User Fees and Demand for Health Care

Operations Research for ASSP (*Accès aux Soins de Santé Primaires*) Project in the Democratic Republic of Congo

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EXECUTIVE SUMMARY

Background: In the DRC, chronic underfunding of the public health care system has meant that zonal health care facilities have historically been heavily reliant upon household out-of-pocket payments and humanitarian programs for financial support. A number of health financing assessments in the DRC have found that user fees are the primary mechanism for public, faith-based and other types of private providers to finance the operating costs of facilities and the salaries of staff. In previous projects supported by DFID in the DRC, health care was provided free of charge. However, recent efforts to create sustainable services entail health facilities in ASSP-supported zones to begin charging fees for services, based on guidelines developed by the project. Charging for health services, however, raises both ethical and economic questions. At the heart of the matter is how responsive households – particularly poor and vulnerable households – are to changes in the prices of care, and to what extent does charging for health services – or raising the prices of non-free services - cause people to switch to alternative providers, to turn to self-treatment of illnesses, to seek out inferior care, to under-use needed care or simply to forego care, thereby potentially worsening overall health. This report examines the responsiveness of households to changes in the price of key health services at facilities in ASSP areas and facilities in non-ASSP areas.

Data: As part of the evaluation of the ASSP project, a population-based household survey of health and health care seeking behaviours was conducted in 2014 in randomly selected households in ASSP areas and in non-ASSP comparison areas. A concurrent health facility survey was undertaken to provide detailed information on the health centre designated to serve households in these areas. Data on health care seeking and health expenditures were collected from 2,045 households in ASSP areas and 2,075 households in non-ASSP areas. Data were collected from 210 health facilities in these areas. This study focuses only on the households in ASSP and non-ASSP rural areas.

Methods: We combine data on household health care seeking behaviours (demand side) with information on the health facilities that serve those households (supply side). We use multilevel multivariate modelling to estimate the demand for specific health services provided by ASSP health facilities, focusing specifically on how the price of care affects the use of essential services. The outcomes we examine are binary: use of outpatient curative care, antenatal care, facility delivery, postnatal care or modern contraception. We focus only on rural ASSP areas, which make up approximately 85% of the sample of ASSP households. Econometric models control for income, education and other household characteristics, as well as characteristics of the nearest health facility (e.g., proximity, size, services offered, staffing, quality, and price). Coefficients from the multivariate models are used to calculate price elasticities – a measure of how responsive potential clients are to different price levels – and income elasticities – a measure of how use of health services differs for different income levels. For curative care models, controls are also taken for non-random reporting of illness (e.g., two-part Heckman selection models).

Results: This study finds that users of health services are relatively insensitive to the price of care, particularly for those health services that may be deemed more necessary (e.g., curative care, ANC, facility delivery) and at the prices currently being charged in this sample of health facilities. This holds for both genders and for different wealth quintiles. All estimates of the price elasticity of demand are well below 1, a range in which demand is considered to be inelastic to changes in price. These findings are consistent with those found elsewhere, both in developing and developed countries. Individuals are more price responsive for post-natal care (ε_D = -0.306), which does not have wide uptake, and for curative care for individuals over the age of 55 years (ε_D = -0.394); nonetheless the price elasticity of demand for all health services is inelastic. We simulate price changes for different services, showing how the use of health services would change at different price points. This is measured with some imprecision because price – in a statistical sense – is generally not related in the models to use of health services. Hence, over reasonable ranges of values, we would not expect substantial decreases in health services utilization. Further, the prices that are being charged are on average a small share of household income and hence do not appear to be impoverishing. In this scenario, raising prices would appear to be able to increase ASSP revenue with minimal effects on the well-being of the populations that they serve.

Policy Implications: The implications of these findings are that reasonable changes in price, as defined in the report, should have very little impact on the utilization of health services. Other factors – distance, quality and education – may play larger roles in the determination of who uses health services, and therefore focus should be on these elements. There are several limitations which need to be taken into consideration if making policy decisions based on results. These are discussed in detail in the report.

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1. Background

Due to the instability that the Democratic Republic of Congo (DRC) has experienced over the past several decades, the country's health care delivery system and financing arrangements have been severely weakened, affecting the availability and quality of health care services. The public health care system remains chronically underfinanced, and as a result, zonal health care facilities have been heavily reliant on household out-of-pocket payments and humanitarian programs. A number of health financing assessments in the DRC have found that user fees are the primary mechanism for public, faith-based and other types of private providers to finance the operating costs of facilities and the salaries of staff.

Historically, the implementation of user fees in developing countries has raised concern because of the potential to limit access to health care, particularly for vulnerable groups (World Bank, 1987). Further, the payment of user fees for catastrophic health events can have sizable opportunity costs, reducing household consumption on other goods and necessities and forcing shifts in household labour patterns, often with detrimental impacts on children's schooling. In the absence of exemption criteria, insurance or other safety nets, raising prices, or charging any price at all, will *ceteris paribus* reduce the utilization of health care, causing individuals to switch to other providers or forego care. If health care were like many other consumer goods and services, this might not be a cause for concern. However, health care is generally considered to be different from other goods.

First, health care is typically not consumed for its own sake. People do not generally derive pleasure or utility simply from going to the doctor. Rather people use health care to improve, maintain or restore good health, which allows people to live longer, enjoy healthier lives, and experience a higher quality of life (Grossman, 1972). In this sense, the demand for good health produces a derived demand for health care (Phelps, 1992). As such, changes in the price of health care may lead to households to reduce their consumption of health care, thereby leading to changes in a person's stock of health.

Related to this is the general belief across societies and cultures that a minimum level of health, or at least access to a minimum package of health services, is a basic right (Sen, 2000). Hence, health care and the consequent good health that it can produce are often accorded greater significance because good health can provide "people with the opportunity and/or capability to achieve desired things" (Rice, 2002). Absence of good health, in contrast, can foster an irremediable bond with poverty; serious illnesses can prevent people from working at a time when the need for additional financial resources is particularly acute. A central public sector role in health is therefore generally felt to be the assurance of an equitable distribution of health resources so that all citizens can enjoy at least some basic level of health (WHO, 1981; World Bank, 1987; Gwatkin, 2000). As described by Culyer (2001), "If it is felt that all residents of a political jurisdiction ought to have equal opportunities for their lives to flourish, then it follows that health care is one of the goods and services whose right distribution must be ensured."

Over the past several decades, user fees for health services have been reviewed and studied extensively in the health economics literature and by development agencies, focusing in particular on how responsive specific groups – particularly the poor – are to changes in price and insurance coverage. An important policy question is whether or not charging for health services – or raising the prices of non-free services – will cause large numbers of people to turn to self-treatment of illnesses, to seek out inferior care, to substantially reduce their use of health care or simply to forego needed care, with resultant worsening of overall health. Studies of user fees have therefore sought to estimate the price elasticity of demand for health care – the percentage change in the utilization of health services for a percentage change in the price of those health services, holding constant other factors that can influence demand.

The demand for health care depends upon a number of factors: the money and time price of using health care, the prices of alternatives (e.g., other forms of prevention or treatment), the prices of complements, perceived need and the severity of illness, the availability of effective treatments or health interventions, individuals' perceptions and valuation of (good health in) the future, and an individual's budget constraint. Supply-side factors, including quality, perceptions of the quality of care, availability of drugs, supplies and equipment have also been shown to matter (Akin, Guilkey & Denton, 1995; Mwabu, 1986; Hutchinson, Do & Agha, 2011).

The empirical literature on the price responsiveness of people to changes in health care prices has been the source of extensive scrutiny (Wedig, 1988; Phelps, 1992; Ringel, Hosek, Vollaard and Mahnovski, 2002; Dupas, 2012). The seminal work in this area – the Rand Health Insurance Experiment in the United States – found price elasticities of demand for health care that were in the range of -0.14- -0.39, indicating that health care utilization changed less than proportionately to changes in price. While subsequent studies in high-income countries have shown greater variation in elasticity estimates, nearly all have shown that the price elasticity of demand tends to be inelastic (Ringel et al., 2002; Wedig, 1988; Zhou, Su, Gao, Xu & Zhanga, 2011).

In lower income countries, studies have provided less consistent results. Some studies report that changes in price have substantial effects on the quantity of medical services demanded (Alderman & Gertler, 1989; Mwabu 1986; Gertler & van der Gaag, 1990), i.e., that demand is elastic. Other studies have found that price elasticities are relatively inelastic, indicating that the quantity demanded of curative care changes little in response to changes in price (Akin, Griffin, Guilkey & Popkin, 1986; Schwartz, Akin & Popkin, 1988; Akin et al., 1998). Simulations from studies using data from Ghana, Nigeria and Kenya have found relatively small changes in utilization due to simulated increases in public and private prices of care (Alderman & Lavy, 1996; Lavy & Germain, 1994; Akin et al., 1995; Mwabu, Ainsworth& Nyamete, 1993).

More recently, evidence from randomized controlled trials in developing countries has also yielded mixed results. For example, Cohen, Dupas and Schaner (2011) find that demand for artemisinin-based combination therapies (ACTs) in Kenya is highly price-elastic above a certain range but very inelastic at low prices, especially for children. They estimated a 13 percent decline in ACT purchases at drug shops when price subsidies for ACT decreased from 92 to 80 percent, corresponding to a 150 percent price increase. However, for children, who are "much more likely to actually have malaria and for whom malaria is most dangerous, there is no significant price sensitivity in this range. This implies that some reduction in the ACT subsidy…. is unlikely to meaningfully reduce access."

Overview of ASSP project and the user fees strategy

In an effort to strengthen the health care delivery system and increase service utilization, the DRC's Ministry of Health has developed a five-year health development plan, which is being implemented with support from a number of international health partners, including the United Kingdom's Department for International Development (DFID) (Ministère de la Santé Publique, 2010). As part of its programme to assist the government in strengthening the country's health system, DFID awarded the five-year ASSP (Accès aux Soins de Santé Primaires) project to IMA World Health and its implementing partners and subcontractors in Fall 2012. ASSP is a health systems strengthening project tasked with working in 56 health *zones* in Equateur, Orientale, Kasai-Occidental, Kasai-Oriental, and Maniema provinces of the DRC.

In previous projects supported by DFID, effort was made to minimize the financial burden of health care costs to users. Health care was provided free of charge to pregnant women and children under five years of age. A nominal charge was paid by other categories of patients consistent with government policy that users participate in health care financing. In an effort to continue to provide services consistent with national policy, health facilities in ASSP-supported zones are currently charging fees for services. Both ASSP and the national government are committed to not charging fees that have deleterious effects. However, knowing what constitutes an unreasonable financial burden, determining how changes in fees will impact households across different income levels, and setting appropriate fee schedules and exemptions requires detailed information on health care utilization patterns and precise measurement of how differences in access, quality, and affordability contribute to those patterns. It also requires tracking whether the strategy is being implemented as planned.

In order to improve the availability and quality of health care services, as well as to make progress towards the financial sustainability of the health system, the ASSP project has introduced an array of health financing initiatives in project-assisted health zones. These include the following:

- In the health zones that were previously receiving financial and technical assistance from DFID, ASSP has eliminated primes, for example top offs and salary supplements, paid to heath care workers.

- In selected health zones, ASSP has introduced community-based income generation schemes (Community Health Endowments [CHE]) that provide financial risk protection to community members. The CHEs are intended to be a new source of funds for the health system, thereby permitting a reduction in user fees charged to clients.

- In all project health zones, ASSP has introduced guidelines aimed at standardizing the user fees setting approach, while allowing for differences in fees level across health zones. Provincial health departments (divisions) participate in the exercise. The guidelines include provisions to exempt the poor and other vulnerable populations for curative care in all ASSP health zones and delineate selected services to be free of charge for all populations. The covered services (services exempt from user charges) include: immunizations, growth monitoring, administration of Vitamin A, distribution of long-lasting insecticide-treated nets (LLINs) to pregnant women and infants during antenatal care and immunization visits, distribution of LLINs in campaigns, prevention of mother-to-child transmission (PMTCT), and basic family planning services.

2. Study Objectives

Tulane University's School of Public Health and Tropical Medicine (Tulane) is responsible for the operations research and impact evaluations for the ASSP project. The user fee study is part of a larger study evaluating the impact of ASSP and will be carried out in two phases. The current (first) phase looks at how user fees affect health care utilization. The objectives for the first phase of the study are the following:

a) To estimate the price elasticity of demand for different health services at ASSP and non-ASSP facilities for different wealth groups and for men and women and to estimate the potential decrease in utilization for these different groups from varying sized changes in price.

b) To assist ASSP in refining its cost recovery strategy so that it minimizes harm to households and provides incentives for households to utilize cost-effective health care services.

c) To assist ASSP in recommending the appropriate levels of user fees, better targeting vulnerable groups, and refining its overall cost recovery strategy.

d) To provide information to the government on harm minimization and to donors on how to get best value for money in settings where the national policy is to incorporate cost recovery.

The following are the principal research questions that will be investigated in phase one:

1. To what degree do changes in user fees affect health care utilisation, after controlling for other characteristics of health services and households that may also impact utilisation?

2. How does this responsiveness in service utilisation to changes in user fees vary by gender, and by the wealth and educational status of household members?

To answer these questions, we combine data on household health care seeking behaviours with data on the health service supply environment in which households reside. This tells us what different people did when faced with different choices about care. Then we specify an econometric model of the demand for health care which includes prices, supply characteristics and household characteristics. This allows us to parse out the effects of price, income, education, gender, quality and other demand determinants. Finally, we estimate the models and calculate elasticities – measures of how responsive consumers are to price and to demand shifters (e.g., income, education, quality of care, alternatives).

The second phase of the study will be a process evaluation of the implementation of the user fee component of ASSP.

3. Data

This study uses data from the 2014 baseline household and health care facility survey, which was administered as part of the overall impact evaluation of the ASSP project. This impact evaluation involves a quasi-experimental panel study design to obtain changes in point estimates of health outcomes, health care utilization, out-of-pocket expenditures, malaria parasite prevalence, quality of health care services and community participation in health care. Baseline and endline data are being used to evaluate the impacts of the changes in ASSP service quality, availability and pricing over the period from 2014 (baseline) to 2017 (endline). A panel design is being implemented at the village level, making it possible to control for unobserved community-level confounding factors that are fixed across time within units of observation (villages), as well as to accurately measure changes in exposure over time to ASSP activities. This approach will allow plausible attribution of ASSP support on outcome and impact indicators using a dose response approach and a difference-in-differences approach.

Ethical approval for the study and collection procedures was obtained from the Institutional Review Boards of both Tulane and Kinshasa School of Public Health.

Household Survey

Households were sampled from health zones in the Orientale, Maniema, Equateur, Kasai-Occidental and Kasai-Oriental provinces. Sampling involved both a two-stage sample design – the probability of first stage selection was proportional to relative village sizes with twenty households then selected in each village using an interval approach – and three-stage sample design – involving intervention and matched comparison areas (Table 1).

For each household selected, the head of the household as well as all female household members of reproductive age (15-49 years) were interviewed. Information for all children under five years of age who are household members was also collected. When possible, this was done by interviewing the mother. However, in cases where no mother was present, the primary care giver was interviewed to take into account vulnerable children, orphans and child-headed households.

Overall, interviews occurred in 2,045 households in ASSP areas and 2,075 households in non-ASSP areas. Interviews were conducted with 2,962 and 3,470 women aged 15-49 years in ASSP and non-ASSP areas respectively. Overall, illness or injury in the four weeks preceding the survey was reported by 1,632 household members in ASSP areas 1,766 household members in non-ASSP areas.

Table 1: Sample sizes and response rates for ASSP and non-ASSP households, by sampling area.

	ASSP Areas	Non-ASSP Areas
Household interviews		
Households selected	2,069	2,109
Households occupied	2,068	2,109
Households interviewed	2,045	2,075
Household response rate	**98.9**	**98.4**
Interviews with women age 15-49		
Number of eligible women	3,168	3,739
Number of eligible women interviewed	2,962	3,470
Eligible women response rate	**93.5**	**92.8**
Sample of respondents reporting illness		
0 – 5 years	**545**	**604**
6-15 years	**318**	**351**
16-54 years	**603**	**676**
55+ years	**106**	**135**

Outcomes

As the goal of the study is to estimate price elasticity of demand for health care, the indicators that are used in this analysis pertain to those services for which a user fee is charged, namely, curative care and delivery services. Indicators relevant to curative care seeking and delivery are as follows:

Curative care:

- Whether or not a household member for whom an illness or injury occurred in the past 4 weeks sought formal **outpatient** health care for their chronic or acute health problems.
- Whether or not a household member for whom an illness or injury occurred in the past 4 weeks was admitted as an **inpatient** health care for their chronic or acute health problems.

