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# Demand for health care in HIV/AIDS – affected households in two communities in the Free State province of South Africa

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# Demand for health care in HIV/AIDS-affected households in two communities in the Free State province of South Africa

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**Abstract**

ABSTRACT: This paper analyses differences in the choice of health care facility by ill individuals in HIV/AIDS-affected households in the Free State province of South Africa. Secondary education, access to medical aid, and household income are significant determinants of choice, as are severity and type of illness, and type of health care required. Ill persons with HIV/AIDS-related illnesses are significantly more likely to opt for public health care, although the strength of this preference declines as household income increases. Ill persons with severe and in particular severe HIV/AIDS-related illness in turn are significantly more likely to opt for private health care, especially at higher levels of income. Furthermore, health care costs associated with HIV/AIDS-related illness is likely to push HIV/AIDS-affected households deeper into poverty, especially where private care is preferred over public health care. The public health care sector therefore will remain the backbone of the health care system in providing health care to those infected with HIV/AIDS.

JEL CLASSIFICAITON: D12

KEYWORDS: health, demand for health care, poverty, HIV/AIDS

## 1. Introduction

The HIV/AIDS epidemic represents one of the most important development challenges facing South Africa. Thus, factors that drive infected individuals' decision-making in choosing specific types of health care are important to clarify, with a view to informing policies around the provision of treatment and care. We examine here the determinants of health care facility choice, and in particular the role of income, by analysing data of ill individuals in HIV/AIDS-affected households.

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The analysis is based on a household panel investigating the socio-economic impact of the epidemic. The results of both the pooled and random effects models are reported.

A distinction is made between visits to public health care providers and private health care providers. Section 2 sketches the background to the paper, while section 3 presents an overview of the data. Section 4 reports the model specification and estimation, while section 5 reports and discusses the results of these analyses. Section 6 concludes.

## 2. Background

South Africa has a well-developed health care system. Expenditure on health care is on par with that of many developed countries. In the late 1990s, total per capita health care expenditure amounted to PPP US$663, with public and private expenditure representing 3.7 and 5.1% of GDP respectively (UNDP, 2003: 256). The availability of health care personnel is relatively good compared to most other developing countries, with a ratio of 443 physicians per 100 000 population (UNDP, 2003). Public health care is funded mainly from general taxation (94%), with user fees representing only 1% of public funding (Thomas *et al.*, 2000) in a system where primary health care is free. Private health care in turn is financed predominantly via medical schemes (73%) and out-of-pocket expenditure (23%) (Goudge *et al.*, 2001). Yet, the public/private divide in access to health care remains stark in this system where public health care for the most part is provided free and private health care is costly. While people from more affluent households access private care, the poor rely mainly on public health delivery and are also more likely to opt for self-treatment (Makinen *et al.*, 2000; Booysen, 2003; Havemann and Van der Berg, 2003). The ratio of trained medical staff (GPs) per 100 000 population, ranges from 380 (34) to 4,453 (2,050) in the public and private health care sectors respectively (Thomas *et al.*, 2000).[1]

[1] These ratios were calculated by dividing the number of health care practitioners employed in the private (public) health care sector by the population with

Although public spending is regressive, the poor benefit less than proportionally from this subsidy (Castro-Leal *et al.*, 2000).

South Africa currently faces one of the highest HIV prevalence rates in the world. Estimates of HIV prevalence among the total population in 2004 range between 8.2% and 12.9% (Dorrington et al., 2004).[2] Those infected with HIV and suffering from AIDS have access to palliative care, both in the private and public health care system. In terms of access to anti-retroviral treatment (ART), until recently, only some people enjoyed access to ART. By 2001, almost three quarters of options offered by private medical schemes in South Africa provided access to anti-retroviral therapy, which covers 92% of beneficiaries of medical schemes (Stein et al., 2002). Yet, only 16% of the population have access to medical aid (Goudge *et al.*, 2001), which implies that the majority of infected persons have no access to ART.

Since then however there has been a shift towards providing universal access to ART. On the one hand, ART in 2005 was added to the list of prescribed minimum benefits that all public hospitals and other

access (without access) to health care insurance. Admittedly this is not a true reflection of disparities in access to health care. This is the case for two reasons. Firstly, the private and public health care sectors do not operate independently and interact in various ways in the provisioning of health care services. In some arrangements, government financing is used to provide patients unable to fund their own care (in other words public sector patients) with access to services that are privately owned. Two other forms of public-private relationships include the private financing of public care for public sector patients, as well as the private financing of private sector care for private sector patients using public facilities (Goudge, 1999). Secondly, patients who pay for health care by means of out-of-pocket expenditure can access care where they choose to, be it in the private or public health care sectors. Despite these limitations, however, these statistics serve here but as a reminder of the considerable inequity that characterises the South African health care system.

[2] Admittedly, these HIV prevalence estimates are not directly comparable, given differences in the underlying data sources and assumptions and methodological approaches employed in estimating HIV prevalence rates. However, these statistics do give an indication of the relative scale of the epidemic in South Africa, which remains considerable even if overall HIV prevalence is 8.2%, a figure that translates into approximately 3.8 million HIV infections (Dorrington et al., 2004).

designated service providers are by law required to provide according to specified clinical protocols and criteria. These benefits must be covered by all benefit options offered by private medical schemes, while the use of monetary limits, levies and co-payments are prohibited for coverage of these minimum benefits (Harrison, 1998/99; Sait, 2001; Pillay *et al.*, 2002; Forman *et al.*, 2004).[3] On the other hand, access to ART also became a reality in the public health care sector in 2003/04. Public access, however, is not as yet universal and treatment is being phased in over a five-year period in the public health care system (Department of Health, 2003).

In this context of disparities in access to health care and in access to HIV/AIDS-related care and treatment, knowledge of health care utilisation amongst ill individuals from HIV/AIDS-affected households is crucial in advancing our knowledge about health care provisioning to populations affected by the epidemic. In particular, one needs to understand how infected individuals choose between public and private health care facilities in accessing care and treatment, which is what this papers sets out to achieve.[4]

[3]In respect of other HIV/AIDS-related care and treatment options, the list of prescribed minimum benefits also includes HIV-associated disease, sexually transmitted diseases, as well as comfort care and pain relief when death is imminent (Pearmain, 2000).

[4]As we collected data on the type of health care facility used, rather than the specific care and treatment received by each ill individual, we are not in a position to investigate the determinants of access to palliative care as opposed to ART. By wave 6 of the study, we did include a specific question pertaining to access to ART following the announcement of the launch of a public sector ART programme in South Africa and given that a number of the public health care facilities where treatment would commence were actually located within our two study sites. Yet, only one ill person reportedly received anti-retroviral treatment at the time, in this case at a mining hospital. In fact, the ART programme in the Free State province only actually commenced following the completion of our study: the first patient in the province received treatment in June 2004. Thus, the focus here, as explained elsewhere, is on the determinants of health care facility choice by ill individuals from HIV/AIDS-affected households rather than on determinants of choices pertaining to specific types of care and treatment available to HIV-infected persons suffering from AIDS, although it is obvious for reasons noted above that

## 3. Data

The household impact of HIV/AIDS was assessed by means of a cohort study of households affected by the disease. The survey was conducted in two local communities in the Free State province during 2001-04, one urban (Welkom) and one rural (QwaQwa), in which the HIV/AIDS epidemic is particularly rife. The two districts in which the study sites are situated, namely Lejweleputswa (Welkom) and Thabo Mofutsanyane (Qwaqwa), in 2000 faced an HIV prevalence rate amongst antenatal clinic attendees of 30.1% and 27.1% respectively. The respective estimates reported for 2003 were 33.3% and 28.0% (Department of Health, 2004). According to the report entitled *Measuring Poverty* published in 2000, the larger Welkom magisterial district is the third richest in the Free State province, with a headcount poverty ratio of 0.34 and average monthly household expenditure of R2,364. The magisterial district of Witsieshoek, which is within the boundaries of the former Qwaqwa, is the poorest in the Free State province and also ranks amongst the poorest in the country. The headcount poverty ratio in this district is 0.69, while average monthly household expenditure amounts to R807 (Statistics South Africa, 2000). Households were defined in terms of the standard definition employed by Statistics South Africa in the 1995 October Household Survey (OHS), i.e. 'a person or a group of persons who live together at least four nights a week at the same address, eat together and share resources' (Statistics South Africa, 1995: 0317-E). A household survey was conducted using semi-structured, face-to-face interviews conducted by trained fieldworkers. Interviews were conducted with one key respondent only, namely the 'person responsible for the daily organization of the household, including household finances'. Six rounds of data collection were completed in May/June and November/December of 2001, in July/August and November/December of 2002, and in July/August 2003 and May/June 2004 respectively.

