Health Insurance for Children:

Selection, Utilization, and Health Status

ANNE FITZPATRICK AND REBECCA L. THORNTON*

Abstract

We evaluate the determinants and effects of health insurance enrollment among children in Nicaragua using an experiment that randomly offered free insurance. We find multiple dimensions of selection: by health status and price sensitivity. Those with worse baseline health are more likely to enroll. However, reducing the price of insurance to zero increases adverse selection by bringing in families who likely could not otherwise afford the insurance. Children of insured parents were 24 percentage points more likely to attend a covered provider. The impact on health expenditures is negative, but not statistically significant. We find no improvements in health outcomes.

*Department of Economics, University of Michigan, 213 Lorch Hall, 611 Tappan St,. Ann Arbor MI, 48109-1220, USA; rebeccal@umich.edu, fitza@umich.edu. Funding for this study was provided by USAID's Private Sector Partnerships-*One* (PSP-*One*) project, the Global Development Network (GDN), and the ILO Micro-insurance Innovation Facility. The authors gratefully acknowledge use of the services and facilities of the Population Studies Center at the University of Michigan, funded by NICHD Center Grant R24 HD041028. The evaluation was coordinated for GDN by EA Consultants. We thank the extensive contributions of the field team at ALVA Consultores including Dr. Ana del Carmen Rojas and Ms. Rosario Duarte, as well as the project coordination and support of Barbara Magnoni, EA Consultants, and the contributions in the project of Tania Dmytraczenko, Erica Field, and Laurel Hatt. We acknowledge contributions from Emily Oster, Jeff Smith, Dan Silverman, and participants of the Michigan Development Economics Informal Seminar.

I. Introduction

There is abundant research on health insurance within both developing and developed countries, much of which has focused on adults or family units rather than children. However, with a growing body of evidence of large long-term returns to investments in child health, there has been increased attention on health insurance for children and some have argued the need to subsidize these programs.[1] On the other hand, there is concern about the financial sustainability of such programs due to adverse selection – that parents with sicker children will be more likely to enroll their children in insurance. Recent health care reforms in the United States illustrate the reality of this concern. In 2010, new regulations stipulated that children could not be denied health insurance coverage due to pre-existing conditions; this has caused a large number of insurers to stop offering child-only insurance plans because of the concern of adverse selection based on children's health (Helfand, 2010).

Despite its policy importance, there is little known about whether insurance is a good health investment for children.[2] This is partly due to the challenge in measuring the causal impact of insurance on utilization, expenditures, and health. Simply comparing the health status of insured children with uninsured children in cross-sectional or panel data confounds the fact that certain types of children or families are more likely to be enrolled (Levy and Meltzer, 2008).

In this paper, we utilize an experiment that randomly offered adults free comprehensive public health insurance that covered themselves and dependents who were under the age of twelve for a period of six months. This allows for measuring selection into health insurance enrollment as well as empirically identifying the causal effect of insurance on health utilization, spending, and health outcomes.

[1] There is a large literature on the returns to child health including Almond and Currie (2010), Bleakley (2007), Baird et al. (2011) as well as others. In the United States, the National Conference of State Legislatures (2012) cites immunizations, regular checkups, and future health benefits as a primary justification for the State Children's Health Insurance Program (SCHIP), created in 1997 to cover uninsured children in low to middle-income families.

[2] Exceptions are Currie and Gruber (1996) who find effects of Medicaid expansions on child mortality and Kaestner et al. (1999) who find no impacts of these expansions.

Our data consists of 2,172 children under the age of twelve of 1,334 parents working in the informal sector in Managua, Nicaragua. In 2007, these parents were selected to participate in a baseline survey which asked questions about health for themselves and their children. At the end of the baseline survey, approximately half of the parents were randomly selected to be given a voucher for six months of free government health insurance. Both groups received information brochures about the new insurance product. The subsidy had a large effect on insurance enrollment: 35 percent of those given the voucher signed up for insurance compared to 2.2 percent enrollment among those who were not given the voucher. One year later, a follow-up survey was conducted and questions about health utilization, expenditures and health status were again asked about the adults and children.

Parent's enrollment decisions were negatively correlated with baseline health – both their own and especially their children's. Having had more health visits or having forgone treatment in the past year due to lack of money at the beginning of the study significantly increased the likelihood of taking up insurance, suggesting adverse selection and a downward-sloping marginal cost curve. Models of adverse selection predict that lowering the price of insurance should attract those who are healthier by inducing those with lower marginal costs to enroll (Rothschild and Stiglitz, 1976; Einav and Finkelstein, 2011). However, we find that the six-month subsidy significantly increased the extent of adverse selection within the sample; i.e., lower prices induced those at higher risk to enroll. In settings such as developing countries where credit constraints play an, if not the most important role in the decision to purchase insurance, reducing the price of insurance may, on net, attract those who could not otherwise afford insurance; in other words, insurance subsidies may attract those who are most likely to have the worst health.

Using the randomization of the offer of free insurance, we measure the impact of insurance on health utilization, expenditures, and health status of children. The intention to treat estimates comparing those who were offered the free insurance with

those who were not indicates moderate but significant increases in total utilization for children. The treatment on the treated estimates indicate similar results, with slightly larger magnitudes. The largest effects on utilization are among children who had been sick in the past year at baseline.

The impact of insurance on health expenditures for children is negative although the estimates are statistically insignificant. We find no significant evidence of improved health outcomes. If anything, our results on health outcomes suggest that parents report children to be sick more often; we interpret this as a result of information from quality health providers on children's' true health status.

Our study is among the first to randomize health insurance allowing us to present causal evidence of the effects of health insurance in a developing country. Moreover, we focus on health insurance among children, which despite the significant policy relevance, has been relatively understudied in both developed and developing countries. The fact that we find limited health improvements among children and yet the subsidies attracted families with sicker children – who subsequently increased their utilization of health services – has important implications for the viability of voluntary, subsidized, insurance programs that are increasingly becoming available and popular in developing countries.

The paper proceeds as follows: Section 2 discusses the theoretical framework as well as previous literature on health insurance enrollment and impacts in developing countries. Section 3 provides background on the insurance program and the research design. Section 4 presents the empirical strategy, Section 5 presents the results on the effects of health insurance on health visits, expenditures, and health outcomes, and Section 6 concludes.

II. Theoretical Framework and Previous Research

Research on health insurance generally focuses on either measuring selection into enrollment or the effects of having insurance. We discuss each of these and present

related literature from developing countries.

A. Selection into Insurance Enrollment

How asymmetric information affects selection into health insurance has been the subject of theoretical and empirical work since the 1970's (Arrow, 1963; Pauly, 1974; Rothschild and Stiglitz, 1976; Wilson, 1977). According to theory, individuals have hidden information – either about their risk, or preferences for risk aversion – and choose to enroll in insurance based on this information. If insurance companies had perfect information about risk types or preferences, they could offer different contracts to individuals with different ex-ante characteristics. However, with imperfect information, individuals who are at ex-ante higher risk may be more likely to enroll in insurance leading to adverse selection.

Measuring the correlation between ex-ante risk and insurance coverage has been a major focus within health economics, but there are significant empirical challenges. One difficulty is disentangling ex-ante correlation and ex-post correlation due to moral hazard (Arrow, 1963; Holstrom, 1979). Another challenge is that selection may be context specific; in other words, the positive correlation between risk and insurance coverage may exist in some markets, among some individuals, or in some contexts, but not in others (Cohen and Siegelman, 2010). For example, Finkelstein and McGarry (2006) demonstrate the existence of multiple dimensions of private information – information about risk type, and risk preferences, which may either act in offsetting directions or reinforce each other (Cohen and Einav, 2005). If individuals are risk averse they may be more likely to select into insurance coverage, predicting advantageous selection (de Meza and Webb, 2001; Cutler et al., 2008). Similarly, risk preferences or cognitive ability and education, including financial planning, may also play a role in the insurance decision, and may indicate advantageous selection (Fang et al. 2008). Ultimately, the net direction of selection has important implications on the financial sustainability of the insurance program

and appropriate policy recommendations.[3]

If there is adverse selection in enrollment based on ex-ante risk, insurance subsidies could help to diversify the risk pool by attracting those who are not willing to pay higher prices, corresponding to those who are at lower ex-ante risk (Einav and Finkelstein, 2011). However, if subsidies are likely to attract the poor who are also those with poorest health, then subsidies instead increase the riskiness of the insurance pool. While this may be beneficial from a social perspective, by lowering social inequality and serving as a safety net for financial or health risks, such a scheme would likely not be financially sustainable without external funding to operate.

Previous studies in developing countries have found evidence of adverse selection based on risk type. In Vietnam, households with more chronically sick members were more likely to have enrolled in insurance (Wagstaff et al., 2009). A study in Cambodia found that households that bought insurance were 13 percentage points more likely to have a member in poor health and 2.3 percentage points more likely to report major health shocks in the previous year (Polimeni and Levine, 2011). In China, even when enrollment rates were high (up to 71 percent), adverse selection was still present, especially among partially enrolled households (Wang et al., 2005).[4]

In developing countries, credit constraints may play an important role in the decision and ability to purchase health insurance. Several previous studies find higher rates of insurance enrollment in wealthier households who can afford payments (Wagstaff et al., 2007; Wagstaff and Pradhan, 2006; Jütting, 2003; Lamiraud et al., 2005). In these cases, a positive correlation between wealth and

[3] In developed countries the evidence on the direction of selection is mixed. Research has generally found evidence of adverse selection although it may depend on the context (Cutler and Zeckhauser, 1998; Cutler and Zeckhauser, 2000). However, in some cases extent of adverse selection has been found to be minimal (Wolfe and Goddeeris, 1991; Finkelstein and Poterba, 2006), non-existent (e.g. Finkelstein and McGarry, 2006; Cardon and Hendel, 2001; Cawley and Philipson (1999), or that there is evidence of advantageous selection (e.g. Fang et al., 2008).

