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Association of Household SES and Provider Characteristics with Healthcare Utilization and Choice of Provider for Sick Children in Uganda

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Abstract

Objectives: This paper evaluates the impact of household socio-economic status (SES) on likelihood of sickness, utilization of health services, and choice of provider for children under the age of five in Uganda.

Methods: Binary, multinomial and conditional logit regression models were fitted to examine the effect of household SES on child sickness, the use of health services and choice of provider for sick children.

Results: There was no significant association between asset ownership or woman's education and probability of sickness; however, women's education was strongly associated with the odds of utilizing care (OR: 1.99, p<0.05; for women with the highest level of education as compared to women with no education). The conditional logit results showed that, *ceteris paribus,* households in the highest wealth quintile were more than twice as likely (OR=2.11 p<0.05) to choose a provider with an additional hour of travel time as compared to households in the poorest wealth quintile and that households with education at the secondary level or above were less than half as likely (OR=0.46, p<0.10) to choose a provider with an additional hour of travel time as compared to those with no education. This model also showed that providers with associated costs (user fees and transportation costs) less than or equal to 500 Ugandan Shillings (USh) were 2.4 (p<0.01) times more likely to be chosen than providers with costs greater than 500 USh.

Conclusions: SES (as measured by household wealth, head of household education, and women's education) plays a significant role in choice of provider. As expected, the wealthier households were more likely to travel an extra hour to see a provider; however, the more educated are more discriminating of their time and were found to be less likely to seek treatment at providers with greater travel time.

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BACKGROUND

Although childhood mortality rates in Uganda have decreased from initial high levels of 180/1,000 births as measured by the 1988-89 Uganda Demographic and Household Survey (UDHS), rates still remain quite high. Results from the most recent UDHS from 2000-2001, which show a child mortality rate of 152/1,000, show no evidence of improvement in infant and childhood mortality in recent years since the 1995 UDHS. (Uganda Bureau of Statistics and ORC Macro 2001)

The Integrated Management of Childhood Illnesses (IMCI) strategy was developed by UNICEF and WHO as a single comprehensive case management approach. In 1995, the Ugandan Ministry of Health adapted the Integrated Management of Childhood Illness (IMCI) strategy to Uganda, and adopted IMCI as part of their child health policy. IMCI has been selected as the main strategy to reduce under-five mortality in Uganda.

At the core of this strategy is the integrated management of the most common childhood illnesses in developing countries through improving the case management skills of health staff, the health system itself as well as household and community practices. (Gove 1997) One of the key practices of the household and community component of IMCI relates to prompt and appropriate care-seeking for sick children ("Recognize when sick children need treatment outside the home and take them for health care to the appropriate providers."). This is also one of the key practices for which the least intervention experience exists. (Kelley and Black 2001)

As the facility-based component of IMCI is currently being implemented mainly in public and some NGO facilities, this component of IMCI can only prove to be effective [in reducing morbidity and mortality] if mothers and caretakers seek care for children and preferentially seek care in government and selected NGO facilities. Therefore, it is essential to look at patterns of health care utilization for childhood illnesses to see where mothers and caretakers are bringing sick children. If the data show (as they do) that the majority of sick children are taken to the providers in the private sector, then it is imperative to find out what factors influence this utilization pattern.

Study Rationale

This paper examines the socioeconomic status (SES) factors that affect household choice of provider treatment options in Uganda for sick children. Improved understanding of the factors that influence care-seeking and choice of provider for a sick child is necessary in order to enhance the effectiveness of IMCI. As the household survey data that are being used for this study were collected from January to May 2000, it reflects an environment of user fees in Uganda. Access for the poor has been a major concern with cost sharing.(Burnham, Pariyo et al. 2004) Since user fees in all government facilities in Uganda were completely abolished in March of 2001, it is important to ascertain if cost of healthcare at the household level (actual and perceived user fees) actually influenced health care utilization for a sick child in Uganda during 1999-2000.

The main factors that affect health-care utilization can be explained by a model of health care demand. Economic demand models attempt to predict or explain health services utilization (quantity demanded) as a function of price in the context of utility maximization. Price of health care includes both monetary costs (consisting of the direct cost of care represented by user fees as well as the indirect cost of transportation) as well as non-monetary opportunity costs (travel time and waiting time).(Acton 1975)

Several studies have shown the significant effect of time cost on the demand for medical services. Dor et al. used a nested multinomial logit model of provider choice and showed that medical care demand for poorer individuals is substantially more travel time elastic than for richer individuals in rural Cote d'Ivoire where monetary prices are zero (1987). A study on child health seeking in Bangladesh found travel time to be negatively associated with the use of a provider. (Levin, Rahman et al. 2001)

Past studies have shown mixed results regarding the relationship between SES and type of care utilized. Terra de Souza concludes that accessibility of services, defined by distance, travel time or availability of transport, was a major determinant in choice and utilization of services for sick infants in Brazil; however, he also hypothesizes that the lack of association between family income and type of care in his study may be due to the fact that income was homogeneously low and government health care was free or not costly. (2000) However, Hill found financial access a major barrier to appropriate care-seeking in Ghana (2003).

Studying the association of SES and utilization is complicated because illness is endogenous to the relationship. Since utilization can only occur among those individuals with a sick child; in a model of healthcare utilization, we are unable to control for sickness to take account of the fact that the same characteristics that are associated with sickness in children are also likely to be associated with utilization. Further information on the problem of endogeneity is detailed in the methods section.

Listed below are the hypotheses that we are proposing to research in this paper.

Hypothesis 1a: Low household SES will be associated with an increased liklihood of sickness, and a lower likelihood of utilizing care.

Hypothesis 1b: Low household SES will increase the odds of using publicly provided health care.

Hypothesis 1c: *Ceteris paribus*, mothers/caretakers will be less likely to choose providers with higher costs.

Hypothesis 1d: Poorer households will be more inhibited from seeking care by costs of care than less poor households.

METHODS

Data

The data used for this research are cross-sectional and come from the Uganda baseline demographic and household survey (UBDHS), which was collected from January to May 2000 as part of the Uganda IMCI Impact Study. The Uganda IMCI Impact Study was funded by USAID and conducted by Makerere University in conjunction with the Johns Hopkins Bloomberg School of Public Health.

The data collected by the UDHS were a sample of approximately 14,000 rural households in 10 districts. The ten districts were selected so as to include at least one from each of the four regions in Uganda: Central, Eastern, Northern and Western. These ten study districts include 23% of the estimated 4.5 million children under five in Uganda (Uganda Bureau of Statistics and ORC Macro 2001) and are shown in Figure 2.

Simple two-stage cluster sampling was used. After stratification by district, the sample frame for the survey consisted of a listing of Demographic and Health Survey (DHS) clusters in each district from which approximately 50 clusters were randomly selected with equal probability, regardless of size. Twenty-eight households were randomly selected within each cluster, totaling approximately 1,400 households per district.

Two types of questionnaires were administered in this survey. The first was the household questionnaire, which was administered to 13,889 households, in which basic data on the size and socioeconomic status of households were obtained from the head of every household. Then an individual questionnaire was administered to a subset of women/caretakers of children. The sampling frame for women's survey consisted of all households in which at least one woman of reproductive age or caretaker of a child under the age of five was present and the sampling interval was three (every third household was selected). Approximately 4,565 women aged 15-49 and caretakers of children under the age of five were interviewed in approximately 3,000 households. Both questionnaires were modeled after the DHS questionnaires.

Data were collected on 4,864 children, some of who were from the same household. After analyzing all the data and variables used to calculate the age of the child from the household survey and performing consistency checks, 158 children whose age was greater than 5 years and/or 71 months were dropped from the sample, leaving a sample of 4,706 observations. These observations were then linked with background data on characteristics of the individual mothers/caretakers and the associated households.

Measurement and Construction of Variables

The variables included in the statistical analysis for this paper are described in Tables 1 and 2 below. Categorical variables with more than two categories were naturally included in the analysis as individual dummy variables. The individual characteristic variables were identified through a literature review of factors affecting health-seeking behavior for childhood illnesses. Detailed descriptions of each variable listed in Tables 1 and 2 can be found in Appendix 1.

Table 1: Description of Outcome Variables

Variable	Description	Type

(1) IMCI Symptom in last two weeks	No (0) Yes (1)	Dichotomous
(2) Utilized health care	No (0) Yes (1)	Dichotomous
(3) Where utilized care	Hospital (1) Other public (2) NGO/other private (3) Drug shop/other shop (4)	Multinomial
(4) Provider Chosen	No (0) Yes (1)	Dichotomous

Table 2: Description of Explanatory Variables

Variable	**Description**	**Type**
COMMUNITY CHARACTERISTICS		
District	Bugiri (1), Iganga (2), Kiboga (3), Kumi (4), Luwero (5), Masaka (6), Masindi (7), Mubende (8), Nebbi (9), Ntungamo (10)	Nominal
HOUSEHOLD SOCIO-ECONOMIC STATUS		
Wealth Index (ownership of durable goods: telephone, radio, TV, watch/clock, car, motor bike, bike; and access to electricity & gas)	None (0) One or more items (1) This variable was also modeled with dummies to represent 5 wealth quintiles created through principal components analysis.	Dichotomous/Nominal
Education of head of household	None (0) Primary (1) Secondary and Above (2)	Nominal
INDIVIDUAL CHARACTERISTICS		
Mother/Caretaker		
Background Characteristics		
Education	None (0); Primary (1) Secondary and Above (2)	Nominal
Age	Age in years	Continuous
Marital status	Not Married (0) Married (1) This variable was also modeled with 3 dummies to represent the 4 categories (never married, married, widowed, and divorced) in regression of utilization	Dichotomous/Nominal
Number of living children	Number of children mother has	Continuous

	living	
Ever lost a child	No (0); Yes (1)	Dichotomous
Previous Health Service Utilization		
Antenatal Care During Last Pregnancy	No (0); Yes (1)	Dichotomous
Where gave birth	Home (1), Public (2), NGO (3), Private (4)	Nominal

Table 2: Description of Explanatory Variables, continued

Variable	Description	Type
Child		
Background Characteristics/Predisposing factors		
Age	This variable was modeled as both continuous and nominal (in the two groupings shown below) in the analyses. Grouping I: 0-5 months (1), 6-11 months (2), 12-23 months (3), 24-35 months (4), 36-47 months (5), 48-59 months (6), 60-71 months (7) Grouping II: 0-11 months (1), 12-23 months (2), 24-59 months (3), 60-71 months (4)	Continuous/Nominal
Sex	Male (1); Female (0)	Dichotomous
Birth Order	1, 2-3, 4-5, 6	Nominal
Preventive health care		
Completely immunized	No (0); Yes (1)	Dichotomous
Ever received Vitamin A	No (0); Yes (1)	Dichotomous
Illness symptoms present		
Fever	No (0); Yes (1)	Dichotomous
Diarrhea	No (0); Yes (1)	Dichotomous
Fast/difficult breathing	No (0); Yes (1)	Dichotomous
Illness severity		
Presence of one or more danger signs	No (0); Yes (1)	Dichotomous
Number of symptoms	Total number of symptoms reported by mother/caretaker	Continuous
Peak stool frequency	Total number of stools on the worst day of watery stools	Continuous
PROVIDER CHARACTERISTICS		
Type	Public (1), Private (2), Drug/other shop (3)	Nominal

Actual/Perceived Cost of Care		
Money Cost	Total amount paid/perceived for consultation and transportation <=500 USh=1 >500 USh=0	Dichotomous
Opportunity Cost	Travel time/perceived travel time (hours)	Continuous

Descriptive Statistics

Table 7 at the end of this paper shows background characteristics of the full sample of children under five, the sample of children sick with one of the IMCI "trigger" conditions, and the sample of these sick children that utilized care, proxied by mother/caretaker reports on choice of provider.