The results reported in this paper are based on an analysis of data

we are talking here mainly about access to palliative care rather than to ART.

for ill individuals from HIV/AIDS-affected households. These households include households sampled purposively at baseline via NGOs and other organizations involved in HIV/AIDS counselling and care and that included at least one person suspected to be HIV-positive or suspected to have died from AIDS in the past six months. In addition, affected households include households from a comparison group sampled at baseline, but that subsequent to or at baseline included ill individuals that suffered from HIV/AIDS-related illnesses, notably HIV/AIDS, tuberculosis, STDs, pneumonia, bronchitis or meningitis. Admittedly, we face an identification problem here, given that ill individuals were not tested so as to determine their HIV status. Thus, one may argue that the said data cannot be employed to investigate determinants of health care utilisation by HIV-infected persons. Due to the purposive sampling design of our survey and the relatively small sample size, moreover, the findings from this study cannot be generalised to South Africa as a whole. In fact, this lack of generalisability is a characteristic shared by the majority of HIV/AIDS household impact studies, not only this particular study (Booysen and Arntz, 2003).

Nevertheless, we would argue the results to be characteristic of the health care seeking behaviour of ill persons from a large proportion of HIV/AIDS-affected households in South Africa. Our reasons for arguing this are as follows. In the *first* instance, it is an acknowledged fact that HIV infection is normally clustered within households (Barnett and Whiteside, 2002). This means that the presence in a household of one person with a HIV/AIDS-related disease makes it likely that other ill persons from the same household also represent HIV-infected individuals, albeit that they may not have suffered from HIV/AIDS-related illnesses at the time. *Secondly*, analysis indicates that a relatively large proportion of morbidity and mortality in affected households can be attributed to HIV/AIDS or related infectious diseases and opportunistic infections (Bachmann and Booysen, 2003/04). In terms of the data employed in this paper, 57.5% of ill individuals in the sub-sample reported diagnosis related to HIV/AIDS, tuberculosis, STDs, pneumonia, bronchitis or meningitis. *Finally*, the

households in our study for the most part share the socio-demographic and socio-economic characteristics of persons that, according to the only national HIV prevalence study ever conducted in South Africa, experience relatively high HIV infection rates. Shisana and Simbayi (2002) report relatively higher HIV prevalence rates among Africans (12.9%), among females (12.8%), among people from the Free State province (14.9%), among those living in formal (12.1%) or informal (21.3%) urban dwellings, among adults aged 25 years or older (15.5%), among the poor (14%)[5], and among those aged 15 years or older with only primary education (12.1%), some secondary education (14.9%), or grade 12 (15.3%) compared with persons from the general populations. The ill individuals in our sub-sample, apart from all living in the Free State province, comprise mainly of Africans (89.5%), females (64.2%), those living in formal urban dwellings (82.9%) or informal urban dwellings (11.6%), adults aged 25 years or older (71.5%), the poor (42.7%)[6], and those aged 15 years or older with only primary education (32.1%), some secondary education (38.9%), or grade 12 (14%). Thus, it is probable that these ill persons do for the most part originate from HIV/AIDS-affected households and that the data can shed light on the health care seeking behaviour of HIV-infected individuals in South Africa at large, this despite the other limitations of these data.

The sub-sample of observations from the larger study employed in this paper includes the health care utilisation information for a total of 730 individuals from HIV/AIDS-affected households that were reported as ill in at least one wave of the panel. We have data for one health care visit per wave only, namely the last visit prior to the interview. Of these 730 ill individuals, 333 or 45.6% are from

[5]The 'poor' represents individuals that resided in households that did not have enough money or were often short of money to afford basics as opposed to individuals from households with enough money to afford the most important things or extras (Sishana and Simbayi, 2002: 54).

[6]In our survey, the 'poor' represents individuals from households where real adult equivalent income fell below R250, a poverty line similar to that employed in recent poverty estimates published by Statistics South Africa (2000: 11).

urban Welkom and 397 or 54.4% from rural Qwaqwa. A relatively large proportion of these individuals were observed as ill once only, namely 224 individuals or 30.7% of the total sample. A total of 88 individuals were ill in two waves (n=176), 36 in three waves (n=108), 24 in four waves (n=96), 12 in five waves (n=60), and 11 in six waves (n=66). The number of observations per period respectively is 211 (wave 1), 135 (wave 2), 100 (wave 3), 105 (wave 4), 94 (wave 5), and 85 (wave 6). The panel is an unbalanced panel, given that health care utilisation information for the 395 observed individuals (395 x 6 waves = 2,370 observations) were missing in certain waves due to ill individuals not being ill, ill individuals having died subsequently, ill individuals joining households in the sample at a later stage, or ill individuals having left their respective households in subsequent periods, as reported in Table 1. Descriptive statistics of variables are reported in Table A in the appendix to this paper.

## 4. Method

Individuals may have specific preferences for health and indirectly for health care. Demand for health care can be directly observed and quantified, and therefor serves as a useful proxy for health if we derive a reduced form estimation of health care choices by individuals in our sample. Given that individual utility ($U_i$) can not be directly observed, the indirect utility $\left(y^*_{itj}\right)$ associated with heath care alternative, $j$ ($j = 1, 2$) is expressed as $y^*_{itj} = U\left(X, \beta\right)$ where $X$ is the matrix of independent individual-, household- and community specific variables for the entire sample ($i = 1, \ldots m$ individuals, $t = 1, \ldots n$ time periods) and $\beta$ is a vector of coefficients. We model demand for health care assuming a simple linear specification of the indirect utility function (adapted from Lindelow, 2002): $y^*_{itj} = \beta' X + \varepsilon_{it}$.

Potential sample selection problems arise given that $y^*_{itj}$ is observed conditional on an individual seeking health care when ill. The decision of which type of health care facility to use is therefore typically modelled as a nested multinomial logit model or a two-stage decision

wherein the individual first choose whether or not to seek medical treatment, and thereafter decides on the type of health care facility to use (Akin *et al.*, 1995; Chang and Trivedi, 2001; Collier *et al.*, 2002; Trivedi, 2002; Havemann & Van der Berg, 2003; Asfaw, 2005).

According to data from a nationally representative household survey conducted in South Africa 1993, 18% of ill household members opted for self-treatment (Havemann and Van der Berg, 2003: 10). In this survey, however, only 3.6% (26/730) of individuals who fell ill chose not to seek health care. (Table 2). This most likely is the result of our sampling design (Heckman, 1979), given that the sampling frame consist of individuals with access to home-based care from NGOs, the low proportion of households who did not seek treatment is not surprising. (The severe illness experienced by HIV-infected persons, particularly when AIDS-symptomic, may also explain the fact that a large proportion of ill persons actually seek treatment.) Given that the proportion of individuals that did not seek treatment is not a significant proportion of our sample, omitting these observations should not introduce significant selection bias to our estimations. As a precautionary measure, we verified the absence of a sample selection problem by estimating a multinomial logit model with three categories (no treatment sought, public health care sought, private health care sought), as well as a Heckman two stage selection model (with joint maximum-likelihood estimation).

Choice of health care facility has been aggregated into public and private health care facilities given the sparseness of the data (refer Table 2). Thus, we estimate the probability of visiting private over public health care facilities as a function of a host of individual and household specific variables. Public facilities include government clinics and hospitals. Private health care facilities include GPs, private hospitals, health care services provided by employers, and pharmacies. A logit model is first estimated for the data pooled across all six waves of the panel. The logit estimations are obtained for heteroscedastic robust standard errors (Butler and Moffit, 1982). A random effects logit model is then estimated using the panel data based on maximum-

likelihood estimation. The random effects logit model is specified as: $y^*_{itj} = \beta x_{it} + u_i + \varepsilon_{it}$, where $u_i \sim IID\,(0, \sigma^2_u)$ normally distributed and $\varepsilon_{it} \sim IID\,(0, \sigma^2_\varepsilon)$ is logistically distributed such that $\varepsilon_{it}$ has mean zero and variance $\sigma^2_\varepsilon = \pi^2/3$ independently of $u_i$(Wooldridge, 2002:482-4).[7]

The individual characteristics in the regression model (model 1) include gender, age, marital status, education, and access to medical aid, as well as health-specific determinants of demand for health care such as type of care (hospital-based *versus* other care), severity of illness, and type of illness (HIV/AIDS-related *versus* other illnesses). Ill persons are considered to have required hospital care if the individual had last visited a public or private hospital and had been hospitalised. Severe cases of illness represent cases where the person had been ill for 30 days out of the past month, had not recovered from their illness, and was not able to perform daily tasks. HIV/AIDS-related illnesses represent cases where the self-reported diagnosis was given as HIV/AIDS, STDs, tuberculosis, pneumonia, bronchitis or meningitis.[8] In addition, we estimate a second model (model 2) in which we

[7] An advantage of using the random effects model over the fixed effects model is that the latter loses a degree of freedom for each observation (N), which typically is a problem if the sample size is relatively small. This loss of degrees of freedom is avoided when we assume ui to be random (Baltagi, 2001:15). We were unable to estimate the fixed effect due to this loss in degrees of freedom as well as the lack of variation in the dependant variable over the six waves.