[4] There are also examples of adverse selection (and moral hazard) for women in Zaire who enrolled in a prepayment scheme for hospital care (Noterman et al., 1995). In Burundi, there was some evidence of adverse selection at the household level – although not the individual level – to purchase national health insurance; large households were more likely to enroll due to the fixed price irrespective of household size (Arhin, 1994).

health implies advantageous selection into insurance enrollment.

In terms of measuring how selection varies with price of insurance, there has been only one study, to our knowledge that examines this. In a study most similar to ours, the SKY insurance program in Cambodia randomly offered one or five months of free health insurance (Polimeni and Levine, 2011). Although there was evidence of adverse selection in take-up, there was no significant impact of lowering the price of insurance on either attracting or deterring sicker individuals or household. One possible reason that there was no impact on selection into insurance is that the reduction price was relatively small, from $2.75 to $0.50 for six months of coverage.

B. Impact of Health Insurance

One of the main challenges in measuring the impact of health insurance is the endogeneity of enrollment (Levy and Meltzer, 2008). Differences in health utilization, expenditures, or status between the insured and the uninsured may only reflect differences in characteristics correlated to enrollment (i.e., risk type, risk preferences, health status or behavior). Even determining the direction of the bias is complicated by the fact that selection could be either adverse or advantageous depending on the context. In addition, the possibility of moral hazard introduces additional complexity.

A number of different strategies have been utilized to empirically identify the impact of health insurance. Most non-randomized studies find a positive relationship between insurance coverage and health-care utilization among adults and families (Jütting, 2003; Jowett, et al., 2003; Yip and Berman, 2001; Waters, 1999; Bertranou, 1998; Ron, 1999; Trujillo et al., 2005; Giedion, 2009; Hidayat et al., 2004; Pradhan et al. ,2007; Wagstaff and Pradhan, 2006; Wagstaff et al., 2007; and Wagstaff et al., 2009). In addition, there is a general negative association between insurance and out-of-pocket expenditures or spending on catastrophic health expenditures (Barros, 2008; Galárraga et al., 2008).

One of the most well-known randomized studies – the RAND Health Insurance Experiment – took place in the United States. This study followed almost 2000 families who were randomly assigned to either free care or plans that had varying co-payment schemes; no families were uninsured. In general, the study found limited effects of the free insurance on health among adults, and no significant effects of differing co-payment rates on health outcomes among children (Newhouse et al., 1981; Newhouse, 1993; Brook et al., 1984; Valdez et al., 1985). More recently, the Oregon Health Insurance Experiment randomized the opportunity to enroll in Medicaid through a lottery, and found those who enrolled in health insurance increased their utilization at providers, reported less health expenditures, and reported better health than those adults who were in the control group (Finkelstein et al. 2012).

There have been more recent randomized studies in developing countries. King et al. (2009) randomly assigned villages to receive *Seguro Popular* in Mexico and found reductions in catastrophic expenditures but no effects on health visits, health outcomes, or medication spending. Thornton et al. (2010) studied this same randomized insurance program in Nicaragua among adults and found substitution away from private clinics and public health centers and towards visits to covered providers. The SKY program in Cambodia which randomized insurance premiums found that health insurance also resulted in a substitution towards covered providers and was effective at insuring families against large catastrophic expenditures, with no effects on health outcomes (Levine et al., 2011).[5]

However, the relationship between insurance and utilization or spending appears to depend on the context and design of the insurance product. For example, in the Philippines, Gertler and Solon (2002) find no impact on out-of-pocket costs in part, due to the design, where covered providers adjusted prices in response to the

[5] There are a growing number of randomized evaluations that have recently been implemented, but results are not yet available. A comprehensive list of these recent studies and their methodologies can be found at: http://www.microinsurancenetwork.org/workinggroup/impact/stocktaking.php.

insurance product. In Chile, Sapelli and Vial (2003) found a negligible impact of insurance; they suggested this could be due to the insurance's limited coverage and benefits. Other studies in Zambia and China also found limited effects (Ekman, 2007; Carrin et al., 1999).

This study adds to the literature on health insurance in developing countries – where the theorized benefits of insurance are large but credit constraints are an important barrier to enrollment. It is among the first randomized studies on health insurance, as well as among the first to present evidence on the effects for children in a developing country.

III. Background and Research Design

A. INSS Health Insurance

In Nicaragua, adults working within the formal sector have access to the Social Security Institute's (INSS) health insurance coverage. The INSS insurance provides all subscribers a comprehensive package of preventive, diagnostic, and curative health services, including primary and specialist care, medication, laboratory exams, prenatal services, hospitalization, and 24-hour emergency care. Importantly, the insurance covers children until their twelfth birthday. The plan requires a flat monthly fee and covers services at EMPs (the private providers where the insurance could be used). No additional fees (i.e. co-pays) are charged for services at EMPs. The cost of the program is structured such that the monthly fee was higher in the first two months, at approximately 18 dollars per month, and then approximately 15 dollars per month in subsequent months; this allowed for a three-month grace period of coverage after participants un-enrolled. Monthly payments could be made directly at the INSS office, banks in the country, or in some cases micro-finance institutions. Unlike many insurance plans in developed countries, this product does not have a menu of insurance options, but rather one plan offered at one price.

While this insurance plan covers those in the formal sector, this represents only a small proportion of the adult population – just under half a million adults or approximately 13.5 percent of the adult population (INSS yearly statistics 2007). While the uninsured can still attend EMPs, they would be required to pay for the services out-of-pocket. Due to the fact that these 'high quality' providers are expensive, many uninsured Nicaraguans instead go to low-quality public clinics, self-medicate at pharmacies, or simply go without health care.

In January 2007, the government of Nicaragua implemented a pilot project that extended the Social Security Institute's (INSS) health insurance program to informal sector workers. This paper evaluates that program, focusing on children.

B. Data & Randomization

In 2007, a few months after the insurance program was publicly available to informal sector workers for the first time, a baseline survey was conducted among randomly selected uninsured informal sector workers in the three largest open-air markets in central Managua.[6] The baseline survey collected information on demographic and socioeconomic characteristics. It also collected information on health utilization, expenditures, and health status for the respondent and his/her children. Specifically, the survey contained questions on the previous year's health utilization: whether the individual had been sick, the number of times that the individual had been sick, whether or not the individual had forgone treatment due to lack of money, and the number of visits and costs at health providers including pharmacies, EMPs, public clinics, private hospitals, private doctors, and laboratories.

At the end of the baseline survey, respondents were either given an informational brochure about the insurance product or the brochure plus a six-month subsidy for

[6] Respondents were selected with the following two methodologies: in the first phase of the survey, prior to the baseline survey a census of market booths was conducted to define the sampling frame of possible respondents. In the second phase of the survey, interviewers went door to door and sampled each market booth with eligible respondents. Participants deemed eligible through the census were selected randomly (stratified by gender marital status and micro-finance client status) and administered the baseline survey. Individuals who were between ages 18 and 54, had a government ID, were an owner of the market booth, and lacked health insurance coverage were eligible. Overall completion rates were 51 and 53 percent for the two phases.

insurance worth approximately USD$100.[7] Respondents could enroll in the insurance plan at the INSS or at local micro-finance institutions. Government ID numbers were collected to match respondents to health insurance enrollment data that was to be provided by the INSS.[8] The overall take-up rate of insurance for respondents with insurance-eligible children was 35 percent among those who were offered the six month subsidy and 2.22 percent among those who were not.

One year later, in 2008, a follow-up study was conducted among the same individuals. Overall, 93 percent completed the follow-up survey and there was no differential sample attrition between those who were offered the subsidy and those who were not (not shown; see Thornton et al. (2010) for further details).

Our analysis focuses on 2,172 children who were under 12 at the baseline living in a total of 1,334 households. We present baseline household- and parent-level characteristics (Table 1, Panel A) and child-level characteristics (Table 1, Panel B). On average, households had 1.62 children in a household of almost 5 individuals. Adult respondents have relatively high levels of education (9.5 years), with a median monthly household income of 3,752 Córdobas (USD$207).

Most parents had been sick in the past year (76 percent), on average 2.4 times. On average, parents made 4 trips to a health care provider – over half of those were to pharmacies (2.14). A quarter (24 percent) of parents reported forgoing treatment due to lack of money in the past year. In all, average total health expenditures among parents were relatively high at 747 Córdobas (USD$ 41) .

Half of the children (0.48) in our study were female with an average age of 6. With respect to average health characteristics, children are similar to their parents. The majority (79 percent) visited any health provider in the past year. However, almost 19 percent were reported to have forgone treatment in the past year due to lack of money. The average number of visits to all providers was 4.18. Average total health

[7] The original study design also assigned respondents into 2-month subsidy group; these individuals were not in the follow-up survey due to low take-up and budget constraints. Full details of the experimental design are available in Thornton et al. (2010).
[8] The baseline survey also included respondents in four other smaller markets but because these respondents were not followed over time, they are not included in the analysis.

expenditures among children were 627 Córdobas (USD$ 35), with a median value of C$204 (USD$11).

In general, parent and child health characteristics are positively correlated. The correlation coefficient ranges from 0.69 on forgone treatment due to lack of money in the past year to 0.47 on having been sick in the past year.

IV. Empirical Strategy

In this section we discuss the empirical strategy to measure the determinants of insurance enrollment and how they vary with price as well as to estimate the effects of having insurance on health utilization, behavior, and health status.