Illness information was provided for all 4706 children in the sample. Note that 59% of children (2777) experienced at least one illness symptom during the two-week period prior to the survey. As shown in table 3 below, there were 32.6% (1536) of children who experienced the IMCI "trigger conditions" of diarrhea, and/or fever and/or fast/difficult breathing. These 1536 children represent 55% of all sick children and will be referred to as "sick" in the remainder of the paper. Of these children with diarrhea, fever, and/or fast/difficult breathing, 584 (38%) utilized care as defined by presence of information on choice of provider.

Table 3: Description of Study Sample

Variable	N	Type of Variable	Percentage
Sick [with IMCI trigger conditions]	4,706	Dichotomous	32.6

Variable		N	Type of Variable	Percentage
Utilize		1,536	Dichotomous	38.0
Provider		584	Categorical	
	Government Hospital			7.0
	Other Government			11.1
	Private/NGO			42.8
	Drug Shop/Other Shop/Traditional Healer			39.0

While the entire sample of 4706 was used to explain the occurrence of sickness in children under the age of five, the subgroup of sick children (n=1536) with one or more of diarrhea, fever, and fast/difficult breathing forms the basis for the analysis of health care utilization in this study. The subgroup of children that utilized care (n=584) forms the sample for the multinomial logit model of choice of provider, and further, the subgroup of children for whom second choice provider information was available (n=309) formed the basis for the conditional logit analysis of choice of (chosen) provider versus the second choice provide, based on provider characteristics.

Calculation of standard errors with survey data

As was mentioned earlier, simple two-stage cluster sampling where clusters were sampled with equal probability, regardless of size, was used for this survey. Because the same number of households was selected from each cluster (regardless of number of households present within each cluster) and the same number of clusters was selected from each district (regardless of the number of clusters present within each district) the sampling fractions were different among clusters and districts, and as a result, regression estimates may have very high standard errors. Since the ten districts each have different populations, but the same number of households were selected in each district, some districts may be over represented in the sample.

One way to adjust for fact that the sample is not representative of the total population it is meant to represent is to apply sampling weights that are equal to the inverse of the overall sampling fraction. Sampling or probability weights proportional to the inverse of the probability of a cluster being selected were applied to the clusters because the number of clusters per stratum (district) was not proportional to the population of each stratum (district). Weight adjusted estimates of means and standard errors of the variables were then calculated and are shown in Table 8.

Although sampling weights were missing for only two percent of the total number of households surveyed (275/13,889), sampling weights were missing for approximately 13.5 percent of the sample of children under five, hence the reduced sample size for the weight-adjusted estimates as shown in Table 8. The problem was due to the fact that many child observations had missing household identifier information, so sampling weights could not be matched to individual child observations.

Standard errors of coefficients in the final multivariate regressions were not adjusted by sample weights because no significant differences were found between weight-adjusted and non-weight-adjusted point estimates or variance estimates (Table 8). A set of dummy variables to represent the ten districts was included in each of the statistical models, however, to compensate for the fact that the sample is not self-weighting across districts.

As there was more than one woman per household, and more than one child per household, some households and women may be represented disproportionately within the analysis. For the logistic regression standard errors, robust variance estimates that adjust for within-cluster correlation were obtained. The adjustment for within-cluster correlation allows observations at the household level that are not independent *within* each cluster. The observations, however, are and must be independent *between* clusters. That is, the clusters themselves are independent.

Statistical Approach

The basic analysis was not restricted to children with complete data for all variables. As a result, the number of children with missing data varies throughout the results. If variables were missing between 3% and 20% of values, data were imputed using means of non-missing values; however, some variables were missing more than 20% and these variables had to be dropped from the analysis. We had evidence that the missing observations were not random events, so simply confining our analysis to complete observations would make our analytical sample unrepresentative of the underlying population. We tested the impact of imputation on our results by forming dummy variables flagging observations that were imputed and then testing the joint significance of these imputation flags.

Univariate analyses were conducted using the chi-square test of independence to explore associations between each independent variable and the dependent variables and to identify significant factors associated with the odds of a child being sick with fever, diarrhea, or fast/difficult breathing in the last two weeks, odds of utilizing care, and mothers' choice of care sought during their childrens' illness. Fisher's exact test was used as an alternative to the chi-square test when there were cells with small frequencies (<5). The students' t-test was used to compare the difference in means between two groups of continuous variables.

Maximum likelihood estimation was the statistical method chosen for testing associations due to the discrete nature of the outcome variables. Bivariate analyses were then conducted in the form of unadjusted logit regressions. On the basis of the bivariate analyses as well as theories of association of variables, explanatory variables were selected for inclusion in the multivariate analysis. Multivariate analyses used logistic regression for the probability of illness and the probability of utilizing care. Multinomial logistic regression was used for choice of provider. Conditional logistic regression, based on McFadden's choice model, was used to examine the provider chosen versus the second choice provider. After fitting the multivariate model and estimating the coefficients, the significance of the variables in the model was assessed.

There are two statistical options for testing the null hypothesis that all of the coefficients are equal to zero. These two tests are the Wald test and the Likelihood Ratio Test (LRT). However, when data are clustered, the likelihood used for estimation is not a true likelihood because individual observations are not independent and the likelihood does not reflect this. Therefore, since the LRT cannot be used to assess significance of variables in samples that have clustered data because of violation of the assumption that the error terms are independently and identically distributed, the Wald test was used to assist in model construction. The Wald statistic for each variable was examined to verify the significance of each variable.

Testing for Interaction of Socio-Economic Status with Covariates

A crucial step in the process of modeling a dataset is to determine whether or not there is evidence of interaction in the data. (Hosmer and Lemeshow 1989) The data were initially stratified by household asset ownership (owning any assets vs. not owning any assets) as a proxy for SES to test the hypothesis that the relationship between cost and utilization would be different across measures of poverty.

Socio-economic status, as measured by asset-ownership, was not associated with any of the three outcomes: probability of sickness, probability of utilizing care, and multinomial probability of choice of provider, as measured by the chi-square test. Sensitivity of the results to choice of SES measure was tested.[1] [2] The absence of an association between

[1] More detail on the construction of these asset indices can be found in Appendix 2

SES and utilization of health care or choice of provider did not depend on choice of wealth measurement. However, it was found that when SES was measured by one of the wealth indices that included household assets as well as household characteristics constructed with principal components, an association with the probability of sickness was found at the 5% level. This association showed those in the fourth wealth quintile more likely to report sickness than those in the poorest wealth quintile. This is probably due to the tendency of the less-educated to under-report sickness. It was concluded that wealth indices based on asset ownership may not be effective markers for SES.

Next, head of household education level and women's' education level were each used as proxies for SES and were tested individually as interaction terms. As expected, both women's and head of households' education levels were associated with household asset ownership. It was not possible to identify interaction of SES, as defined by asset ownership or education level of head of household or woman, with any of the covariates for the sickness outcome.

Sickness and Utilization Outcomes

As mentioned earlier, studying the determinants of medical service utilization is complicated by the endogeneity of sickness. Only sick individuals generally use services, and if wealthier households experience less sickness, it may appear that wealth reduces health care utilization. We checked for the distribution of wealth between the full sample and the sample of sick and those who utilized care, and did not find any perceptible differences as shown in Table 4 below.

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[2] Detailed results of the sensitivity analysis can be found in Appendix 3.

Table 4: Distribution of assets among the three samples

Asset status	All (n=3981)	Sick (n=1317)	Utilized care (n=499)
One or more assets	76.7%	76.9%	76.75
No Assets	23.3%	23.1%	23.25%

There are very few strategies to control for the endogeneity of sickness—few natural experiments, and no acceptable instruments for sickness. Our approach is to accept the endogeneity as insoluble in this application. By separately estimating equations for sickness and then for utilization, we hope to shed light on these separate processes, and can offer some information on the magnitude of bias introduced by the endogeneity of sickness by exploring the determinants of sickness.

Multivariate logistic regression was initially used to separately assess the likelihood of sickness ($Y_i=1$) and the likelihood of utilizing care ($Y_i=1$) against the household and individual characteristics shown in table 2 (presented earlier).

Log odds $(Y_i=1)=\beta_0+\beta_1 X_1+\beta_2 X_2+\ldots+\beta_N X_{N+}\varepsilon_i$

Each group of predictor variables (community, household, individual, etc.) was entered sequentially in regression analyses to determine the relative contribution of each group as indicated by the change in regression coefficients, significance of the coefficients, and change in the pseudo-R^2. Beta coefficients and p-values were examined to assess increased or decreased likelihood of child sickness and health care utilization, respectively, and significance of the variable. Then the beta coefficients (log odds) were exponentiated to give odds ratios to estimate associations, with corresponding 95%

confidence intervals to access significance of any associations. All results were adjusted for district and household asset ownership, as measured by the dichotomous variable.

Multinomial Logit Model for Choice of provider

The survey instrument was designed to obtain information for the first treatment action. Therefore, the analysis in this paper focuses on the choice of the first provider visited for a child that was sick in the two weeks preceding the survey. One advantage of using the first provider visit is that the dependent variables (the provider choice options) are mutually exclusive and therefore multinomial logit analysis could be used. A key assumption of the multinomial logit model is the independence of irrelevant alternatives (IIA) axiom. The IIA property assumes that the odds of a particular choice are unaffected by the presence of additional alternatives. The IIA property was verified by estimating a model, saving the results, estimating an alternate model with one of the outcome categories excluded, and performing a Hausman test against the full model. The results of the Hausman IIA test (p=0.99) show that we cannot reject the null hypothesis that the difference in coefficients between the two models is not systematic. Thus, the IIA property has been upheld in our multinomial model.

The multinomial logit model will assume that each household has access to the same given set of treatment options when faced with a sick child with one or more of the following conditions: diarrhea, fever, fast/difficult breathing. Analysis of treatment options was performed at the cluster level; however, due to thinly populated clusters, household access to all treatment options could not be confirmed. This model will test which characteristics, or combinations of characteristics of the household and individual (both the caretaker and the child) have the greatest effect on a household's decision in choice of provider, once the household has decided to seek care. Influence of individual provider characteristics such as cost and perceived cost will be tested in the conditional logit model.