Delivery:

- Whether or not a woman with a pregnancy in the last 5 years used **antenatal care** for the most recent pregnancy.
- Whether or not a woman with a pregnancy in the last 5 years **delivered in a health care facility**.
- Whether or not a woman with a pregnancy in the last 5 years used **postnatal care** for the most recent pregnancy.
- Average out-of-pocket household health expenditures per delivery attended by a skilled attendant.

Contraceptive Use

- Whether or not a woman of reproductive age (15-49 years) is currently using **any method** of contraception or a **modern method** of contraception (female sterilization, male sterilization, implants, injectables, IUD, pill, male condom, female condom, suppository, jelly or foam).

Most of these outcomes are binary – whether services are used or not. For many of the services, this is an accurate depiction of the choices that people make because the outcomes occur only once – use postnatal care or not, deliver in a health facility or not, or use modern contraception or not. For others, it is possible that there is a measure of intensity of use, such as the number of visits for treatment of illness or the number of antenatal care visits. For the former, questions were asked only for the principal health care provider visited. No questions were asked about how many visits to the provider were required to treat the malady. In most cases, however, it is expected that a single visit would be necessary. For antenatal care, we focused only on a binary outcome of use to be in line with the other reproductive health outcomes – deliver in a facility or not or use postnatal care or not.

Health Facility Survey

The health facility survey was designed to be linkable with the household survey. Because only one village for the household survey was selected per health area, the health centre designated for serving that health area was selected. Thirty-five villages in each of three domains (Equateur; Maniema and Orientale; and Kasai-Occidental and Kasai-Oriental) were selected, resulting in 210 facilities being sampled. For each selected health facility survey, the head of the facility was interviewed using a structured questionnaire to measure facility-level indicators. All health care providers on duty at chosen health facilities were also interviewed using a structured health worker survey with questions on qualifications and experience, services offered, supervision, satisfaction, motivation, and income.

Conducting the facility survey in the same areas as the household survey allows the sample households to be "linked" to the attributes of a nearby health facility that they can utilize, making it possible to investigate the role of facility attributes in the utilization of health care services. Following the panel design approach, the same selected facilities are being surveyed at baseline and endline. Of greatest importance for this study is the estimate of the price that people are charged for health services. This information is taken from the health facility survey.

The health facility survey provides detailed information on the characteristics of the official health centre serving a village, including:

1. Levels, training and type of staffing
2. Services available
3. Prices of services
4. Privacy and confidentiality of visits
5. Physical infrastructure (e.g., running water, electricity, waiting areas, laboratories, inpatient and outpatient facilities, waste disposal)
6. Availability of essential drugs, equipment and supplies
7. Management and measures to respond to community input
8. Community financing initiatives

For our econometric models, we use two price variables: (1) the average of all prices at a facility (available for full sample)[1]and (2) the price of specific service at that facility (e.g., price of an antenatal care visit) (available only for partial sample; some households may be linked with a facility that does not offer that service). Those represent the actual price data that we have from our facility survey (i.e., what the facilities reportedly charge for specific health services). An alternative might have been to use self-reported medical expenditures from the household surveys (i.e., the total amounts that individuals report paying for health services). However, self-reported expenditures face a very large problem in that their use as a price variable conflates both price and quantity demanded, and therefore would be endogenous to the model. Hence, we have focused on the specific prices that facilities reportedly charge. We discuss below whether the prices set by facilities are exogenously determined or endogenously determined based on perceptions of local demand patterns, willingness to pay, or other characteristics of the local market.

Table 2 presents the price data for health facilities in ASSP and non-ASSP areas. In general, median prices for services are slightly lower in ASSP areas than non-ASSP areas. For three services (ANC, PNC and FP), the median price is 0 in ASSP areas, while the median prices for a delivery and the composite price variable ae 2,000 and 833 respectively. Slightly more than half of facilities in ASSP areas reportedly charge for ANC and FP but almost none charge for PNC.

[1] Information on the charges for outpatient visits was not collected in the health facility survey as it was reported there is not a standard fee for such visits. We then tried to infer an average price from what individuals reported paying for OP services. However, this proved infeasible; averaging across provinces and project/non-project areas did not provide sufficient variation while averaging across households within the same cluster resulted in too few observations in many cases such that the price was likely to be endogenous in our demand equations.

Table 2. Prices for specific services at sampled health facilities.

Variable	Obs	Median	Pct. Free	Mean	Std. Dev.	Min	Max
ASSP areas							
Average Price	105	833	2.9%	2,163	7,538	0	75,000
P (ANC)	103	0	52.4%	776	4,919	0	50,000
P (Delivery)	97	2,000	1.0%	5,980	30,247	0	300,000
P (PNC)	102	0	95.2%	10	70	0	500
P (FP)	63	0	56.2%	108	502	0	3,000
Non-ASSP areas							
Average Price	105	1,357	2.9%	2,016	3,291	0	21,500
P (ANC)	103	500	23.8%	833	849	0	3,000
P (Delivery)	103	3,200	3.8%	4,037	3,338	0	14,000
P (PNC)	104	0	92.4%	55	225	0	1,500
P (FP)	57	0	41.0%	304	749	0	3,500

We restrict our analysis to rural areas, where respondents are likely to have very limited health care options: generally, the official health centre, pharmacies or drug shops or self-treatment. Hence the characteristics of the official health centre – its proximity, quality and affordability – are likely to substantially influence care-seeking decisions. In peri-urban areas, however, the assumption that a single health facility accurately depicts a household's health care choice set may be more tenuous, as there are likely to be a much wider set of options.

4. Analytic Methods

The primary goal of the analysis is to estimate demand elasticities, focusing in particular on own price elasticity and income elasticity of demand for ASSP services. Of greatest importance is calculating the **own price elasticity of demand,** which refers to how the quantity of a good or service changes for different prices of that good or service. As noted, when prices rise – all other things held equal – consumers tend to use less of that good or service. But how much less? To ascertain this, we use multivariate models to estimate price elasticities. Price elasticities less than one indicate that a health service is price inelastic; a percentage change in price induces a less than proportionate change in the quantity demanded. Price elasticities greater than one indicate that the price elasticity of demand is elastic; people alter their use of health services by a greater percentage than the percentage changes in price.

The values of price elasticities are important not just to see how utilization changes but also to estimate how facility revenue will change with price changes. If prices rise but people do not reduce consumption very much (i.e., demand is inelastic), then facility revenue will increase. On the other hand, if prices rise and everyone switches to different providers or no providers at all, then revenue will decrease (even go to zero if price is raised too much).

We also estimate the **income elasticity of demand,** which refers to how responsive the demand for a good or service is to changes in income. In general, higher income households tend to consume more goods and services because they have more resources available to consume those goods and services. This has been shown to be true in health care as well, although most of the empirical literature has found that health care tends to be relatively income elastic (Ringel et al., 2002; Phelps, 1992; DiMatteo & DiMatteo, 1998). In the case of health care, some types of providers may be considered to be of lower quality – or inferior – to other, more expensive types of providers. As such, at higher levels of income, households may switch from lower quality public care, or care with longer waiting times, to more expensive private care with more amenities.

Numerous studies have shown that the non-poor and more educated tend to use more health services (van Doorslaer, Masseria, Koolman & OECD, 2006; Zhou et al., 2011; Hutchinson, 1999; Mwabu et al., 1993). Similarly, demand tends to be more elastic among the poor, when there are many substitutes, in urban areas, for non-necessities and for less severe illnesses/conditions.

Because we link households to only one health care provider, we cannot demonstrate the effect of changes in prices at alternative health care providers. Hence, we cannot estimate **cross price elasticities**.

Multivariate Analysis

The health facility and household variables are a source of contextual information that captures the effects of different influences on care-seeking behaviour. In order to capitalize on the richness of these data, we use multilevel regression analysis to estimate the adjusted relative effects of both facility characteristics (user fees, proximity, service availability, facility attributes that influence service quality) and of household and women's characteristics (wealth, education, severity of illness) on service utilization and health outcomes after controlling for other individual, household, and facility-level factors. Modelled in this way, the analysis looks at the factors associated with whether or not a person uses the local health facility or does not. If they do not, they choose the alternative (e.g., self-treat, go to the pharmacy, use a private provider for curative care; deliver at home; or do not use antenatal care, postnatal care or contraception).

We specify a two-level econometric model in which at the first (micro) level are the individual respondents (denoted by the subscript i), while at the second (macro) level are the sampled villages (denoted by the subscript j) in which these individuals live. The principal outcome (Y_{ij}) is a binary variable indicating whether or not a person uses health care: Y_{ij}=1 if a person uses care and Y_{ij}=0 otherwise.

$$Y_{ij} = \beta_0 Y_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 M_{ij} + \beta_3 F_j + \beta_4 C_j + \beta_5 P_j + \beta_6 T_j + \varepsilon_{ij} + \mu_j \quad \varepsilon_{ij} \sim N(0,1), \quad \mu_j \sim N(0,\tau)$$

where:

X_{ij} = matrix of individual characteristics (age, gender, level of education, severity of illness, days of illness) for individual i in community j

M_{ij} = matrix of household characteristics (wealth, household structure) for individual i in community j

F_j = matrix of facility characteristics (type, size, services offered, availability of drugs and supplies, equipment index, hours open, staffing, distance from household) for a facility in community j

C_j = matrix of community characteristics (norms, infrastructure, roads) for community j

Pj = price index for health services at the designated health centre in community j

The term ε_{ij} is an independent and normally distributed error term that varies by individual and community. Its variance is standardized to equal one. The term μ_j is a group level normally distributed error term with mean of zero and variance of τ.

We estimate the above econometric model using *Stata 14.0*. We use a probit link function for binary outcomes (use or do not use care).

This study uses a multi-stage cluster sampling strategy for the household survey for intervention and control areas. All analyses control for differential probabilities of selection of households using sample weights and for intracluster correlation using robust standard errors.

Elasticities

The primary objective of the above model specification is to estimate the elasticity of demand for health services using information from a random sample of individuals who face different prices and quality in their health care options and therefore make different choices. The model allows for quantifying the individual effects of each covariate on indicators of health service utilization, and therefore determining the relative importance of factors affecting the utilization of health services. For example, models that include multiple characteristics of facilities could potentially estimate the relative influence of different prices for health care, relative to differences in accessibility (e.g., how does service utilization change for every kilometre closer a household lives to a facility?), drug availability, hours of service, levels of staffing (e.g., do staff absences impact upon utilization?), or equipment (e.g., does non-functioning equipment or absence of lab tests deter utilization?). This allows for calculation of elasticities of demand for each of the variables in the model. The main question is to determine how responsive people are to different prices for services that differ in quality and accessibility. However, with elasticities of demand for different quality variables, we are able to simulate the relative impacts of changes in each of the determinants of demand. Notably, we can determine how price increases offset by quality improvements affect overall demand.

Elasticities are calculated using the post-estimation command *margins, eyex(var)* (for continuous variables such as price) and *margins, eydx (var)* for discrete variables (e.g., facility has doctor).

Policy Simulations

In addition to elasticity calculations, post-estimation simulations will be carried out using the estimated models to aid in the interpretation of regression results. Simulations are often used to determine the net effect of a change in variables of interest. This is done by predicting the direction of impact of the estimated variable on utilization of curative care and delivery services under different conditions, while holding other variables constant. This is particularly useful when trying to examine how different policies will affect utilization. For example, how would the predicted probabilities of seeking treatment when ill change if the user fee was increased by 100%, decreased by 50%, or set at a certain level? Do changes in user fees affect different segments of the population differently? If so, which sub-populations are more responsive to changes prices and more likely to be priced out of the formal health care system when user fees are increased? These simulations can be carried out on other variables of policy interest besides user fees, such as distance to health facility, drug and supply availability, weekly hours of operation, etc. In short, the simulation exercise allows for a deeper understanding of the regression results, and indeed the data, than the coefficients and elasticities alone, and is therefore a powerful tool for guiding policy changes.

Endogenous Illness Reporting and Sample Selection Bias

Previous researchers (Akin, Guilkey, Hutchinson and McIntosh 1998) have argued that estimations of the demand for curative care that do not account for the non-random self-reporting of illness are potentially biased because such respondents may be more or less price responsive than the full sample of respondents. In short, recognition and reporting of illness may be a function of whether or not a household member feels that a course of action (e.g., health care that is proximate, affordable, and of sufficient quality) is open to that person. To control for non-random self-reporting of illness, we will first estimate an equation for self-reported illness. Then, using a Heckman-type correction procedure, we will estimate the demand for different health care services. The price elasticity of demand for curative care will be derived from this second-stage equation.

Further details on the methods can be found in the research protocol, presented in Appendix 1.

5. Results

In the bivariate analysis, we look at differences in outcomes for the key individual level characteristics: gender, education, income and zone. In the multivariate analysis, we estimate the price, income and education elasticities from the coefficients in the regression models. All analyses focus solely on households from ASSP and non-ASSP rural areas.

Bivariate

Delivery Care and Family Planning

Overall, the use of modern contraception is quite low, currently used by only 4.2% of women who are currently married or in a union in the data set in ASSP rural areas. Modern contraceptive use is even lower in non-ASSP rural areas (2.3%). There are however significant differences by wealth quintile and domain. This is true as well for the delivery care outcomes. While 66.7% of women in ASSP areas made at least one ANC visit during the most recent pregnancy, women with a secondary or higher education were 19.1 percentage points more likely to make at least one ANC visit as compared with women with no education (75.0% versus 55.9%). Similar differences – in bivariate comparisons – were evident for delivering in a health facility (74.5% versus 48.9%) and use of postnatal care (44.7% versus 34.4%). A less linear relationship between wealth quintile and these outcomes was evident. Nonetheless, women in higher wealth households in ASSP areas tended to use more of all services.

Table 3. Reproductive, maternal and child health outcomes by level of education, wealth and zone (ASSP and non-ASSP rural areas)*

Background characteristic	% using modern contraception[1]	p-value	% with at least 1 ANC visit[2]	p-value	% delivered at health facility[3]	p-value	% with postnatal care[4]	p-value
ASSP areas								
Mother's educational attainment								
None	4.4	0.115	55.9	**0.019**	48.9	**0.004**	34.4	0.209
Primary	2.4		67.6		54.7		35.2	
Secondary and higher	7.2		75.0		74.5		44.7	
Wealth quintile								
Low	1.0	**0.010**	51.5	**0.016**	42.5	**0.022**	38.9	0.335
Low middle	1.5		76.2		63.5		35.6	
Middle	3.3		73.4		63.4		38.3	
High middle	9.8		62.0		58.1		30.4	
High	6.6		76.1		75.8		50.2	
Domain								
Equateur	1.4	**<0.001**	84.7	**0.027**	36.7	0.112	21.1	0.193
Kasai Occidental/ Oriental	1.2		58.4		59.6		42.2	
Maniema / Orientale	10.6		71.9		66.7		38.0	
Total	**4.2**		**66.7**		**58.7**		**37.7**	
n	**1,242**		**1,060**		**1,883**		**1,053**	

* Bold indicates that result is statistically significant at the 5% level.

Table 3 (continued). Reproductive, maternal and child health outcomes by level of education, wealth and zone (ASSP and non-ASSP rural areas)*

Background characteristic	% using modern contraception[1]	p-value	% with at least 1 ANC visit[2]	p-value	% delivered at health facility[3]	p-value	% with postnatal care[4]	p-value
Non-ASSP areas								
Mother's educational attainment								
None	1.1	0.211	55.9	**0.019**	48.9	**0.005**	34.3	0.209
Primary	2.1		67.6		54.7		35.2	
Secondary and higher	3.6		75.0		74.5		44.7	
Wealth quintile								
Low	2.2	0.053	51.5	**0.016**	42.5	**0.022**	38.9	0.335
Low middle	0.8		76.2		63.5		35.6	
Middle	0.9		73.4		63.4		38.3	
High middle	2.2		62.0		58.1		30.4	
High	4.8		76.1		75.8		50.2	
Domain								
Equateur	2.1	0.365	84.7	**0.030**	36.7	**0.112**	21.1	0.193
Kasai Occidental/ Oriental	2.9		58.4		59.6		42.2	
Maniema / Orientale	0.7		71.9		66.9		38.0	
Total	**2.3**		**66.7**		**58.7**		**37.7**	
n	**1,339**		**1,060**		**1,887**		**1,053**	

[1] Denominator includes women who are married or in union age 15-49.

[2] Denominator includes most recent births within 5 years of interview.

[3] Denominator includes all births within 5 years of interview.

[4] Denominator includes most recent births within 5 years of interview.

* Bold indicates that result is statistically significant at the 5% level.