[8] The number of cases of illness attributed specifically to HIV/AIDS was 30. This number was too small to allow a meaningful analysis of choice of health care facility across the three types of illness: HIV/AIDS-specific, other HIV/AIDS-related and other illnesses, not to mention the interaction of severity of illness with each illness type. In fact, HIV/AIDS-specific illnesses were not significantly more severe compared with other HIV/AIDS-related illnesses, although HIV/AIDS-related illnesses in general were significantly more severe compared with other illnesses: 23.8% versus 16.3% ($p<0.05$). Moreover, in the absence of HIV testing, such distinction between HIV/AIDS-specific as opposed to other HIV/AIDS-related illnesses based on self-reported diagnosis of illness probably only reflects differences between individuals in knowledge and disclosure of their HIV status. Interestingly, however, the bivariate analysis reveals that those with HIV/AIDS-specific illnesses are significantly more likely to have opted for private health care compared with those that experienced other HIV/AIDS-related illnesses ($p<0.10$),

interact severity and type of illness to determine the nature of preferences for private over public health care for severe HIV/AIDS-related illnesses.[9] Furthermore, we take into account the effect of certain household characteristics in modelling the choice of health care facility, including place of residence (urban versus rural), household size, age and gender of head of household, household wealth (represented here by a crude asset index), and total real household income.[10] These particular individual and household characteristics are commonly employed in models of demand for health care (Cameron *et al.*, 1988; Mwabu *et al.*, 1993; Akin *et al.*, 1995; Pohlmeier and Ulrich, 1995; Geil *et al.*, 1997; Windmeijer and Santos Silva, 1997; Hotchkiss, 1998; Gulliford and Mahabir; Deb and Trivedi, 2002; Mariko, 2003; Sahn *et*

but significantly less so than persons with other illnesses ($p<0.05$).

[9]As real household income does not differ significantly by type of illness, we did not explore the interaction between income and type of illness in our paper. However, the effects of severity and type of illness and their interaction differ significant by income level in respect of choice of health care facility, as explained in the text. In an attempt to investigate other ways in which HIV/AIDS may affect demand for health care, we estimated two additional models, the one including an interaction term combining type of illness and type of care and the other including an interaction term combining type of care and severity of illness. Although these two models performed adequately in terms of overall fit, these interaction terms were not statistically significant in the pooled or random effects models. In addition, the results were not significantly different from the estimates reported in Table 4, which confirms that these results are relatively robust.

[10]The asset index and household income are significantly positively correlated ($p<0.01$), which suggests that one may here also want to rather include one of the two only due to problems with collinearity. However, these two measures of household welfare are considered here rather as two conceptually different aspects of welfare, namely income and wealth. Estimates of household income as well as all other monetary variables were converted into real values using the most recent CPI estimates (2000=100) published by Statistics South Africa (2004). In the case of household income, measures of equivalent income were employed to allow for differences in standard of living related to household characteristics (Lipton and Ravallion, 1995; Burkhauser, Frick and Schwarze, 1997). Household income was adjusted for differences in household size by dividing real monthly income by na, where n represents the number of household members and a an adjustment for household economies of scale (Filmer and Pritchett, 1998: 13).

*al.*, 2003; Lahiri and Xing, 2004; Mocan *et al.*, 2004).[11]

Empirical studies of demand for health care often include the cost of care as independent variable in regression models. In developing countries, moreover, under-utilisation of health care clinics and services is often prevalent due to the existence of significant non-pecuniary costs of consuming medical services, and poor quality of health care. It is therefore popular to also include attribute specific measures such as travel costs, travel time and quality of health care in such models (Mwabu *et al.*, 1993; Akin *et al.*, 1995; Hotchkiss, 1998; Lindelow, 2002; Havemann and Van der Berg, 2003; Mariko, 2003; Sahn *et al.*, 2003; Mocan *et al.*, 2004; Asfaw, 2005). We chose to exclude these variables (i.e. direct and indirect costs and quality of health care) from our model for three reasons. *Firstly*, treatment and transport costs were only reported in our survey for the facility actually used by the ill individual, whereas discrete choice models such as mixed multinomial logit or conditional logit models (McFadden and Train, 2000) also requires data on treatment and transport costs for alternatives.[12] In the *second* instance, there is the problem of endo-

[11]Three other variables commonly employed in models of this nature include race/ethnicity (Gulliford and Mahabir; Deb and Trivedi, 2002; Lahiri and Xing, 2004; Mocan et al., 2004), employment status (Cameron et al., 1988; Geil et al., 1997; Windmeijer and Santos Silva, 1997; Gulliford and Mahabir; Lahiri and Xing, 2004; Mocan et al., 2004), and access to health care services (Mwabu et al., 1993; Akin et al., 1995; Pohlmeier and Ulrich, 1995; Geil et al., 1997; Mariko, 2003; Lahiri and Xing, 2004). The latter is commonly measured by means of distance from the closest health care facility, but this data unfortunately is not available in our case. Employment status of the ill individual and/or household head was excluded from our model, given that these variables were positively and statistically significantly associated with education ($p<0.01$), which we do include in the model. Including employment status in addition to education would result in problems with multicollinearity. Lastly, race is excluded from the model as the majority of individuals are of African origin (90%). This precludes the meaningful analysis of health care use by race.

[12]In our survey, we did ask respondents why ill individuals opted for visiting a particular health care facility. The majority of responses (approximately 90% or more) are related to affordability and quality of care issues. If one takes the perspective that these responses reflect an individual's evaluation of the cost and

geneity. Treatment and transport costs are both functions of health care choice. Similarly, retrospective questions on the reason for choosing to visit a particular health care facility mean that the response is in part dependent on the choice of facility.[13] Thus, the presence of endogeneity and the absence of suitable instruments to adjust for this endogeneity rule out the inclusion in our model of any of these variables. *Finally*, one also faces problems of multicollinearity when including the quality of health care and affordability measures derived from the data as determinants of health care choice, given the strong and significant ties of the latter to other independent variables in the model.[14]

quality of care, not only for the facility visited, but also for other alternatives, it is possible of course to employ these data as proxy measures of cost and quality of health care. Nevertheless, the two other reasons for excluding these variables from the model, namely problems with endogeneity and the presence of collinearity, rule out even this approach.

[13]Treatment and transport costs and quality and affordability of health care are statistically significantly associated with choice of health care facility ($p<0.01$). Health care costs are significantly higher for private as opposed to public health care services: R340 versus R28 for treatment costs and R30 versus R10 for transport costs. In turn, quality of care is the main reason for preferences for private health care (84.7%) and affordability for preferences for public health care (66.7%). Reason for use also differs statistically significantly for different types of transitions in health care choice over time ($p<0.01$). Of those individuals that visited a public health care facility when ill (n=269), 7.8% opted to visit a private health care facility when they again experienced an episode of illness at a later point in time. The main reason these individuals reported for having visited a private facility in 95.2% of cases was related to quality considerations. In turn, 58% of those individuals that visited a private health care facility when ill (n=50), visited a public health care facility when they again experienced an episode of illness. The main reason these individuals reported for having visited a public facility in 72.4% of cases was related to affordability considerations

[14]Affordability is significantly associated with need for hospital-based care (positive), severity of illness (negative), severity of HIV/AIDS-related illness (negative), place of residence (urban), and total household income (negative)($p<0.10$). The association of quality of health care with each of these independent variables in the model is also statistically significant ($p<0.10$), the only difference being that the signs are reversed. The significant association between affordability and quality of

All continuous variables in the models were transformed into logs and scaled up by 1 to ensure that zeros are not transformed into missing values. The number of observations included in the two regression models (n=685) are slightly fewer than the number of persons who visited public or private facilities (n=699), given that information on all variables included in the models was missing for a small number of individuals. All results are reported as marginal effects. In the case of continuous variables, these marginal effects reflects the change in the probability that an ill individual used private over public health care associated with one percentage point change in the independent variable. Marginal effects of income are also reported as partial elasticities in order to assess the effect of income on the probability of seeking private health care over public health care, both on average and specifically for households in the lower and upper quintiles of our sample. The same approach is employed to determine how the effects of type of care and nature and severity of illness on choice of health care facility differ by income quintile.[15]

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care and place of residence is particularly interesting. In urban areas, affordability rather than quality of care is the main reason sited for any health care choice (69.1% versus 16.4%), whereas the opposite apply in rural settings (41.7% versus 52%)($p<0.01$). Yet, choice of health care facility does not exhibit any significant association with place of residence, not in the bivariate nor in the regression analysis (refer Table 4). When including a dummy variable for quality and affordability of health care in the regression models, however, place of residence is statistically significantly associated with choice of private over public health care: persons in urban (rural) areas are significantly more likely to opt for private (public) health care. In these models, the quality and affordability of care variables crowd out most other variables in respect of the size of the coefficients, with quality of care (affordability) as expected being associated with a significantly higher probability of private (public) health care use.