The market consists of the set of *j* competing providers (indexed by $j = 1, \ldots, N$). Each provider *j* is treated as a bundle of characteristics. Utility maximizing consumers (indexed by *i*) have preferences over these characteristics specified by their individual utility function:

$$U_{ij} = X_i\beta_1 + \varepsilon_i$$

U_{ij} represents the utility valuation that individual *i* ($i=1, \ldots, N$) gives to choice *j*, where j=1 is a public health facility, j=2 is a hospital, j=3 is a private/NGO facility, and j=4 is a drug shop or other shop. X is a vector of consumers' observable demographic characteristics.

Others have reassembled the unconditional multinomial probability of choosing a provider by multiplying the conditional multinomial probability by binomial probabilities of sickness and care seeking, respectively, as shown below.

$$Pr(X)=Pr(X \mid Utilize) * Pr(Utilize \mid Sick) * Pr(Sick)$$

In future work, we hope to reassemble these unconditional probabilities. Another approach is to model the option of no-care or self-care in a multinomial logit, but to do so would violate the IIA as the probability of an individual choosing no care/self-care (vs. visiting a provider) affects the probability of choosing an individual provider, which is conditional upon the decision to seek care.

In order to control for the effect of illness on the dependent variable (type of provider being chosen), only sick children who were reported to have any one or more of: diarrhea, fever, fast/difficult breathing, were included in the sample for the multinomial provider choice regression. Dummies for specific illness symptoms were also included as covariates, despite our recognition that they were endogenous.

McFadden's Choice Model for Choice of Chosen Provider vs. Next Best Alternative

This model uses conditional logit regression to test which characteristics, or combinations of characteristics of the provider options, namely cost (both actual and perceived), have the greatest effect on a households' decision in choice of provider, once the household has decided to seek care.

Three measures of actual and perceived cost were present in the data. Two of these are money costs—user fees and transportation cost, and one is a time cost—travel time to provider. We lack wage data, and rather than impute a wage to value our respondents time, we simply keep travel time in units of time. User fees and transportation costs were summed into a composite of money costs, while time costs were measured separately in physical units of time.

Although information on choice of provider exists for 584 children who utilized care, information for the second choice provider exists for only 309 of these children due to the fact that many mothers/caretakers stated that if the provider they visited was not available, they would not have consulted another provider (Table 5 below). The provider actually visited and the second choice provider were categorized into three groups: public, private, and drug/other shops. The 309 children for whom second choice provider information was reported were more likely to have visited private facilities while the children for whom no information on second choice provider was reported were more likely to have visited drug and other shops.

Table 5: Description of Data used for Conditional Logit Model

	Provider Visited			
Second choice provider data present	Public	Private	Drug Shop/Other	Total
Yes	63 (20.4%)	**175 (56.6%)**	71 (23%)	309 (100%)
No	37 (13.5%)	81 (29.5%)	**157 (57.1%)**	275 (100%)
Total	100 (17.1%)	256 (43.8%)	228 (39.0%)	584 (100%)
Pearson chi2(2) = 71.9787 Pr = 0.000				

McFadden's choice model is a model of individual choice behavior based on the behavioral axiom that human choice behavior can be described by: 1) sets of alternatives available to decision makers and 2) observed attributes of the decision makers.(McFadden 1974) The main difference between this model and the multinomial logit model is that this model, which uses conditional logit regression, predicts individual choice probabilities, conditional on *both* the exogenously given provider characteristics and the distribution of observed attributes of the individual decision makers (choosers), while the multinomial logit model predicts individual choice probabilities, conditional only on the individual attributes of the choosers. (McFadden 1974)

This model assumes that each household has access to a given set of provider options when faced with a sick child with one or more of the following conditions: diarrhea, fever, fast/difficult breathing. This set of alternatives consists of two choices for each household: the provider actually visited and a second choice provider that was not visited.

The market consists of the set of *j* competing providers (indexed by $j = 1, j = 2$). Each provider *j* is treated as a bundle of characteristics. Utility maximizing consumers (indexed by *i*) have preferences over these characteristics specified by their individual utility function:

$$U_{ij} = X_i\beta 1 + Z_j 1\alpha + \varepsilon_i$$

U_{ij} represents the utility valuation that individual i (i=1, . . . , N) gives to choice j, where j=1 is the provider that was chosen and j=2 is the next best alternate forgone. X is a vector of consumers' observable demographic characteristics and Z is a vector of observable characteristics of the provider choices.

In the equation below, Y_j, the outcome, is a dichotomous variable equal to one if the provider was chosen, and equal to zero if the provider was not chosen. P_1 and P_2 are dummy variables representing private facilities and drug/other shops, respectively. The coefficients, β_1 and β_2, each represent the log odds of a positive outcome for each of the respective types of providers--private providers and drug/other shops, as compared to public providers. In the equation below, C is a vector of the two provider characteristics (money costs and travel time) and $W_{(1\text{-}3)}$ are dummy variables for the wealth quartiles with the lowest quartile as the reference.

$$Y_j = \beta_0 + \beta_1 P_1 + \beta_2 P_2 + \beta_3 C + \beta_{(4\text{-}5)} E_{(1\text{-}2)} * C + \beta_{(6\text{-}8)} W_{(1\text{-}3)} * C + \varepsilon_i$$

Summary statistics for these provider characteristics are provided below.

Table 6: Descriptive Statistics of Provider Background Characteristics

PROVIDER LEVEL (N=309)	**Mean/Percentage (s.d.)**	**N**
Money cost (consult fee & transport cost) of visit at original provider	1788.8 (2309.5)	304
Perceived money cost (consult fee & transport cost) of visit at alternate provider	2599.4 (3189.4)	306
Travel time (one-way) to original provider (minutes)	82.4(169.7)	304
Perceived travel time (one-way) to alternate provider (minutes)	100.1 (141.4)	304
Alternate Provider		309
Community Health Worker	17.2	
Dispensary	35.9	
Private Practitioner	34.0	
Other (not specified)	12.9	

The outcome of interest, whether an individual provider was chosen (1=chosen) was first regressed against type of provider in simple binary conditional logistic regression. The outcome was also separately regressed against individual provider characteristic (actual and perceived) variables.

RESULTS

Results from the binomial and multinomial logistic models are presented in terms of exponentiated coefficients (odds ratios for the former and relative risk ratios for the latter). All standard errors were adjusted for clustering. Results from the binomial conditional logistic model are presented in odds ratios. The following sections present results of the analysis.

Outcomes 1 & 2: Sickness and Utilization

Factors positively associated with probability of sickness were age of child and whether the child had received Vitamin A supplementation. There was no significant association between asset ownership or woman's education (as a proxy for SES) and probability of sickness (Table 10 at end of paper); however, women's education was strongly associated with the odds of utilizing care.

The odds of sickness for children in the 6-11 month age group as compared to children 0-5 months were 1.62 ($p<0.01$). In addition to the 6-23 months age group, Vitamin A was shown to be positively associated with the probability of sickness in both unadjusted (OR: 1.28, $p<0.01$) and adjusted regressions (OR: 1.19, $p<0.10$).

As shown in Table 11 (end of paper), the probability of utilizing care had a strong positive association with the education level of the mother/female female caretaker. Multivariate analysis showed that women with education at the secondary level and above are almost two times as likely to utilize services for their children (OR: 1.99; $p<0.05$) and woman with primary education are almost one and a half times likely to utilize services (OR: 1.41; $p<0.10$) as compared to women with no education. As expected, whether the mother saw anyone for antenatal care (ANC) was also positively associated with utilizing care with those who had received ANC at 2.04 ($p<0.05$) times the odds of utilizing care. The data also show that mother/caretakers are much more likely to utilize care for children with fever (OR: 4.95 $p<0.01$) and diarrhea (OR: 1.47, $p<0.05$) adjusting for maternal and child characteristics including presence of other IMCI illness characteristics.

Outcome 3: Multinomial Choice of Provider

The data showed that women with education at the secondary level or above are much more likely to go to a hospital as a first line of care (rather than a government health centre, RRR=7.32 p=0.09) as compared to women with no education.

Outcome 4: Provider Choice

McFadden's choice model, as shown in Table 13 at the end of paper, showed that private providers are more likely to be chosen than public providers (OR=4.23, p=0.00), and further drug shops are more likely to be chosen than public providers (OR=5.67, p=0.00).

Providers with money costs (user fees and associated transportation cost) less than or equal to 500 USh were about 2.4 (p=0.00) times more likely to be chosen than providers with user fees greater than 500 USh, adjusting for type of provider (public, private, or drug shop/other) and one-way travel time to the provider. Sensitivity analysis of different price cut points was conducted, and a threshold of 500 USh appeared to have the best fit.

Multivariate models showed no effect of travel time on choice of provider, but travel time was shown to affect choice of provider more strongly in lower SES sub-groups suggesting possible interaction effects of SES and travel time.

The effect of the interaction of SES on travel time was significant. Households from the highest wealth quintile were more than twice as likely (OR: 2.11, p=0.03) to choose a provider requiring an additional hour of travel time, as compared those households from the lowest wealth quintile (Table 13). Households with education at the secondary level or above were less than half as likely (OR=0.46, p=0.09) to choose a provider requiring an additional hour of travel time as compared to households with no education.

DISCUSSION

The main finding of this paper is that SES (as measured by household wealth, head of household education, and women's education) plays a significant role in choice of provider. As expected, the wealthier households were more likely to seek treatment at providers with greater travel time; however, more educated households were found to be less likely to seek treatment at providers with greater travel time.

Households with education at the secondary level or above were less than half as likely to choose a provider requiring an additional hour of travel time as compared to households with no education as shown in Table 13. This is consistent with the interpretation that the opportunity cost of time is higher for the better educated households and accordingly, these households place a higher value on their time than the less educated households, and as such, are more discriminating with use of their time. If we accept higher education as a proxy for potentially higher wages and higher opportunity costs of time, we can shine light on this finding.

This study also found that the more educated a woman is, the more likely she is to seek care directly at a hospital as an initial provider, possibly bypassing primary care facilities. Also, as expected, user fees were found to have a significant effect on the choice of health care provider, adjusting for type of provider. Unfortunately, data limitations did not allow us to see what effect, if any actual and/or perceived quality has on choice of provider.

It is interesting to note that there was no association between woman's education and likelihood of reporting sickness. It would be expected that women who are better educated take better care of their children and their children would be less likely to fall sick. The fact that no association is evident could be due to the fact that woman's education also predisposes women to be more likely to report sickness than their less-educated peers, so the protective effect of education may be cancelled out by the greater tendency to report sickness among educated women. Sindelar (1991) reported a similar finding. The education level of the mother/female female caretaker did, however, show a strong dose-response effect on the likelihood of utilizing care.