A. Empirical Strategy: Health Insurance Enrollment

Which types of individuals choose to enroll in health insurance? In order to answer this question we first consider which characteristics, conditional on the (randomized) price of insurance, are correlated with enrollment. Our main analysis measures the association between child health characteristics and probability of insurance enrollment by estimating the following regression:

$$(1) \qquad \text{Insurance}_{ij} = \beta_0 + \beta_1 \text{Free}_j + X'_{ij}\delta + \varepsilon_{ij}$$

where *Insurance* is an indicator if child *i*, of parent *j* enrolled in health insurance. *Free* indicates that the child's parent was offered the six-month subsidy, and X_j is a vector of survey round and market fixed effects as well as baseline health variables.[9] Baseline health variables include if the child was sick in the past year, the number of times sick in the past year, the number of visits to the pharmacy, the total number of health visits, and if the child had forgone treatment in the past year due to lack of

[9] Recall that there were two phases of baseline surveying with differing sampling strategies. Further note that as subsidies were randomly assigned, results are invariant to excluding price from the specification (not shown).

money during the past year. We cluster our standard errors by household. Results are robust to specifications when additional household-level or child-level controls are included (not shown).

In our setting, children were automatically covered if their parent chose to enroll in health insurance. Because of this feature, it is not clear ex-ante whether parental characteristics or child characteristics are more strongly correlated with enrollment in health insurance. Additionally, parental and child characteristics are highly correlated and thus we consider specifications that include both child and parent characteristics in the same specification (Appendix A).

We also consider how the composition of the insurance pool changes with the price of insurance. Because the price of the subsidy was randomized, we can compare the determinants of enrollment when the insurance was free and at full price by interacting each of the baseline health characteristics in the vector X above, with the indicator that the parent was offered the free insurance. The interaction represents the differential enrollment among those offered and not offered the subsidy, by baseline health characteristics. Under a model of adverse selection with a downward sloping marginal cost curve, those who are most willing to pay for insurance are those who face the highest ex-ante risk. These individuals would be least likely affected by the subsidy, predicting that the interaction is negative. On the other hand, if lower prices attract those who are most credit constrained (i.e., the poor, who also are most likely to be sick), then we might the interaction term as positive, indicating advantageous selection. Of course, individuals may be heterogeneous with differing responses to price or there may be multiple dimensions of selection which may drive the overall average effect of changes in price. The net effect is theoretically ambiguous, yet has important implications for the impact of free health insurance on the risk pool.

B. Empirical Strategy: Impact of Insurance

To quantify the causal effects of having a parent with insurance among children we

estimate both the intention to treat (ITT) and treatment on the treated (TOT) effects. By simply comparing those who were offered the subsidy with those who were not, the ITT estimates answer the question, "What is the impact of offering six months of free health insurance?" This is estimated in the following regression:

$$(2) \qquad Y_{ij} = \beta_0 + \beta_1 \text{Free}_j + \varepsilon_{ij}$$

Our main outcome variables measured at the follow-up include: visits to health providers (all health providers, pharmacies, EMPs, public clinics, public hospitals, private hospitals, private doctors, and laboratories), the log costs at each health provider, if the child was ever sick in the previous year, and the number of times sick.

Because the subsidy was randomly offered, comparing those who were offered the subsidy with those who were not provides an unbiased estimate of the impact of the subsidy offer. It is important to note that this empirical strategy relies on the randomization where the identification assumption is that those offered the subsidy are similar to those who are not, along both observable and unobservable characteristics. Table 1 provides some assurances for the validity of this assumption. For almost every baseline household and child-level variable, there is no statistically significant difference between those whose parent was offered a subsidy, and those whose were not (Column 4).[10] Figures 1A and 1B graph the number of times sick and number of visits to a health provider for each aged child, separately by those whose parent was offered a subsidy and whose parent was not, also indicating balance across groups.

Because some parents who were offered the subsidy did not choose to enroll in the insurance, the ITT estimates provide a lower bound on the impacts of being insured.

[10] There is a statistically significant difference in average household income, at the 10 percent level; however, this effect is driven by a few high outlying observations. A Komolgorov-Smirnoff test of equality of distributions could not that reject the null that the distribution of income between those offered subsidies and those not offered subsidies are the same (p-value 0.918). Results are insensitive to including or excluding this covariate.

To estimate the TOT we use the subsidy offer as an instrument for insurance enrollment and estimate the Local Average Treatment Effect (LATE) of having insurance among those who were affected by the subsidy with the following specification (Imbens and Angrist, 1994):

$$(3) \qquad Y_{ij} = \beta_0 + \beta_1 \widehat{\text{Insurance}}_j + \varepsilon_{ij}$$

where the first stage is: $\text{Insurance}_{ij} = \beta_0 + \beta_1 \text{Free}_j + \varepsilon_{ij}$.[11]

Lastly, we examine how children who were sick at baseline and who were not sick at baseline differentially utilize health services due to the insurance using the ITT specification above.

V. Results

A. Health Insurance Enrollment and Adverse Selection

We first examine how the health insurance enrollment decision depended on the subsidy offer and children's baseline characteristics. Overall, 19.5 percent of the households enrolled in the insurance. The subsidy had a large effect on take-up, increasing the likelihood that a parent enrolled in health insurance by 32.3 percentage points (estimated at a 30.8 percentage point effect at the child-level; Table 2 Panels A and B, Column 1).[12]

Next we separately add indicators of baseline health to the model. Conditional on the price of insurance, being sick in the past year at baseline increased the probability of enrollment by nearly 5 percentage points with an increase in the likelihood of enrollment by 0.6 percentage points for every additional time sick. Each additional visit to a pharmacy increased the likelihood of enrollment by 1.2 percentage point;

[11] The F-statistic on the first stage is 217.

[12] The results of take-up and retention among adult survey respondents are documented in Thornton et al. (2010). They also find that the randomized subsidies had large effects on take-up of insurance, however, overall take-up was only 20.3 percent overall enrolling after one year. Retention after the subsidy expiration was also low, with less than 10 percent still enrolled after one year of signing up for insurance and 6.5 percent enrolled 18 months after subsidies expired.

there was a 0.5 percentage point effect for every additional health visit at any provider. The largest determinant of insurance enrollment was if the child had forgone treatment in the past year due to lack of money, increasing the probability of enrollment by 6.7 percentage points. When each baseline indicator is included in the model, only forgone treatment is statistically significant with a 5.2 percentage point increase in the likelihood of enrolling.

Figures 2A and B present the average number of times sick and number of health visits at baseline, separately among those who enrolled in health insurance and those who did not, for different aged children. Children whose parents eventually enrolled had more total visits and more times sick at baseline; this is especially among younger children, who also tended to have more visits on average. These figures and the results in Table 2 illustrate the challenge in identifying the effect of insurance among non-randomized studies because of selection into enrollment.

Among parents, the results are similar, but with smaller and mostly insignificant coefficients (not shown). Only forgone treatment predicts significant differences in enrollment with those without treatment being 5 percentage points more likely to have enrolled in insurance, significant at the 95 percent level. When we control for both parent and child baseline characteristics in the same model we find generally larger coefficients on the child health variables, although the coefficients are statistically distinguishable only for pharmacy visits and total visits (Appendix A).

Note that linear and higher-order age terms or gender of either parent or child, years of parent education, and log household income had no statistically significant association with insurance enrollment (not shown). Forgone treatment due to lack of money, simultaneously indicates poor health and inability to pay for health care; this is consistently a large predictor of enrollment. It is these characteristics together – poor health and inability to pay – that we argue in this paper are the most important dimensions for selection into insurance in developing country settings.

How does a reduction in price change the pool of those insured? When we interact

variables indicating children's baseline health with being offered free insurance, the coefficients on the interaction term are all positive and many are significant (Table 3). The subsidy differentially attracted families with children who had been sick at baseline, by a large magnitude: the coefficient on the interaction term is 8.6 percentage points, significant at the 5 percent level. The subsidy also differentially attracted families with children who had more pharmacy visits, and more total visits to health providers at baseline. The magnitude of the interaction term of the subsidy and forgone treatment is large at 0.083 (standard error 0.058), although we lack precision (p-value=0.148).

In this table we also present the p-value on the F-test of the null hypothesis that the health variable plus the interaction of free insurance and the health variable is equal to zero. This is an additional test of adverse selection. Within the group of children whose parents were offered free insurance, this test represents whether there is a differential effect on enrollment by whether or not the child has a given baseline health characteristic. These p-values demonstrate that at the 5 percent level, we can reject the null that were was no adverse selection in favor of the alternative for having been sick at baseline, the number of pharmacy visits, the total number of visits, and having forgone treatment in the past year due to lack of money.

In sum, not only were children with worse health more likely to be enrolled in the insurance program, but lowering the price of insurance exacerbated the extent of adverse selection by attracting those in families who could not have otherwise afforded it.

B. Impact on Utilization, Expenditures, and Health

We next turn to estimating the impact of the subsidy offer and being insured on health provider utilization, expenditures and reported health outcomes. We present the ITT and TOT estimates for each outcome.

Table 4 examines health provider utilization in the year prior to the follow-up

survey including visiting any provider, pharmacies, EMPs, public clinics, private hospitals, private doctors, or laboratories. Recall that with insurance coverage, EMP visits, prescriptions, and laboratory visits are free. Panel A presents the ITT estimates; this estimates the impact of being offered the subsidy. Panel B presents the TOT estimates, which estimates the impact of being insured among those who are induced to enroll in health insurance as a result of the subsidy.

There are several important findings. First, while there was no statistically significant impact of the subsidy or being enrolled on having any visits, the total number of visits to any provider increased significantly by between 0.4 visits (Panel A) and 1.4 visits (Panel B). Over half of these increases are from covered providers: EMPs, pharmacies, and laboratories, with the main increases due to visits to pharmacies and EMPs. Furthermore, the coefficients of the effects on visits to other providers suggest that there was little substitution from other providers for these children.