Outpatient Care

Overall, there are few statistically significant differences in care-seeking behaviours for recent illnesses across genders, levels of education, wealth, and zone. In none of the age groups are men and women in ASSP areas statistically different in their care-seeking behaviours. Differences are evident for wealth quintile but in no cases are these differences statistically significant. There are statistically significant differences in care-seeking behaviour for 0-5 year olds by domain: 88.7% for children in Equateur, 73.0% in Maniema/Orientale and 67.1% in Kasai Occidental/Oriental (p=0.032).

Table 4. Percent of self-reported ill seeking care by gender, level of education, wealth and survey domain (ASSP rural areas).

Background characteristic	0-5 years	p-value	5-15 years	p-value	15-54 years	p-value	55+	p-value
ASSP areas								
Gender								
Female	71.0	0.860	58.8	0.941	63.6	0.662	56.2	0.272
Male	71.8		58.2		60.9		70.2	
Mother's educational attainment								
None	69.7	0.636	45.3	0.407	56.3	0.503	61.5	0.441
Primary	76.6		52.0		65.0		69.0	
Secondary and higher	68.2		67.6		64.8		46.7	
Wealth quintile								
Low	75.3	0.055	46.5	0.218	53.3	0.143	0.628	0.972
Low middle	65.5		74.0		63.7		0.609	
Middle	79.4		43.8		77.6		0.558	
High middle	58.0		64.7		55.8		0.646	
High	88.5		84.3		73.1		0.646	
Domain								
Equateur	88.7	**0.032**	79.2	0.396	72.4	0.484	15.9	0.232
Kasai Occidental/ Oriental	67.1		54.2		63.0		24.2	
Maniema / Orientale	73.0		63.9		58.4		15.8	
Total	**71.4**		**58.5**		**62.7**		**62.0**	
n	**457**		**261**		**507**		**565**	
Non-ASSP areas								
Gender								
Female	76.8	0.856	72.4	0.352	70.4	0.848	53.4	**0.045**
Male	77.5		66.8		71.6		75.3	
Mother's educational attainment								
None	83.6	0.078	73.5	0.846	66.1	0.675	59.1	**0.012**
Primary	80.4		68.2		70.5		53.4	
Secondary and higher	64.9		68.1		73.0		88.8	

Table 4 (continued). Percent of self-reported ill seeking care by gender, level of education, wealth and survey domain (ASSP rural areas).

Background characteristic	0-5 years	p-value	5-15 years	p-value	15-54 years	p-value	55+	p-value
Wealth quintile								
Low	67.8	0.175	54.0	0.123	69.5	0.249	45.0	0.100
Low middle	69.5		71.5		65.9		49.7	
Middle	85.0		60.4		59.2		60.8	
High middle	91.6		68.2		77.2		85.9	
High	71.5		80.3		76.5		79.5	
Domain								
Equateur	82.8	0.097	64.2	0.321	74.8	0.515	47.5	0.184
Kasai Occidental/ Oriental	79.3		67.6		67.8		63.9	
Maniema / Orientale	66.2		77.5		71.2		77.7	
Total	**77.1**		**69.8**		**70.8**		**62.3**	
n	**549**		**302**		**587**		**119**	

Multivariate

Price Elasticities of Demand

Table 5 presents the price elasticity estimates from the multivariate models (full regression results are in Appendix 2). In general, households in ASSP (rural) areas do not appear to be very responsive to different levels of prices, at least at the current levels of service pricing. This holds for households in non-ASSP areas as well. In other words, the demand for health care services is relatively inelastic. All price elasticity estimates are < 1 (i.e., inelastic). This holds both when we use the average price of health services at a facility and when we use the service-specific price. In ASSP areas, the price elasticity estimates range from ε_D = 0.0606 for outpatient care (5-15 years old) to ε_D = -0.2438 for OP care (55+ years). Only in 2 cases is there a statistically significant price effect (in the expected direction). This means that within the range of prices observed in the data, changes in price will not affect the probability of using those services very much. If desired, prices could potentially be raised to increase revenue without much affecting overall service utilization.

Table 5. Price elasticities of demand for specific types of services.

	ey/ex	Std. Err.	z	P>z	[95%	CI]	N
ASSP areas							
Antenatal care							
General price	-0.0508	0.0395	-1.29	0.198	-0.1281	0.0266	1,038
Service specific	0.0435	0.0130	3.34	**0.001**	0.0180	0.0690	1,046
Facility delivery							
General price	-0.0339	0.0303	-1.12	0.264	-0.0933	0.0256	1,842
Service specific	0.0376	0.0764	0.49	0.622	-0.1121	0.1874	1,804
Postnatal care							
General price	-0.1825	0.0750	-2.43	**0.015**	-0.3295	-0.0356	1,031
Service specific	-0.0004	0.0098	-0.04	0.971	-0.0196	0.0188	1,022
Any contraception							
General price	-0.0890	0.0745	-1.19	0.233	-0.2350	0.0571	1,219
Service specific	0.0242	0.0140	1.73	0.083	-0.0032	0.0516	928
Modern contraception							
General price	-0.0851	0.2761	-0.31	0.758	-0.6263	0.4561	1,219
Service specific	-0.0359	0.0940	-0.38	0.702	-0.2201	0.1483	928
Outpatient care							
Under 5s	-0.0099	0.0436	-0.23	0.820	-0.0954	0.0756	453
Age 5-15 years	0.0606	0.0515	1.18	0.239	-0.0403	0.1615	293
Age 15-54 years	0.0398	0.0285	1.40	0.162	-0.0160	0.0956	490
Age 55+	-0.2438	0.1088	-2.24	**0.025**	-0.4570	-0.0306	146
Non-ASSP areas							
Antenatal care							
General price	0.0647	0.0285	2.27	**0.023**	0.0089	0.1206	1,154
Service specific	0.0591	0.0214	2.77	**0.006**	0.0172	0.1010	1,154
Facility delivery							
General price	0.0183	0.0179	1.03	0.305	-0.0167	0.0533	2,111
Service specific	-0.0048	0.0482	-0.10	0.921	-0.0993	0.0897	2,111

Table 5 (continued). Price elasticities of demand for specific types of services.

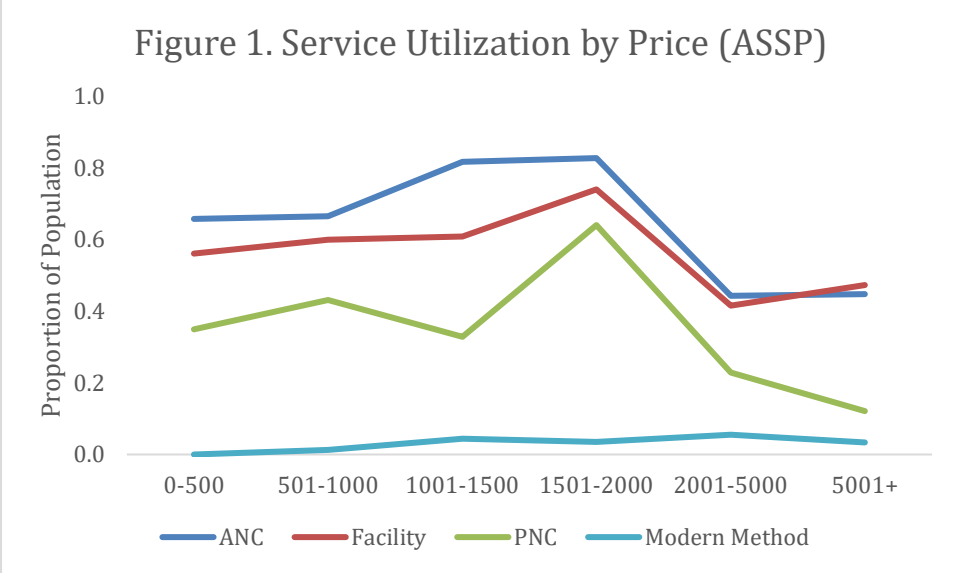
	ey/ex	Std. Err.	z	P>z	[95%	CI]	N
Postnatal care							
General price	-0.0080	0.1398	-0.06	0.954	-0.2821	0.2660	1,148
Service specific	0.0260	0.0404	0.64	0.519	-0.0531	0.1052	1,148
Any contraception							
General price	0.1392	0.0512	2.72	**0.007**	0.0388	0.2396	1,308
Service specific	-0.2069	0.1301	-1.59	0.112	-0.4620	0.0482	690
Modern contraception							
General price	0.2877	0.1078	2.67	**0.008**	0.0764	0.4989	1,308
Service specific	0.6613	0.1872	3.53	**<0.001**	0.2944	1.0282	690
Outpatient care							
Under 5s	-0.0117	0.0120	-0.98	0.327	-0.0352	0.0117	526
Age 5-15 years	-0.0308	0.0230	-1.34	0.181	-0.0759	0.0143	316
Age 15-54 years	-0.0473	0.0231	-2.05	**0.040**	-0.0926	-0.0021	561
Age 55+	0.1725	0.0960	1.80	0.072	-0.0157	0.3607	124

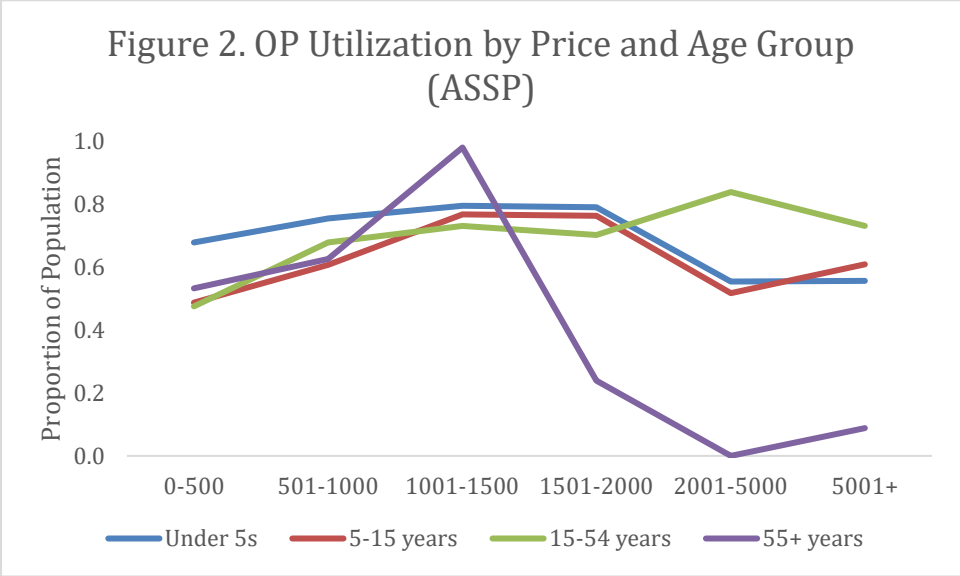
To get a sense of how the price elasticities translate into actual service utilization, we re-ran the multivariate regression models using a categorical price variable that allowed for the effects of price to differ at different values of price. Specifically, we used a six category price variable: 0-500; 501-1000; 1,001-1,500; 1,501-2,000; 2,001-5,000; 5,001+ (Francs). We then used these models to predict the proportion of people who would use a service at different values of price. These relationships are depicted in Figures 1 and 2. Steeper slopes indicate greater price responsiveness,[2] although it should be noted that price was only statistically significantly related to service utilization in two cases – for PNC and for OP care for the over 55 age group. It is also important to note that even at a price of zero, the quantity demanded for many services is quite low. For example, at a price of zero, less than 5% of women would reportedly use modern FP, only 60 percent of women would deliver in a health facility and 30% of women would still not use ANC.

[2] Note that these are not demand curves as price is depicted along the horizontal access, while the vertical access represents the proportion of the population that uses health services at specific prices – not the quantity demanded (e.g., number of visits) at different prices.

These multivariate results indicate that, in general, people are not very responsive to price at low levels of price (0-2,000 francs). This is evident in the flat (or actually in most cases slightly rising) lines over this price range. Prices within this range could be potentially increased with little detrimental effect on utilization. In fact, for nearly all services except outpatient care for individuals over the age of 55, raising price appears to be associated with increased service utilization. For example, a change in price from 0 to 2,000 francs is associated with an increase in the utilization of ANC from 65.8% to 82.7%, of facility deliveries from 56.1% to 73.9%, and PNC from 34.9% to 64.0%. This is perhaps a surprising result. It may be that people perceive services with zero price to be of low quality and services with non-zero prices to be of higher quality and therefore more desirable. Such a results would, of course, need to be confirmed by additional – perhaps qualitative – study.

However, there does appear to be a threshold beyond which people sharply reduce service utilization. For most services, this appears approximately 2,000 francs. For example, increasing price from 2,000 to 5,000 francs is predicted to lead to a decrease in utilization of OP for under-fives from 78.9% to 55.4%, of OP for 5 to 15 year olds from 76.3% to 51.7%, of ANC from 82.7% to 44.3%, of facility deliveries from 73.9% to 41.5% and of PNC from 64.0% to 22.9%. For over 55s, this effect starts at lower values of price - in the range of 1,001-1,500 francs. The demand for modern contraception, however, appears so low that changes in price have virtually no effect across the entire range of prices modelled in this analysis. While any decrease in the utilization of essential health services is undesirable, coupling changes in price with improvements in quality and increased accessibility may offset the effects of price increases. This will be discussed further in the simulations below.





Price elasticities by Wealth Quintile

To provide a better sense of how responsive households of different socioeconomic backgrounds are to changes in price, we also ran demand models in which we interacted the price variable with the wealth quintile variable to test for differences in responsiveness across quintiles. In general, we found that the poor were no more or less price responsive than the non-poor, as indicated by no statistically significant differences in the price elasticity coefficients by wealth quintile. For example, the price elasticity of demand for facility delivery was 0.0721 (a positive elasticity indicating that individuals would be more likely to deliver in a health facility at higher prices, contrary to standard economic theory), which was not statistically different from the price elasticity of demand for all other wealth quintiles except the wealthiest, who were the most price responsive. Only in one case – for OP care for under-fives – were households in the lowest wealth quintile more price responsive. For OP care for over 55s, households in the poorest quintile were actually the least price responsive, perhaps indicating that wealthier households have access to more alternative providers that they would switch to if prices increased at ASSP facilities.

Table 6. Price elasticities by wealth quintile

	Poorest	Second Poorest	Middle	Second Wealthiest	Wealthiest	Total	N
ASSP areas							
Antenatal care							
General price	0.1101	-0.0710	-0.0320	-0.0128	-0.0962	-0.0508	1,057
Service specific	0.0468	0.0287	**0.0589**	**0.0611**	0.0022	0.0435	1,046
Facility delivery							
General price	0.0721	-0.0243	0.0249	0.0505	**-0.1421**	-0.0339	1,883
Service specific	-0.0035	0.0998	0.0639	-0.0257	-0.0585	0.0376	1.804
Postnatal care							
General price	-0.0997	**-0.3903**	-0.0677	-0.1438	-0.3287	-0.1825	1,050
Service specific	x	x	x	x	x	-0.0004	1,022
Modern contraception							
General price	-0.5736	0.1880	0..0607	-0.0365	-0.3696	-0.0851	1,219
Service specific	x	x	x	x	x	-0.0359	928
Outpatient care							
Under 5s	**-0.1732**	-0.0486	-0.0149	-.0486	0.0255	-0.0099	452
Age 5-15 years	0.0743	0.0233	0.0670	0.0250	0.0385	0.0606	294
Age 15-54 years	**0.0944**	-0.2063	0.0544	0.0077	0.0811	0.0398	491
Age 55+	**-0.1169**	-0.4461	**-0.2717**	-0.1725	-0.2473	-0.2438	153

Income and Education Elasticities

Consistent with the bivariate results, demand also appears to be relatively income inelastic *ceteris paribus* for some services (e.g., outpatient (OP) care, post-natal care (PNC)) but somewhat more income dependent for other services (modern family planning (FP), antenatal care (ANC), facility delivery) (Tables 7 and 8). In ASSP areas, most of the statistically significant differences in utilization are between the lowest quintile and the quintiles immediately above that (i.e., 2nd lowest quintile, middle quintile).

Further, we find that education does not appear to be highly correlated with use of health care in ASSP areas once we control for other factors. Only in one case – facility delivery – is there evidence of an education effect; women with secondary or higher education are more likely to deliver in a facility than women with no education.

Income elasticities also tended to be quite small for outpatient care. Only for two wealth groups (15-54, middle quintile and highest quintile) are income elasticities significantly different from 0.