Factors positively associated with probability of reporting sickness were child's age and whether the child had received Vitamin A supplementation. The result that the odds of sickness for children in the 6-11 month age group as compared to children 0-5 months were 1.62 ($p<0.01$) is expected because exclusive breastfeeding protects children from disease for the first six months of life and then children are at an increased risk of disease until about 24 months. Although data on exclusive breastfeeding were not collected, the survey showed that virtually all (98.8%) of the women (n=2256) breastfed for 6 or more months.

The positive association between having Vitamin A supplementation compared to none, and the probability of sickness (OR: 1.19, $p<0.10$) cannot be easily explained. The data show that the majority (77.9%) of children who received Vitamin A received it as part of a National Immunization day, in September 1999. Therefore, one would expect the same association between immunization status and sickness; however, no significant association was found. Vitamin A status is a marker of attendance at a single National Immunization Day; however, attaining full immunization status requires multiple visits to health providers. Mothers who take children to receive vaccines and vitamin A may be more likely to do so out of a concern that the child is generally sickly, thus one must be on guard for endogeneity bias in interpreting the results of vitamin A and immunization on incidence of illness.

Limitations

The models suffer from a number of limitations. First is the problem of omitted variable bias. It is not possible that all the relevant variables affecting the choice of health provider have been captured in the model. For example, because quality of the provider visited and the perceived quality of the second choice provider were not measured on the same scale, quality could not be included in McFadden's choice model along with the other provider characteristics.

There is also the potential for endogeneity bias because utilization can only occur among those individuals with a sick child and sickness in children is correlated with certain unobserved and unmeasurable characteristics, which in turn affect utilization. These unobserved and unmeasurable characteristics of individuals are relegated to the error term in the regression equations.

There is also the potential for respondent recall bias given that the data were collected retrospectively and were based on mother/caretakers' ability to recall, which can be inaccurate. Educational status may have been associated with the accuracy of mothers' reporting leading to a systematic bias. Previous studies have documented that less educated mothers are more likely to report medical events less accurately than their more educated counterparts. (Kroeger 1983) In addition, the illness data may have limited validity/accuracy because all of the information pertaining to illnesses in children was self-reported by mothers and based on their perception of the illness(s). None of the information provided by mothers was validated with clinical observation from health center or hospital records. Therefore, it is not possible to determine if the child actually had the sign or symptom when the respondents mention that they did. Thus, although this paper has generated some insights into health care utilization for childhood sickness, the model cannot be used to predict health care demand.

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Table 7: Descriptive Statistics of Explanatory Variables-Full Sample of under fives, Sample of Sick children, and Sample of children who visited a provider (sample for multinomial logit)

	All (n=4706)		Sick (n=1536)		Users (n=584)	
	Mean/Percentage (s.d)	**N**	**Mean/Percentage (s.d.)**	**N**	**Mean/Percentage (s.d.)**	**N**
District						
Bugiri	11.0	4080	11.6	1357	12.8	514
Iganga	14.1		19.4		21.6	
Kiboga	8.4		4.5		2.7	
Kumi	13.0		11.4		6.8	
Luwero	9.2		8.6		5.6	
Masaka	5.3		4.1		6.2	
Masindi	9.7		12.3		13.8	
Mubende	8.2		7.5		7.6	
Nebbi	9.8		6.5		6.2	
Ntungamo	11.2		14.1		16.5	
HOUSEHOLD LEVEL						
Mother of child (1=yes)	89.9	4666	91.2	1526	91.9	580
Asset-ownership(1=no assets)	23.3	3981	23.1	1323	23.3	499
Head of household's education level		3804		1274		485
None	18.5		19.9		19.8	
Primary	62.0		60.7		61.4	
Above Primary	19.5		19.5		18.8	

	All (n=4706)		Sick (n=1536)		Users (n=584)	
	Mean/Percentage (s.d)	**N**	**Mean/Percentage (s.d.)**	**N**	**Mean/Percentage (s.d.)**	**N**
INDIVIDUAL LEVEL						
Mother/Caretaker						
Age (in years)	30.4 (10.5)	4653	30.0(10.5)	1522	29.9(10.8)	578
Marital Status		4663		1524		577
Never married	5.2		6.0		7.1	
Married	83.2		83.0		82.0	
Widowed	4.8		4.6		5.0	
Divorced	6.8		6.4		5.9	
Number of children ever born	4.3 (3.0)	4706	4.3 (3.0)	1536	4.2(3.0)	584
Number of living children	3.7 (2.6)	4706	3.7 (2.6)	1536	3.6(2.5)	584
Number of children living at home	3.0 (2.2)	4706	3.1(2.2)	1536	3.0(2.2)	584
Ever lost a child (1=yes)	30.6	4706	32.0	1536	34.9	584
Woman's education level		4672		1525		578

None	31.9		31.0		28.0	
Primary	59.7		60.1		62.1	
Above Primary	8.5		9.0		9.9	
ANC (1=yes)	87.8	4267	88.9	1417	91.9	546
Where gave birth		3890		1321		506
Home	59.8		60.7		61.5	
Public	23.4		20.6		21.3	
NGO	2.2		2.9		2.6	
Private	14.6		15.8		14.6	

Child						
Socio-demographic characteristics						
Age group		3960		1334		506
0-2 months	5.0		4.0		2.4	
3-5 months	5.0		7.5		7.7	
6-11 months	11.3		16.2		19.4	
12-23 months	18.9		26.1		28.1	
24-35 months	17.4		17.0		18.6	
36-47 months	14.7		10.5		8.1	
48-59 months	15.9		11.8		9.5	
60-71 months	11.6		6.9		6.3	
Sex (male=1)	50.1	3970	50.0	1333	48.7	507
Birth order		4693		1534		583
1	13.2		12.7		13.0	
2-3	28.2		27.9		27.4	
4-5	26.1		26.3		27.6	
6+	32.5		33.1		31.9	
Received Vitamin A		3992		1298		492
Never	41.2		38.5		35.4	
>6 months ago	20.5		19.1		19.5	
0-6 months ago	38.4		42.4		45.1	
Received Measles vaccine	52.7	4259	48.6	1417	48.7	538
Received BCG	74.3	4261	74.1	1418	72.0	539
Completely immunized	14.2	4261	15.2	1418	15.6	539
Illness characteristics		4706		1536		584
4 key danger signs						
Convulsions	2.0		4.6		5.7	
Difficult to wake	1.2		2.7		3.4	
Vomiting	5.4		14.3		16.3	
Drinking poorly/not able to breastfeed	3.0		7.3		7.0	
5 key symptoms						
Fever	27.2		83.5		92.0	
Diarrhea	10.7		32.9		33.6	
Cough	26.8		42.0		44.2	
Fast Breathing	3.7		11.3		12.3	

Difficult Breathing	3.0		9.2		9.4	
Other symptoms						
Blocked/runny nose	22.0		34.3		33.7	
Sore throat	0.8		1.8		2.7	
Ear pain	2.7		4.6		5.8	
Loss of appetite	4.8		10.7		12.7	
Redness/discharge in eyes	6.1		10.6		10.6	
Generalized Rash	8.9		12.9		13.0	
Pale palms	1.2		3.0		4.1	
Other	5.1		6.5		6.8	
*Illness classification**						
Probable Pneumonia (cough & fast/difficult breathing)	3.6		11.1		11.5	
Severe Diarrhea	9.4		28.8		31.7	
Fever w/o cough/diarrhea	12.3		37.6		37.7	
Respiratory	9.1		57.7		57.4	
Illness Severity						
One or more danger signs (convulsions, difficult to wake, vomiting everything, and drinking poorly/not able to drink or breastfeed)	9.1	4706	21.7	1536	23.1	584
Number of symptoms			2.9(1.9)	1536	3.1(2.1)	584
Blood in stool			56.4	397	65.7	172
Peak stool frequency for diarrhea			5.3(3.9)	336	5.1(3.1)	139

Table 8: Descriptive Statistics of All Variables in Full Sample-With and Without Sampling Weights					
		Unweighted		**Weighted**	
	Type	**Mean/Percentage (s.d)**	**N**	**Mean/Percentage (s.d.)**	**N**
Dependent variables					
Sick in last two weeks	Dichotomous	59.0	4706	61.2	4051
Sick with diarrhea, fever, or fast/difficult breathing	Dichotomous	32.6	4706	34.5	4051
Utilized care for diarrhea/fever	Dichotomous	38.02	1536	37.8	1348
Where advice/tx first sought	categorical		584		509
Hospital		7.0		6.4	
Public		11.1		10.6	
NGO/private		42.8		43.3	
drug shop/other shop/traditional provider		39.0		39.7	
Independent Variables					
COMMUNITY/DISTRICT LEVEL					
District	categorical				
Bugiri		11.0	4080	9.9	3978
Iganga		14.1		19.8	
Kiboga		8.4		6.7	
Kumi		13.0		12.2	
Luwero		9.2		9.2	
Masaka		5.3		6.1	
Masindi		9.7		8.5	
Mubende		8.2		7.0	
Nebbi		9.8		9.4	
Ntungamo		11.2		11.1	
HOUSEHOLD LEVEL					
Asset-ownership(1=no assets)	dichotomous	23.3	3981	23.1	3978
Head of household's education level	categorical		3804		3801
None		18.5		18.8	
Primary		62.0		61.4	
Above Primary		19.5		19.8	
INDIVIDUAL LEVEL					
Mother/Caretaker					
Age	continuous	30.4 (10.5)	4653	30.0 (10.1)	3960
Currently Married (1=yes)	dichotomous	83.2	4661	83.4	3957
Marital Status	categorical		4663		3937
Never married		5.2		4.5	
Married		83.2		82.8	
Widowed		4.8		5.0	
Divorced		6.8		7.7	
Number of living children	continuous	3.7 (2.6)	4706	3.8(2.5)	3957
Ever lost a child (1=yes)	dichotomous	30.6	4706	30.7	3957
Woman's education level	categorical		4672		3961

None		31.9		30.9	
Primary		59.7		60.3	
Above Primary		8.5		8.8	
ANC (1=yes)	dichotomous	87.8	4267	88.1	3664
ANC provider					
Doctor (1=yes)	dichotomous	11.9	3777	11.1	3201
Clinical Officer (1=yes)	dichotomous	4.7	3774	4.8	3197
Nurse/Midwife (1=yes)	dichotomous	82.2	3790	82.5	3213
Other Health Professional (1=yes)	dichotomous	4.1	3773	4.2	3197
TBA (1=yes)	dichotomous	1.5	3773	1.4	3197
Where gave birth	categorical		3890		3334
Home		59.8		58.2	
Public		23.4		23.4	
NGO		2.2		2.1	
Private		14.6		16.3	