Having been offered a subsidy or having health insurance significantly increased the probability of going to an EMP, the covered providers. This effect is large; a 7.4 percentage point increase for the ITT estimate and a 23.9 percentage point increase for the TOT estimate (Column 5). However, there are no statistically significant differences on any visits to other types of providers, or increasing the likelihood of ever visiting a provider (Column 1). Thus, while there was an increase in attendance at the EMP, there were no significant substitutions from other providers.

In general, the results are similar for parents; however there is more substitution across providers rather than the total increase in utilization as observed in the children's analyses. The probability of ever visiting an EMP is double the effect as compared to the children's sample (0.136, significant at the 1 percent level; Appendix B).[13] The impact of the subsidy offer on times at the EMP is 0.427, significant at the 1 percent level.

[13] These results are comparable to those in Thornton et al. (2010) except restricted to the sample of parents of children who are under the age of 12.

C. Impact on Expenditures

There were no statistically significant effects of either being offered the subsidy or having insurance on logged out-of-pocket expenditures at any health provider (Table 5, Panels A and B). Each of the ITT estimates is relatively small in magnitude (Panel A). The TOT estimates, however, are consistently negative and at times large in magnitude (Panel B). For example, the coefficient on total visits indicates that children of insured parents spent 43 percent less overall than uninsured children; similarly, expenditures at pharmacies and private hospitals are lower by approximately 21 percent and 14 percent, respectively. The results are suggestive of reduced expenditures. Because of the large standard errors in Panel B, power may be one factor for not detecting significant effects on reductions in expenditures.

D. Impact on Health Status

Table 6 presents the effects of having the subsidy or being insured on health status as measured by ever being sick or the number of times sick in the past year. The point estimate for whether a child was sick at all in the past year is not statistically significant and small in magnitude for both the ITT or TOT estimates; however, children with parents who were offered the subsidy report being sick 0.20 more times on average throughout the year and children with insured parents are sick 0.65 more times, than children with uninsured parents; these are each significant at the 10 percent level.[14]

The positive coefficient of having insurance on reported times sick has several plausible interpretations. One possible explanation for the results is that the health insurance actually makes children sicker. Germs in the waiting room or other

[14] In count models (both poisson and negative binomial), the coefficient falls to 0.109 but retains significance at the 5 percent level. In Tobit models the coefficient is approximately the same at 0.249 but falls in significance to the 10 percent level; 22 percent of the sample reports 0 times sick. The result remains if we cut the top 1 percent of observations, and is approximately the same magnitude although less precisely estimated if we trim the top 5 percent of observations.

iatrogenic illness – illness caused by a physician – could be one factor.[15] One classic study on the subject found that "36 percent of 815 consecutive patients on a general medical service of a university hospital had an iatrogenic illness" (Steel et al, 2004). Similarly, Kemper (1988) in a systematic study of patients 18 and under at the University of Wisconsin Hospital finds a "substantial rate of inappropriate hospital use in pediatrics", with insured patients having a higher rate of inappropriate hospital use than uninsured patients; there was no difference between children who were publicly insured compared to those privately insured.

Unfortunately, our study lacks objective measures of health status, and we lack the sample size to detect rare outcomes such as child mortality. However, several other survey measures do not support the interpretation that children are actually sick more often. For example, in the ITT estimates, children of parents awarded the subsidy missed no more days of school in the past year (coefficient 0.4; p-value 0.236), although only half of the sample is age-eligible for school; there was no difference in respondents reporting that it was "very likely" that their child would be sick in the next month (coefficient 0.016; p-value 0.617), or minutes spent in the waiting room (coefficient 1.35; p-value 0.726).

A second possible explanation for this result is that who enrolled took fewer precautions and preventive action with their children, making them more at risk (traditional moral hazard with hidden action). At the follow-up survey, parents were asked the number of days they waited before taking their child to the doctor for their last illness; in the TOT estimate, insured parents reported waiting 0.344 fewer days before taking their children to the doctor (not shown) which is small in magnitude and statistically insignificant (p-value=0.446). Parents were also asked a number of hypothetical questions about preventative behavior for their children, in particular: "What would you do to prevent your children from illness/injury [under a number of

[15] It is important to clarify that "the term 'iatrogenic' should not be construed to mean that there was any culpability on the part of the physician or hospital, or that the illness was necessarily preventable" (Steel et al, 2004).

different circumstances?"[16] Parents could answer: keep the child home from school, consult a doctor immediately, restrict the amount of time they leave the house or bed, restrict certain foods, or give home remedies. For each of the six possible actions, yes/no responses were summed (1=Yes, 0=No) to describe the number actions that would be taken. We also aggregate all possible actions across circumstances. The estimated impacts of insurance are presented in Appendix C and does not support the possibility that moral hazard is driving increased number of times being sick.

A third, more likely, explanation is that insurance altered the reporting of the subjective measure of being sick, either by lowering the threshold of how parents understood the definition of "sick" for their children or by increasing parent's knowledge of their child's true health status with more contact with healthcare providers. This is an especially relevant issue given the predominance of self-medication as evidenced by the reliance on pharmacies and the reliance on understaffed and unlicensed medical providers; this finding is also consistent with the observed increases in utilization among children. The fact that insurance is negatively associated with reported health status on the intensive, rather than extensive margin is closer to the idea of increased knowledge of health status rather than lowering the threshold for seeing the doctor.

While we find no evidence of improved health outcomes, we do have evidence that children who were most sick experienced the most benefit from the insurance at the intensive margin. While there were no differential effects in ever visiting a provider by baseline health status, there were large differential effects on the number of times visiting a provider (Table 7). The increased utilization due to insurance is concentrated on children who were sick at baseline, with healthy children relatively unaffected.

[16] Circumstances included 1) child has trouble breathing; 2) child has a sore throat; 3) child is excessively tired or fatigued; 4) child has a higher than normal fever; 5) child has stomach problems or diarrhea; 6) child has a minor cut on their leg; 7) child has a swollen ankle.

VI. Conclusion

This paper presents results from one of the few randomized experiments on health insurance, and the first to our knowledge that examines the effects among children in a developing country. We first examined the enrollment decision and found evidence of adverse selection based on health characteristics when controlling for the price of insurance. In our case, we find evidence of multiple dimensions of selection – based on health characteristics and price sensitivity, which may be particularly important in low-income settings. Rather than diversifying the risk pool, we find that lowering the price of insurance attracted those who were sicker at baseline and thus more likely to utilize insurance in the future. This suggests that while lowering the premium of health insurance may be useful in increasing overall uptake, especially among relatively sick children who may be targeted in public health insurance expansions, this may not be effective in diversifying the risk pool and thus may be a challenge for the financial sustainability of such programs.

We then examined the causal impacts of health insurance on children's utilization, expenditures, and health outcomes. We found that children who were covered by their parent's insurance have 1.4 more visits to all providers, specifically covered health providers such as EMPs and pharmacies. There is some suggestive evidence of reductions in expenditures, and we find no statistically significant effect of the insurance on reducing the likelihood of being sick. If anything, the coefficients suggest either increase in times sick, or that increased utilization and provider contact alter parent's reports on their children's health status.

From a social welfare perspective, investing in children's health can have important long-run effects on a variety of outcomes. To the extent that subsidizing health insurance for children has an impact on children's health, and that those who are relatively more likely to be sick differentially utilize insurance more, this also could be a good investment that promotes social equality by providing relatively sick children more health access. Moreover, from a human rights perspective some have

argued that children have an inherent right to health care and insurance (Brock, 2001). However, our findings suggest that while children increased their total utilization, we find little in terms of positive effects on health overall.

Importantly, our analyses are limited in the set of health indicators that we measure in our setting and time frame. Our sample was children under the age of 12 and of middle-class urban entrepreneurs in the informal sector, and may not be generalizable to other populations. In addition, we cannot say anything about potential longer run effects of health insurance. On the other hand, the fact that the subsidy induced less healthy individuals to enroll in insurance and significantly increased utilization in the short-run suggests a trade-off between financial sustainability and social goals of increasing health care coverage and access among children. Therefore, care is needed in designing these types of programs in developing countries where price could be a deterrent for the poor and their children to enroll and seek health care. However, the conjecture that health insurance will improve health, especially in a cost-effective manner, should be carefully considered and examined in a randomized setting.

REFERENCES

Almond, D., and J. Currie. (2010). “Human Capital Development Before Age Five”, NBER Working Paper #15827.

Arhin, D. (1994). The Health Card Insurance Scheme in Burundi: A social asset or a non-viable venture? *Social Science and Medicine, 39 (6): 861-870.*

Arrow K. (1963). “Uncertainty and the Welfare Economics of Medical Care”. *American Economic Review*. 53(5): 941-973.

Baird, S., J. Hicks, M. Kremer and E. Miguel. (2011). “Worms at Work: Long-run Impacts of Child Health Gains”. George Washington University working paper.

Barros, R. (2008). “Wealthier But Not Much Healthier: Effects of a Health Insurance Program for the Poor in Mexico.” Stanford University working paper.

Bertranou, F. (1998). “Health Care Services Utilization and Health Insurance Coverage: Evidence from Argentina”. *Revista de Análisis Económico*, 13(2):25-52.

Bleakley, H. (2007). “Disease and Development: Evidence from Hookworm Eradication in the American South.” *Quarterly Journal of Economics*, 122(1):73-117.

Brock, D. (2001). “Children’s Rights to Health Care.” *Journal of Medicine and Philosophy*, 26(2): 163-177.

Brook, R., J. Ware, W. Rogers, E. Keeler, A. Davies, C. Sherbourne, G. Goldberg, K. Lohr, P. Camp, J. Newhouse. (1984). *The Effect of Coinsurance on the Health of Adults: Results from the RAND Health Insurance Experiment*. RAND Corporation: Santa Monica, CA.

