Health Insurance Effects among Nicaraguan Children

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Abstract

Using two rounds of existing data among 2608 uninsured adult informal-sector workers in Nicaragua, we report the causal effects of having health insurance on the health care utilization among 2,170 children covered as dependents. We utilize the fact that at the baseline, some adult respondents were randomly given six months of free insurance, which allows for us to empirically identify causal effects of having health insurance. Our results indicate that the primary benefit of health insurance is access to higher-quality providers. Children of insured parents were reported to have an average increase of 0.5 visits to covered providers and 0.3 visits to pharmacies one year later. This effect is particularly strong among younger children, specifically toddlers, as well as children who were sick in the past year at baseline. We find no evidence of improved health outcomes, as reported by the survey questions, and find no changes in parents' health expenditures on children.

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1. Introduction

How does health insurance benefit children? Standard economic theory suggests that the benefits of insurance are to permit risk-averse individuals to smooth income and insure against loss in the event of a "bad state" such as illness or accident. From a strictly consumer theory perspective, the only benefit to health insurance is to allow individuals to insure specifically against expensive medical losses. However, a different portrayal of health insurance markets incorporates other potential benefit of being insured: access. Specifically, those who are insured may have access to higher-quality providers and care, resulting in preventive care and ultimately better health. From a government perspective, the pecuniary externality imposed by sick patients who are unable to utilize preventive care, along with concerns about equity, is a rationale for government intervention. There may be especially large benefits and externalities to insuring children. However, while the importance of health insurance for children is often stressed by policy makers and child advocates, there is limited rigorous empirical evidence on the effects of these types of programs.

Researchers have documented the effects of national expansions of the formal health insurance system among covered individuals (adults) in Vietnam (Wagstaff 2007), Mexico (Barros 2008), the Philippines (Gertler and Solon, 2002), Colombia (Panopoulous et al 2001), and the United States (Currie and Gruber, 1996) finding overall strong results on increased utilization of services, but conflicting results on the effects of insurance on health outcomes and out-of-pocket expenditures. One challenge with these studies is the difficulty in making causal inferences from cross-sectional or panel studies. Even with plausible random variation in program intensity across a country, selection into insurance take-up and healthcare utilization provides challenges for observational researchers. Moreover, recent evidence has cast doubt onto even whether the researcher can theoretically assume that there is adverse or advantageous selection into subscribing for health insurance. Standard theoretical models, as well as empirical studies, posit adverse selection into health insurance and individuals who are likely to be sick, and will benefit more from insurance are those who enroll (Oster et al, 2010). However, recent evidence has found advantageous selection into some health insurance markets, where the most responsible, healthiest, or most knowledgeable individuals choose to enroll (Fang et al, 2006). One notable exception is the RAND Health Insurance Experiment (HIE) which was the first successful randomized experiment to provide identification of the causal effect of health insurance executed in the United States between 1974 and 1982.[1] Other recent studies that involve randomization in developing countries have recently been implemented.[2]

In addition to methodological challenges associated with studying the effects of health insurance, there is little evidence on the effectiveness of health insurance schemes targeting populations that are the most vulnerable, such as the poor and informal sector and their children. One exception is Currie and Gruber (1996) who find effects of Medicaid on reducing child mortality.

This paper presents the results of a randomized trial comparing the effects of voluntary health insurance program on children living in Managua, Nicaragua. Our study differs fundamentally from the RAND HIE, which compared outcomes where all respondents are insured, and differ only in their cost-sharing plan. Our study compares outcomes between insured and uninsured children. Moreover, this study is in an urban developing country setting.