Child					
Age group	categorical		3960		3397
0-11 months		21.6		21.7	
12-23 months		18.9		18.7	
24-35 months		17.4		17.2	
36-47 months		14.7		14.9	
48-59 months		15.9		16.2	
60-71 months		11.6		11.4	
Sex (male=1)	Dichotomous	50.1	3970	50.4	3396
Birth order	Categorical		4693		3965
1		13.3		13.1	
2		13.9		13.9	
3		14.3		14.8	
>4		58.6		58.2	
Received Vitamin A	Categorical		3992		3408
Never		41.2		40.6	
>6 months ago		20.5		19.1	
0-6 months ago		38.4		40.3	
Completely immunized	Dichotomous	14.2	4261	14.7	3634
IMCI Symptoms	Dichotomous		2777		2393
Fever		46.2		47.2	
Diarrhea		18.2		19.0	
Fast Breathing		6.2		6.7	
Difficult Breathing		5.1		5.2	
One or more danger signs (convulsions, difficult to wake, vomiting everything, and drinking poorly/not able to drink or breastfeed)		15.4		15.5	2393
Illness Severity					
Peak stool frequency for diarrhea	continuous	5.25 (3.9)	336	5.4 (5.0)	286

PROVIDER LEVEL					
Money cost (consult and transport) of visit at original provider		1212.2 (2214.3)	569	1226.2 (2382.2)	496
Perceived money cost of visit to alt. provider		2599.4 (3189.4)	306	2501.2 (3051.9)	273
Travel time (one-way) to original provider (minutes)		84.4 (166.4)	442	80.4 (168.8)	389
Perceived travel time (one-way) to alternate provider		100.1(141.4)	304	103.5 (171.2)	271
Alternate Provider	categorical		313		276
Community Health Worker		17.9		18.4	
Dispensary		35.5		36.0	
Private Practitioner		33.9		31.6	
Other (not specified)		12.8		14.0	

Table 9: Analysis of Travel Time and Travel Costs

	Percent (N)	Median Amount Paid in USh (N)	Median One-way Travel Time in Minutes (N)	Median distance in km (N)
Paid for Transportation	16.1 (68)	1100 (38)	60 (62)	2 (39)
Walked	63.8 (270)	0	40 (263)	1 (142)
Used Own	16.6 (70)	0	60 (67)	3 (49)
Borrowed	2.1 (9)	0	60 (7)	5 (5)
Other	1.4 (6)	0	30 (6)	1 (6)
Total	100 (423)	1100 (38)	45 (405)	2 (241)

Table 10: Logistic Models of the Liklihood of IMCI Illness Symptoms in Children Under Five

Logistic Models of the Liklihood of Sickness (diarrhea, and/or fever, and/or fast/difficult breathing)

Model	(1) Woman/Caretaker Characteristics	(2) (1) + Child Socio-Demographic Characteristics
Woman's education: none	ref.	ref.
Woman's education: primary	1.01 (0.84 - 1.20)	1.05 (0.86 - 1.28)
Woman's education: secondary and above	1.08 (0.79 - 1.48)	1.19 (0.82 - 1.73)
Woman's age (years)	0.99* (0.98 - 1.00)	0.99 (0.97 - 1.02)
Currently Married	1.12 (0.89 - 1.42)	1.03 (0.80 - 1.32)
Received ANC during last birth	1.22 (0.94 - 1.57)	1.16 (0.87 - 1.55)
child age=0-5 months		ref.
child age=6-11 months		1.66*** (1.21 - 2.29)
child age=12-23 months		1.33* (0.97 - 1.84)
child age=24-35 months		0.8 (0.58 - 1.10)
child age=36-47 months		0.45*** (0.32 - 0.65)
child age=48-59 months		0.54*** (0.39 - 0.76)
child age=60-71 months		0.34*** (0.23 - 0.51)
child is male		1.02 (0.88 - 1.19)
birthorder		1.05 (0.99 - 1.11)
Received Vitamin A		1.19* (0.98 - 1.43)
Child is completely immunized		1.08 (0.86 - 1.36)
Observations	3653	3105
Model chi-square	0.00	0.00
Pseudo R-squared	0.03	0.07

All results are adjusted for district and household SES
Odds Ratios presented;Robust 95% confidence intervals in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 11: Logistic Models of the Liklihood of Healthcare Utilization for children sick with IMCI Illness Symptom (diarrhea, and/or fever, and/or fast/difficult breathing)

Model	(1) Caretaker Characteristics	(2) (1) + child characteristics	(3) (2) + illness characteristics
Woman's education: none	ref.	ref.	ref.
Woman's education: primary	1.42**	1.35*	1.41*
	(1.01 - 1.99)	(0.96 - 1.91)	(0.98 - 2.01)
Woman's education: secondary and above	1.74**	1.82**	1.99**
	(1.00 - 3.00)	(1.02 - 3.25)	(1.12 - 3.53)
Woman's age (years)	0.99	0.99	0.99
	(0.97 - 1.01)	(0.95 - 1.03)	(0.95 - 1.03)
Never Married	ref.	ref.	ref.
Married	0.81	0.62	0.69
	(0.45 - 1.46)	(0.34 - 1.15)	(0.35 - 1.34)
Widowed	1.04	1.11	1.2
	(0.40 - 2.73)	(0.41 - 3.01)	(0.40 - 3.56)
Divorced	0.52	0.45*	0.41*
	(0.22 - 1.25)	(0.19 - 1.10)	(0.16 - 1.05)
Ever lost a child (1=yes)	1.36**	1.31*	1.28*
	(1.03 - 1.80)	(0.99 - 1.74)	(0.96 - 1.72)
ANC during last birth (1=yes)	2.11***	1.94**	2.04**
	(1.25 - 3.58)	(1.11 - 3.37)	(1.16 - 3.57)
Birthplace: home	ref.	ref.	ref.
Birthplace: public	1.14	1.17	1.11
	(0.82 - 1.59)	(0.83 - 1.67)	(0.77 - 1.58)
Birthplace: NGO	1.26	1.44	1.41
	(0.52 - 3.06)	(0.59 - 3.54)	(0.58 - 3.42)
Birthplace: Private	0.8	0.72	0.68*
	(0.53 - 1.21)	(0.47 - 1.11)	(0.44 - 1.05)
child's age (months)		1	0.99*
		(0.99 - 1.00)	(0.98 - 1.00)
child's sex (1=male)		0.85	0.85
		(0.66 - 1.10)	(0.65 - 1.10)
birth order (continuous)		1.03	1.02
		(0.93 - 1.14)	(0.92 - 1.12)
ever had Vitamin A		1.19	1.11
		(0.86 - 1.65)	(0.79 - 1.55)
child is completely immunized		1.19	1.33
		(0.81 - 1.75)	(0.90 - 1.97)
had fever			4.95***
			(3.14 - 7.82)
had diarrhea			1.47**

			(1.09 - 1.99)
had fast/difficult breathing			1.17
			(0.78 - 1.74)
Observations	1138	1040	1040
Model chi-square	0.00	0.00	0.00
Pseudo R-squared	0.05	0.06	0.09

All results are adjusted for district and household SES
Odds Ratios Presented; Robust 95% confidence intervals in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 12 Multinomial Logit Models of Provider Choice

Model	(1) Indiv. woman characteristics			(2) 1+Child socio.-demo.characteristics			(3) 2+Child illness characteristics			(4) 3+ Illness Severity		
Provider (Reference: Public)	Hospital	Private	Drug Shop	Hospital	Private	Drug Shop	Hospital	Private	Drug Shop	Hospital	Private	Drug Shop
Woman's Education: Primary	1.98	1.23	0.94	2.02	1.15	0.95	1.8	1.21	1.01	1.36	1.11	1.01
	(0.48 - 8.13)	(0.60 - 2.53)	(0.45 - 1.98)	(0.44 - 9.23)	(0.50 - 2.67)	(0.42 - 2.13)	(0.37 - 8.77)	(0.50 - 2.92)	(0.43 - 2.39)	(0.26 - 7.05)	(0.45 - 2.71)	(0.42 - 2.43)
Woman's Education: Secondary and above	3.6	2.02	0.73	4.02	2.46	0.87	3.94	2.4	0.84	7.32*	2.87	1.06
	(0.56 - 23.32)	(0.63 - 6.41)	(0.21 - 2.61)	(0.55 - 29.44)	(0.62 - 9.73)	(0.19 - 3.88)	(0.51 - 30.52)	(0.60 - 9.63)	(0.18 - 3.86)	(0.85 - 63.33)	(0.63 - 13.10)	(0.20 - 5.54)
Woman's Education: None	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Woman's age (years)	1.01	1	1.01	1	0.98	1.02	1.01	0.98	1.02	1.02	0.97	1.03
	(0.97 - 1.06)	(0.97 - 1.03)	(0.99 - 1.04)	(0.92 - 1.09)	(0.92 - 1.05)	(0.97 - 1.08)	(0.93 - 1.09)	(0.92 - 1.04)	(0.97 - 1.08)	(0.91 - 1.15)	(0.90 - 1.05)	(0.96 - 1.11)
Married	0.55	0.49	0.55	0.19*	0.23*	0.29	0.20*	0.22*	0.27	0.32	0.21*	0.4
	(0.13 - 2.35)	(0.19 - 1.27)	(0.21 - 1.43)	(0.03 - 1.12)	(0.05 - 1.03)	(0.06 - 1.36)	(0.03 - 1.19)	(0.05 - 1.03)	(0.06 - 1.33)	(0.03 - 3.13)	(0.04 - 1.06)	(0.08 - 2.05)
Ever lost a child	0.34*	0.68	0.58	0.35*	0.67	0.54*	0.38*	0.69	0.58	0.4	0.79	0.61
	(0.11 - 1.02)	(0.35 - 1.32)	(0.30 - 1.13)	(0.11 - 1.10)	(0.32 - 1.41)	(0.26 - 1.12)	(0.12 - 1.19)	(0.33 - 1.48)	(0.27 - 1.23)	(0.10 - 1.69)	(0.35 - 1.82)	(0.27 - 1.38)
Number of living children	1.28**	1.29***	1.33***	1.28*	1.30**	1.24**	1.28**	1.31**	1.24**	1.34*	1.41**	1.28*
	(1.03 - 1.59)	(1.11 - 1.51)	(1.13 - 1.56)	(0.98 - 1.67)	(1.05 - 1.62)	(1.00 - 1.53)	(1.00 - 1.63)	(1.05 - 1.62)	(1.01 - 1.53)	(0.95 - 1.88)	(1.07 - 1.85)	(0.98 - 1.66)
Child age=0-11 mths				ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.	ref.
Child age=12-23 mths				1.1	1.98	1.37	1.17	2.11	1.48	2.44	2.81**	1.65
				(0.37 - 3.28)	(0.81 - 4.81)	(0.56 - 3.35)	(0.38 - 3.56)	(0.86 - 5.13)	(0.59 - 3.73)	(0.68 - 8.80)	(1.03 - 7.69)	(0.63 - 4.31)
Child age=24-59 mths				1.28	3.49***	3.56***	1.36	3.41***	3.40***	1.86	4.25***	3.88***
				(0.34 - 4.85)	(1.51 - 8.07)	(1.46 - 8.66)	(0.34 - 5.40)	(1.47 - 7.92)	(1.37 - 8.39)	(0.31 - 11.09)	(1.76 - 10.25)	(1.59 - 9.44)
Child age=60-71 mths				0.93	1.46	1.68	1.02	1.34	1.47	1.65	2.69	2.16
				(0.14 - 6.24)	(0.32 - 6.55)	(0.36 - 7.93)	(0.14 - 7.41)	(0.28 - 6.31)	(0.30 - 7.31)	(0.14 - 19.88)	(0.46 - 15.66)	(0.33 - 13.96)
Child had fever							0.28	0.53	0.27*	0.02**	0.11*	0.16
							(0.05 - 1.50)	(0.13 - 2.08)	(0.07 - 1.11)	(0.00 - 0.46)	(0.01 - 1.38)	(0.01 - 1.82)
Child had diarrhea							1.36	0.62	0.44*	0.31	0.52	0.84
							(0.38 - 4.87)	(0.27 - 1.41)	(0.18 - 1.04)	(0.02 - 4.12)	(0.12 - 2.22)	(0.19 - 3.77)
Child had fast/difficult breathing							0.55	0.8	0.56	0.10**	0.30**	0.47
							(0.16 - 1.95)	(0.35 - 1.81)	(0.23 - 1.39)	(0.02 - 0.66)	(0.10 - 0.92)	(0.16 - 1.38)
Child had one or more danger signs										7.54**	2.21	0.94
										(1.33 - 42.81)	(0.70 - 7.04)	(0.30 - 2.91)
Number of symptoms										1.37	1.12	0.97
										(0.91 - 2.06)	(0.88 - 1.44)	(0.73 - 1.28)
Peak stool frequency										0.93	0.95	0.97
										(0.67 - 1.30)	(0.77 - 1.18)	(0.79 - 1.18)
Observations		473			418			418			379	
Model chi-square		0.05			0.00			0.00			0.00	
Pseudo R-squared		0.04			0.07			0.08			0.12	