Cardon, J. and I. Hendel (2001). “Asymmetric Information in Health Insurance: Evidence from the National Medical Expenditure Survey.” RAND Journal of Economics. 32 (3): 408-27.

Carrin, G. A. Ron, Y. Huiet al. (1999). “The Reform of the Rural Cooperative Medical System in the People’s Republic of China: Interim Experience in 14 Pilot Counties. *Social Science and Medicine*, 48: 961-72.

Cawley, J. and T. Philipson. (1999). "An Empirical Examination of Information

Barriers to Trade in Insurance," *American Economic Review*, vol. 89(4), pages 827-846, September.

Cohen, A. and P. Siegelman. (2010). “Testing for Adverse Selection in Insurance Markets”. *Journal of Risk and Insurance*. 77(1): 39-84.

Currie, J., and J. Gruber. (1996). “Health Insurance Eligibility, Utilization of Medical Care, and Child Health.” Quarterly Journal of Economics. 111(2).

Cutler, D., A Lleras-Muney, and T. Vogl. (2008). “Socioeconomic Status and Health: Dimensions and Mechanisms.” Harvard University Working Paper.

Cutler, D. ,and R. Zeckhauser. (2000) The Anatomy of Health Insurance, in The Handbook of Health Economics, Culyer AJ and Newhouse JP (eds).

Cutler, D. and R. Zeckhauser. (1998). “Adverse Selection in Health Insurance.” *Frontiers in Health Policy Research.* 1(2).

De Meza, D., and D. Webb. (2001). “Advantageous Selection in Insurance Markets”. *The RAND Journal of Economics*. 32(2): 249-262.

Einav, L. and A. Finkelstein. (2011). “Selection in Insurance Markets: Theory and Empirics in Pictures”. *Journal of Economic Perspectives*. 25(1): 115-138.

Ekman, B. (2007). “Catestrophic Health Payments and Health Insurance: Some Counterintuitive Evidence from one Low-Income Country”, *Health Policy* 83, 304-313.

Fang, H., M. Keane, et al. (2008). “Sources of Advantageous Selection: Evidence from the Medigap Insurance Market.” *Journal of Political Economy.* 116(2).

Finkelstein, A., and K. McGarry. (2006). "Multiple Dimensions of Private Information: Evidence from the Long-Term Care Insurance Market." *American Economic Review*, 96(4): 938–958.

Finkelstein, A. and J. Poterba, (2006). "Testing for Adverse Selection with "Unused Observables"," NBER Working Papers 12112, National Bureau of Economic Research, Inc.

Finkelstein, A., S. Taubman, B. Wright, M. Bernstein, J. Gruer, J.P. Newhouse, H.

Allen, K. Baicker, and the Oregon Health Study Group (2012). “The Oregon Health Insurance Experiment: Evidence from the First Year.” Quarterly Journal of Economics (forthcoming)

Galárraga, O., S. Sosa-Rubí, A. Salinas-Rodríguez, S. Sesma-Vázquez. (2008). “Health Insurance for the Poor: Impact on Catastrophic and Out-of-Pocket Health Expenditures in Mexico”. *European Journal of Health Economics*. 11(5): 437-447.

Gertler, P. and O. Solon. (2002).“Who Benefits From Social Health Insurance? Evidence from the Philippines”. University of California-Berkley Working Paper.

Giedion, U., and M. Uribe. (2009). “Colombia’s Universal Health Insurance System.” *Health Affairs*. 28(3): 853-863.

Helfand, D. (2010). “Big Health Insurers to Stop Selling New Child-Only Policies”. *Los Angeles Times*. 21 September 2010.

Hidayat, B., H. Thabrany, H. Dong, and R. Sauerborn. (2004). “The Effects of Mandatory Health Insurance on Equity in Access to Outpatient Care in Indonesia”. *Health Policy and Planning.* 19(5): 322-335.

Holstrom (1979), “Moral Hazard and Observability”, *Bell Journal of Economics*, pp. 74-91.

Imbens, G., J. Angrist (1994). “Identification and Estimation of Local Average Treatment Effects”. *Econometrica*. 62(2): 467-475.

INSS Yearly Statistics (2007)

Jowett, M., P. Contoyannis, and N. Vinh. (2003) “The Impact of Public Voluntary Health Insurance on Private Health Insurance in Vietnam”. *Social Science and Medicine*. 56, 333-342.

Jütting, J. (2003). “Do Community-based Health Insurance Schemes Improve Poor People’s Access to Health Care? Evidence From Rural Senegal.” *World Development.* 32(2): 273–288.

Kaestner, R. T. Joyce, and A. Racine. (1999). “Does Publicly Provided Health Insurance Improve the Health of Low-Income Children in the United States,”

NBER Working Papers 6887, National Bureau of Economic Research.

Kemper, K. "Medically Inappropriate Hospital Use in a Pediatric Population". (1988). *The New England Journal of Medicine*, 318(16): 1033-1037.

King, G., E. Gakidou, K. Immai, J. Lakin, R. Moore, C. Nail, N. Ravishankar, et al. (2009). "Public policy for the poor? A randomized assessment of the Mexican universal health insurance programme". *Lancet.* 373(9673): 1447-54.

Lamiraud, K., F. Booysen, et al. (2005). "The Impact of Social Health Protection on Access to Health Care, Health Expenditure and Impoverishment". *Extension of Social Security Papers*: 23, International Labour Organization.

Levine, D., R. Polimeni, and I. Ramage. (2011) "Insuring Health or Insuring Wealth? An Experimental Evaluation of Health Insurance in Rural Cambodia". University of California, Berkeley Working Paper.

Levy, H., and D. Meltzer. (2008). "The Impact of Health Insurance on Health." *Annual Review of Public Health*, 29: 399-409.

National Conference of State Legislatures (2009). "Children's Health Insurance Reform: State Laws". Retrieved March 9, 2012. from. http://www.ncsl.org/issues-research/health/childrens-health-reform-state-laws.aspx

Newhouse, J. (1993). "Free For All? Lessons from the RAND Health Insurance Experiment". Cambridge, MA: Harvard University Press.

Newhouse, J., W. Manning, C. Morris, L. Orr, N. Duan, E. Keeler, A. Leibowitz, K. Marquis, M.S. Marquis, C. Phelps, and R. Brook (1981). "Interim Results From a Controlled Trial of Cost Sharing in Health Insurance". *The New England Journal of Medicine.* 305(24): 1501-1507.

Noterman, J., B. Criel, G. Kegels, and K. Isu. (1995). "A Prepayment Scheme for Hospital care in the Masisi district in Zaire: A Critical Evaluation." *Social Science and Medicine.* 40(NE7), 919-930.

Pauly, M. (1974). "Overinsurance and Public Provision of Insurance: The Roles of Moral Hazard and Adverse Selection". *Quarterly Journal of Economics*. 88(1):

1974.

Polimeni, R. and D. Levine. (2011). “Adverse Selection Based On Observable and Unobservable Factors in Health Insurance”. University of California-Berkley working paper.

Pradhan, M., F. Saadah, and R. Sparrow. (2007). “Did the Health Card Program Ensure Access to Medical Care for the Poor during Indonesia’s Economic Crisis?” *World Bank Economic Review*. 21(1): 125-150.

Ron, A. (1999). “NGOs in Community Health Insurance Schemes: Examples from Guatemala and the Philippines”. *Social Science and Medicine*. 48(7): 939-950.

Rothschild, M. and J. Stiglitz. (1976). “Equilibrium in Competitive Insurance Markets: an Essay on the Economics of Imperfect Information.” *Quarterly Journal of Economics.* 90(4): 629-649.

Sapelli, C., and B. Vial. (2003). “Self-Selection and Moral Hazard in Chilean Health Insurance”. *Journal of Health Economics*. 22(3): 459-476.

Steel, K, P. Gertman, C. Crescenzi, and J. Anderson. “Classic Paper: Iatrogenic Illness on General Medical Service at a University Hospital”. *Quality & Safety in Health Care*. 2004(13):76-80. First published in *New England Journal of Medicine*, 1981, Volume 304, pages 638-42.

Thornton, R., L. Hatt, E. Field, M. Islam, F. Solís, M. González Moncada. (2010). “Social Security Health Insurance for the Informal Sector in Nicaragua: A Randomized Evaluation”. *Health Economics*. 19(S1): 181-206.

Trujillo, A., J. Portillo, and J. Vernon. (2005). “The Impact of Subsidized Health Insurance for the Poor: Evaluating the Colombian Experience Using Propensity Score Matching.” *International Journal of Health Care Finance and Economics*. 5, 211-239.

Valdez, R Burciaga, R Brook, et al. (1985). “Consequences of Cost-Sharing for Children’s Health” *Pediatrics*. 75; 952.

Wagstaff, A., M. Lindelow, G. Jun, X. Ling, and Q. Juncheng. (2009). “Extending Health Insurance to the Rural Population: An Impact Evaluation of China’s New Cooperative Medical Scheme”. *Journal of Health Economics*. 28(1): 1-19

Wagstaff, A. and M. Pradhan. (2006). “Health Insurance Impacts on Health and Nonmedical Consumption in a Developing Country.” *Policy Research Working Paper Series*, World Bank Policy Research Working Paper 3563.

Wang, H., W. Yip, L. Zhang, L. Wang, and W. Hsiao (2005). “Community-Based Health Insurance in Poor Rural China: The Distribution of Net Benefits”. *Health Policy and Planning*. 20(6): 366-374.

Waters, H. (1999). “Measuring The Impact of Health Insurance With a Correction for Selection bias - A Case Study of Ecuador”. *Health Economics*. 8:473-483.

Wilson, C. (1977). A model of insurance markets with incomplete information. Journal of Economic Theory 16, 167-207.