[15]The specification for calculating income effects (marginal effects) on the probability of seeking private health care over public health care is defined as $\frac{\partial p(x)}{\partial x_k} = g\left(\beta\beta x\beta_j \; where \; g\left(z\right) = \frac{\partial \Lambda(z)}{\partial z}\right)$ and $x_k$ is continuous. The marginal effect is evaluated at the means (Wooldridge, 2002:459) for each income quintile. Here is the log of real adult equivalent income calculated for individuals from estimates of the total household income. The predicted marginal effect of a change in income

An additional question we address in this paper is whether the increased burden of morbidity exerted on households by HIV/AIDS will cause households to become impoverished or to move deeper into poverty. Demand for health care is directly affected by such factors as income and education. These variables are also important determinants of health, which subsequently affect demand for health care. The direction of causality in the relationship between access to health care, health status and poverty status and education of the household is therefore not obvious and may give rise to endogeneity in the specification of our model. We do not instrument for income in our model, but report average household health care expenditure by choice of health care facility, with a distinction being made between HIV/AIDS-related and other illnesses. Household health care costs represent the sum of expenditures on consultation, treatment and related travel costs for all ill individuals, thus allowing for the clustering of illness in households.[16] We then compare the proportion of households classified as poor based on real adult equivalent household income as opposed to real adult equivalent household income exclusive of total health care expenditure. The poverty line employed for this purpose is R250 adult equivalent income per month (Statistics South Africa, 2000: 11).[17] While rudimentary, these comparisons of the change in the incidence of poverty, when accounting for health care expenditures on HIV/AIDS-related as opposed to other illnesses, gives us some indication of the possible impoverishing impact of the

for the random effects logit model is calculated at $u_i = 0$.

[16]The dataset we use only contain information about actual visits to health care facilities and does not include observations for waves where the individual did not visit a health care facility. These estimates therefore do not report the average individual health care expenditure over all waves, but rather the expenditure on either public or private healthcare as a share of income in the periods when the household to which the relevant ill individual belonged incurred any health care expenditure

[17]In poverty analysis, the common practice is to employ a range of poverty lines so as to determine whether the results are robust. However, due to constraints of space, the focus here is on one poverty line only.

epidemic.[18]

## 5. Results and Discussion

### *5.1. Descriptive Analysis*

This section explores the association between gender, age, education and income and the incidence and severity of illness and decisions about health care use. These results are reported in Table 3a and Table 3b. The incidence of illness, calculated here across all individuals belonging to those HIV/AIDS-affected households including at least one ill person, exhibits a statistically significant association with gender, age by gender, age, and education ($p<0.01$). Women are significantly more likely than men to have been ill. Given the nature of the HIV/AIDS epidemic, the incidence of illness as expected is significantly higher among adults compared with the two other age groups, both in general and for men and women. Asfaw (2005) reports similar results. Furthermore, the incidence of illness is significantly higher among those with primary and secondary education compared with persons with no education or tertiary education. Interestingly, this pattern in the incidence of illness by education closely corresponds to the HIV prevalence rates by education level reported by Sishana and Simbayi (2002). This again underscores the extent to which these data can be argued to be characteristic of the health care seeking behaviour of those from HIV/AIDS-affected households. According to the results presented in Tables 3a abd 3b, the incidence of illness declines as household income increases. However, these differences are not statistically significant.

In terms of the severity of illness, women are significantly less likely than men to have recovered from their illness ($p<0.10$). Furthermore, older persons and older men are significantly less likely to have recov-

[18] Given the relatively low use of private health care in the sample (18%), it was not possible to perform these comparisons by facility and illness type also by income quintile.

ered from their illness ($p<0.10$ and $p<0.05$ respectively). Adults are significantly more likely to not be able to perform daily tasks on their own ($p<0.10$). Less educated persons (especially those without tertiary education) and those from households with lower income levels (in particular those in the lower three income quintiles of the distribution) are significantly less likely to have recovered from their illness compared to persons with higher levels of education ($p<0.05$). Asfaw (2005) also reports poverty to be significantly and positively associated with severity of illness (measured in this case by the number of days the person was not able to work), given that members of wealthier households are more likely to access treatment before their illness gets worse.

In terms of health care seeking behaviour, less educated persons are significantly more likely to seek treatment compared to persons with higher levels of education ($p<0.05$). In turn, adults in general are significantly more (less) likely to have visited public (private) health care facilities compared to children and the elderly ($p<0.10$). Health care facility choice is also significantly associated with education. However, the association is not strictly linear. Persons with no education and with tertiary education were most likely to visit private health care facilities compared to persons with primary or secondary education ($p<0.01$). (The data reveals that persons with no education that visited a private health care facility primarily accessed GPs (82.5%) and had no access to medical aid.) Most importantly, there is a statistically significant association between income and choice of health care facility ($p<0.01$). The proportion of ill persons that visited private (public) health care facilities increases (declines) with income. Hence, ill persons from poorer HIV/AIDS-affected households rely mainly on public health care, while ill persons from more affluent households are more likely to visit private health care facilities. Similarly, Asfaw (2005) reports higher use of public (private) health care facilities amongst the poor (affluent)

### *5.2. Determinants of choice of health care*

Results, expressed as marginal effects, obtained from the logit estimation for both the pooled and the panel data are presented in Table 4. The Likelihood ratio test, where rho ($\rho$) reflects the ratio of the total variance that is due to the panel level variance component, is used to compare the pooled estimator with that of the panel estimator. From this test, we infer that the panel estimator is significantly different from the pooled estimator ($p < 0.01$). The variables important in affecting the probability that individuals visit private or public health care facilities are however similar to that observed for the pooled estimation. Overall comparison of the random effects models with the pooled models indicates that the latter somewhat over-estimates the effects of individual and household specific variables in determining the probability of seeking private healthcare over public health care. The results obtained from the Wald-type test indicates that all the models are significant in describing the choice of health care facility type ($p < 0.01$). A quadrature check of the model indicates the numeric technique for estimating the model is in fact stable.

#### *5.2.1. Individual characteristics*

Neither age nor gender is associated with choice of health care facility. The results suggest that individuals with secondary education are less likely to visit private health care facilities than those with no education (Table 4). However, this is the case only in the pooled models. This finding is somewhat surprising, as one would have expected to observe a correlation between education, income and the choice of private health care facilities (or in other words access to facilities perceived to provide better quality but more expensive services). The reason for this particular finding is the fact that a significantly larger proportion of individuals with no education opted for private health care (mainly visits to private GPs) compared to those with primary or secondary education: 24.7% versus 14.4% and 16.1%. Tertiary education did not have a significant effect on the likelihood to visit private

facilities in any of the models, but this may be the result of the small number of individuals in our sample with tertiary education (n=21). However, bivariate analysis reveals that those with tertiary education are significantly more likely to have visited private health care facilities (64.7%) compared with persons with lower levels of education ($p<0.01$).

As expected, access to medical aid in all four models has a strong and significant positive impact on the probability of private health care utilisation. Given that access to primary health care is free in South Africa, it is likely that access to medical aid makes private health care accessible and is in itself reflective of demand for a higher quality of health care. The latter argument is substantiated by differences in the main reason for visiting public as opposed to private health care facilities. Two thirds of persons that used public care did so because treatment was free, whereas 84.7% of persons who used private care cited quality of care as the main reason for visiting this facility ($p<0.01$). Palmer (1999) and Havemann and Van der Berg (2003) report similar reasons for the preference of private over public health care facilities in South Africa.