Table 7. Income and education elasticities for specific services.

	ey/dx	SE	z	P>z	[95%	CI]
ASSP areas						
Antenatal care (N=1,038)						
Education (base="none")						
Primary	0.1060	0.0731	1.45	0.147	-0.0373	0.2492
Sec plus	0.1555	0.1034	1.50	0.133	-0.0472	0.3582
Income (base="lowest")						
Second	0.3113	0.1234	2.52	**0.012**	0.0695	0.5531
Middle	0.2353	0.1209	1.95	0.052	-0.0017	0.4724
Fourth	0.0662	0.1669	0.40	0.691	-0.2608	0.3933
Wealthiest	0.3024	0.1333	2.27	**0.023**	0.0412	0.5637
Facility delivery (N=1,842)						
Education (base="none")						
Primary	-0.0477	0.0919	-0.52	0.604	-0.2278	0.1324
Sec plus	0.3198	0.1054	3.03	**0.002**	0.1133	0.5263
Income (base="lowest")						
Second	0.3395	0.1808	1.88	0.060	-0.0149	0.6938
Middle	0.3591	0.1420	2.53	**0.011**	0.0808	0.6374
Fourth	0.2154	0.1547	1.39	0.164	-0.0878	0.5187
Wealthiest	0.3903	0.1870	2.09	**0.037**	0.0237	0.7569
Postnatal care (N=1,031)						
Education (base="none")						
Primary	-0.0187	0.1296	-0.14	0.885	-0.2727	0.2354
Sec plus	0.2761	0.1780	1.55	0.121	-0.0727	0.6248
Income (base="lowest")						
Second	-0.0685	0.2122	-0.32	0.747	-0.4843	0.3473
Middle	0.0182	0.1727	0.11	0.916	-0.3203	0.3567
Fourth	-0.1895	0.2373	-0.80	0.424	-0.6545	0.2755
Wealthiest	0.1751	0.2808	0.62	0.533	-0.3752	0.7254
Modern contraception (N=1,219)						
Education (base="none")						
Primary	-1.2282	0.6912	-1.78	0.076	-2.5830	0.1266
Sec plus	-0.2937	0.6114	-0.48	0.631	-1.4920	0.9046

Table 7 (continued). Income and education elasticities for specific services.

	ey/dx	SE	z	P>z	[95%	CI]
Income (base="lowest")						
Second	0.0169	1.1677	0.01	0.988	-2.2718	2.3055
Middle	0.5309	1.1074	0.48	0.632	-1.6396	2.7014
Fourth	2.0253	0.7399	2.74	**0.006**	0.5751	3.4755
Wealthiest	2.4540	0.7143	3.44	**0.001**	1.0539	3.8541
Non-ASSP areas						
Antenatal care (N=1,154)						
Education (base="none")						
Primary	0.0774	0.0749	1.03	0.301	-0.0694	0.2241
Sec plus	0.1809	0.0813	2.22	**0.026**	0.0216	0.3403
Income (base="lowest")						
Second	0.0759	0.1046	0.73	0.468	-0.1291	0.2810
Middle	0.0485	0.0933	0.52	0.603	-0.1344	0.2315
Fourth	0.1278	0.0858	1.49	0.136	-0.0403	0.2959
Wealthiest	0.0935	0.0919	1.02	0.309	-0.0865	0.2736
Facility delivery (N=2,111)						
Education (base="none")						
Primary	0.0231	0.0492	0.47	0.638	-0.0734	0.1197
Sec plus	0.0872	0.0667	1.31	0.191	-0.0436	0.2179
Income (base="lowest")						
Second	0.0746	0.0718	1.04	0.299	-0.0662	0.2154
Middle	0.0952	0.0713	1.34	0.182	-0.0445	0.2349
Fourth	0.0888	0.0731	1.21	0.224	-0.0545	0.2322
Wealthiest	0.1460	0.0856	1.71	0.088	-0.0217	0.3138
Postnatal care (N=1,148)						
Education (base="none")						
Primary	-0.4002	0.1343	-2.98	**0.003**	-0.6634	-0.1370
Sec plus	-0.0489	0.1472	-0.33	0.740	-0.3373	0.2396

Table 7 (continued). Income and education elasticities for specific services.

	ey/dx	SE	z	P>z	[95%	CI]
Income (base="lowest")						
Second	0.3549	0.2880	1.23	0.218	-0.2095	0.9193
Middle	0.5776	0.2863	2.02	**0.044**	0.0165	1.1388
Fourth	0.6512	0.2773	2.35	**0.019**	0.1076	1.1948
Wealthiest	0.8577	0.2884	2.97	**0.003**	0.2924	1.4231
Modern contraception (N=1,308)						
Education (base="none")						
Primary	1.0746	0.7548	1.42	0.155	-0.4048	2.5540
Sec plus	1.7835	0.7749	2.30	**0.021**	0.2647	3.3022
Income (base="lowest")						
Second	-1.1364	1.4045	-0.81	0.418	-3.8891	1.6164
Middle	-0.9797	1.2156	-0.81	0.420	-3.3623	1.4029
Fourth	0.0528	1.0696	0.05	0.961	-2.0435	2.1491
Wealthiest	0.5274	0.8846	0.60	0.551	-1.2064	2.2612

Table 8. Income elasticities: Outpatient care

	ey/dx	SE	z	P>z	[95%	CI]
ASSP areas						
Under 5s (base="lowest")						
Second	-0.2201	0.1291	-1.70	0.088	-0.4732	0.0329
Middle	-0.0291	0.1465	-0.20	0.843	-0.3162	0.2581
Fourth	-0.3033	0.1789	-1.70	0.090	-0.6539	0.0474
Wealthiest	0.1327	0.0965	1.38	0.169	-0.0564	0.3218
Age 5-15 years (base="lowest")						
Second	0.2399	0.2000	1.20	0.230	-0.1521	0.6319
Middle	-0.2179	0.2595	-0.84	0.401	-0.7266	0.2908
Fourth	-0.3035	0.2786	-1.09	0.276	-0.8495	0.2426
Wealthiest	0.3340	0.1978	1.69	0.091	-0.0536	0.7217
Age15-54 years (base="lowest")						
Second	0.3285	0.2357	1.39	0.163	-0.1334	0.7905
Middle	0.5406	0.1957	2.76	**0.006**	0.1570	0.9242
Fourth	0.3140	0.2120	1.48	0.139	-0.1015	0.7296
Wealthiest	0.4625	0.2253	2.05	**0.040**	0.0209	0.9041
Age 55+ (base="lowest")						
Second	-0.0899	0.3235	-0.28	0.781	-0.7240	0.5442
Middle	0.0805	0.2287	0.35	0.725	-0.3678	0.5289
Fourth	0.1924	0.2789	0.69	0.490	-0.3542	0.7389
Wealthiest	0.0458	0.3247	0.14	0.888	-0.5906	0.6823
NON-ASSP areas						
Under 5s (base="lowest")						
Second	0.1823	0.1156	1.58	0.115	-0.0442	0.4088
Middle	0.3932	0.1241	3.17	**0.002**	0.1500	0.6365
Fourth	0.5783	0.1464	3.95	**<0.001**	0.2914	0.8652
Wealthiest	0.3608	0.1387	2.60	**0.009**	0.0889	0.6327
Age 5-15 years (base="lowest")						
Second	0.3620	0.3030	1.19	0.232	-0.2318	0.9559
Middle	0.1879	0.2214	0.85	0.396	-0.2459	0.6218
Fourth	0.4410	0.3140	1.40	0.160	-0.1744	1.0564
Wealthiest	0.3376	0.2523	1.34	0.181	-0.1569	0.8322

Table 8 (continued). Income elasticities: Outpatient care

	ey/dx	SE	z	P>z	[95%	CI]
Age15-54 years (base="lowest")						
Second	0.0892	0.2310	0.39	0.700	-0.3637	0.5420
Middle	-0.0735	0.2224	-0.33	0.741	-0.5095	0.3624
Fourth	0.1710	0.1968	0.87	0.385	-0.2147	0.5567
Wealthiest	0.1990	0.1866	1.07	0.286	-0.1667	0.5647
Age 55+ (base="lowest")						
Second	-0.552	0.673	-0.82	0.412	-1.8715	0.7676
Middle	0.494	0.517	0.96	0.340	-0.5197	1.5074
Fourth	1.019	0.490	2.08	**0.038**	0.0587	1.9792
Wealthiest	0.770	0.406	1.90	0.058	-0.0252	1.5654

Facility Characteristics

While price seems to have minimal associations with utilization of health services, there are some facility attributes that might be more strongly associated with utilization, such as distance to the clinic and measures of quality (e.g., number of services provided, having a doctor, size, having a separate treatment area, age of facility). Improvements in these attributes in ASSP areas could mitigate the (negligible) effects of price increases.

For delivery services (Table 9), we find that distance to the health facility is significantly related to the likelihood that a woman delivers in a health facility, while health facilities offering more services tend to be more attractive for ANC, facility delivery and PNC. Not surprisingly, having a separate maternity ward increases the likelihood of delivering in a facility and seeking PNC but is not significantly associated with the use of ANC.

For OP services (Table 10), almost no facility characteristics are significantly related to the use of health care, except for years open (16-54 age group), having safe drinking water (16-54 age group), and having at least one doctor (6-15 age group).

Table 9. Marginal effects of facility characteristics on the use of delivery services

	Antenatal Care		Facility Delivery		Postnatal Care	
	dy/dx	P	dy/dx	P	dy/dx	P
Characteristic						
Hospital	-0.1577	**0.005**	0.0966	0.132	-0.1187	0.063
Distance to facility	-0.0033	0.361	-0.0074	**0.001**	-0.0016	0.363
Has electricity	0.0438	0.579	0.0385	0.630	0.0050	0.948
Years open	0.0000	0.981	-0.0001	0.328	-0.0002	**0.039**
Number of Staff	-0.0154	0.354	0.0259	0.144	0.0142	0.418
Has IP facilities	0.1329	0.089	-0.0643	0.312	-0.0157	0.795
Has a separate treatment area	0.1264	**0.021**	0.1048	0.051	0.0633	0.242
Has outreach services	-0.0778	0.332	-0.3408	**0.000**	-0.2356	**0.000**
Has at least one doctor	0.0268	0.800	0.1002	0.323	0.3689	**0.000**
Number of services offered	0.0720	**0.000**	0.0583	**0.001**	0.0818	**0.000**
Has maternity ward	-0.0029	0.956	0.1876	**0.000**	0.1813	**0.001**
Has safe drinking water	0.0612	0.345	-0.0548	0.356	-0.0739	0.288

Table 10. Marginal effects of facility characteristics on the use of OP services

	0-5		6-15		16-54		55+	
	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z	dy/dx	P>z
Characteristic								
Hospital	0.1000	0.228	0.2279	0.117	0.0447	0.739	-0.0258	0.783
Distance to facility	0.0011	0.461	0.0026	0.245	0.0001	0.955	0.0053	0.313
Electricity	0.0160	0.851	0.0617	0.694	-0.0457	0.660	0.0465	0.801
Years open	0.0000	0.920	-0.0002	0.140	-0.0002	**0.004**	-0.0002	0.203
Number of staff	0.0083	0.652	-0.0186	0.465	-0.0424	0.066	-0.0097	0.765
Have IP area	-0.1332	0.056	0.0793	0.377	0.0762	0.302	0.1877	0.193
Have treatment area	-0.0565	0.246	0.0507	0.600	-0.0569	0.324	-0.2094	**0.030**
Conducts outreaches	0.0542	0.336	0.2008	0.069	0.0993	0.168	0.1004	0.454
Has a doctor	-0.0640	0.499	-0.4563	**0.006**	0.0848	0.492	0.3624	0.133
Number of services	0.0120	0.640	-0.0036	0.925	-0.0306	0.248	0.0789	0.075
Safe drinking water	0.0223	0.820	0.1978	0.266	0.1896	**0.018**	0.0204	0.927

Policy Simulations

We ran policy simulations, in which we used the coefficients from the ASSP multivariate models, to examine how utilization might be affected from changes or improvements in health facility characteristics, such as setting price to 0 (as we did earlier). Because there were few statistically significant effects in the multivariate models, very few policy simulations actually reflect statistically significant effects. In all cases, reducing price to 0 increased predicted utilization, albeit slightly. For example, reducing the price to 0 at all facilities would increase utilization of ANC from 66.8% of women to 69.5% of women. For delivery services, there was almost no effect – a rise in utilization from 58.4% to 60.1%.

For outpatient services (Table 10), changes in price also had minimal effects. The largest effect was for the 55+ age group, in which a simulated reduction in the price to 0 would increase utilization of curative care from 60.3% to 64.0%.

Increasing service availability had the largest effects on the use of delivery services. For example, increasing the services increased predicted ANC use from 66.8% to 88.1%, predicted facility deliveries from 58.4% to 78.2% and PNC use from 37.6% to 68.3%. For outpatient services, improvements in the facility characteristics included in the model would show very minimal effects on utilization.[3]

[3] To provide additional context for interpreting the price elasticities for the poor and non-poor, simulations were run in which the prices of six services were reduced from 2,000 FC to 0 FC. For those in the poorest quintile, lowering price actually decreased health service utilization for all services except PNC. Households in the second poorest quintile were more price responsive (but still price inelastic) than the poorest quintile for several services, including for outpatient care and ANC. The wealthiest quintile tended to be completely price unresponsive except for PNC Service and facility deliveries; a decrease in price from 2,000 FC to 0 FC would increase utilization of health services by 1% or less for ANC, FP and outpatient care.

Table 11. Predicted likelihood of using reproductive health services from simulated changes in health facility characteristics, ASSP areas.

Simulation	Antenatal Care	Facility Delivery	Postnatal Care
Characteristic	Pr()	Pr()	Pr()
Base	**66.8**	**58.4**	**37.6**
Price set to 0	69.5	60.1	43.2
Distance set to 0	69.1	**63.6**	38.8
Price doubles	63.8	54.2	34.6
Price set at 10,000	44.0	44.5	10.0
All HFs provide all 11 services	**88.1**	**78.2**	**68.3**
All HFs have a separate treatment area	**72.4**	62.7	40.3
Bold indicates simulation is based on statistically significant coefficient in multivariate analysis.			

Table 12. Predicted likelihood of using outpatient services from simulated changes in health facility characteristics, ASSP areas.

Simulation	0-5	5-15	15-54	55+
Characteristic	Pr()	Pr()	Pr()	Pr()
Base	**71.6**	**56.7**	**63.0**	**60.3**
Price set to 0	73.1	56.1	62.6	**64.0**
Distance set to 0	70.6	63.8	62.8	56.8
Price doubles	66.2	57.5	67.5	**55.4**
Price set at 10,000	59.2	57.5	63.6	**53.5**
All HFs provide all 11 services	71.6	55.6	52.1	83.6
All HFs have a separate treatment area	64.6	59.4	60.1	**51.7**
Have a doctor	61.6	**21.6**	74.3	**89.9**
Have IP beds	**58.1**	62.6	69.2	73.8
Have safe drinking water	73.9	73.7	**78.5**	60.8
*Bold indicates statistically significant in multivariate analysis.				

6. Discussion

The main objectives of this study involved the calculation of price, income and education elasticities of demand for health services; assessments of how ASSP's cost recovery strategy can be balanced against the financial burden of medical care costs borne by households; assistance to ASSP in fee-setting, targeting to vulnerable groups, and refining the cost recovery strategy; and provision of suggestions to government and donors on cost recovery and harm minimization issues. The main message of this report, it should be made clear, is that the current pricing strategy employed by ASSP does not appear to adversely affect the use of essential health services, and hence is unlikely to render the type of harm to households that critics might fear. This result, of course, should be taken within the context of the study limitations as discussed below. It also does not mean that prices should be the same for all individuals regardless of socioeconomic status. For nearly all services, utilization rates are lower for those in lower wealth quintiles and hence differential pricing may help address this.

Objective 1: Price, Income and Education Elasticities

As part of this analysis, we have estimated elasticities for price, income and levels of education. Regarding price, the results presented here provide evidence that households are not particularly responsive to changes in prices of health care, at least at the price levels currently being charged. This result is robust regardless of the price that is included in the multivariate modelling – either a general (averaged) price or a service-specific price. Further, we examined price responsiveness by wealth group and determined that responsiveness does not appear to differ by wealth, except perhaps for wealthier households who may opt for alternative providers when ASSP prices rise.

The absence of a strong response to changes in price should be seen in the context of how these prices relate to current income levels in the DRC. The prices of antenatal care, modern contraception and postnatal care are all less than $1 on average. A health facility delivery in ASSP areas costs $6 on average (median price = $2). At a per capita gross national income of $740 per year ("GNI Per Capita, PPP (Current International $) | Data"), expenditures on these items do not appear to pose a large financial burden for the typical household.