All results are adusted for household SES
Relative Risk Ratios presented; robust 95% confidence intervals in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Table 13: Conditional Logit Models of Choice for Health Provider

Model	**(1)** **Base Model**	**(2)** **SES*travel time interaction**	**(3)** **head of household education*travel time interaction**
Provider			
Public Facility	ref.	ref.	ref.
Private Facility	4.31***	4.00***	4.23***
	(2.80 - 6.64)	(2.47 - 6.45)	(2.57 - 6.96)
Drug shop/other shop	5.01***	5.04***	5.67***
	(2.86 - 8.79)	(2.71 - 9.37)	(2.97 - 10.84)
Money and Opportunity Costs			
Money Cost <= 500 USh	2.33***	2.32***	2.38***
	(1.47 - 3.71)	(1.42 - 3.79)	(1.44 - 3.93)
Travel time (hours)	0.95	0.48**	0.62
	(0.88 - 1.02)	(0.26 - 0.88)	(0.30 - 1.30)
Interaction terms			
lowest/poorest wealth quartile*travel time		ref.	ref.
second wealth quartile*travel time		1.36	1.13
		(0.63 - 2.90)	(0.52 - 2.48)
third wealth quartile*travel time		1.98*	2.07*
		(0.98 - 3.99)	(1.00 - 4.27)
highest/richest wealth quartile*travel time		2.20**	2.11**
		(1.17 - 4.12)	(1.09 - 4.07)
head of household education: none*travel time			ref.
head of household education: primary*travel time			0.8
			(0.49 - 1.31)
head of household education: secondary and above*travel time			0.46*
			(0.19 - 1.11)
Observations	588	520	504
Model chi-square	0.00	0.00	0.00
Pseudo R-squared	0.19	0.21	0.22

Odds Ratios presented; 95% confidence intervals in parentheses
*significant at 10%; ** significant at 5%; *** significant at 1%

FIGURE 1: Description of Data

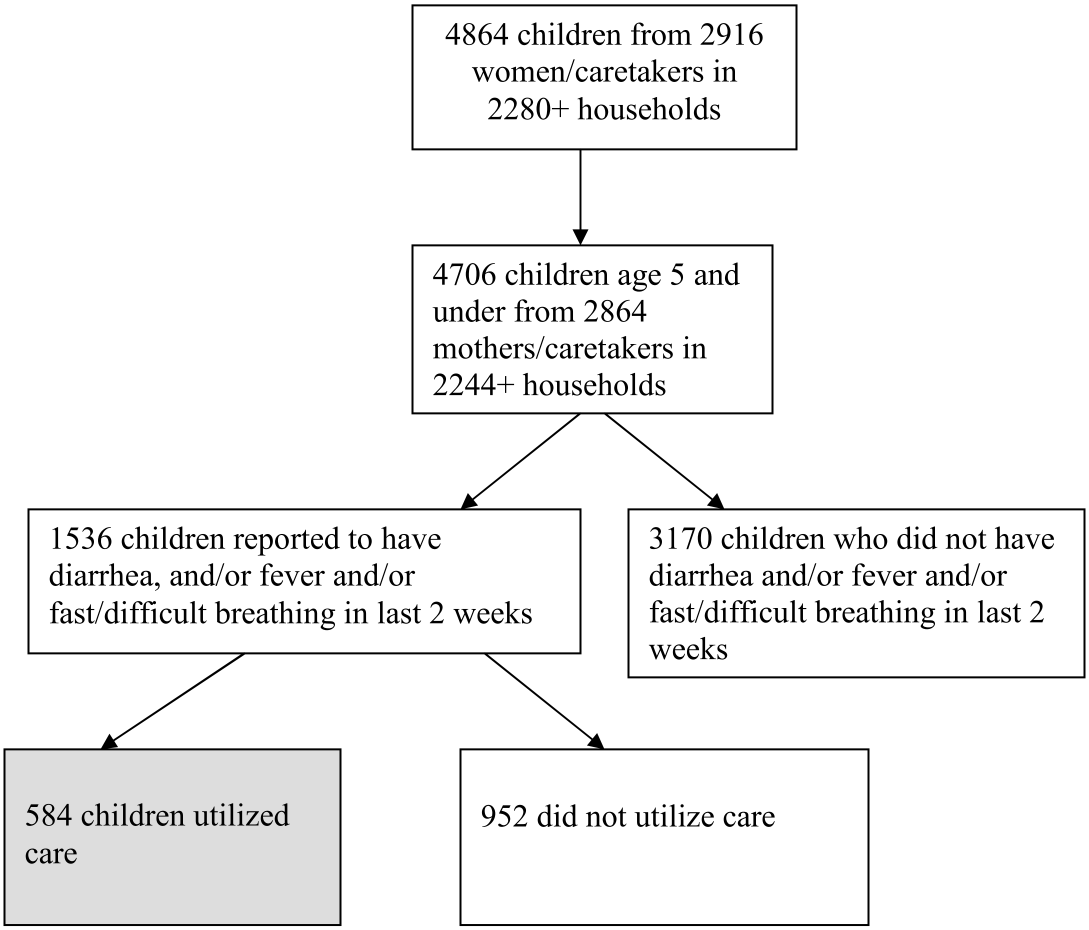
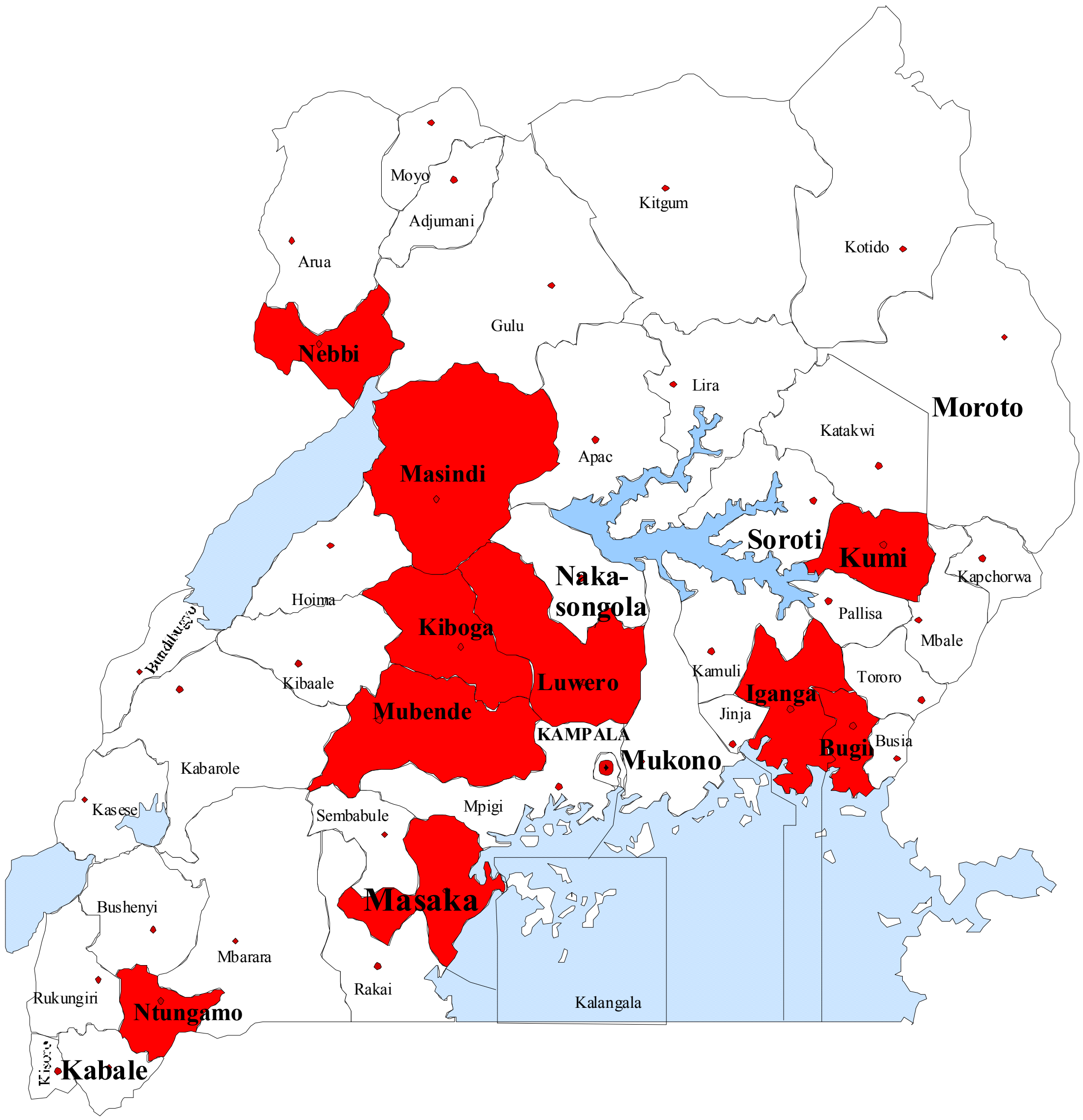


FIGURE 2: Map of Uganda (Study Districts Highlighted)



APPENDIX 1: DEFINITIONS OF VARIABLES USED IN ANALYSIS

Outcome Variables

1) IMCI Symptom(s) in last two weeks: The presence of diarrhea and/or fever, and/or fast/difficult breathing in a child under the age of five on the day of the survey or in the two weeks preceding the survey, as determined by mothers'/caretakers' report.