Those in need of hospital-based care are largely dependent on the public health care system, with a significant negative marginal effect observed between type of care required and the probability of choosing private over public health care. This result, which is observed in all four regression models, for the main part reflects the fact that only 20 ill persons (2.9%) visited a private or mine hospital, this compared to 22.6% (or 158 persons) who visited public hospitals. The data reveals that those that visited a public hospital are significantly more likely to have sited affordability (55.7%) rather than quality of care (37.3%) as main reason for visiting this facility ($p<0.01$). In turn, those that visited a private hospital are significantly more likely to have sited quality of care (65%) rather than affordability (0%) as main reason for visiting this facility ($p<0.01$). The cost of health care for those who visited public as opposed to private hospitals differ significantly: R85 versus R1,095 ($p<0.01$). Hence, our results indicate that the high cost

involved with hospitalization result in a strong preference for public health facilities amongst ill individuals in our sample of HIV/AIDS-affected households.

Persons who suffer more severe illness (those who were ill for 30 days of the past month, who had not recovered from their illness, and who could not perform daily tasks) are more likely to opt for private as opposed to public health care. Again, considerations of quality of care and affordability seem to be key in driving this decision. Those with severe illness are significantly more likely to have sited quality of care (50.7%) rather than affordability (41.2%) as main reason for visiting a particular facility ($p<0.01$). Mean health care costs, moreover, are significantly higher for severe as opposed to non-severe illnesses: R282 versus R50 ($p<0.01$).

Finally, and most importantly, those with HIV/AIDS-related illness are significantly less likely to visit private health care facilities and thus to remain dependent on public health care. This result is observed in all four of the regression models and probably reflects the extent to which poorer households are more susceptible and vulnerable to HIV/AIDS (Gillies et al., 1996; Nyamathi et al., 1996; Desmond, 2001; Poku, 2001; Whiteside, 2002), as well as the extent to which HIV/AIDS and its associated impacts will push households into or deeper into poverty (Bachmann & Booysen, 2003/2004; Gaffeo, 2003; Booysen, 2004). Together, this explains why those with HIV/AIDS-related illnesses remain dependent on the public heath care system. When severity of illness is interacted with type of illness, the results interestingly show that those with more severe HIV/AIDS-related illness in turn exhibit a preference of private over public health care. Once again, the bivariate analysis shows that persons experiencing severe HIV/AIDS-related illness are significantly more likely to have sited quality of care (52.6%) rather than affordability (39.2%) as main reason for visiting a particular facility ($p<0.01$). Mean health care costs are significantly higher for severe HIV/AIDS-related as opposed to other non-severe illnesses: R367 versus R57 ($p<0.01$). However, this result is only significant for the pooled model (model 2).

### *5.2.2. Household Characteristics*

The partial elasticity associated with the logarithm of real adult equivalent household income is positive and highly significant in influencing the choice to visit private health care facilities.[19] This largely is the result of the greater direct and indirect costs incurred in accessing private as opposed to public care. None of the other household characteristics in the model exhibited a statistically significant relationship with choice of health care facility.

## *5.3. Marginal effects of income on choice of health care*

The discussion now proceeds to the results of the analysis of how changes in income effects choice of health care facility, in general as well as when looking at type of care and the nature and severity of illness. We investigate the nature of these marginal effects using the model where the particular variable of interest (i.e. income, severity of illness, type of care, type of illness and severity of HIV/AIDS-related illness respectively) on aggregate is statistically significantly associated with choice of health care, be it in the pooled or panel model (refer Table 4). The argument here is that it does not make sense to investigate these effects when the variable of interest in fact is not at all associated with the dependent variable. In addition, one would want to assess these income effects when accounting also for the greater severity of HIV/AIDS-related disease as opposed to other illnesses. Therefore, in cases where variables of interest are significant in both models, we prefer the full model (model 2). Thus, the effect of income on choice of health care facility when accounting for severity of illness in general is investigated with the aid of model 1 (severity of illness in model 2 is not statistically significant, neither in the pooled nor in the panel model), whereas model 2 is employed in all other cases to estimate these marginal effects.

[19] As discussed earlier, the relationship between health care choice and income may be endogenous. In the absence of an appropriate instrument, we do not correct for this.

For the logit estimation from the pooled sample - Table 5, the change in probability of choosing private health care over public health care varies from 0.028 for a 1% increase in income evaluated at the mean of the poorest quintile to 0.163 for a 1% increase in income evaluated at the mean of the wealthiest quintile. For the random effects logit estimation, the difference in marginal effect of income is even more pronounced. Here, a 1% increase in income for the poorest quintile only increases the probability of using private health care over public health care by 0.012, whereas a 1% increase in income for the richest quintile translates to an increase in the probability of using private over public healthcare by 0.171. The chronically poor (those that remained in the bottom quintile in each period of the survey), therefore, are likely to remain dependent on public health care compared to the more affluent. Hence, the results reveal that the marginal effect of income on demand for private health care over public health care varies depending on the level of income. When evaluated at the mean income for each quintile in our sample, the probability of choosing private health care over public health care becomes pronouncedly more inelastic the lower the income quintile. Yet, it is not only the effect of income on choice of health care facility that varies depending on the level of income, but also the effect of severity and type of illness, as well as type of care required.

The results show that the probability of choosing private over public health care in the case of severe illness increases with household income See Table 6.. Only in the random effects model is severity of illness not significantly associated with choice of health care facility in the bottom quintile. Thus, ill individuals from more affluent households in this population of HIV/AIDS-affected households are much more likely to opt for private over public health care when experiencing severe illness when compared to persons from poorer households.

Ill persons in our population of HIV/AIDS-affected households are mainly dependent on the public health care sector when in need of hospital-based care (Table 7). However, the strength of this preference declines as household income increases. This suggests that ill persons

from more affluent households are much less likely to be dependent on public health care facility when in need of hospitalisation. Only in the panel model, is type of care required not significantly associated with choice of health care facility, this being the case only in the bottom quintile of the income distribution.

Other things being equal, persons with HIV/AIDS-related illness remain dependent on public health care services (See Table 8). However, the probability of choosing public over private health care declines as household income increases. This is the case in both models, the only exception being that type of illness is not significantly associated with choice of health care facility in the bottom quintile of the income distribution in the panel model. Yet, income is crucial in affording those with severe HIV/AIDS-related illnesses access to private health care facilities (Table 8). With the exception of the bottom quintile of the income distribution, the probability of choosing private over public health care when experiencing severe HIV/AIDS-related illnesses increases with household income in the pooled model. In the case of the panel model results, this positive and significant association between choice of health care facility and severity of HIV/AIDS-related illness is only observed in the top half of the income distribution. Therefore, only ill individuals from more affluent households (or non-poor households if we define households in the bottom 40% of the income distribution as poor, as is common in many poverty studies) are in a position to opt for private over public health care when experiencing severe HIV/AIDS-related illness.

### *5.4. The impoverishing impact of health care expenditure*

Table 9 reports average household health care expenditure by choice of health care facility, with a distinction being made between HIV/AIDS-related and other illnesses. In the last three columns of the table, we report the incidence of poverty calculated based on real adult equivalent household income inclusive as opposed to exclusive of real adult equivalent total health care expenditure, expressing the change in

poverty resulting from total health care expenditure as percentage and in percentage points.

Evident from Table 9, is that health care costs are significantly lower in the public sector compared to the private sector ($p<0.10$). This is the result of the fact that means testing is employed to determine user fee payments, based on how much you earn and on many dependants you have. Since 1996, moreover, free services are available for pregnant women, children under six and for all primary health care services.[20] Furthermore, although free services (other than these primary health care services) are intended to be available only to those who cannot afford to pay for health care services, services in practice are rendered free to anyone presenting at public facilities (McIntyre *et al.*, 2003).

In absolute terms, health care expenditure on HIV/AIDS-related illnesses exceeds the expenditure incurred by households for other types of illness, both in the public as well as in the private sector (Table 9). This is expected, given that HIV/AIDS-related illness as explained elsewhere is significantly more likely to be severe compared to other types of illness, thus requiring more and more expensive care. However, these differences are not statistically significant.[21]

As expected, levels of poverty are significantly higher in households dependent on public as opposed to private health care, as the poor is primarily served by the public health care sector ($p<0.01$). Given the reported cost differentials between the public and private health care sectors, the impoverishing impact of health care expenditures is much greater for private than for public health care services, regardless of type of illness. The answer, however, to the question as to the possible impoverishing effect of HIV/AIDS-related health care

[20] This policy of free primary health care forms part of a broad range of policies and strategies implemented post-1994 to create a "unified health system capably of providing quality health care for all" (Forman et al., 2004:14).