As noted previously, previous studies in low income countries have been inconclusive regarding how price responsive consumers are to changes in prices. This study is consistent with the literature that indicates that the demand for health care is relatively inelastic, indicating that the quantity demanded of care changes little in response to changes in price (Akin, Griffin, Guilkey & Popkin, 1986; Schwartz, Akin & Popkin, 1988; Akin et al., 1998, Alderman & Lavy, 1996; Lavy & Germain, 1994; Akin et al., 1995; Mwabu, Ainsworth& Nyamete, 1993). However, there have been virtually no studies using a randomized controlled design in a similar manner to the more definitive Rand Health Insurance experiment.

While not discussed, we also found little evidence that endogenous illness – the sample of individuals who self-report illness may be more or less responsive than the general population – affected estimates of price elasticities. The results from the Heckman selection models are presented in Appendix 2.

Objectives 2 and 3: ASSP Cost Recovery Strategy and Fee Setting for Vulnerable Groups

The potential for harm to households from raising fees does not appear to be a major concern at this time, assuming that prices stay within the ranges modelled in this analysis. Our modelling examined non-linearities in pricing, allowing for differential effects of price at different price levels. For most services, there appears to be a threshold of approximately 2,000 francs beyond which service utilization rates decrease rapidly. This threshold appears to occur at lower prices for outpatient services for individuals over the age of fifty-five. Given that the median prices for ASSP services all appear to be less than 2,000 francs, this would seem to be an indication that prices could be increased modestly up to this threshold with little harmful effects, assuming that price increases were accompanied by careful monitoring of service utilization levels to verify this conclusion.

In terms of better targeting or differential pricing for vulnerable groups, this analysis indicates that the poor respond to price changes in the same way that the non-poor do. However, for nearly all services, the poor are less likely to use those services; Relative to women in the wealthiest quintile, women in the poorest quintile are 24.6 percentage points less likely to use ANC (76.1% versus 51.5%), 33.3 percentage points less likely to deliver in a health facility, and 11.3 percentage points less likely to use PNC. For this reason, there is a clear need to segment catchment populations based on levels of poverty. Zero prices are likely to make the most sense for the very poorest, although even zero prices may not ensure that utilization levels for the poor reach those of the non-poor.

Objective 4: Recommendations for government, donors and policy makers

These results should prove useful to those interested in assessing the effects of changes in price on different vulnerable groups. One key point that should come out of this analysis is that price is only one factor influencing decisions to use health care. Quality of care and physical accessibility have also been shown to determine health service utilization, particularly for health facility deliveries.

An additional consideration for policy makers could be the implementation of a randomized control trial, in which ASSP randomly assigns prices (within reasonable values) for different services at different facilities. This would address the study limitation (discussed below) that prices are endogenously determined by (non-random) market characteristics and hence elasticity estimates are potentially biased. In the current context, an RCT may not be beyond the realm of the possible. Given that people do not appear to be highly responsive to price at lower price levels, randomly setting prices within this range could be done with reasonable certainty that household welfare would not be harmed. Implementing an RCT – in a similar manner to Cohen et al (2012) and the Rand Health Insurance Experiment – would be a novel approach to some of the research questions posed by this study.

The results here may be difficult to reconcile with the situation that occurred when new pricing policies were originally implemented. At the time, there was in fact an observed downturn in patient flows initially in areas where there was previously free health care – Maniema, Tshopo, and several zones in Central Kasai. Several rationales are posited for this phenomenon. First, it is possible that many people may have been slow to mentally accept the price change and hence initially responded by lowering service utilization. Further, it has typically been the case that new projects experience a dip in utilization during the transition from the previous project. In USAID supported zones of Prosani, Management Sciences for Health had a 15% drop in utilization when they took over after IMA even though they implemented the same pricing policy.

Third, when a startup assessment was undertaken, health workers admitted to inflating their utilization figures so they would receive more of their performance prime. This was also true in a World Bank project when Performance-Based Financing was implemented, even though the primes were very modest. Fourth, the previous project did not emphasize improving the quality of services so the willingness to pay higher prices for higher quality was initially low at the outset of ASSP. As ASSP has worked to improve quality, in most places the utilization is higher now than when health care was free. Finally, because salaries were no longer being covered by the project, the motivation of the workers declined as well. Some workers resorted to hiding utilization figures so they could keep a larger proportion of the local receipts for their salaries. As utilization increased there was less incentive to hide cases.

7. Study Limitations

There are several limitations to the present study. First, based on the cost considerations at the outset of the evaluation, households have been linked to only one health facility – the designated health centre. To collect information on all the possible health care options in all sampled areas would have been cost prohibitive. This means that health care decisions that we are modelling are limited. We must assume that these other health care options are randomly distributed across areas and types of households. To the extent that this assumption is unrealistic, noise enters into our models and this design may bias our results towards the null (non-significance) since households in some areas may face many more health care options (e.g., pharmacies, other providers). For this reason, the current analysis looks only at rural areas (~85% of the sample).

Second, it is not certain which measure of price is most appropriate for our models. For simplicity, we have generally used a price variable that averages the prices listed in a facility. This allows for a price variable to be included for everyone in the sample in the econometric models. To use a more specific price variable comes at a cost. For example, in models looking at family planning, not all women have been linked with a facility that offers family planning. So, in those cases, there is no price of family planning to include in the model, and those women would be dropped from the analysis. This is a substantial cost. As a result, we have run models with the mean price variable (and full samples) and specific price variables (with reduced samples).

Third, related to this is the possibility that the price variable is endogenously related to observable or unobservable characteristics of communities. That is, decisions about what prices to set may be related to levels of education or affluence. Considerable effort was expended to explore this possibility. In an assessment of the effects of price on health care utilization, it would be ideal if prices were set randomly based on a consideration of the costs of delivering those services and expectations of levels of demand. In the Rand Health Insurance experiment (Ringel et al., 2002), prices were set randomly, allowing for unbiased estimates of price elasticities.

However, in the case of ASSP, prices were set in conjunction with other interventions intended to affect prices and/or demand. Hence, price may be tied to many factors – both observable and unobservable – that also influence healthcare demand. To test for the potential non-randomness of prices, we employed the following strategy.

First, we aggregated the individual-level data to the community level. This is the same level as that observed for facility characteristics such as price (i.e., a price variable in a cluster is the same for all households in that cluster) and ideally the level at which randomization of prices would take place. Aggregation at this level means that observable characteristics of individuals and households represent averages for the individuals and households in that cluster.

With the aggregated data, we ran a regression of each price variable P_j on the community-level variables (Cj), the facility characteristics (Fj) and the aggregated individual (Xj) and household variables (Mj). The intent of this model was to determine if prices could be explained by a linear combination of the observables. We checked for individual significance of each of the variables. Following that, we examined the joint F-test for the regression to determine if the vector of observables explained variance in prices. The variables that we included in those models were: age, education (of individual or mother in the case of children), insurance status, parity (for models looking at use of reproductive health status), gender (in curative care models), and a set of facility characteristics (e.g., distance to the index facility, whether or not the facility was a hospital, if the facility had electricity, number of years that the facility had been open, total number of health personnel, if the facility had inpatient beds, a separate treatment area, outreaches or at least one doctor; if the facility had a separate maternity ward; if the facility had safe drinking water).

Overall, we found no evidence of endogenous price setting but it is possible that our controls were not sufficient to detect such correlations. Specifically, we found that in no cases were the aggregated individual and household characteristics statistically related to any of the price variables. Further, the joint F tests of all of the regressors were also not statistically significant. From this, we concluded that prices are not correlated with the characteristics of the communities in which respondents reside. It is still possible that we still have an issue with endogenous prices if prices are correlated with unobservable characteristics of communities. Because of this finding, we used the simpler models in which price was assumed to be exogenously set by health facilities.

Fourth, it is difficult to capture the construct of health care quality. In our analysis, we use information on the availability of equipment and services as measures of health care quality, but these variables only measure some aspects of health care quality. Other aspects that may affect demand, such as the treatment of patients by health care providers and perceived quality of care, are difficult to quantify.

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Appendix 1: Research Protocol

Research Protocol
Operations Research for ASSP
User Fees and Demand for Health Care
Phase 1

6 May 2014

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EXECUTIVE SUMMARY

In the DRC, the public health care system has historically been underfinanced, leaving zonal health care facilities heavily reliant upon household out-of-pocket payments and humanitarian programs. A number of health financing assessments in the DRC have found that user fees are the primary mechanism for public, faith-based and other types of private providers to finance the operating costs of facilities and the salaries of staff. Over the past several decades, user fees for health services have been reviewed and studied extensively in the health economics literature, focusing in particular on how responsive specific groups – particularly the poor – are to changes in price. An important policy question is whether or not charging for health services – or raising the prices of non-free services - will cause large numbers of people to turn to self-treatment of illnesses, to seek out inferior care or simply to forego needed care.

In previous projects supported by DFID in the DRC, health care was provided free of charge to users, and in contrast to the government policy that all patients be charged user fees for services. In an effort to create sustainable services consistent with national policy, health facilities in ASSP-supported zones will be charging fees for services.

This protocol outlines the research questions, data, methods and analysis plan for evaluation of the ASSP project. This study will utilize data from Tulane's 2014 baseline household and health care facility survey, which being administered as part of a study that assesses the overall impact of the ASSP project. This impact evaluation involves a quasi-experimental panel study design to obtain changes in point estimates of health outcomes, health care utilization, out-of-pocket expenditures, malaria parasite prevalence, quality of health care services and community participation in health care. Baseline and endline data will be used to evaluate the impacts of the changes in ASSP service quality, availability and pricing over the period from 2014 (baseline) to 2017 (endline).

Background and ASSP Project Description

Background and previous research on user fees and demand

Due to the instability that the DRC has experienced over the past several decades, the country's health care delivery system and financing arrangements have been severely weakened, affecting the availability and quality of health care services. The public health care system remains chronically underfinanced, and as a result, zonal health care facilities have been heavily reliant on household out-of-pocket payments and humanitarian programs. A number of health financing assessments in the DRC have found that user fees are the primary mechanism for public, faith-based and other types of private providers to finance the operating costs of facilities and the salaries of staff.

Over the past several decades, user fees for health services have been reviewed and studied extensively in the health economics literature, focusing in particular on how responsive specific groups – particularly the poor – are to changes in price. An important policy question is whether or not charging for health services – or raising the prices of non-free services - will cause large numbers of people to turn to self-treatment of illnesses, to seek out inferior care or simply to forego needed care. Studies of user fees have therefore sought to estimate the price elasticity of demand for health care – the percentage change in the utilization of health services for a percentage change in the price of those health services, holding constant other factors that can influence demand. Price elasticities less than one indicate that a health service is price inelastic; a percentage change in price induces a less than proportionate change in quantity demanded. Price elasticities greater than one indicate that the price elasticity of demand is elastic; people alter their use of health services by a greater percentage than the percentage changes in price.

The literature on the impacts of user fees on health care utilization is inconsistent. Some studies report that changes in price have substantial effects on the quantity of medical services demanded (Alderman and Gertler, 1989, Mwabu 1986, Gertler and van der Gaag 1990), i.e., that demand is elastic. Others studies find that price elasticities are relatively inelastic, indicating that the quantity demanded of curative care changes little in response to changes in price (Akin et al 1986, Schwartz, Akin and Popkin, 1988, Akin et al 1998). Simulations from studies using data from Ghana, Nigeria and Kenya have found relatively small changes in utilization due to simulated increases in public and private prices of care (Alderman and Lavy, 1996, Lavy and Germain, 1994, Akin, Guilkey and Denton 1995, Mwabu, Ainsworth and Nyamete 1993). However, evidence from other studies in sub-Saharan African countries suggests that user fees can be detrimental to the financial access to health care services, particularly among the poor and other vulnerable populations.

Overview of ASSP Project and the user fees strategy

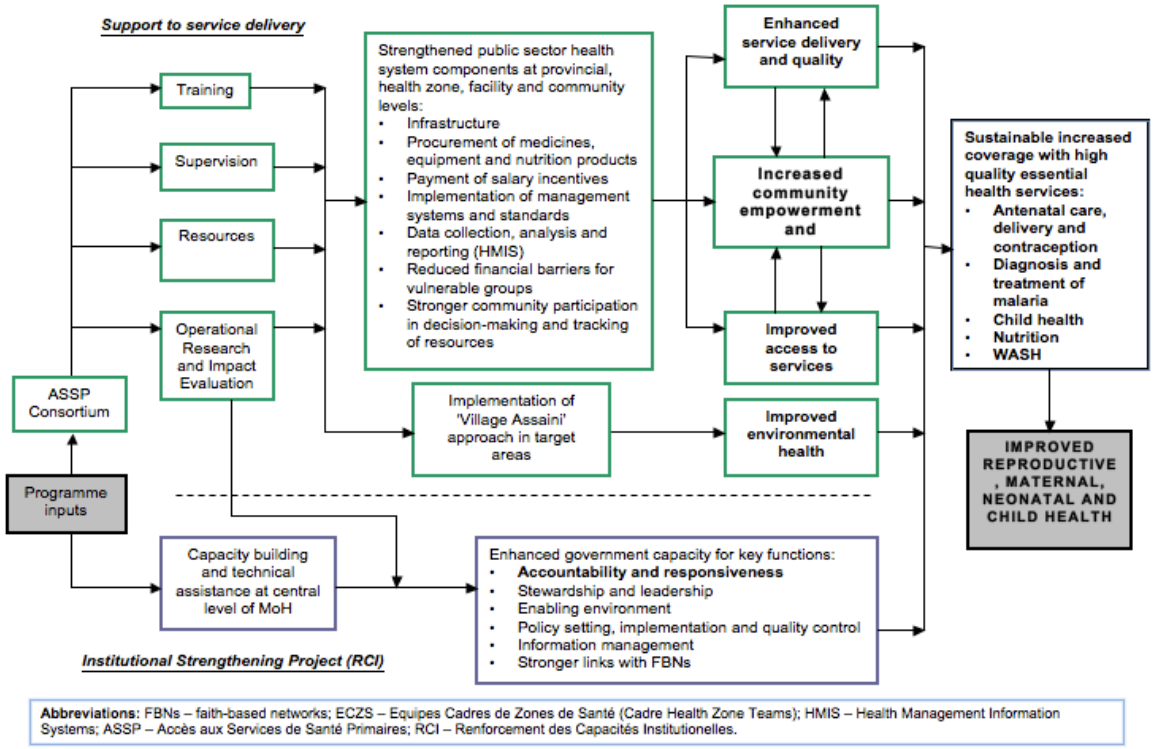
In an effort to strengthen the health care delivery system and increase service utilization, the DRC's Ministry of Health has developed a five-year health development plan, which is being implemented with support from a number of international health partners, including the United Kingdom's Department for International Development (DFID) (Ministère de la Santé Publique, 2010). The DRC government's National Health Development Plan for the period 2011-2015 defines eight priority pillars: governance, human resources for health, medicines and specific inputs, health financing, health information management system, infrastructure and equipment, health service delivery and collaboration with related sectors (Ministère de la Santé Publique, 2010).

As part of its programme to assist the government in strengthening the country's health system, DFID awarded the five-year ASSP (*Accès aux Soins de Santé Primaires*) project to IMA World Health and its implementing partners and subcontractors in Fall 2012. ASSP is a health systems strengthening project tasked with working in 56 *health zones* in Equateur, Orientale, Kasai-Occidental and Maniema provinces of the DRC. As shown in the Theory of Change (figure 1), ASSP consists of a broad range of facility- and community-based health interventions designed to:

1. Strengthen the public health sector at the provincial, health zone, facility and community level though improved availability of infrastructure, equipment, supplies and improved financial and managerial practices

2. Improve environmental health in targeted areas via the introduction of "Village Assaini," a water, sanitation, and hygiene (WASH) approach
3. Broaden key governance functions, including accountability, governance, stewardship and leadership

Figure 1: ASSP Project's Theory of Change



In previous projects supported by DFID, effort was made to minimize cost to users. Health care was provided free of charge to pregnant women and children under five years of age. A nominal charge was paid by other categories of patients consistent with government policy that users participate in health care financing. In an effort to continue to provide services consistent with national policy, health facilities in ASSP-supported zones will be charging fees for services. Both ASSP and the national government are committed to not charging fees that have deleterious effects. But knowing what constitutes an unreasonable financial burden, determining how changes in fees will impact on households across different income levels, and setting appropriate fee schedules and exemptions requires detailed information on health care utilization patterns and precise measurement of how differences in access, quality, and affordability contribute to those patterns. It also requires tracking whether the strategy is being implemented as planned.

In order to improve the availability and quality of health care services, as well as to make progress towards the financial sustainability of the health system, the ASSP project will introduce an array of health financing initiatives in project-assisted health zones. These include the following:

- In the health zones that were previously receiving financial and technical assistance from DFID, ASSP will eliminate primes, for example top offs and salary supplements, paid to heath care workers.