2) Utilization of care: Utilizing care outside of the home for a child sick with diarrhea, and/or fever and/or fast/difficult breathing during the 2-week period prior to interview. An indicator variable for whether any provider was visited was constructed to use as the outcome variable for predicting the likelihood of utilizing care for a sick child in the last two weeks.

3) Provider first utilized: The choice of one type of provider (private/NGO, drug/other shop, or hospital) as compared to public facilities, which are the reference group. The majority (86%) of the observations in the hospital category are government hospitals, and the remaining (14%) are NGO hospitals. After private health facilities, drug and other shops form the next largest category of "providers," with a sizable portion at almost 40 percent. Drug shops form the majority at 74% of this category. Other shops form 23%; however, it seems that there is not a clear demarcation between the "drug shop" and "other shop" category as any shop selling

drugs could be classified as a drug shop. In addition, it appears that the drug shop category may have been used to include private pharmacies as well, as no respondents selected the “private pharmacy” category. Although drug shops are allowed to sell class “C” or non-prescription drugs, in practice, they sell all classes of drug.(Tabuti, Dhillion et al. 2003) Traditional practitioners form less than two percent of this category.

4) Choice of Provider: This outcome represents the decision to choose a provider when presented with a choice set consisting of two providers—the provider actually visited and the second choice provider.

Independent Variables

Many of these variables have also been measured in national surveys, such as the DHS, done in 2000-2001. Whenever possible, we compared sample characteristics with equivalent measures in the 2000-2001 Uganda DHS to help evaluate external validity.

District: This is a set of nine dummy variables denoting the ten districts in which the survey took place. These dummy variables were created in order to examine unobserved characteristics of each district. The inclusion of these variables also compensates for the fact that the sample is not self-weighting across districts.

Household Socio-Economic Status

Below are the two variables that were constructed to measure household SES.

a. Wealth Index: Ownership of assets as well as presence of electricity and gas were modeled both as a dichotomous variable and as wealth quintiles, with each asset weighted according to analysis of principal components.

The first two logistic regressions (likelihood of sickness and utilization) used the dichotomous measure with 1=assets owned, and 0= no assets owned, to adjust for SES. The multinomial and conditional logit regressions used the categorical variable with the poorest quintile as the reference group. We also attempted to include education level of the head of household in a composite wealth index, based on Filmer and Prichet (2001); however, the conditional logit model proved unstable, so head of household education was modeled as a separate variable in the conditional logit model. Further information on construction and sensitivity analysis of the wealth indices can be found in Appendices 2 and 3.

b. Education of head of household: This is a categorical ordinal variable representing the level of education with 0-none, 1=primary, and 2=secondary and above.

Education can also be used as a proxy for SES. Both women's and head of household's education levels were measured in this dataset. The women's education variable is described under the next section on individual women's characteristics.

Individual Characteristics

Mother/Caretaker

a. Education: This is a categorical ordinal variable representing the level of education with 0=none, 1=primary, and 2=above secondary and above.

b. Age: This is a continuous variable measured in terms of age (number of years).

c. Marital Status: This is a dummy variable representing the marital status of the mother/caretaker with never married equal to zero and currently married equal to one. However, in the regression model of healthcare utilization, martial status was modeled as nominal with the following categories: never married (1), married (2), widowed (3) and divorced (4).

d. Number of Living Children: This is a continuous variable measuring the total number of living children.

e. Ever Lost a Child: This is a dichotomous variable with 1 representing yes and 0 representing no.

f. Antenatal care: This is a dichotomous variable with 1 representing yes and 0 representing no for ANC care at the last or current pregnancy.

g. Place of birth: This is a categorical variable with the following categories to describe where the child was given birth: home, public, NGO, and private.

Child

a. Age: Age is measured in months and is a nominal variable in the first logistic regression model (likelihood of IMCI illness symptoms) with the following categories: 0-5 months, 6-11 months, 12-23 months, 24-35 months, 36-47 months, 48-59 months, 60-71 months. In the multinomial logit model of provider choice, age was also modeled as a nominal variable with the following categories: 0-11 months, 12-23 months, 24-59 months, and 60-71 months. Age was modeled as a continuous variable in the logistic regression of healthcare utilization.

b. Gender: This is a dichotomous variable with 1 representing a male child.

c. Birth Order: This variable represents the birth order of the child, and is represented by a set of three dummy variables with the following categories: birth order: 2-3, birth order: 4-6, birth order: 6. First born is the reference category.

d. Complete immunization status: This variable represents complete immunization status, which is defined as the child having received one dose of BCG vaccine, three doses of DPT vaccine, three doses of polio vaccine (the first does of oral polio at birth is not included) and one dose of measles vaccine.

e. Vitamin A Status: This was constructed as a dichotomous variable, coded as 0 if a child never received Vitamin A and coded as 1 if a child ever received Vitamin A.

f. Illness Conditions: Due to the heterogeneous nature of children's illness patterns and frequent occurrence of multiple symptoms, childhood illnesses are represented as the presence or absence of selected symptoms, rather than by categorization into mutually exclusive illness categories. A dichotomous dummy variable was created for each of the three illness symptoms listed below.

- Fever
- Diarrhea
- Fast/difficult breathing

g. Illness severity

Severity of illness was measured by the three variables listed below.

1) Presence of one or more danger signs (convulsions, difficult to wake, vomiting, drinking poorly/not able to breastfeed).

2) Number of symptoms: This is continuous numerical variable that represents the total number of symptoms reported for each child. A maximum of twelve conditions could be reported (fever, diarrhea, cough, fast/difficult breathing, ear pain, loss of appetite, blocked or runny nose, sore throat, eye problems, generalized rash, pale palms, and other).

3) Peak Stool Frequency: This is a continuous variable and measures the number of watery stools on the worst day, for children who were reported to have many watery stools (diarrhea).

Provider

a. Type: This is represented by a set of two dummy variables, representing private facilities and drug/other shops respectively, with public facilities as the reference.

b. Cost of Care

Cost of care consists of money as well as time (opportunity) costs. In addition to obtaining information on observed time and money expenditures for actual provider visits, the survey obtained information on expected (perceived) travel time and money costs of visiting a second choice provider if the provider visited (first choice provider) was not available. The two variables listed below were used in the analysis to measure both actual costs of care for the provider visited and perceived costs of care for a second choice provider.

1) Money Cost (consultation fee and transportation cost) (Ugandan Shillings)

2) Travel time to provider (one-way travel time in minutes)

APPENDIX 2: CONSTRUCTION OF HOUSEHOLD SES INDEX

There were five variables constructed: 1) using principal components, a categorical variable with 5 categories (quintiles) of households based on household asset ownership, household housing characteristics data, and education level of the head of household, 2) using principal components, a categorical variable with 5 categories (quintiles) of households based on household asset ownership and household housing characteristics data, 3) using principal components, a categorical variable with 5 categories (quintiles) of households based on household asset ownership and head of household education, 4) using principal components, a categorical variable with 4 categories (quartiles) of households based only on household asset ownership and 5) a dichotomous variable based on household asset ownership with 1 representing the poorest households owning no assets and 0 representing the households owning at least one asset.

All five wealth variables were retained and tested for sensitivity analyses of outcomes based on choice of wealth indicator. This appendix provides details on construction of the SES indices through use of Principal Components Analysis (PCA).

The household survey asked about existence (Y/N) of gas and electricity as well as ownership of the following assets:

- Telephone
- Radio (working specified)
- TV (working specified)
- Watch/clock
- Car
- Motorcycle
- Bicycle

In addition, the household survey collected the following information regarding household characteristics:

- Source of drinking water
- Source of water for dish washing
- Type of toilet or sanitation facility
    - Shared? (Y/N)
- Material of floor
- Material of roof
- Material of walls

The household survey also collected the following information regarding education level of the head of household:

- Highest level of school attended

    - None
    - Primary
    - Secondary
    - Higher

- Highest grade completed at that level
-

Principal Components Analysis (PCA)

The statistical technique of principal components analysis as a method of data reduction was used to create three different wealth indices. Households were classified according to their position with respect to the entire sample of households and not merely the sub sample of households with children under the age of five.

The first index used information on ownership of assets, to include gas and electricity; all household characteristics; and education level of the head of household. Only the variable denoting the highest level of school attended was used for the index. The other education variable, highest grade completed at that level, had too many missing values to be used for the index. The table below presents the wealth index distribution at the level of the household as well as the individual child.

Principal Components Analysis using Assets, Household Characteristics, and Education Level of head of household		
Wealth level	Proportion (percent) Unit of analysis=household (N=10393)	Proportion (percent) Unit of analysis=child<5 years N=3265
Poorest	20.0	17.1
Second Quintile	19.9	21.1
Third Quintile	20.0	20.9
Fourth Quintile	20.0	20.7
Richest	20.1	20.2

The second index used information on ownership of assets, to include gas and electricity, as well as information on all household characteristics. The principal components analysis retained 52 out of 58 components as the default in Stata is to set the minimum value of eigenvalues to be retained equal to one, so that factors that predict less variance than would be expected from random data will be screened out. Out of 13,889 households, information was missing in 2,959 households. Information on the characteristics and asset ownership of 10,930 households was used to construct five quintiles of relative poverty, based on scoring only the first principal component. The quintiles are not exactly equal as the statistical software that was used, Stata, will not cut the data into groups of equal numbers of observations if that would require it to break up groups of observations that have the same value. These household wealth quintiles were then applied to individual child observations, so that all children in the same household were put into the same wealth quintile. To control for clustering at the household level, standard errors are adjusted for clustering in the analysis. The table below presents the wealth index distribution at the level of the household as well as the individual child.

Principal Components Analysis using Assets and Household Characteristics		
Wealth level	Proportion (percent) Unit of analysis=household (N=10930)	Proportion (percent) Unit of analysis=child<5 years N=3468
Poorest	19.3	17.4
Second Quintile	20.6	22.3
Third Quintile	20.1	19.6
Fourth Quintile	20.0	20.3
Richest	20.0	20.4

The third index used information on assets and head of household education. The table below presents the wealth index distribution at the level of the household as well as the individual child.

Principal Components Analysis using Household Assets and Head of Household Education		
Wealth level	Proportion (percent) Unit of analysis=household (N=12114)	Proportion (percent) Unit of analysis=child<5 years (N=3748)
Poorest	15.71	10.91
Second Quintile	19.11	16.92
Third Quintile	23.38	25.03
Fourth Quintile	21.25	22.92
Richest	20.56	24.23

The forth index only used information on assets. Asset information was missing in only 1,148 households, so 12,741 households were used. Stata retained all nine components, and the first principal component was scored. The distribution of this scored variable did not allow cuts into quintiles, as most of the observations were clustered on the very poor side. Instead, Stata cut the data into four groups. The table below presents the wealth index distribution at the level of the household as well as the individual child.