[21] Health care expenditure per case of illness is however significantly higher for HIV/AIDS-related as opposed to other illnesses, both in the public as well as in the private sectors: R45 versus R32 in public facilities ($p<0.10$) and R600 versus R190 in private facilities ($p<0.05$).

expenditures lies in the comparison of the poverty estimates inclusive and exclusive of total health care expenditure. In the case of visitations to public facilities, total health care expenditures push household poverty up by 12% and 7% for HIV/AIDS-related and other illnesses respectively. The impoverishing effect is much greater for private visitations for HIV/AIDS-related illnesses: 77.2% versus 50% for other illnesses. On aggregate, the extent of impoverishment amounts to 16.8% and 14.3% for HIV/AIDS-related and for other illnesses respectively. The evidence therefore suggests that health care costs associated with HIV/AIDS-related illness may push HIV/AIDS-affected households deeper into poverty compared with other illnesses, especially in the case of HIV/AIDS-affected households opting for private as opposed to public health care.

## 6. Conclusion

In addition to access to medical aid and household income, the nature and severity of illness and the type of care required are important in explaining differences in demand for health care amongst ill persons from HIV/AIDS-affected households. As reported in most of the literature, the poor are significantly more likely to opt for public care while the more affluent opt for private health care. The results show that ill persons with HIV/AIDS-related illness and those who require hospital-based care rely primarily on public health care services, although this dependency on public health care declines as household income increases. Poorer households are more susceptible and vulnerable to HIV/AIDS. In addition, the evidence suggests that HIV/AIDS and its associated impacts push households into or deeper into poverty. Thus, those affected by HIV/AIDS will remain largely dependent on the public heath care system, especially in countries in sub-Saharan Africa and in particular those in Southern Africa, given the high levels of poverty and HIV prevalence in these countries.

The demand for public care in South Africa and other developing countries in sub-Saharan African countries affected fundamentally

by the epidemic can therefore be expected to rise as the HIV/AIDS epidemic takes its toll. The results also suggest that only more affluent HIV/AIDS-affected households are in a position to afford to access private rather than public health care services when experiencing severe and in particular severe HIV/AIDS-related illness. The evidence illustrates that severity and type of illness and type of care required often plays no role in explaining differences in the choice of health care facility of individuals in poor households, i.e. households in the bottom two income quintiles. These factors exhibit a significant relationship with health care choice at higher levels of income, however, with the importance of these factors varying with income. Thus, household welfare stands central in decisions related to choice of health care facility.

However, the current public roll-out of anti-retroviral treatment (ART) in South Africa and in many other developing countries in sub-Saharan Africa may over the next five years see the role of socio-economic status in explaining differences in health care choice change, given that all HIV-positive persons will have free access to ART. In particular, demand for ART may shift from the private to the public health care sector. It is as yet unclear as to whether governments has taken full cognisance of this problem, given that many people are not aware of their HIV status and that current estimates of the uptake of treatment may therefore be underestimated. This could result in serious problems in ensuring access to treatment for all.

Given consequent problems in financing treatment and other health care services as a result of these and other pressures on current sources of health care financing sources, governments would perhaps need to explore additional financing options. One such option is social health insurance, which the current government in South Africa has proposed to implement to pay for hospitalisation (Taylor Commission, 2001) and is also a health care financing option considered for implementation in other African countries.

Given the burden that HIV/AIDS in particular exerts on hospital care and the dependency of the poor on public hospital care, this seems

a feasible option. Yet, the international evidence on social health insurance suggests that these financing schemes generally have low coverage in middle- and low-income countries and provide little additional revenue to finance health care compared to general taxation (Witter et al., 2000). Community health insurance schemes represent another option for health care financing in developing countries, particularly for the poor, although the literature also suggests that the poorest of the poor is often excluded from these schemes (Jütting, 2005; Osei-Atako, 2005). Given evidence moreover that the poor also often are less likely to access treatment (Asfaw, 2005), vigilance is required in ensuring that the poor in developing countries have equitable access, not only to anti-retroviral treatment but also to palliative care provided via public health care facilities, be it financed via general taxation, a social health insurance scheme, or complementary community insurance schemes.

The other important point to note is that some persons will risk impoverishment by rather utilizing private health care services, especially for more severe illnesses, including HIV/AIDS-related illnesses. The question therefore is how policy can be employed to protect these persons from incurring such catastrophic and impoverishing private health care expenditures. While improvements in the quality of public health care can play an important role here, expanding health insurance coverage, be it via private, social or community health care insurance, can also protect the poor from such expenditures, as can the development of more affordable medical aid benefit packages.

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**Table 1: Sub-sample of ill individuals from HIV/AIDS-affected households**

| Status | Sample (n) | Percentage (%) |
|---|---|---|
| Ill | 730 | 30.8 |
| Not ill | 972 | 41.0 |
| Recruited in subsequent wave | 178 | 7.5 |
| Left household in previous wave | 248 | 10.5 |
| Died in subsequent wave | 242 | 10.2 |
| *Total* | *2,370* | *100.0* |

Note: Percentage totals may not add up due to rounding.

**Table 2: Choice of health care facility by ill individuals from HIV/AIDS-affected households**

| Choice | Sample (n) | Percentage (%) |
|---|---|---|
| No/self treatment | 26 | 3.6 |
| Public facility | 568 | 77.8 |
| Private facility | 131 | 18.0 |
| Traditional/naturalist | 5 | 0.7 |
| *Total* | *730* | *100.0* |

Note: Percentage totals may not add up due to rounding.

| Table 3: Incidence of illness, characteristics of illness and choice of health care facility by socio-demographic characteristics | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **Incidence of illness (%)** | **Disability (%)** | **Mean duration of illness (days)** | **Has not recovered from illness (%)** | **Sought treatment (%)** | **Visited public health care facility (%)** | **Visited private health care facility (%)** |
| *Gender:* | | | | | | | |
| Male | 19.1 | 38.2 | 22.4 | 79.5 | 96.9 | 81.2 | 18.8 |
| Female | 27.0 | 38.1 | 22.9 | 83.7 | 96.1 | 81.4 | 18.6 |
| *Sample (n)* | *3,095* | *724* | *726* | *723* | *727* | *696* | *696* |
| *Gender and age:* | | | | | | | |
| Male | | | | | | | |
| < 15 years | 28.1 | 28.8 | 22.5 | 70.8 | 98.6 | 76.1 | 23.9 |
| 15-49 years | 56.5 | 41.1 | 22.1 | 81.5 | 95.9 | 85.0 | 15.0 |
| 50+ years | 15.4 | 45.0 | 23.2 | 87.5 | 97.5 | 76.9 | 23.1 |
| *Sample (n)* | *1,363* | *259* | *259* | *258* | *260* | *250* | *250* |
| Female | | | | | | | |
| < 15 years | 14.4 | 31.3 | 22.0 | 79.1 | 94.0 | 74.2 | 25.8 |
| 15-49 years | 57.2 | 40.4 | 22.7 | 84.5 | 97.0 | 83.7 | 16.3 |
| 50+ years | 28.5 | 36.8 | 23.8 | 84.2 | 95.5 | 80.3 | 19.7 |
| *Sample (n)* | *1,732* | *465* | *467* | *465* | *467* | *446* | *446* |
| Total | | | | | | | |
| < 15 years | 19.2 | 30.0 | 22.3 | 74.8 | 96.4 | 75.2 | 24.8 |
| 15-49 years | 56.7 | 40.6 | 22.5 | 83.5 | 96.6 | 84.1 | 15.9 |
| 50+ years | 24.1 | 38.6 | 23.6 | 85.2 | 96.0 | 79.3 | 20.7 |
| *Sample (n)* | *3,099* | *727* | *729* | *726* | *730* | *699* | *699* |

**Table 3: Incidence of illness, characteristics of illness and choice of health care facility by socio-demographic characteristics**

| | Incidence of illness (%) | Disability (%) | Mean duration of illness (days) | Has not recovered from illness (%) | Sought treatment (%) | Visited public health care facility (%) | Visited private health care facility (%) |
|---|---|---|---|---|---|---|---|
| *Education:* | | | | | | | |
| No education | 22.9 | 37.3 | 22.8 | 82.5 | 98.2 | 75.3 | 24.7 |
| Primary education | 30.9 | 32.1 | 22.6 | 81.2 | 97.3 | 83.9 | 16.1 |
| Secondary education | 43.4 | 42.0 | 23.1 | 84.7 | 95.6 | 85.6 | 14.4 |
| Tertiary education | 2.9 | 42.9 | 18.1 | 60.0 | 85.7 | 35.3 | 64.7 |
| *Sample (n)* | *3,094* | *723* | *726* | *722* | *726* | *695* | *695* |
| *Income quintile:* | | | | | | | |
| 1 | 23.2 | 32.1 | 21.6 | 85.7 | 96.4 | 90.8 | 9.2 |
| 2 | 24.4 | 42.9 | 23.7 | 81.8 | 96.1 | 87.1 | 12.9 |
| 3 | 21.1 | 39.0 | 23.2 | 87.0 | 98.7 | 82.8 | 17.2 |
| 4 | 18.8 | 37.5 | 23.3 | 75.2 | 94.2 | 74.8 | 25.2 |
| 5 | 12.6 | 39.1 | 21.2 | 79.1 | 96.7 | 59.1 | 40.9 |
| *Sample (n)* | *3,099* | *727* | *729* | *726* | *730* | *699* | *699* |
| Total | 23.6 | 38.1 | 22.7 | 82.2 | 96.4 | 81.3 | 18.7 |
| *Sample (n)* | *3,099* | *727* | *729* | *726* | *730* | *699* | *699* |