- In selected health zones, ASSP will introduce community-based income generation schemes (Community Health Endowments [CHE]) that provide financial risk protection to community members. The CHEs are intended to be a new source of funds for the health system, thereby permitting a reduction in user fees charged to clients.

- In all project health zones, ASSP will introduce guidelines aimed at standardizing the user fees setting approach, while allowing for differences in fees level across health zones. Provincial health departments (divisions) participate in the exercise. The guidelines will include provisions to exempt the poor and other vulnerable populations for curative care in all ASSP health zones and will delineate selected services to be free of charge for all populations. The covered services (services exempt from user charges) will include: immunizations, growth monitoring, administration of Vitamin A, distribution of long-lasting insecticide-treated nets (LLINs) to pregnant women and infants during antenatal care and immunization visits, distribution of LLINs in campaigns, prevention of mother-to-child transmission (PMTCT), and basic family planning services.

2. Study objectives

Tulane University's School of Public Health and Tropical Medicine (Tulane) is responsible for the operations research and impact evaluation for the ASSP project. This study is part of a larger study evaluating the impact of ASSP.

The ASSP user fee study will be carried out in two phases. The first phase looks at how changes in user fees affect health care utilization.

The objectives for the first phase of the study are the following:

e) To estimate the price elasticity of demand for different health services at ASSP and non-ASSP facilities for different wealth groups and for men and women and to estimate the potential decrease in utilization for these different groups from varying sized changes in price

f) To assist ASSP in refining its cost recovery strategy so that it minimizes harm to households and provides incentives for households to utilize cost-effective health care services

g) To assist ASSP in recommending the appropriate levels of user fees, better targeting vulnerable groups, and refining its overall cost recovery strategy.

h) To provide information to the government on harm minimization and to donors on how to get best value for money in settings where the national policy is to incorporate cost recovery.

The following are the principal research questions that will be investigated in phase one:

3. To what degree do changes in user fees affect health care utilisation, after controlling for other characteristics of health services and households that may also impact utilisation?

4. How does this responsiveness in service utilisation to changes in user fees vary by gender, and by the wealth and educational status of household members?

The second phase of the study will be a process evaluation of the implementation of the user fee component of the ASSP. This research protocol describes the approach for the first phase of the study only.

Research Design

This study will utilize data from Tulane's 2014 baseline household and health care facility survey, which being administered as part of a study that assesses the overall impact of the ASSP project. This impact evaluation involves a quasi-experimental panel study design to obtain changes in point estimates of health outcomes, health care utilization, out-of-pocket expenditures, malaria parasite prevalence, quality of health care services and community participation in health care. Baseline and endline data will be used to evaluate the impacts of the changes in ASSP service quality, availability and pricing over the period from 2014 (baseline) to 2017 (endline). The panel design will be at the village level and not the individual level. The village level panel design will makes it possible to control for unobserved community-level confounding factors that are fixed across time within units of observation (villages), as well as to accurately measure changes in exposure over time. This approach will allow plausible attribution of ASSP support on outcome and impact indicators using a dose response approach and a difference-in-differences approach (described below).

This first phase of the user fee study will use household survey data from a random sample of potential users of health services linked with health care facility survey data of prices and facility quality. This phase of the study will involve a micro-level analysis of the role of user fees and health facility characteristics on health care utilisation, focusing in particular on differential impacts between wealth groups and between males and females. Through the use of an econometric model, price elasticities of demand for curative health care will be estimated for the overall sample as well as the sub-samples of interest. In addition, policy simulations of the effects of hypothetical changes in user fees and other facility-level characteristics on health care utilisation rates will be carried out. The simulations can be used to identify user fee levels that do not deter the use of necessary health care services.

Ethical approval for the study and collection procedures was obtained from the Institutional Review Boards (IRB) of both Tulane and Kinshasa School of Public Health (KSPH).

Data

As noted above, data for this study will come from a household survey of potential users of health services linked with health care facility survey in the areas serving those households. The Kinshasa School of Public Health (KSPH) is implementing the baseline survey.

Household Survey

Households will be sampled from health zones in the Orientale, Maniema, Equateur, Kasai-Occidental and Kasai-Oriental provinces. Sampling will involve both a two-stage sample design - the probability of first stage selection will be proportional to relative village sizes with twenty households then selected in each village using an interval approach – and three-stage sample design - involving intervention and matched comparison areas (Table 1). The target sample size is 4,200 households, corresponding to 700 households per sampling area in the ASSP project area and in comparison areas.

For each household selected, the head of the household as well as all female household members of reproductive age (15-49 years) will be interviewed. Information for all children under five years of age who are household members will also be collected. When possible, this will be done by interviewing the mother. However, in a case where no mother is present, the primary care giver will be interviewed to take into account vulnerable children, orphans and child-headed households.

Health Facilities Survey

A convenience sample of one health facility for each sampled village, in total 210 facilities (35 villages for 6 groups), will be chosen once teams are in the field. As only one village for the household survey is selected per health area, the health centre designated for serving that health area will be selected. The head doctor or nurse will be interviewed using a structured questionnaire to measure facility level indicators. Conducting the facility survey in the same areas as the household survey will allow sample households to be "linked" to the attributes of a nearby health care facility that they can utilize, making it possible to investigate the role of facility attributes in the utilization of health care services. Following the panel design approach, the same selected facilities will be surveyed at baseline and endline. Of greatest importance for this study is the estimate of the price that people pay for health services. This information will be taken from the health facility survey.

Table 1. Data Sources, Sampling Methodology and Indicators

Survey	Unit of Analysis	Sampling Frame	Sampling Methodology	Summary of indicators
Household (N=4,200)	• Households • Individual household members	• **Intervention sampling area-** list of villages with population size from IMA's internal assessment in June 2013 • **Matched comparison groups-** list of health areas with population size estimates and urban or rural status from MOH. Matching was done using this list as well as vaccination coverage data from the national EPI programme.	Both two-stage sampling design (intervention sampling areas) and three-stage sampling design (matched comparison groups). See Main Research Protocol "Study methodology" section 3 for more details.	• Health care utilization for all family members • Out-of-pocket health care expenditures, quality of service

Women's Estimate: 4,200 **(One woman of reproductive age per household)**	• Woman age 15-49 • Children under 5	• Same as household survey	All eligible woman from sampled households	• Treatment of child illness • Maternal health such as utilization of antenatal care and births by skilled birth attendant • Family planning utilization
Health Facility (N=210)	Health Centres	Documentation of the official health centre serving the health area in which each selected village is located.	Convenience sample of the official health centre designated for serving the administrative health area in which each selected village is located	• Price of health services • Service readiness (adequate equipment and drug supplies) • Minimum package of services offered

Indicators

Data from the household survey will be used to collect information on the utilization of key health services, as well as expenditures on different health services. As the goal of phase one of the user fees study is to estimate price elasticity of demand for health care, the indicators that will be used in this analysis pertain to those services for which a user fee is charged, namely, curative care and delivery services. In addition to individual and household-level characteristics, such as age, gender, education, wealth, and household structure, facility-level indicators are needed for the estimation.

Indicators relevant to curative care seeking and delivery are briefly are as follows (for exact definitions, calculation methods and data sources see Appendix 3):

Curative care:

- Percentage of individuals sick or injured in the last four weeks who sought care, by chronic or acute health problems.
- Percentage of people who were hospitalized in the last six months, by chronic or acute health problems
- Average out-of-pocket household health expenditures per episode of illness/injury
- Average number of outpatient visits to a health facility among individuals sick or injured in the last four weeks
- Average out-of-pocket household health expenditures per episode of illness/injury

Delivery:

- Percentage of live births delivered in past 5 years by skilled birth attendant
- Average out-of-pocket household health expenditures per delivery attended by a skilled attendant

Data analysis

Descriptive and multivariate analyses will be carried out on the data collected from the household and facility baseline surveys. Households will be linked with the official health centre responsible for providing health care to their respective villages. The health facility survey provides detailed information on the characteristics of the official health centre serving a village, including:

9. Levels, training and type of staffing
10. Services available and prices of services
11. Privacy and confidentiality of visits
12. Physical infrastructure (e.g., running water, electricity, waiting areas, laboratories, inpatient and outpatient facilities, waste disposal)
13. Availability of essential drugs, equipment and supplies
14. Management and measures to respond to community input
15. Community financing initiatives

In rural areas, respondents are likely to have very limited health care options: generally the official health centre, pharmacies or drug shops or self-treatment. Hence the characteristics of the official health centre – its proximity, quality and affordability – are likely to substantially influence care-seeking decisions. In peri-urban areas, however, the assumption that a single health facility accurately depicts a household's health care choice set may be more tenuous, as there are likely to be a much wider set of options. The analysis will therefore be stratified by peri-urban and rural areas.

Adjustments for weighting and clustering

This study will use a multi-stage cluster sampling strategy for the household survey for intervention and control areas. Descriptive and quantitative analysis will adjust for differential probabilities of selection using sample weights and to correct for intracluster correlation using robust standard errors.

Descriptive analysis

The descriptive analysis will assess overall health care utilization rates, the type of health care provider utilized, and out-of-pocket health care costs, by type of service and by socio-economic status. The appropriate analysis will be carried out for the variable type, e.g. frequencies and cross-tabulations for categorical variables and measures of central tendency for continuous variables.

Multivariate analysis

This study will collect data at two levels, the household and health facility, which will then be linked together to yield a dataset with information at three levels: health facility, household, and individual. The health facility and household variables are a source of contextual variables that potentially affect care-seeking behaviour in important ways. In order to capitalize on the richness of these data, multilevel regression analysis will be used to estimate the adjusted relative impacts of both facility characteristics (project or other ownership, user fees, proximity, service availability, facility attributes that influence service quality) and of household and women's characteristics (wealth, education, religion, autonomy) on service utilization and health outcomes after controlling for other individual, household, and facility-level factors.

Econometric model specification

A two-level econometric model will be specified in which the first (micro) level are the individual respondents (denoted by the subscript i), while at the second (macro) level are the sampled villages (denoted by the subscript j) in which these individuals live. Because the recall period for the health care utilization questions is one month, the principal outcome (Y_{ij}) will be a binary outcome for whether or not a person uses health care: Y_{ij}=1 if a person uses care and Yij=0 otherwise. For outcomes which reflect the intensity of demand (or quantity demanded), such as the number of visits made during an interval, we will also use count models, such as poisson, negative binomial, zero-inflated poisson, or zero-inflated negative binomial models, if there is enough variation in the response to the number of health provider visits in the data to permit use of these models.

$$Y_{ij} = \beta_0 Y_{ij} = \beta_0 + \beta_1 X_{ij} + \beta_2 M_{ij} + \beta_3 F_j + \beta_4 C_j + \beta_5 P_j + \beta_6 T_j + \varepsilon_{ij} + \mu_j \quad \varepsilon_{ij} \sim N(0,1), \quad \mu_j \sim N(0,\tau)$$

where:

X_{ij} = matrix of individual characteristics (age, gender, level of education) for individual i in community j.
M_{ij} = matrix of household characteristics (wealth, household structure) for individual i in community j
F_j = matrix of facility characteristics (type, size, services offered, availability of drugs and supplies, equipment index, hours open, staffing, distance from household) for a facility in community j
C_j = matrix of community characteristics (norms, infrastructure, roads) for community j
Pj = price index for health services at the designated health centre in community j
Tj = 0/1 indicator for whether or not a village is an ASSP-supported treatment area

The term ε_{ij} is an independent and normally distributed error term that varies by individual and community. Its variance is standardized to equal one. The term μ_j is a group level normally distributed error term with mean of zero and variance of τ.

Elasticities

The primary objective of the above model specification is to estimate the elasticity of demand for health services using information from individuals who face different prices and quality in their health care options and therefore make different choices. The model will allow for quantifying the individual effects of each covariate on indicators of health service utilization, and therefore determine the relative importance of factors affecting the utilization of health services. For example, models that include multiple characteristics of facilities could potentially estimate the relative influence of different prices for health care, relative to differences in accessibility (e.g., how does service utilization change for every kilometre closer a household lives to a facility?), drug availability, hours of service, levels of staffing (e.g. do staff absences impact upon utilization?), or equipment (e.g., does non-functioning equipment or absence of lab tests deter utilization?). This will allow calculation of elasticities of demand for each of the variables in the model. The main question is to determine how responsive people are to different prices for services that differ in quality and accessibility. However, with elasticities of demand for different quality variables, we will be able to simulate the relative impacts of changes in each of the determinants of demand. Notably, we will be able to determine how price increases offset by quality improvements will affect overall demand.

Policy simulations

In addition to elasticity calculations, post-estimation simulations will be carried out using the estimated models to aid in the interpretation of regression results. Simulations are often used to determine the net effect of a change in variables of interest. This is done by predicting the direction of impact of the estimated variable on utilization of curative care and delivery services under different conditions, while holding other variables constant. This is particularly useful when trying to examine how different policies will affect utilization. For example, how would the predicted probabilities of seeking treatment when ill change if the user fee was increased by 100%, decreased by 50%, or set at a certain level? Do changes in user fees affect different segments of the population differently? If so, which sub-populations are more responsive to changes prices and more likely to be priced out of the formal health care system when user fees are increased? These simulations can be carried out on other variables of policy interest besides user fees, such as distance to health facility, drug and supply availability, weekly hours of operation, etc. In short, the simulation exercise allows for a deeper understanding of the regression results, and indeed the data, than the coefficients and elasticities alone, and is therefore a powerful tool for guiding policy changes.

Endogeneity

Previous researchers (Akin, Guilkey, Hutchinson and McIntosh 1998) have argued that estimations of the demand for curative care that do not account for the non-random selection of people self-reporting illness are potentially biased because such respondents may be more or less price responsive than the full sample of respondents. In short, recognition and reporting of illness may be a function of whether or not a household member feels that a course of action (e.g., health care that is proximate, affordable, and of sufficient quality) is open to that person. To control for non-random self-reporting of illness, we will first estimate an equation for self-reported illness. Then, using a Heckman-type correction procedure, we will estimate the demand for different health care services. The price elasticity of demand for curative care will be derived from this second-stage equation.

Study Limitations

There are several limitations to the present study. First, because this study will use non-experimental data, we cannot draw conclusions on the causal relationship between the project intervention and the observed outcomes. However, the quasi-experimental design that we have chosen will allow us to make strong plausibility arguments about the effect of ASSP on demand for health care. Second, it is difficult to capture the construct of health care quality. In our analysis, we will use information on the availability of equipment and services as measures of health care quality, but these variables only measure some aspects of health care quality. Other aspects that may affect demand, such as the treatment of patients by health care providers and perceived quality of care are difficult to quantify. The Heckman-type correction for self-selection into seeking care we have proposed will help us control for the unobserved factors affecting care-seeking, such as those aspects of health care quality that were not collected in the household or facility surveys.

Results dissemination

Upon completion of the baseline evaluation of the demand for health care, Tulane and KSPH will host a results dissemination workshop to inform all stakeholders of the survey results. Reports will be written in English and in French, summarizing the study results. The workshop will present the findings in a clear and concise manner and invitees will include representative from DFID, IMA World Health, Implementing Partners, Tulane, the Ministry of Health and where possible community leaders from the communities selected for the study. In addition, datasets will be publicly released after the conclusion of the study, following data sharing policies of the Ministry of Health and DFID.

Planning, study management and governance

The evaluation of ASSP Project is being conducted by Tulane University's School of Public Health and Tropical Medicine Operations Research and Impact Evaluation (ORIE) team as part of the research activities of the Department of Global Health Systems and Development. Tulane has established an office in Kinshasa to monitor the implementation of health development activities undertaken with Tulane technical assistance in the DRC. With regard to ASSP evaluation, the Tulane KSPH team is composed of a Senior Research Director and a Research Manager. Tulane subcontracted the implementation of this study to the KSPH, who trained study supervisors and data collectors in February and March 2014. Data collection began in April 2014 and is expected to be completed by June 2014.

Phase 1 of the study will be led by Dr. Paul Hutchinson, a health economist with substantial research experience in assessing the role of user fees on health care utilization in sub-Saharan Africa and Asia. He will be assisted by Rieza Soelaeman, a PhD student at Tulane University, and a Congolese health economist who will be identified later. Dr. David Hotchkiss will lead phase 2 of the study.