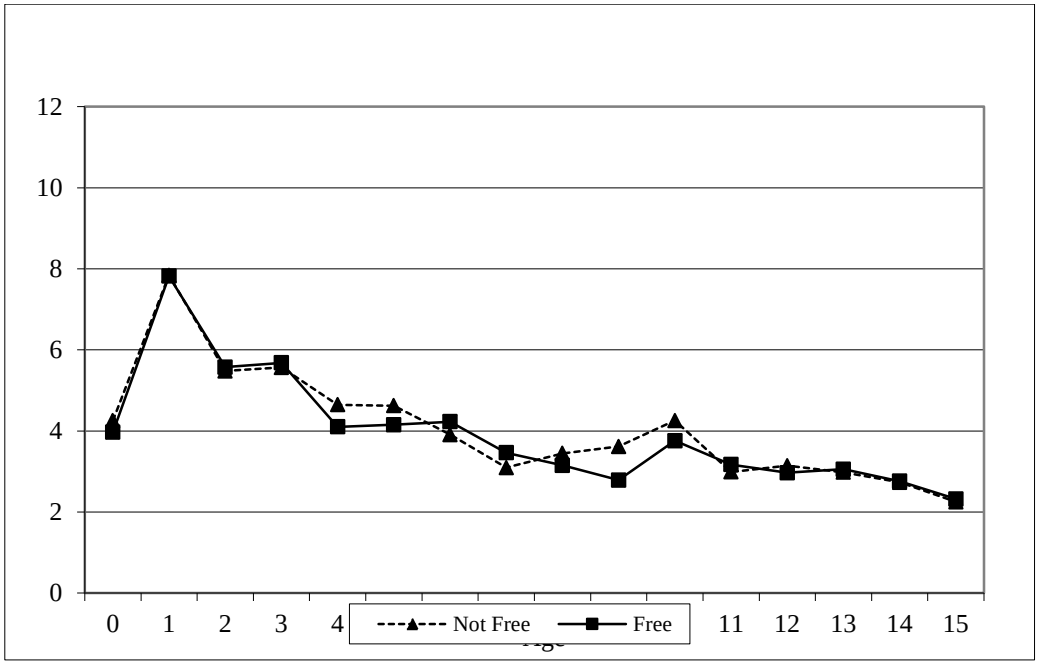
Wolfe J., and J. Goodeeris. (1991). “Adverse Selection, Moral Hazard and Wealth Effects in the Medigap Insurance Market. *Journal of Health Economics*. 10,433–59.

World Bank Development Indicators, The World Bank.

Yip, W. and P. Berman. (2001). “Targeted Health Insurance in a Low Income Country and Its Impact on Access and Equity in Access: Egypt's School Health Insurance,” *Health Economics*, vol. 10(3), pages 207-220.

Figure 1: Number of Baseline Times Sick and Provider Visits by Subsidy Offer

A. Average Number of Health Visits



B. Average Number of Times Sick

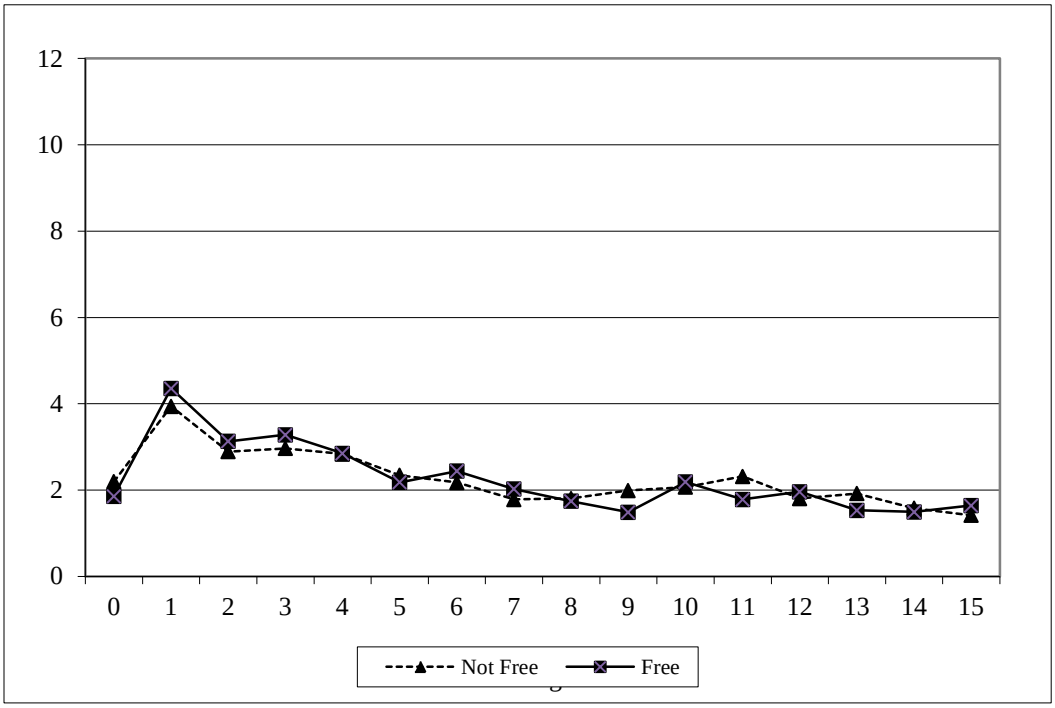
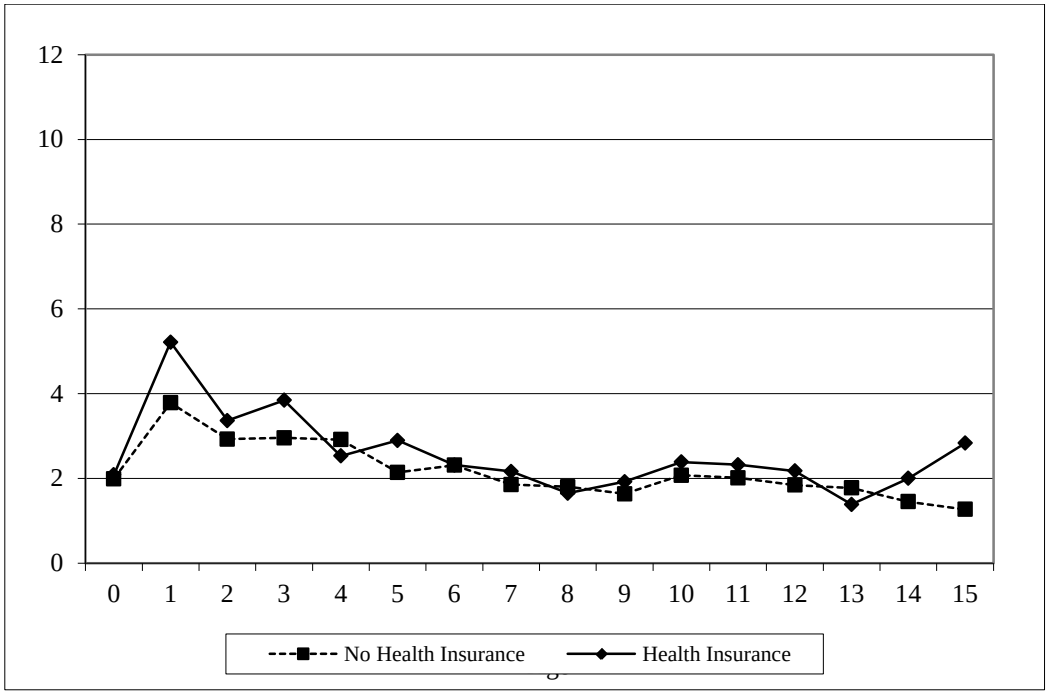