*Note*: Incidence of illness refers to percentage of persons who were continuously ill in the month preceding the interview. Disability represents the percentage of ill persons that were not able to perform daily tasks by themselves. Mean duration of illness represents the mean number of days for which the person was ill in the past month. Incidence of illness, disability, mean duration of illness and recovery from illness are only available for persons that were ill and not for those persons that died in the six month preceding the interview (these persons were not recorded on the household roster in the interview following their death), but for which information on choice of health care facility is recorded. The percentage of ill persons that visited public and private health care facilities was calculated exclusive of the use of traditional healers. Income is measured in real adult equivalent per capita terms.

**Table 4: Determinants of choice of private over public health care**

| Independent variable | Model 1 | | | | Model 2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Pooled Logit | | Random Effects Logit | | Pooled Logit | | Random Effects Logit | |
| | dy/dx | (SE) | dy/dx | (SE) | dy/dx | (SE) | dy/dx | (SE) |
| *Individual Characteristics:* | | | | | | | | |
| Gender (Male=1, Female=0) | -0.011 | (0.034) | -0.007 | (0.027) | -0.011 | (0.034) | -0.006 | (0.025) |
| Log (Age) | -0.006 | (0.021) | -0.007 | (0.016) | -0.004 | (0.021) | -0.005 | (0.015) |
| Married (yes=1, no=0) | 0.057 | (0.048) | 0.052 | (0.046) | 0.050 | (0.047) | 0.044 | (0.043) |
| Primary education | -0.055 | (0.038) | -0.036 | (0.029) | -0.052 | (0.037) | -0.034 | (0.027) |
| Secondary education | -0.070 * | (0.040) | -0.040 | (0.034) | -0.069 * | (0.039) | -0.038 | (0.033) |
| Tertiary education | 0.042 | (0.115) | 0.088 | (0.147) | 0.062 | (0.114) | 0.116 | (0.170) |
| Access to medical aid (yes=1, no=0) | 0.774 *** | (0.063) | 0.886 *** | (0.061) | 0.779 *** | (0.065) | 0.896 *** | (0.060) |
| Required hospital care (yes=1, no=0) | -0.103 *** | (0.028) | -0.071 *** | (0.023) | -0.105 *** | (0.027) | -0.067 *** | (0.023) |
| Severity of illness (yes=1, no=0) | 0.091 ** | (0.041) | 0.069 * | (0.041) | 0.000 | (0.047) | -0.018 | (0.033) |
| Suffers from HIV/AIDS-related illness (yes=1, no=0) | -0.095 ** | (0.038) | -0.080 ** | (0.032) | -0.133 *** | (0.048) | -0.114 *** | (0.040) |
| Severity of illness*HIV/AIDS-related illness | | | | | 0.192 * | (0.113) | 0.228 | (0.143) |
| *Household Characteristics:* | | | | | | | | |
| Place of residence (urban=1, rural=0) | -0.033 | (0.037) | -0.023 | (0.027) | -0.033 | (0.037) | -0.021 | (0.025) |
| Log (Household Size) | 0.001 | (0.031) | 0.002 | (0.026) | 0.001 | (0.031) | 0.002 | (0.025) |
| Log (Age of head of the household) | -0.069 | (0.070) | -0.045 | (0.044) | -0.064 | (0.070) | -0.041 | (0.041) |
| Female head of household (yes=1, no=0) | 0.038 | (0.039) | 0.040 | (0.029) | 0.036 | (0.040) | 0.038 | (0.027) |
| Log (Asset index) | -0.042 | (0.027) | -0.028 | (0.022) | -0.045 | (0.028) | -0.029 | (0.021) |
| Log (Real adult equivalent income) | 0.082 *** | (0.018) | 0.060 *** | (0.017) | 0.082 *** | (0.018) | 0.056 *** | (0.017) |
| *Number of observations* | *685* | | *685* | | *685* | | *685* | |
| *Wald chi2 statistic (p-value)* | *94.95 (p<0.001)* | | *45.54 (p<0.001)* | | *95.19 (p<0.001)* | | *43.80 (p<0.001)* | |
| *Likelihood-ratio test of rho=0 (p-value)* | | | *13.16 (p<0.001)* | | | | *14.55 (p<0.001)* | |

Note: Robust standard errors are reported in brackets. Variables were scaled up by one prior to converting variables with zero values into natural logarithms. Required hospital care represents cases where the individual had last visited a public or private hospital and had been hospitalised. Severe cases of illness represent cases where the person had been ill for the past month (30 days out of the past month), had not recovered from their illness, and was not able to perform daily tasks. Cases of HIV/AIDS-related illness represent cases where the self-reported diagnosis was given as HIV/AIDS, STDs, tuberculosis, pneumonia, bronchitis or meningitis. Three asterisks denote significance at the 1% level, while two and one asterisk denote significance at the 5% and 10% levels respectively.

**Table 5: Marginal effect of income on choice of private over public health care, by income quintile**

| Quintile | Mean real adult equivalent income | Pooled Logit | | | Random Effects Logit | | |
|---|---|---|---|---|---|---|---|
| | | Dy/dx | | (SE) | dy/dx | | (SE) |
| 1 | 79.56 | 0.028 | *** | (0.005) | 0.012 | ** | (0.006) |
| 2 | 217.23 | 0.079 | *** | (0.017) | 0.053 | *** | (0.016) |
| 3 | 326.54 | 0.098 | *** | (0.026) | 0.073 | *** | (0.024) |
| 4 | 546.17 | 0.124 | *** | (0.038) | 0.106 | *** | (0.039) |
| 5 | 1342.93 | 0.163 | *** | (0.054) | 0.171 | ** | (0.069) |
| *Mean* | *412.02* | *0.082* | *** | (*0.018*) | *0.056* | *** | (*0.017*) |

Note: Results are for model 2 in Table 5. Robust standard errors are reported in brackets. Three asterisks denote significance at the 1% level, while two and one asterisk denote significance at the 5% and 10% levels respectively.

**Table 6: Marginal effect of severity of illness on choice of private over public health care, by income quintile**

| Quintile | Mean real adult equivalent income | Pooled Logit | | | Random Effects Logit | | |
|---|---|---|---|---|---|---|---|
| | | dy/dx | | (SE) | dy/dx | | (SE) |
| 1 | 79.56 | 0.034 | * | (0.018) | 0.017 | | (0.014) |
| 2 | 217.23 | 0.088 | ** | (0.040) | 0.065 | * | (0.039) |
| 3 | 326.54 | 0.106 | ** | (0.048) | 0.088 | * | (0.050) |
| 4 | 546.17 | 0.130 | ** | (0.058) | 0.122 | * | (0.067) |
| 5 | 1342.93 | 0.161 | ** | (0.069) | 0.177 | * | (0.092) |
| *Mean* | *412.02* | *-0.095* | ** | *(0.038)* | *-0.080* | ** | *(0.032)* |

Note: Results are for model 1 in Table 6. Robust standard errors are reported in brackets. Three asterisks denote significance at the 1% level, while two and one asterisk denote significance at the 5% and 10% levels respectively.

**Table 7: Marginal effect of need for hospital care on choice of private over public health care, by income quintile**

| Quintile | Mean real adult equivalent income | Pooled Logit | | | Random Effects Logit | | |
|---|---|---|---|---|---|---|---|
| | | dy/dx | | (SE) | dy/dx | | (SE) |
| 1 | 79.56 | -0.034 | ** | (0.015) | -0.014 | | (0.010) |
| 2 | 217.23 | -0.100 | *** | (0.025) | -0.063 | *** | (0.022) |
| 3 | 326.54 | -0.127 | *** | (0.032) | -0.088 | *** | (0.028) |
| 4 | 546.17 | -0.166 | *** | (0.045) | -0.132 | *** | (0.038) |
| 5 | 1342.93 | -0.233 | *** | (0.070) | -0.227 | *** | (0.067) |
| *Mean* | *412.02* | *-0.105* | *** | *(0.027)* | *-0.067* | *** | *(0.023)* |

Note: Results are for model 2 in Table 7 and reflect need for hospital care. Robust standard errors are reported in brackets. Three asterisks denote significance at the 1% level, while two and one asterisk denote significance at the 5% and 10% levels respectively.