Our results indicate that the primary benefit to health insurance is access to higher-quality providers. Children of insured parents attended covered providers by 0.5 more visits and 0.3 visits to pharmacies. Younger children, specifically toddlers, increase their visits the most. We find no evidence of improved health outcomes, and find no changes in either the level of expenditures or the log of expenditures, although caution that these results may be due to the short-term nature of the intervention and do not reflect long-term benefits of health insurance. This study demonstrates a revealed preference

[1] This experiment, which enrolled all participants under various cost-sharing plans at six cities across the country, found increased medical usage with lower cost-sharing, familial patterns of healthcare utilization between parents and children, but few effects on health outcomes (see Manning et al, 1986, Manning, 1987). However, this study was not designed to identify the causal effects of insurance among those newly enrolled.
[2] A comprehensive list of these recent studies and their methodologies can be found at: http://www.microinsurancenetwork.org/workinggroup/impact/stocktaking.php.

for higher-quality care that, at least in this setting, may be only possible through health insurance: visit increases were large among children who reported being sick in the past year at baseline. The results also shows that covered, high-quality providers are visited significantly fewer times when patients have common illnesses such as cold and flu. Overall, the results suggest those who most utilize insurance primarily are the youngest children, those who were sick in the past year, and those who experience expensive and/or rare health shocks, rather than common ailments. The findings also indicate that usage of insurance does not lead to improved health outcomes or reductions in overall family health care expenditures, at least in the short run.

The paper proceeds as follows: Section 2 provides background on the project, data collection, and randomization. Section 3 presents our empirical strategy, Section 4 presents our results on utilization and health outcomes, Sections 5-7 presents results on heterogeneous treatment effects of insurance, and Section 8 concludes.

2. Background, Data Collection and Randomization

In Nicaragua, there are approximately 1.2 million workers in the informal sector out of a total population of nearly 6 million. In theory, urban informal workers in Managua should have access to free public sector health services, but these services are under-resourced and 93 percent lack the Social Security health insurance coverage that is available to formal sector workers.

In January 2006, the government of Nicaragua implemented a demonstration project aimed at extending the Nicaraguan Social Security Institute's (INSS) health insurance program to informal sector workers. Individuals and eligible dependents (defined as children age 11 and under) who enroll pay a flat monthly fee for covered services at EMPs (the private providers where the insurance can be used), but no co-pays at the time of service. The INSS insurance provides all subscribers with a comprehensive package of preventive, diagnostic, and curative health services and medications, including primary and specialist care, medication and laboratory exams, hospitalization, 24-hour emergency care, as well as other services.

There were two rounds of surveys conducted among 2608 representative uninsured informal sector workers in Managua, Nicaragua. At the end of the 2007 baseline survey, respondents were randomly assigned to receive a six-month subsidy plus an informational brochure on the insurance product.[3] One year later, a follow-up study was conducted among the same individuals. Overall, 93% completed the follow-up survey and there was no differential sample attrition or completion between those who were offered the subsidy and those who were not (not shown; further details can be found in Thornton et al. 2010). Table 1 presents baseline statistics separately by random assignment status among 1334 adult respondents who had least one child age 11 or younger at baseline, or 2170 total children.

We present both parent-level characteristics at the household level (Panel A), as well as child level characteristics (Panel B). On average, households had 1.85 children in a household of almost 5 individuals. Adult respondents have relatively high levels of education (9.5 years), with a median annual income of 3,752 Cordobas (approximately 18.1 Cordobas in one 2008 US dollar). Among all children in the sample ages 11 and under at baseline, the average age is 6. Almost all (93 percent) of the children age five and older were in school, and 28 percent saw a doctor in the past year. On the other hand, many more children were sick in the previous year, 80 percent report ever being sick in the past year, and 24% report having forgone treatment in the past year due to lack of money. The average number of visits to all providers was 4.18, with a median value of 3 visits. Total average health costs for the child over the past year were nearly C$627, with a median value of C$204, demonstrating that some families experience extremely large health costs for their children.