Principal Components Analysis using Household Assets Only

Wealth level	Proportion (percent) Unit of analysis=household (N=12714)	Proportion (percent) Unit of analysis=child<5 years (N=3981)
Poorest	29.24	23.29
Second Quartile	26.58	28.16
Third Quartile	23.40	24.16
Richest	20.78	24.39

Equal weighting of Assets

I also used information on only assets from these 12,471 households to form an asset index by weighting each of the nine assets equally. Stata cut this asset index into three groups. The poorest group by this method consisted of 3,726 households with no assets. These households match the same households in the bottom category from principal components analysis of the asset data.

Index of Household Assets Weighted Equally		
Wealth level	Proportion (percent) Unit of analysis=household (N=12714)	Proportion (percent) Unit of analysis=child<5 years N=(3981)
Poorest	29.24	23.29
Second Tertile	27.17	28.59
Richest	43.58	48.03

Because the households were not equally divided between the three groups, I decided to create a dichotomous variable for asset ownership with 1 representing the poorest households with no reported assets and 0 representing the non-poorest with at least one reported asset.

I tested each asset index in the respective multivariate models of sick, utilize and choice of provider to ascertain the most appropriate scale for the SES variable.

Wealth groups	Proportion (percent) Of all households (N=12714)	Proportion (percent) Of all children child<5 years N=3981
No Assets	29.24	23.29
One or more assets	70.76	76.71

APPENDIX 3: Analysis of the Sensitivity SES Association with Outcomes to Choice of SES Measure

SES Measures:

a) Dichotomous variable of asset ownership (1=yes, 0=no) [poorest3]
b) Asset Quintiles created through PCA, including only household assets [quintcuts2]
c) Wealth Quintiles created through PCA, including household assets and housing characteristics [quintcuts]
d) Wealth Quintiles created through PCA, including household assets, housing characteristics, and education level of head of household [quintcuts5]
e) Wealth Quintiles created through PCA, including household assets and head of household education [quintcuts6]

Outcomes:

1) Probability of Sickness (diarrhea, and/or fever, and/or fast/difficult breathing)
2) Probability of Utilizing Care for these conditions/symptoms
3) Multinomial probability of choice of provider

1) Sickness

a)

```
       |    1=hh reports no
           |        assets
     sick2 |    assets  no assets |     Total
-----------+----------------------+----------
         0 |      2036        622 |      2658
         1 |      1018        305 |      1323
-----------+----------------------+----------
     Total |      3054        927 |      3981

          Pearson chi2(1) =   0.0597   Pr = 0.807
```

b)

```
                      Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      2.47575921      4   .618939802      2.80     0.0245
 Within groups      765.167551   3463   .220955111
------------------------------------------------------------------------
    Total            767.64331   3467    .22141428

Bartlett's test for equal variances:  chi2(4) =   3.2831  Prob>chi2 = 0.512

                       Comparison of sick2 by quintcuts
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu   fourth q
```

```
---------+--------------------------------------------
second q |    .053525
         |      0.362
         |
third qu |    .062689    .009163
         |      0.172      1.000
         |
fourth q |    .082147    .028622    .019458
         |      0.017      1.000      1.000
         |
 Richest |    .036305    -.01722   -.026384   -.045842
         |      1.000      1.000      1.000      0.671
```

c)

```
                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups        1.901748      4   .475437001      2.14     0.0730
 Within groups      723.208819   3260   .221843196
------------------------------------------------------------------------
    Total           725.110567   3264   .222153973

Bartlett's test for equal variances:  chi2(4) =   2.0085  Prob>chi2 = 0.734

                      Comparison of sick2 by quintcuts5
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu   fourth q
---------+--------------------------------------------
second q |   -.007823
         |      1.000
         |
third qu |    .034398    .042221
         |      1.000      0.971
         |
fourth q |    .057133    .064956    .022736
         |      0.340      0.108      1.000
         |
 Richest |    .009597     .01742   -.024801   -.047536
         |      1.000      1.000      1.000      0.652
```

d)

```
                                            Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      .083389009      3   .027796336      0.13     0.9453
 Within groups      883.245925   3977    .22208849
------------------------------------------------------------------------
    Total           883.329314   3980   .221942039

Bartlett's test for equal variances:  chi2(3) =   0.0945  Prob>chi2 = 0.992

                      Comparison of sick2 by quintcuts2
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu
---------+---------------------------------
second q |    .006396
         |      1.000
```

```
         |
third qu |    .008819    .002423
         |      1.000      1.000
         |
 richest |   -.002551   -.008947    -.01137
         |      1.000      1.000      1.000
```

e)
```
                        Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      1.39807066      4   .349517666      1.57     0.1803
 Within groups      835.016017   3743   .223087368
------------------------------------------------------------------------
    Total           836.414088   3747   .223222335

Bartlett's test for equal variances:  chi2(4) =   1.3839  Prob>chi2 = 0.847

                      Comparison of sick2 by quintcuts6
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu   fourth q
---------+--------------------------------------------
second q |   -.029995
         |      1.000
         |
third qu |    .024439    .054435
         |      1.000      0.250
         |
fourth q |   -.015174    .014822   -.039613
         |      1.000      1.000      0.758
         |
 Richest |   -.015206     .01479   -.039645   -.000032
         |      1.000      1.000      0.715      1.000
```

2) Utilization

a)

```
utilized |
  care for |
  diarrhea |
  or fever |
        or |
fast/diffi |    1=hh reports no
      cult |        assets
 breathing |    assets  no assets |     Total
-----------+----------------------+----------
         0 |       635        189 |       824
         1 |       383        116 |       499
-----------+----------------------+----------
     Total |      1018        305 |      1323

          Pearson chi2(1) =   0.0168   Pr = 0.897
```

b)
```
                      Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      .564670332      4   .141167583      0.60     0.6643
 Within groups      269.702113   1142   .236166473
------------------------------------------------------------------------
```

```
    Total           270.266783   1146   .235834889

Bartlett's test for equal variances:  chi2(4) =   0.2326  Prob>chi2 = 0.994

Comparison of utilized care for diarrhea or fever or fast/difficult breathing
                                 by quintcuts
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu   fourth q
---------+--------------------------------------------
second q |      .0181
         |      1.000
         |
third qu |      .0199      .0018
         |      1.000      1.000
         |
fourth q |    .003044   -.015055   -.016856
         |      1.000      1.000      1.000
         |
 Richest |    .063399    .045299    .043499    .060355
         |      1.000      1.000      1.000      1.000
```

c)

```
                       Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      1.37388887      4   .343472218      1.45     0.2138
 Within groups      255.420959   1082   .236063733
------------------------------------------------------------------------
    Total           256.794848   1086   .236459345

Bartlett's test for equal variances:  chi2(4) =   0.5641  Prob>chi2 = 0.967

Comparison of utilized care for diarrhea or fever or fast/difficult breathing
                                by quintcuts5
                                (Bonferroni)
Row Mean-|
Col Mean |    Poorest   second q   third qu   fourth q
---------+--------------------------------------------
second q |    .047583
         |      1.000
         |
third qu |   -.014008   -.061591
         |      1.000      1.000
         |
fourth q |     .00255   -.045033    .016558
         |      1.000      1.000      1.000
         |
 Richest |    .081315    .033732    .095323    .078765
         |      1.000      1.000      0.379      0.821
```

d)

```
                       Analysis of Variance
    Source              SS         df      MS            F     Prob > F
------------------------------------------------------------------------
Between groups      1.37388887      4   .343472218      1.45     0.2138
 Within groups      255.420959   1082   .236063733
------------------------------------------------------------------------
    Total           256.794848   1086   .236459345

Bartlett's test for equal variances:  chi2(4) =   0.5641  Prob>chi2 = 0.967

Comparison of utilized care for diarrhea or fever or fast/difficult breathing
                                by quintcuts5
                                (Bonferroni)
```

Row Mean- / Col Mean	Poorest	second q	third qu	fourth q
second q	.047583 1.000			
third qu	-.014008 1.000	-.061591 1.000		
fourth q	.00255 1.000	-.045033 1.000	.016558 1.000	
Richest	.081315 1.000	.033732 1.000	.095323 0.379	.078765 0.821

e)

Analysis of Variance

Source	SS	df	MS	F	Prob > F
Between groups	1.36765977	4	.341914943	1.45	0.2139
Within groups	295.053769	1255	.235102605		
Total	296.421429	1259	.235441961		

Bartlett's test for equal variances: chi2(4) = 0.7833 Prob>chi2 = 0.941

Comparison of utilized care for diarrhea or fever or fast/difficult breathing
by quintcuts6
(Bonferroni)

Row Mean- / Col Mean	Poorest	second q	third qu	fourth q
second q	-.083911 1.000			
third qu	-.043771 1.000	.04014 1.000		
fourth q	.016345 1.000	.100255 0.260	.060115 1.000	
Richest	-.030038 1.000	.053872 1.000	.013732 1.000	-.046383 1.000

3) Provider

a)

multinomial variable for where advice/tx 1st sought outside the home	1=hh reports no assets: assets	no assets	Total
Hospital	27	7	34
other government/publ	44	14	58
NGO/other private	162	49	211
drug shop/other shop/	150	46	196
Total	383	116	499

Pearson chi2(3) = 0.1660 Pr = 0.983

b)

quintcuts	multinomial variable for where advice/tx 1st sought outside the home				Total
	Hospital	other gov	NGO/other	drug shop	
Poorest	4	8	27	22	61
second quintile	5	13	35	45	98
third quintile	4	12	41	32	89
fourth quintile	7	16	35	35	93
Richest	10	6	48	31	95
Total	30	55	186	165	436

Pearson chi2(12) = 13.5490 Pr = 0.330

c)

quintcuts5	multinomial variable for where advice/tx 1st sought outside the home				Total
	Hospital	other gov	NGO/other	drug shop	
Poorest	4	7	26	26	63
second quintile	2	12	34	38	86
third quintile	5	11	37	29	82
fourth quintile	6	16	36	33	91
Richest	8	6	46	34	94
Total	25	52	179	160	416

Pearson chi2(12) = 10.6755 Pr = 0.557

d)

quintcuts2	multinomial variable for where advice/tx 1st sought outside the home				Total
	Hospital	other gov	NGO/other	drug shop	
Poorest	7	14	49	46	116
second quartile	5	14	50	54	123
third quartile	12	20	62	47	141
richest	10	10	50	49	119
Total	34	58	211	196	499

Pearson chi2(9) = 6.6139 Pr = 0.677

e)

quintcuts6	multinomial variable for where advice/tx 1st sought outside the home				Total
	Hospital	other gov	NGO/other	drug shop	
Poorest	0	7	19	31	57
second quintile	4	6	31	23	64
third quintile	7	12	58	48	125
fourth quintile	12	20	45	42	119
Richest	5	10	51	46	112
Total	28	55	204	190	477

Pearson chi2(12) = 18.5083 Pr = 0.101