**Table 8: Marginal effect of HIV/AIDS-related illness on choice of private over public health care, by income quintile**

| Quintile | Mean real adult equivalent income | Pooled Logit | | | Random Effects Logit | | |
|---|---|---|---|---|---|---|---|
| | | dy/dx | | (SE) | dy/dx | | (SE) |
| **A. Individual experienced an HIV/AIDS-related illness (yes=1, no=0)** | | | | | | | |
| 1 | 79.56 | -0.047 | * | (0.025) | -0.027 | | (0.017) |
| 2 | 217.23 | -0.127 | *** | (0.046) | -0.108 | *** | (0.038) |
| 3 | 326.54 | -0.156 | *** | (0.054) | -0.146 | *** | (0.048) |
| 4 | 546.17 | -0.194 | *** | (0.065) | -0.205 | *** | (0.065) |
| 5 | 1342.93 | -0.245 | *** | (0.078) | -0.305 | *** | (0.092) |
| *Mean* | *412.02* | *-0.133* | *** | *(0.048)* | *-0.114* | *** | *(0.040)* |
| **B. Individual experienced a severe HIV/AIDS-related illness (yes=1, no=0)** | | | | | | | |
| 1 | 79.56 | 0.075 | | (0.060) | 0.061 | | (0.054) |
| 2 | 217.23 | 0.185 | * | (0.111) | 0.217 | | (0.139) |
| 3 | 326.54 | 0.219 | * | (0.122) | 0.278 | * | (0.162) |
| 4 | 546.17 | 0.259 | ** | (0.131) | 0.356 | * | (0.184) |
| 5 | 1342.93 | 0.299 | ** | (0.128) | 0.447 | ** | (0.185) |
| *Mean* | 412.02 | *0.192* | * | *(0.113)* | *0.228* | | *(0.143)* |

Note: Results are for model 2 in Table 8. Robust standard errors are reported in brackets. Three asterisks denote significance at the 1% level, while two and one asterisk denote significance at the 5% and 10% levels respectively.

**Table 9: Impact of total health care expenditure on household poverty**

| Type of health care facility | Real Health Care Expenditure (Rands) | Poverty headcount ratio inclusive of health care expenditure (%) | Poverty headcount ratio exclusive of health care expenditure (%) | Percentage change in incidence of poverty |
|---|---|---|---|---|
| *1. Public health care facilities:* | | | | |
| HIV/AIDS-related illnesses | 61.70 | 53.3 | 47.6 | 12.0 |
| | (182.01; 347) | (0.026) | (0.026) | (5.7) |
| Other illnesses | 48.32 | 50.2 | 46.9 | 7.0 |
| | (126.20; 213) | (0.034) | (0.034) | (3.3) |
| | *56.13* | *51.9* | *47.2* | *10.0* |
| Total | | | | |
| | *(162.04; 568)* | *(0.020)* | *(0.020)* | *(4.7)* |
| *2. Private health care facilities:* | | | | |
| HIV/AIDS-related illnesses | 649.88 | 39.7 | 22.4 | 77.2 |
| | (2,027.65; 58) | (0.064) | (0.055) | (17.3) |
| Other illnesses | 524.28 | 41.7 | 27.8 | 50.0 |
| | (1,450.63; 72) | (0.058) | (0.053) | (13.9) |
| | *576.96* | *41.2* | *25.2* | *63.5* |
| Total | | | | |
| | *(1,719.69; 131)* | *(0.043)* | *(0.038)* | *(16.0)* |
| *3. All facilities:* | | | | |
| HIV/AIDS-related illnesses | 145.93 | 51.4 | 44.0 | 16.8 |
| | (806.84; 405) | (0.024) | (0.024) | (7.4) |
| Other illnesses | 168.56 | 48.1 | 42.1 | 14.3 |
| | (762.16; 285) | (0.029) | (0.029) | (6.0) |
| | *153.74* | *49.9* | *43.1* | *15.8* |
| Total | | | | |
| | *(783.25; 699)* | *(0.018)* | *(0.018)* | *(6.8)* |

Note: Standard deviations and sample sizes are reported in brackets for total household health care expenditure. The poverty line is R250 real adult equivalent income per month (Statistics South Africa, 2000: 11). Standard errors are reported in brackets for poverty headcount ratios. In the final column, the percentage point change in the headcount poverty index is reported in brackets. Percentage changes in poverty is calculated based on poverty inclusive of health care expenditure, thus indicating the extent to which total health care expenditure increased levels of household poverty.

## APPENDIX

### Table A: Descriptive statistics

| Variable | Sample (N) | Mean | Standard error | Confidence interval 95% | | Sample (n) | Standard deviation Overall | Standard deviation Betweenn | Standard deviation Within |
|---|---|---|---|---|---|---|---|---|---|
| *Individual characteristics:* | | | | | | | | | |
| Gender (Male=1, Female=0) | 727 | 0.358 | 0.018 | 0.323 | - 0.393 | 395 | 0.480 | 0.488 | 0.000 |
| Age (years) | 730 | 34.786 | 0.762 | 33.290 | - 36.282 | 395 | 20.591 | 21.255 | 0.626 |
| Married (yes=1, no=0) | 729 | 0.246 | 0.016 | 0.214 | - 0.277 | 394 | 0.431 | 0.424 | 0.117 |
| Primary education | 726 | 0.309 | 0.017 | 0.275 | - 0.342 | 394 | 0.462 | 0.441 | 0.186 |
| Secondary education | 726 | 0.434 | 0.018 | 0.398 | - 0.470 | 394 | 0.496 | 0.477 | 0.162 |
| Tertiary education | 726 | 0.029 | 0.006 | 0.017 | - 0.041 | 394 | 0.168 | 0.167 | 0.069 |
| Access to medical aid (yes=1, no=0) | 729 | 0.055 | 0.008 | 0.038 | - 0.071 | 394 | 0.228 | 0.237 | 0.076 |
| Required hospital care (yes=1, no=0) | 729 | 0.150 | 0.013 | 0.124 | - 0.175 | 394 | 0.357 | 0.294 | 0.234 |
| Severity of illness (yes=1, no=0) | 730 | 0.205 | 0.015 | 0.176 | - 0.235 | 395 | 0.404 | 0.363 | 0.239 |
| Severity of illness*hospital care | 729 | 0.066 | 0.009 | 0.048 | - 0.084 | 394 | 0.248 | 0.220 | 0.155 |
| Suffers from HIV/AIDS-related illness (yes=1, no=0) | 721 | 0.566 | 0.018 | 0.530 | - 0.602 | 393 | 0.496 | 0.468 | 0.231 |
| Severity of illness* HIV/AIDS-related illness | 721 | 0.135 | 0.013 | 0.110 | - 0.160 | 393 | 0.341 | 0.302 | 0.208 |
| Hospital care* HIV/AIDS-related disease | 720 | 0.115 | 0.012 | 0.092 | - 0.139 | 392 | 0.320 | 0.262 | 0.208 |
| *Household characteristics:* | | | | | | | | | |
| Place of residence (urban=1, rural=0) | 730 | 0.456 | 0.018 | 0.420 | - 0.492 | 395 | 0.498 | 0.501 | 0.000 |
| Household Size | 730 | 5.299 | 0.100 | 5.102 | - 5.495 | 395 | 2.709 | 2.616 | 0.535 |
| Age of head of the household (years) | 730 | 51.425 | 0.571 | 50.304 | - 52.545 | 395 | 15.424 | 15.629 | 2.977 |
| Female head of household (yes=1, no=0) | 730 | 0.564 | 0.018 | 0.528 | - 0.600 | 395 | 0.496 | 0.489 | 0.099 |
| Asset index (max=14) | 730 | 3.574 | 0.075 | 3.427 | - 3.721 | 395 | 2.021 | 1.917 | 0.692 |
| Real adult equivalent income (Rand) | 730 | 412.023 | 18.869 | 374.978 | - 449.068 | 395 | 509.825 | 443.468 | 246.209 |

Note: Required hospital care represents cases where the individual had last visited a public or private hospital and had been hospitalised. Severe cases of illness represent cases where the person had been ill for the past month (30 days out of the past month), had not recovered from their illness, and was not able to perform daily tasks. Cases of HIV/AIDS related illness represent cases where the self-reported diagnosis was given as HIV/AIDS, STD's, tuberculosis, pneumonia, bronchitis or meningitis