12.052	1	0.001
price2_5	0.383	1	0.536
cspr_ia2	2.108	1	0.147
cspr_ia3	5.126	1	0.024
cspr_ia4	4.139	1	0.042
cspr_ia5	3.939	1	0.047
time_2	1.035	1	0.309
time_3	0.518	1	0.472
time_4	0.105	1	0.746
time_5	5.600	1	0.018

Ho: All coefficients associated with given variables are 0.

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