Table 2. Phase 1 Study timeline: Operational Research Steps and Milestones

	Steps and Milestones (marked in *)	**Expected**	**Completed**
1	**Identifying Research Topics**		
	Study topics proposed to DFID	Dec-2013	Dec-2013
*	DFID APPROVAL : Study topic agreed by DFID (with input from IMA)	Jan- 2014	Jan-2014
2	**Drafting Concept Note**		
	Discussions with DFID, gov and other stakeholders on research questions for the study completed	Jan-2014	Jan-2014
	Development of study concept note	Feb-2014	Feb-2014
	Submission of Concept Note to DFID	Feb 14, 2014	Mar 22, 2104 (final submission after revisions)
*	DFID APPROVAL: Concept Note approved by DFID (OR STUDIES ONLY)	Mar 28, 2014	Apr 8, 2014
*	DFID APPROVAL: CV of lead researcher agreed by DFID	Mar 28, 2014	Mar- 2014
3	**Developing Study Protocol**		
	Protocol and instruments completed (analysis plan)	Mar 28	May 6, 2014
	Submission of Study Protocol to DFID	Mar 28, 2014	May 6, 2014
	DFID review and QA	Mar 28-April 11, 2014	
*	DFID APPROVAL: When protocol has passed QA	Apr 11, 2014	
	Authorisation in writing from DFID to start research implementation	May 1, 2014	
	Tulane IRB approval given	* N/A	N/A
	Local IRB approval given	* N/A	N/A
4	**Implementing Study**		
	Field workers trained	* N/A	* N/A

	Field work/ secondary data collection completed.	* N/A	* N/A
	Analysis of data completed	Oct 30, 2014	
5	**Reporting,**		
	Preliminary findings presented in routine meetings with IMA and DFID	Ongoing	
	Drafting preliminary report	Oct-Nov, 2014	
	Preliminary report submitted	Nov 15, 2014	
	Dissemination and uptake plan, based on dissemination strategy in study protocol approved earlier by DFID (following QA), submitted	Oct, 2014	
*	DFID APPROVAL: Preliminary report	Nov 30, 2014	
*	DFID APPROVAL: Dissemination and uptake plan	Oct, 2014	
	Final report revisions	Dec 30, 2015	
	Final report submitted to DFID for approval	Dec 30, 2015	
	DFID review and final report	Jan 15, 2015	
*	DFID APPROVAL: Final report	Jan 15, 2015	
6	**Dissemination, Uptake**		
	Publication paper(s) reviewed by DFID	TBD	
	Dissemination activities conducted	Jan 30, 2015	
	Study submitted for publication	Mar, 2015	

*Not applicable as this study is using baseline survey data from the ASSP Impact Evaluation

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Appendix. Indicator definitions

Curative care	
Indicator	**Percentage of individuals sick or injured in the last four weeks who sought care, by chronic or acute health problems**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The percent of individuals who reported being sick or injured in the four weeks prior to the survey who sought care, including care from traditional healers, pharmacists, doctors and nurses in health care facilities To avoid problems of recall bias, questions on outpatient care will be limited to the previous 30 days
Numerator	Number of individuals sick or injured in the last four weeks who sought care
Denominator	Number of individuals who reported being sick or injured in the four weeks prior to the survey
Link to TOC/Assumption	**TOC:**
	Improved Access to Services
	Assumptions:
	Improving the quality of and access to curative health care will increase the number of individuals sick or injured who seek care.
Data Source	Household survey, question 306
Indicator	**Percentage of people who were hospitalized in the last six months, by chronic or acute health problems**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The percent of individuals who spent one or more nights in a health care facility in the six months prior to the survey

	Since inpatient care is less common and easier to remember, the recall period for inpatient care will be the previous 6 months
Numerator	Number of individuals who reported spending one or more nights in a health care facility in the six months prior to the survey
Denominator	Number of household members
Link to TOC/Assumption	**TOC:**
	Improved Access to Services
	Assumptions:
	Improving the quality of and access to preventative and curative health care will both increase the number hospitalized who need services and decrease the number of individuals hospitalized as a result of preventative care
Data Source	Household survey, question 20
Indicator	**Average out-of-pocket household health expenditures per episode of illness/injury**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The average of all household health expenditures paid in cash per episode of illness or injury
	Expenditures will include consultation and hospitalization costs, medicine costs, laboratory test costs, and transportation costs.
Numerator	Total household health expenditures paid in cash
Denominator	Number of illnesses or injuries
Link to TOC/Assumption	**TOC:**
	Improved Access to Services
	Assumptions:
	Households exposed to health care financing interventions, such as community health endowments, will reduce the average out-of-pocket expense per illness/injury
Data Source	Household survey, questions 213, 214, 314, 315, 332, 333, 347, 348

Indicator	**Average number of outpatient visits to a health facility among individuals sick or injured in the last four weeks**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The average of number of outpatient visits made to a health facility by individuals who were sick or injured within four weeks of interview
Numerator	Number of outpatient visits
Denominator	Number of individuals who reported being sick or injured in the four weeks prior to the survey who sought outpatient care
Link to TOC/Assumption	**TOC:**
	Assumptions:
	Households exposed to health care financing interventions, such as community health endowments, will face lower out-of-pocket expense per illness/injury and will be more likely to seek curative care when it is needed
Data Source	Household survey, questions 305, 308, 327, 342, 357
Indicator	**Average out-of-pocket household health expenditures per episode of illness/injury**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The average of all household health expenditures paid in cash per episode of illness or injury Expenditures will include consultation and hospitalization costs, medicine costs, laboratory test costs, and transportation costs.
Numerator	Total household health expenditures paid in cash
Denominator	Number of illnesses or injuries
Link to TOC/Assumption	**TOC:**
	Improved Access to Services
	Assumptions:

	Households exposed to health care financing interventions, such as community health endowments, will reduce the average out-of-pocket expense per illness/injury
Data Source	Household survey, questions 213, 214, 314, 315, 332, 333, 347, 348

Deliveries	
Indicator	**Percentage of live births delivered in past 5 years by skilled birth attendant (Rutstein, 2006)**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	Percentage of women with a birth in the five years prior to the survey who delivery was attended to by a skilled attendant The category skilled birth attendant includes only medically trained and licensed personnel. Traditional birth attendants (also sometimes called midwives) are not included, whether trained or untrained. The category "Traditional birth attendant/other" includes auxiliary health personnel and cases where the respondent did not know the level of qualification.
Numerator	Number of births in the five years prior to the survey that was attended to by a skilled birth attendant
Denominator	Number of births in the five years prior to the survey
Link to TOC/Assumption	**TOC:**
	Improved reproductive health
	Assumptions:
	Improving the quality of and access to reproductive health will increase the number of pregnant women receiving use trained birth attendants for delivery
Data Source	Woman's questionnaire, question 434

Indicator	**Average out-of-pocket household health expenditures per delivery attended by a skilled attendant**
Type (process, outcome, impact)	Outcome- Indicators concerned with the intermediate or long-term outcomes
Precise Definition	The average of all household health expenditures paid in cash per delivery attended by a skilled attendant Expenditures will include consultation and hospitalization costs, medicine costs, laboratory test costs, and transportation costs.
Numerator	Total household health expenditures paid in cash
Denominator	Number of births in the five years prior to the survey that was attended to by a skilled birth attendant
Link to TOC/Assumption	**TOC:**
	Improved Access to Services
	Assumptions:
	Households exposed to health care financing interventions, such as community health endowments, will reduce the average out-of-pocket expense for skilled deliveries
Data Source	Woman's questionnaire, question 438

Appendix 2: Additional Results

Multivariate Regression Results

Comparison of models determining seeking care, ASSP Areas

	(1) UNDER5	(2) AGE515	(3) AGE1554	(4) AGE55
seekcare				
insured	0.0000	0.0000	0.0210	0.0000
	(.)	(.)	(0.064)	(.)
tot_men	-0.0287	-0.0013	0.0055	0.0188
	(0.410)	(0.972)	(0.870)	(0.782)
age	-0.1653	0.0107	-0.0024	0.0246
	(0.056)	(0.634)	(0.775)	(0.259)
momalive	0.1496	-0.8314		
	(0.841)	(0.168)		
dadalive	1.0959***	-0.1681		
	(0.001)	(0.764)		
daysill	0.0446	0.0182	0.0433**	0.0301
	(0.184)	(0.327)	(0.002)	(0.076)
statut	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
1.hhwealt~le	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
2.hhwealt~le	-0.4094	0.4022	0.4499	0.1518
	(0.116)	(0.207)	(0.154)	(0.656)
3.hhwealt~le	-0.0104	-0.1744	0.9470**	0.0909
	(0.977)	(0.580)	(0.002)	(0.802)
4.hhwealt~le	-0.5190	-0.3031	0.5097	0.2899
	(0.122)	(0.339)	(0.064)	(0.531)
5.hhwealt~le	0.4641	0.5613	0.7954*	0.3295
	(0.169)	(0.092)	(0.022)	(0.480)
hosp	0.3346	0.7052	0.1337	-0.0823
	(0.233)	(0.133)	(0.740)	(0.784)
hosp	0.0000			
	(.)			
dist	0.0035	0.0080	0.0003	0.0168
	(0.461)	(0.247)	(0.955)	(0.324)
electricity	0.0535	0.1910	-0.1369	0.1484
	(0.852)	(0.696)	(0.662)	(0.802)
yrsopen	0.0000	-0.0007	-0.0005**	-0.0005
	(0.920)	(0.172)	(0.007)	(0.219)
numstaff	0.0276	-0.0575	-0.1269	-0.0310
	(0.652)	(0.471)	(0.075)	(0.766)
ip	-0.4456	0.2455	0.2279	0.5990
	(0.057)	(0.381)	(0.307)	(0.205)

treatarea	-0.1889	0.1568	-0.1702	-0.6682*
	(0.239)	(0.605)	(0.327)	(0.038)
outreach	0.1813	0.6212	0.2970	0.3202
	(0.344)	(0.070)	(0.173)	(0.458)
havedoctor	-0.2142	-1.4118**	0.2537	1.1562
	(0.497)	(0.010)	(0.491)	(0.141)
services	0.0401	-0.0111	-0.0916	0.2518
	(0.638)	(0.925)	(0.252)	(0.095)
drinkwater	0.0746	0.6119	0.5674*	0.0651
	(0.821)	(0.286)	(0.023)	(0.927)
mprice2	-0.0432	0.0624	0.0513	-0.2623**
	(0.467)	(0.409)	(0.367)	(0.006)
female	0.0050	-0.1923	0.2058	-0.1199
	(0.962)	(0.390)	(0.158)	(0.776)
_cons	-0.3726	0.6597	0.5314	-3.1577
	(0.673)	(0.467)	(0.439)	(0.148)
N	452	294	491	153
r2				
F	4.1598	2.9648	2.2649	1.6177
ll				

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Comparison of models determining seeking care, Non-ASSP Areas

	(1)	(2)	(3)	(4)
	UNDER5	AGE515	AGE1554	AGE55
seekcare				
insured	0.0162*	0.0042	-0.0096	0.8078
	(0.013)	(0.332)	(0.183)	(0.341)
tot_men	0.0025	0.0386	-0.0090	-0.0441
	(0.916)	(0.135)	(0.700)	(0.387)
age	-0.1653**	0.0059	0.0007	-0.0396
	(0.002)	(0.847)	(0.900)	(0.078)
daysill	0.0797**	0.0855*	0.0275	0.0437*
	(0.006)	(0.040)	(0.075)	(0.017)
female	0.1431	0.0482	0.0446	-0.5122
	(0.336)	(0.794)	(0.806)	(0.065)
statut	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
hosp	0.5427	0.1076	0.8673**	-0.4191
	(0.118)	(0.627)	(0.006)	(0.526)
mprice2	-0.0110	-0.0307*	-0.0513**	0.1322*
	(0.551)	(0.030)	(0.003)	(0.013)
1.hhwealt~le	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
2.hhwealt~le	0.2466	0.5699	0.1393	-0.8646
	(0.138)	(0.161)	(0.722)	(0.069)

3.hhwealt~le	0.7174**	0.2611	-0.1249	0.5617
	(0.001)	(0.332)	(0.730)	(0.243)
4.hhwealt~le	1.4108**	0.7450	0.2977	1.4209*
	(0.002)	(0.114)	(0.400)	(0.035)
5.hhwealt~le	0.5733**	0.5083	0.3787	0.8002
	(0.008)	(0.092)	(0.244)	(0.108)
dist	0.0033	-0.0376	-0.0236	0.1831
	(0.953)	(0.415)	(0.135)	(0.113)
electricity	-0.5601*	0.0350	-0.0210	-0.5707
	(0.020)	(0.861)	(0.913)	(0.200)
hosp	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
dist	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
electricity	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
yrsopen	0.0001	-0.0002	0.0004	0.0020**
	(0.679)	(0.624)	(0.080)	(0.004)
numstaff	0.0151	0.0646	0.0080	0.3867***
	(0.350)	(0.063)	(0.569)	(0.000)
ip	-0.3388	-0.3038	-0.2701	-1.6822***
	(0.229)	(0.099)	(0.156)	(0.000)
treatarea	-0.7624**	-0.4166*	-0.2627	-0.4138
	(0.004)	(0.031)	(0.151)	(0.428)
outreach	0.3712	0.1836	-0.0011	-0.5041
	(0.158)	(0.417)	(0.996)	(0.358)
havedoctor	-0.4512	-0.3472	-0.4412	-1.2154
	(0.057)	(0.182)	(0.154)	(0.095)
services	-0.0265	-0.1380	0.0073	-0.2409
	(0.793)	(0.193)	(0.944)	(0.340)
drinkwater	0.0409	0.0016	-0.1724	-0.0163
	(0.830)	(0.992)	(0.438)	(0.971)
_cons	0.8619	0.5871	0.4348	4.0329
	(0.202)	(0.460)	(0.562)	(0.089)
N	576	371	648	139
r2				
F	3.0721	15.3334	4.4893	2.6854
ll				

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

ASSP Areas
Child Health Services

	(1) ANC	(2) FACDELIV	(3) PNC
main			
statut	0.0000	0.0000	0.0000

	(.)	(.)	(.)
1.agecat	0.0000	0.0000	0.0000
	(.)	(.)	(.)
2.agecat	-0.3184*	-0.0576	-0.1973
	(0.016)	(0.701)	(0.127)
3.agecat	-0.0233	0.2155	-0.3066
	(0.908)	(0.445)	(0.250)
working	0.0382	-0.2516	-0.4259*
	(0.823)	(0.126)	(0.018)
qw208o	-0.0332	-0.0611	0.0258
	(0.369)	(0.078)	(0.438)
insured	0.0974	-0.8963	-0.8617
	(0.874)	(0.206)	(0.132)
0.educ	0.0000	0.0000	0.0000
	(.)	(.)	(.)
1.educ	0.1811	-0.0616	-0.0164
	(0.144)	(0.610)	(0.886)
2.educ	0.2773	0.5198**	0.2657
	(0.146)	(0.003)	(0.125)
hosp	-0.4943**	0.3032	-0.3674
	(0.008)	(0.137)	(0.071)
dist	-0.0104	-0.0232**	-0.0050
	(0.362)	(0.001)	(0.364)
electricity	0.1373	0.1210	0.0153
	(0.582)	(0.631)	(0.948)
yrsopen	-0.0000	-0.0003	-0.0006
	(0.981)	(0.335)	(0.053)
numstaff	-0.0482	0.0812	0.0441
	(0.350)	(0.152)	(0.420)
ip	0.4166	-0.2019	-0.0485
	(0.102)	(0.313)	(0.796)
treatarea	0.3962*	0.3289	0.1959
	(0.030)	(0.060)	(0.253)
outreach	-0.2439	-1.0699***	-0.7293**
	(0.333)	(0.000)	(0.001)
havedoctor	0.0839	0.3145	1.1424***
	(0.801)	(0.324)	(0.001)
services	0.2257***	0.1830**	0.2532***
	(0.001)	(0.002)	(0.000)
maternity	-0.0089	0.5890***	0.5612**
	(0.957)	(0.001)	(0.001)
drinkwater	0.1918	-0.1721	-0.2288
	(0.343)	(0.362)	(0.288)
1.hhwealt~le	0.0000	0.0000	0.0000
	(.)	(.)	(.)
2.hhwealt~le	0.5669**	0.4556*	-0.0631
	(0.009)	(0.043)	(0.749)

3.hhwealt~le	0.3979	0.4878**	0.0172
	(0.053)	(0.005)	(0.916)
4.hhwealt~le	0.0985	0.2698	-0.1687
	(0.698)	(0.152)	(0.429)
5.hhwealt~le	0.5456*	0.5409*	0.1742
	(0.023)	(0.031)	(0.537)
mprice2	-0.0757	-0.0486	-0.1322**
	(0.162)	(0.244)	(0.005)
_cons	-1.1194*	-0.7670	-1.5215**
	(0.039)	(0.112)	(0.009)
N	1057	1883	1050
F	5.9260	11.6455	3.9250

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Non_ASSP Areas
Child Health Services