Figure 2: Number of Times Sick and Provider Visits by Insurance Enrollment

A. Average Number of Health Visits



B. Average Number of Times Sick

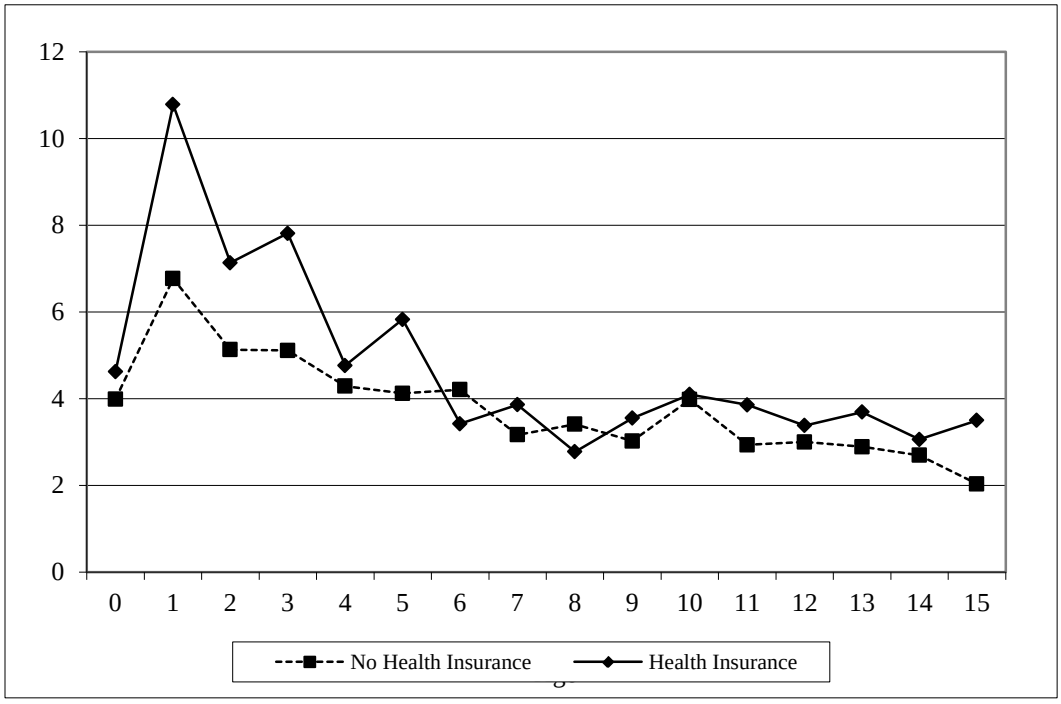


Table 1: Baseline Characteristics of Households and Children under 12

Panel A: Parent/Household Characteristics	All (1)	No Subsidy (Control) (2)	6-Month Subsidy (Treatment) (3)	Difference (Control - Treatment) (4)
Size of household	4.83	4.76	4.90	-0.13
Number of children 11 and under	1.62	1.65	1.61	0.04
Median income	3752	3752	3752	0.00
Household income	5747.12	5277.27	6169.83	-892.56**
Years of education	9.49	9.36	9.62	-0.26
Age	34.58	34.25	34.87	-0.62
Ever sick (Parent)	0.76	0.78	0.75	0.02
Number of times sick (Parent)	2.42	2.55	2.28	0.27
Forgone treatment (Parent)	0.24	0.26	0.23	0.03
Ever visit health provider (Parent)	0.75	0.76	0.74	0.02
Number of visits, all providers (Parent)	4.09	4.25	3.95	0.29
Health expenditures (Parent)	747.18	817.04	684.29	132.75
Households (N)	1334	632	702	--
Panel B: Child Characteristics				
Age	6.02	6.00	6.03	-0.02
Ever sick	0.80	0.79	0.80	-0.02
Number of times sick	2.34	2.36	2.32	0.04
Forgone treatment	0.19	0.21	0.17	0.03
Ever visit health provider	0.79	0.78	0.79	-0.01
Number of visits, all providers	4.18	4.28	4.09	0.19
Health expenditures	626.72	570.17	678.77	-108.60
Children (N)	2172	1041	1131	--

Notes: Above are sample averages for the full sample (Column 1), the Control group of respondents not awarded a 6 month subsidy for insurance (Column 2), and the Treatment group of respondents who were awarded a 6 month subsidy (Column 3). Panel A uses the sample of households with at least one child under age 12 at baseline. Panel B uses as the child-level observations, for all children under age 12. All income and expenditure data are in 2008 Cordobas. Valid income data are not available for 174 families. *** p<0.01, ** p<0.05, * p<0.1

Table 2: Determinants of Health Insurance Enrollment among Children under 12

	Dependent Variable: Parent Enrolled in Insurance						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Free	0.308***	0.307***	0.308***	0.308***	0.309***	0.310***	0.310***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Ever sick		0.049**					0.0190
		(0.021)					(0.024)
Number of times sick			0.006*				-0.004
			(0.004)				(0.003)
Number of pharmacy visits				0.012***			0.005
				(0.004)			(0.007)
Number of visits, all providers					0.005***		0.003
					(0.002)		(0.003)
Forgone treatment						0.067**	0.052*
						(0.028)	(0.029)
Constant	-0.032	-0.065**	-0.044*	-0.046**	-0.047**	-0.043*	-0.062**
	(0.023)	(0.025)	(0.024)	(0.023)	(0.023)	(0.023)	(0.026)
R-squared	0.180	0.182	0.182	0.184	0.184	0.184	0.1881

Notes: Sample is all children age 11 and younger at baseline (N=2172). Above are coefficients from OLS regressions of whether or not the child's parent enrolled in health insurance on baseline variables, conditional on random assignment status. All regressions include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors are clustered at the family level. The mean of the dependent variable for the Control group is .026. *** p<0.01, ** p<0.05, * p<0.1.

Table 3: Differential Health Insurance Enrollment by Children's Baseline Health Characteristics

	Dependent Variable: Parent Enrolled in Insurance				
'Interaction Variable' includes ---->	Ever Sick	Number of Times Sick	Number of Pharmacy Visits	Number of Total Visits	Forgone Treatment
	(1)	(2)	(3)	(4)	(5)
Free	0.239***	0.293***	0.282***	0.278***	0.294***
	(0.037)	(0.027)	(0.024)	(0.025)	(0.022)
Free * *'Interaction Variable'*	0.086**	0.006	0.015**	0.007**	0.083
	(0.040)	(0.008)	(0.007)	(0.004)	(0.058)
'Interaction Variable'	0.005	0.003	0.004	0.002	0.026
	(0.011)	(0.003)	(0.003)	(0.002)	(0.022)
Constant	-0.031	-0.035	-0.032	-0.031	-0.034
	(0.020)	(0.023)	(0.022)	(0.023)	(0.023)
R-squared	0.16	0.161	0.162	0.162	0.168
P-value testing 'Interaction Variable' + Subsidy * *'Interaction Variable'* =0	0.020	0.187	0.006	0.006	0.039

Notes: Sample is all children age 11 and younger at baseline (N=2172). Above are coefficients from OLS regressions of whether or not the child's parent enrolled in health insurance on baseline variables interacted with random assignment status. All regressions include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors are clustered at the family level. The mean of the dependent variable is .026. *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Effects of Health Insurance on Health Care Utilization among Children under 12

Dependent Variable:	All Providers		Pharmacy		EMP		Public Clinic		Public Hospital		Private Hospital		Private Doctor		Laboratory	
	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits
Panel A: ITT	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Free	0.003	0.403**	0.008	0.111	0.070***	0.175***	0.009	0.04	0.000	-0.002	-0.002	0.068	0.012	-0.007	0.009	0.018
	(0.021)	(0.199)	(0.025)	(0.092)	(0.015)	(0.048)	(0.023)	(0.081)	(0.014)	(0.040)	(0.020)	(0.069)	(0.018)	(0.052)	(0.019)	(0.040)
Constant	0.795***	3.082***	0.676***	1.490***	0.025	0.030	0.160***	0.346***	0.069***	0.127***	0.243***	0.514***	0.144***	0.345***	0.142***	0.231***
	(0.028)	(0.214)	(0.033)	(0.108)	(0.016)	(0.040)	(0.029)	(0.075)	(0.016)	(0.036)	(0.031)	(0.083)	(0.025)	(0.067)	(0.025)	(0.050)
R-squared	0.002	0.005	0.007	0.008	0.017	0.012	0.009	0.009	0.002	0.001	0.016	0.007	0.002	0.001	0.004	0.004
Panel B: TOT	Any Provider		Pharmacy		EMP		Public Clinic		Public Hospital		Private Hospital		Private Doctor		Laboratory	
	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits	Any visit	Number of visits
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Enrolled in insurance	0.01	1.309**	0.025	0.36	0.229***	0.568***	0.028	0.130	0.001	-0.008	-0.006	0.222	0.038	-0.021	0.028	0.057
	(0.068)	(0.645)	(0.082)	(0.298)	(0.047)	(0.152)	(0.076)	(0.263)	(0.045)	(0.130)	(0.065)	(0.225)	(0.057)	(0.168)	(0.061)	(0.129)
Constant	0.795***	3.125***	0.677***	1.502***	0.032**	0.049	0.161***	0.350***	0.069***	0.127***	0.243***	0.521***	0.145***	0.344***	0.143***	0.233***
	(0.027)	(0.208)	(0.032)	(0.105)	(0.014)	(0.035)	(0.028)	(0.071)	(0.015)	(0.033)	(0.030)	(0.081)	(0.025)	(0.066)	(0.024)	(0.049)
R-squared	0.003	0.008	0.008	0.007	0.130	0.081	0.007	0.007	0.002	0.001	0.016	0.001	0.000	0.002	0.005	0.005
Mean of dependent var when free=1	0.763	3.357	0.618	1.430	0.054	0.156	0.234	0.618	0.093	0.191	0.161	0.343	0.134	0.321	0.172	0.299

Notes: N=2172 for each regression in each panel. Sample is children of respondents aged 11 and younger at date of baseline survey. Panel A presents the coefficient estimates from ITT regressions of the effect of the randomly assigned subsidy on the probability of visiting a various provider as well as the number of visits at that provider. Panel B presents the coefficient estimates from 2SLS regressions of the effect of insurance on the probability of visiting a various provider as well as the number of visits at that provider, where the randomly assigned subsidy is used as an instrument for the decision to enroll in health insurance. All columns also include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 5: Effects of Health Insurance on Log Expenditures At Providers for Children under 12

Dependent Variable: Log Expenditures at ---->	Total	Pharmacy	EMP	Public Clinic	Private Hospital	Private Doctor	Laboratory
Panel A: ITT	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Free	-0.069	-0.027	0.008	-0.006	-0.016	-0.003	-0.059
	(0.154)	(0.150)	(0.006)	(0.009)	(0.105)	(0.091)	(0.082)
	4.168***	3.841***	(0.004)	0.003	1.237***	0.747***	0.558***
	(0.204)	(0.197)	(0.003)	(0.005)	(0.161)	(0.134)	(0.105)
R-squared	0.012	0.013	0.002	0.003	0.016	0.003	0.004
Panel B: TOT	Total	Pharmacy	EMP	Free Clinic	Private Hospital	Private Doctor	Laboratory
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Enrolled in insurance	-0.225	-0.087	0.027	-0.021	-0.053	-0.01	-0.193
	(0.502)	(0.487)	(0.019)	(0.030)	(0.341)	(0.296)	(0.265)
	4.161***	3.838***	(0.003)	0.003	1.235***	0.747***	0.552***
	(0.199)	(0.192)	(0.002)	(0.004)	(0.157)	(0.131)	(0.102)
R-squared	0.011	0.012	0.005	0.000	0.017	0.003	0.003
Mean of dependent var when free=1	3.691	3.421	0.000	0.012	0.825	0.694	0.627