	(1)	(2)	(3)
	NA_ANC	NA_FACDELIV	NA_PNC
main			
statut	0.0000	0.0000	0.0000
	(.)	(.)	(.)
1.agecat	0.0000	0.0000	0.0000
	(.)	(.)	(.)
2.agecat	-0.1651	-0.0375	0.2214
	(0.296)	(0.796)	(0.190)
3.agecat	-0.2335	-0.1168	0.5806*
	(0.252)	(0.515)	(0.029)
working	0.8102***	-0.1499	0.1563
	(0.000)	(0.459)	(0.268)
qw208o	0.0104	-0.0526*	-0.0239
	(0.695)	(0.018)	(0.275)
insured	0.3726	-0.0769	-0.4652
	(0.304)	(0.823)	(0.055)
0.educ	0.0000	0.0000	0.0000
	(.)	(.)	(.)
1.educ	0.1858	0.0579	-0.3666**
	(0.285)	(0.633)	(0.005)
2.educ	0.5049*	0.2405	-0.0496
	(0.017)	(0.201)	(0.741)
hosp	-1.2773**	-1.2477**	-1.2939**
	(0.008)	(0.001)	(0.003)
dist	-0.0115	-0.0098	0.0145
	(0.610)	(0.376)	(0.319)
electricity	1.3711**	0.3416	0.8872**
	(0.002)	(0.097)	(0.002)
yrsopen	0.0003	0.0004	-0.0001
	(0.404)	(0.084)	(0.676)

```
numstaff           0.0186         -0.0210          0.1206*
                  (0.534)        (0.547)         (0.028)

ip                 0.5266          0.2090         -0.4796
                  (0.078)        (0.456)         (0.063)

treatarea          0.2843          0.3256         -0.1254
                  (0.077)        (0.082)         (0.503)

outreach          -0.2299         -0.3481         -0.0032
                  (0.365)        (0.146)         (0.987)

havedoctor         0.0799          0.5020          0.2184
                  (0.900)        (0.403)         (0.473)

services           0.2902***       0.2295**        0.0935
                  (0.000)        (0.008)         (0.262)

maternity         -0.7358**        0.5685**        0.6497***
                  (0.002)        (0.005)         (0.001)

drinkwater         0.5018*         0.2242          0.1631
                  (0.018)        (0.191)         (0.339)

1.hhwealt~le       0.0000          0.0000          0.0000
                     (.)            (.)             (.)

2.hhwealt~le       0.1865          0.1727          0.2686
                  (0.457)        (0.284)         (0.200)

3.hhwealt~le       0.1153          0.2265          0.4613*
                  (0.599)        (0.158)         (0.032)

4.hhwealt~le       0.3368          0.2096          0.5304*
                  (0.102)        (0.209)         (0.011)

5.hhwealt~le       0.2350          0.3748          0.7429**
                  (0.288)        (0.080)         (0.001)

mprice2            0.1999*         0.0333         -0.0044
                  (0.027)        (0.317)         (0.954)

_cons             -2.4651***      -1.2710*        -2.1844***
                  (0.000)        (0.047)         (0.000)
------------------------------------------------------------
N                   1154            2111            1148
F                  4.5283          4.8574         10.8453
------------------------------------------------------------
p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

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Contraceptive Use, ASSP and non-ASSP areas

```
------------------------------------------------------------------------------
                     (1)             (2)             (3)             (4)
              currmeth_A~P    modmeth_ASSP    currmeth_N~P    modmeth_NA~P
------------------------------------------------------------------------------
main
statut             0.0000          0.0000          0.0000          0.0000
                     (.)             (.)             (.)             (.)

1.agecat           0.0000          0.0000          0.0000          0.0000
                     (.)             (.)             (.)             (.)

2.agecat           0.1968          0.3693          0.0744          0.1996
                  (0.246)         (0.150)         (0.728)         (0.483)
```

3.agecat	-0.0732	0.5143	-0.0617	0.1907
	(0.840)	(0.434)	(0.801)	(0.571)
working	0.1770	1.0934**	0.1765	-0.1769
	(0.471)	(0.002)	(0.430)	(0.511)
livekids	0.0746	-0.0004	0.0792	0.0645
	(0.090)	(0.996)	(0.068)	(0.173)
insured	0.1865	-0.1151	0.1675	0.2122
	(0.631)	(0.844)	(0.585)	(0.565)
0.educ	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
1.educ	0.1447	-0.4719	0.2951	0.3823
	(0.416)	(0.071)	(0.086)	(0.145)
2.educ	0.2569	-0.1200	0.4838*	0.6644*
	(0.168)	(0.634)	(0.019)	(0.015)
hosp	0.0705	0.7238*	0.3222	0.8838**
	(0.746)	(0.019)	(0.265)	(0.006)
dist	-0.0071	0.0011	0.0100	0.0021
	(0.351)	(0.897)	(0.485)	(0.925)
electricity	-0.1606	-1.1444*	0.1049	0.3186
	(0.454)	(0.020)	(0.483)	(0.197)
yrsopen	0.0006*	0.0004	-0.0002	0.0005
	(0.016)	(0.126)	(0.422)	(0.060)
numstaff	0.0520	0.0796	-0.0112	-0.1513*
	(0.173)	(0.136)	(0.681)	(0.043)
ip	0.3107	-0.5944*	-0.8643**	-1.0152***
	(0.121)	(0.010)	(0.001)	(0.000)
treatarea	-0.1013	-0.0279	0.1105	-0.2126
	(0.555)	(0.879)	(0.492)	(0.331)
outreach	0.5254	0.1116	0.0052	0.1551
	(0.068)	(0.683)	(0.982)	(0.715)
havedoctor	0.5029*	-0.2461	0.4559	-0.3465
	(0.027)	(0.747)	(0.059)	(0.501)
services	0.0014	0.1697	0.0473	0.1282
	(0.986)	(0.060)	(0.561)	(0.273)
maternity	-0.3108*	0.0554	0.5173**	0.4170
	(0.017)	(0.799)	(0.007)	(0.085)
drinkwater	0.0478	0.5789	0.0762	0.0296
	(0.873)	(0.139)	(0.672)	(0.891)
mprice2	-0.0152	-0.0084	0.0237**	0.0372**
	(0.226)	(0.754)	(0.008)	(0.004)
1.hhwealt~le	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
2.hhwealt~le	-0.5301	0.0058	-0.5652**	-0.4150
	(0.065)	(0.988)	(0.001)	(0.411)
3.hhwealt~le	-0.3789	0.1888	-0.4082	-0.3610
	(0.055)	(0.635)	(0.108)	(0.424)
4.hhwealt~le	0.1319	0.7969**	-0.3101	0.0208

	(0.488)	(0.005)	(0.152)	(0.961)
5.hhwealt~le	-0.1428	1.0005***	-0.4946	0.2147
	(0.488)	(0.000)	(0.060)	(0.543)
_cons	-1.9307**	-5.0978***	-2.5198***	-3.7432***
	(0.006)	(0.000)	(0.000)	(0.000)
N	1219	1219	1308	1308
r2				
F	7.7462	12.0843	3.8966	2.6701
ll				

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Selection Models

ASSP Areas
Comparison of models determining seeking care

	(1) seek05_sel	(2) seek615_sel	(3) seek1654_sel	(4) seek55_sel
seekcare				
insured	0.8951	5.6982**	-0.3246	5.5333***
	(0.168)	(0.002)	(0.691)	(0.000)
tot_men	-0.0522*	0.0003	0.0157	-0.0107
	(0.024)	(0.993)	(0.701)	(0.881)
age	-0.1006**	-0.0074	-0.0014	0.0140
	(0.003)	(0.747)	(0.889)	(0.633)
momalive	1.0891*	-0.3026		
	(0.010)	(0.599)		
dadalive	0.4463	-0.1921		
	(0.108)	(0.653)		
daysill	0.0205	0.0122	0.0397**	0.0287*
	(0.059)	(0.394)	(0.004)	(0.038)
statut	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
1.hhwealt~le	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
2.hhwealt~le	-0.4067**	0.2457	0.3437	0.1552
	(0.003)	(0.429)	(0.343)	(0.698)
3.hhwealt~le	-0.2346	-0.2214	0.8951*	0.4242
	(0.175)	(0.413)	(0.022)	(0.236)
4.hhwealt~le	-0.3528*	-0.4066	0.4353	-0.0224
	(0.021)	(0.174)	(0.214)	(0.959)
5.hhwealt~le	-0.3129	0.1359	0.8527	0.9882
	(0.103)	(0.648)	(0.058)	(0.060)
hosp	0.1353	0.4778	0.5905	0.8364
	(0.226)	(0.286)	(0.055)	(0.182)
dist	0.0010	0.0090	0.0073	0.0287
	(0.678)	(0.253)	(0.287)	(0.075)
electricity	0.0793	0.2604	-0.1695	0.0068
	(0.464)	(0.542)	(0.644)	(0.990)
yrsopen	0.0001	0.0003	0.0003	0.0014
	(0.556)	(0.633)	(0.539)	(0.083)
numstaff	0.0479	-0.0418	-0.0899	0.1318
	(0.186)	(0.552)	(0.234)	(0.269)
ip	-0.1748*	0.2263	0.0512	0.4825
	(0.048)	(0.342)	(0.794)	(0.354)
treatarea	-0.0298	0.1316	0.0104	-0.4912
	(0.623)	(0.600)	(0.957)	(0.139)
outreach	0.0720	0.2550	0.3268	0.8767
	(0.380)	(0.398)	(0.161)	(0.066)

havedoctor	-0.0383	-0.5504	0.3678	1.5572
	(0.803)	(0.162)	(0.282)	(0.070)
services	0.0136	0.0074	-0.1626*	0.0188
	(0.712)	(0.933)	(0.047)	(0.904)
maternity	-0.0891	0.5212*	0.2849	-0.0817
	(0.211)	(0.038)	(0.079)	(0.827)
drinkwater	0.0298	0.1589	0.2649	-0.1177
	(0.790)	(0.687)	(0.232)	(0.854)
mprice2	-0.0125	-0.0031	0.0121	-0.1322***
	(0.197)	(0.850)	(0.410)	(0.000)
female	-0.1013	-0.1467	0.2235	-0.2478
	(0.211)	(0.432)	(0.304)	(0.626)
_cons	-1.8365***	-0.9739	0.2909	-2.1205
	(0.000)	(0.193)	(0.746)	(0.480)
sick				
insured	-0.2787	-0.4363	0.3442	1.3801*
	(0.575)	(0.327)	(0.287)	(0.010)
tot_men	-0.0406*	-0.0325	-0.0500**	-0.0466
	(0.016)	(0.168)	(0.008)	(0.057)
age	-0.0363*	-0.0359*	0.0136***	0.0413***
	(0.021)	(0.028)	(0.000)	(0.000)
momalive	1.1521**	0.6928**		
	(0.002)	(0.007)		
dadalive	-0.0226	-0.0488		
	(0.945)	(0.690)		
statut	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
1.hhwealt~le	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
2.hhwealt~le	-0.1745	-0.0123	-0.1853	-0.4405
	(0.172)	(0.947)	(0.231)	(0.147)
3.hhwealt~le	-0.1981	0.0630	-0.2886	-0.3621
	(0.168)	(0.718)	(0.136)	(0.292)
4.hhwealt~le	-0.1406	-0.0661	-0.2769	-0.1234
	(0.390)	(0.698)	(0.091)	(0.726)
5.hhwealt~le	-0.4119*	-0.2585	-0.3083	-0.3640
	(0.031)	(0.218)	(0.133)	(0.364)
female	-0.1025	0.0996	0.3322**	0.4151**
	(0.273)	(0.270)	(0.002)	(0.001)
0.domain	0.0000	0.0000	0.0000	0.0000
	(.)	(.)	(.)	(.)
1.domain	0.2909*	0.5432**	0.3720*	0.3492
	(0.011)	(0.002)	(0.035)	(0.190)
2.domain	0.3178*	0.3582*	0.1617	0.2809
	(0.015)	(0.017)	(0.352)	(0.304)
_cons	-1.4795***	-1.6377***	-1.3728***	-3.1783***
	(0.000)	(0.000)	(0.000)	(0.000)

athrho				
_cons	2.5355***	0.7916	0.0413	-0.0206
	(0.000)	(0.064)	(0.942)	(0.971)
N	2080	2681	3697	612
r2				
F	3.6811	1.0699	1.8278	17.5868
ll				

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

NON-ASSP Areas
Comparison of models determining seeking care

	(1)	(2)
	seek05_sel	seek615_sel
seekcare		
insured	0.8235	1.5769*
	(0.078)	(0.046)
tot_men	0.0074	0.0293
	(0.744)	(0.347)
age	-0.1374*	-0.0141
	(0.011)	(0.721)
momalive	-0.1424	-0.5416
	(0.801)	(0.274)
dadalive	0.7713	0.7576
	(0.282)	(0.072)
daysill	0.0763*	0.0890
	(0.017)	(0.089)
statut	0.0000	0.0000
	(.)	(.)
1.hhwealt~le	0.0000	0.0000
	(.)	(.)
2.hhwealt~le	0.1703	0.6374
	(0.356)	(0.144)
3.hhwealt~le	0.6309*	0.4073
	(0.021)	(0.259)
4.hhwealt~le	1.3590*	0.7655
	(0.039)	(0.148)
5.hhwealt~le	0.5756*	0.6823*
	(0.014)	(0.047)
hosp	0.5130	-0.2841
	(0.252)	(0.392)
dist	-0.0171	0.0086
	(0.774)	(0.858)
electricity	-0.5456	-0.4161
	(0.070)	(0.159)
yrsopen	0.0002	-0.0014**
	(0.722)	(0.001)

```
numstaff           0.0124          0.1167*
                  (0.811)         (0.013)

ip                -0.4085         -0.3711
                  (0.248)         (0.164)

treatarea         -0.7597**       -0.1796
                  (0.009)         (0.362)

outreach           0.1547         -0.1433
                  (0.656)         (0.519)

havedoctor        -0.5324          0.7379
                  (0.368)         (0.086)

services          -0.0116         -0.0881
                  (0.914)         (0.386)

maternity          0.0172         -0.0782
                  (0.951)         (0.679)

drinkwater         0.1103          0.3305
                  (0.662)         (0.117)

mprice2            0.0105         -0.0121
                  (0.537)         (0.413)

female             0.1586         -0.0108
                  (0.345)         (0.962)

_cons             -0.3047          0.4641
                  (0.795)         (0.731)
------------------------------------------
sick
insured            0.4288*         0.0609
                  (0.020)         (0.778)

tot_men           -0.0052         -0.0083
                  (0.777)         (0.734)

age               -0.0176         -0.0483***
                  (0.625)         (0.000)

momalive           0.2234          0.3861
                  (0.331)         (0.126)

dadalive           0.3206         -0.2584*
                  (0.142)         (0.020)

statut             0.0000          0.0000
                     (.)             (.)

1.hhwealt~le       0.0000          0.0000
                     (.)             (.)

2.hhwealt~le      -0.0773         -0.0410
                  (0.631)         (0.823)

3.hhwealt~le      -0.0938         -0.2649
                  (0.514)         (0.241)

4.hhwealt~le      -0.3135*        -0.4495*
                  (0.011)         (0.016)

5.hhwealt~le      -0.0848         -0.1357
                  (0.575)         (0.486)

female             0.1277          0.0343
                  (0.344)         (0.672)
```

```
0.domain            0.0000          0.0000
                       (.)             (.)

1.domain            0.2382          0.3881**
                   (0.051)         (0.003)

2.domain            0.6508***       0.7229***
                   (0.000)         (0.000)

_cons              -1.3889***      -0.9759*
                   (0.001)         (0.016)
------------------------------------------
athrho
_cons               0.3398          0.0451
                   (0.459)         (0.938)
------------------------------------------
N                     2605            3212
r2
F                   2.1628          7.8180
ll
------------------------------------------
p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001
```

Note: Models did not converge for older age groups.

Estimated Price Elasticities from Selection Models

	ey/ex	Std. Err.	z	P>z	[95% Conf.	Interval]
ASSP areas						
0-5 years	-0.0650	0.0515	-1.26	0.207	-0.1660	0.0359
6-15 years	-0.0253	0.0968	-0.26	0.794	-0.2151	0.1645
16-55 years	0.0285	0.0407	0.70	0.483	-0.0512	0.1082
55+ years	-0.3603	0.2931	-1.23	0.219	-0.9349	0.2142
Non-ASSP areas						
0-5 years	0.0323	0.0352	0.92	0.359	-0.0367	0.1014
6-15 years	-0.0016	0.0069	-0.23	0.817	-0.0152	0.0120
16-55 years	Did	not	converge			
55+ years	Did	not	converge			