Notes: N=2172 for each regression in each panel. Sample is children of respondents aged 11 and younger at date of baseline survey. Panel A presents the coefficient estimates from ITT regressions of the effect of the randomly assigned subsidy on log spending +1 at various providers over the past year as of follow-up. Panel B presents the coefficient estimates from 2SLS regressions of the effect of insurance where the randomly assigned subsidy is used as an instrument for the decision to enroll in health insurance. All regressions include market and round fixed effects. All income and expenditure data are reported in 2008 Cordobas. Free indicates that the child's parent was offered free health insurance. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 6: Effect of Insurance on Health Outcomes among Children under 12

Dependent Variable:	Ever Sick	Times Sick
Panel A: ITT	(1)	(2)
Free	0.005	0.201*
	(0.020)	(0.106)
Constant	0.800***	1.796***
	(0.028)	(0.111)
R-squared	0.002	0.003
Panel B: TOT	Ever Sick	Times Sick
	(1)	(2)
Enrolled in insurance	0.017	0.651*
	(0.066)	(0.342)
Constant	0.800***	1.817***
	(0.027)	(0.108)
R-squared	0.003	0.012
Mean of dependent var when free=1	0.772	1.939

Notes: N=2172 for each regression in each panel. Sample is children of respondents aged 11 and younger at date of baseline survey.The dependent variable in Column 1 is whether or not the child was sick in the past year at follow-up and the dependent variable in Column 2 is the number of times the child was sick in the past year. Panel A presents the coefficient estimates from ITT regressions of the effect of the randomly assigned subsidy. Panel B presents the coefficient estimates from 2SLS regressions of the effect of health insurance where insurance is instrumented with the randomly assigned subsidy. All regressions include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 7: Health Status and Provider Visits by Baseline Sick Status - Intention To Treat Estimates

					Number of Visits to:				
Dependent Variable:	Times Sick	Total Number of Visits	Pharmacies	EMPs	Public Clinics	Public Hospitals	Private Hospitals	Private Doctors	Laboratories
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Free	-0.039	-0.505	-0.189	0.058	-0.059	-0.044	-0.086	-0.104	-0.081
	(0.199)	(0.327)	(0.155)	(0.064)	(0.151)	(0.050)	(0.081)	(0.096)	(0.061)
Free*Child sick at baseline	0.290	1.116***	0.367**	0.144*	0.122	0.05	0.191*	0.121	0.121
	(0.220)	(0.383)	(0.180)	(0.079)	(0.169)	(0.070)	(0.109)	(0.110)	(0.075)
Child sick at baseline	0.538***	0.905***	0.459***	0.076	0.058	0.078	0.119*	0.027	0.088
	(0.160)	(0.301)	(0.138)	(0.046)	(0.139)	(0.056)	(0.069)	(0.095)	(0.061)
Constant	1.459***	2.552***	1.209***	-0.011	0.315***	0.078*	0.447***	0.334***	0.180***
	(0.153)	(0.290)	(0.140)	(0.043)	(0.119)	(0.046)	(0.089)	(0.097)	(0.058)
R-squared	0.021	0.029	0.029	0.017	0.01	0.003	0.011	0.003	0.01
P-value of Child Sick + Free*Child sick at baseline	0.000	0.000	0.000	0.001	0.068	0.001	0.000	0.012	0.000
Mean of dependent var when free=1	1.939	3.357	1.430	0.156	0.618	0.191	0.343	0.321	0.299

Notes: Sample is children of respondents aged 11 and younger at date of baseline survey (N=2172). Above are coefficient estimates from OLS regressions of the effect of the subsidy interacted with whether the child was ever sick in the past year at baseline on the number of visits to various providers. All columns also include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Appendix A: Determinants of Health Insurance Enrollment among Children under 12 including Parent and Child Variables Baseline Health Characteristics

	Dependent Variable: Parent Enrolled in Insurance							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Free	0.308***	0.307***	0.308***	0.308***	0.309***	0.311***	0.311***	0.311***
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Ever sick in past year		0.048**					0.023	0.038*
		(0.021)					(0.024)	(0.022)
Ever sick in past year (Parent)		0.007					-0.008	-0.01
		(0.025)					(0.028)	(0.026)
Number of times sick			0.006				-0.004	
			(0.004)				(0.003)	
Number of times sick (Parent)			0.000				-0.002	
			(0.003)				(0.003)	
Number of pharmacy visits				0.011***			0.005	
				(0.004)			(0.007)	
Number of pharmacy visits (Parent)				0.001			0.001	
				(0.003)			(0.006)	
Total number of visits					0.005***		0.003	
					(0.002)		(0.003)	
Total number of visits (Parent)					0.001		0.00	
					(0.002)		(0.003)	
Forgone treatment						0.041	0.026	0.03
						(0.031)	(0.032)	(0.031)
Forgone treatment (Parent)						0.047	0.05	0.052*
						(0.029)	(0.031)	(0.030)
Constant	-0.032	-0.068**	-0.045*	-0.048**	-0.049**	-0.050**	-0.064**	-0.068**
	(0.023)	(0.027)	(0.024)	(0.023)	(0.024)	(0.024)	(0.027)	(0.027)
R-squared	0.180	0.182	0.182	0.184	0.185	0.186	0.19	0.187
p-value of F test that child var = parent var	-	0.2725	0.2456	0.0843	0.0755	0.9061	-	-

Notes: N=2172 for each regression. Sample is all children age 11 and younger at baseline. Regressions are OLS estimates of the effect of baseline variables on the decision to enroll in health insurance. All variables are measured as of the baseline survey. All regressions include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors are clustered at the family level. The mean of the dependent variable for the control group is 0.026. *** p<0.01, ** p<0.05, * p<0.1.

Appendix B: Impact of Free Insurance Offer on Parents Health and Utilization (ITT)

Panel A: Ever Visit/Sick	Ever Sick (1)	Any Visit to a Provider (2)	Pharmacy (3)	EMP (4)	Public Clinic (5)	Public Hospital (6)	Private Hospital (7)	Private Doctor (8)	Laboratory (9)
Free	-0.016	-0.019	-0.011	0.136***	-0.033	-0.045**	-0.029	0.045**	-0.007
	(0.015)	(0.017)	(0.022)	(0.015)	(0.024)	(0.020)	(0.025)	(0.018)	(0.027)
Constant	0.935***	0.887***	0.829***	-0.017	0.174***	0.195***	0.338***	0.129***	0.416***
	(0.020)	(0.024)	(0.029)	(0.016)	(0.029)	(0.029)	(0.035)	(0.026)	(0.037)
R-squared	0.002	0.003	0.013	0.066	0.024	0.006	0.008	0.01	0.019
Mean of dependent var when free=1	0.922	0.896	0.809	0.0222	0.294	0.171	0.294	0.106	0.434

Panel B: Number of Visits/Times Sick	Times Sick (9)	Total Number of Visits (1)	Pharmacy (2)	EMP (3)	Public Clinic (4)	Public Hospital (5)	Private Hospital (6)	Private Doctor (7)	Laboratory (8)
Free	0.177	0.313	0.184	0.427***	-0.214	-0.053	-0.067	0.074	-0.038
	(0.802)	(0.353)	(0.200)	(0.068)	(0.142)	(0.074)	(0.087)	(0.057)	(0.079)
Constant	3.340***	5.691***	2.895***	-0.001	0.567***	0.474***	0.770***	0.270***	0.716***
	(0.499)	(0.493)	(0.330)	(0.079)	(0.128)	(0.121)	(0.108)	(0.072)	(0.098)
R-squared	0.003	0.003	0.008	0.031	0.012	0.002	0.007	0.008	0.021
Mean of dependent var when free=1	3.802	5.823	2.622	0.0601	0.975	0.383	0.663	0.245	0.875

Notes: Sample is parents with children aged 11 and younger at date of baseline survey (N=1334). Above are coefficient estimates from OLS regressions of the effect of the subsidy on ever visiting various providers or being sick (Panel A), and the number of visits to various providers or times sick (Panel B) at various providers. All regressions include market and round fixed effects. Free indicates that the parent was offered free health insurance. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Appendix C: Measuring Moral Hazard among Parents

Dependent Variable:	Consult doctor immediately	Keep child home from school	Restrict time they leave home/bed	Restrict certain foods	Give home remedies	Sum
	(1)	(2)	(3)	(4)	(5)	(6)
Free	-0.003	-0.012	0.032	-0.061	0.017	-0.027
	(0.078)	(0.143)	(0.153)	(0.141)	(0.145)	(0.435)
Constant	5.322***	4.366***	4.064***	2.570***	2.218***	18.540***
	(0.117)	(0.201)	(0.218)	(0.207)	(0.217)	(0.615)
R-squared	0.004	0.022	0.006	0.01	0.005	0.014
Mean of dependent var when free=1	5.206	4.25	3.921	2.393	2.097	17.87

Notes: Sample is parent respondents with at least one child age 5-11 at baseline (N=1028). Above are coefficient estimates from OLS regressions of receiving a subsidy on a moral hazard index (ITT). This index was constructed from a series of questions where the parents were asked the action they would take to prevent their children from illness/injury under each of the circumstances: 1) child has trouble breathing; 2) child has a sore throat; 3) child is excessively tired or fatigued; 4) child has a higher than normal fever; 5) child has stomach problems or diarrhea; 6) child has a minor cut on their leg; 7) child has a swollen ankle. For each of the 6 circumstances, responses were summed (1=Yes, 0=No) as a summary of number actions that would be taken. Therefore, for each column 1-5 the dependent variable potentially ranges from 0 to 6. Column 6 aggregates all responses and therefore potentially ranges from 0 to 30. All regressions include market and round fixed effects. Free indicates that the child's parent was offered free health insurance. Robust standard errors in parentheses. *** p< 0.01, ** p <0.05, * p <0.1