3. Empirical Strategy

Our goal is to estimate the causal effects of having a parent with insurance on children's health utilization

[3] The original study design also assigned respondents into 2-month subsidy group; these individuals were not in the follow-up survey due to low-takeup and budget constraints. Full details of the experimental design are available in Thornton et al (2010).

and expenditure. To do so, we estimate:

(1) $$Y_i = \alpha + \beta_1 Insurance_i + X_i' \mu + \varepsilon_i$$

where Y_i represents health outcomes or utilization at various providers within the past year and *Insurance* represents whether or not a parent chose to enroll in health insurance. In most cases (ie. without randomized subsidies), individuals (parents) choose to purchase insurance or enroll either because they benefit the most, perhaps knowing that they are at risk with health conditions (adverse selection), or they are health conscious and are more likely to take care of themselves (advantageous selection). In that case, these biases will either overestimate or underestimate the true impacts of adults being insured. To correct for this endogeneity, we utilize the experimental allocation of health insurance subsidies and instrument parental insurance enrollment with whether the parent was randomly offered the six-month subsidy. This first stage equation is:

(2) $$Insurance_i = \alpha + \beta_1 SixMonths_i + X_i' \mu + \varepsilon_i$$

where 'SixMonths' is an indicator of whether the parent was offered the six-month subsidy.

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. Table 1 gives us some assurances for this. For almost every baseline parent-level variable as well as child-level variable, there is no statistically significant difference between those whose parent were offered a subsidy, and those who were not (Column 4).[4] This provides evidence that randomization was effective, an important part of our empirical identification strategy mentioned below: at baseline, individuals in the treatment and control had balanced observable characteristics.

[4] There is a statistically significant difference in average household income, at the 10% 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. We therefore do not consider this a threat to validity, but include logged parental income as a control variable in all specifications. Results are insensitive to this covariate.

In the analysis, we also control for a number of baseline control variables to improve precision, but results are not sensitive to the choice or inclusion of covariates. These baseline controls includes household size, household-size squared, logged parent income, parent's years of education, child's age, age-squared, gender, the number of times sick, and fixed effects by market and round of interview. Regressions where the dependent variable is visits contain the control variable of total number of visits in the past year at baseline; similarly, regressions where the dependent variable is (logged) expenditures contain the baseline level of total (logged) expenditures in the past year. We run the analysis at the child level and because most families have more than one child, standard errors are clustered by household. It is worth noting that all results are robust to a first-differencing specification (not shown).

Take-up was strongly predicted by the offer of subsidies. The first stage results among parents and children under the age of 11 are presented in Appendix A. In each sample, being or having a parent who was offered the subsidy is the largest predictor of enrollment by increasing that probability by approximately 30 percentage points. In the childrens' sample, household size and the number of visits to all providers in the past year at baseline are also significant, although small in magnitude. Among children, there was a significant relationship between enrollment and logged parental income. Note that in both samples, the F-statistic of excluded instruments is large at over 200.

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 low with only 20.3 percent overall who enrolled 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% enrolled 18 months after subsidies expired. Those who received insurance substituted towards services at covered facilities and total out-of-pocket expenditures fell**.**

4. Main Results: Effects of Insurance

We now present the main results from equation (1) by examining health care utilization, expenditures and reported health outcomes among covered children. Table 2 presents the effect of having a parent with health insurance on ever visiting a provider (Panel A), the number of times visited (Panel B), any expenditures (Panel C), or log expenditures at a provider (Panel D). Results overall demonstrate a strong effect of usage of insurance, although no corresponding increases in expenditures. Panel A demonstrates that for the outcome of any visit, enrolling in health insurance increased the probability of going to a covered provider by almost 23 percentage points (Column 3). However, there is no statistical difference between insured children going to any other type of provider (Column 2, 4-7), or reporting a visit at all providers combined (Column 1). Panel B uses as the dependent variable the total number of visits in total and to each provider individually. Children of insured parents report over one more full visit to all providers than children of uninsured parents (Column 1), with over half of this increase (0.566) coming from covered providers. This is a large increase from an average number of visits for all children in 2008 of 3.43. Furthermore, the mostly positive coefficients on other providers suggest that this is a true increase in healthcare utilization, as opposed to substitution across different providers for these children. The number of visits to pharmacies from insured children is higher by nearly 0.35 of a visit, and similarly the number of free clinic visits and private hospital visits is 0.2 visits higher, although these differences are statistically insignificant. Visits to public hospitals, private doctors, and lab visits are not different between insured and uninsured children.

Our randomized design allows us to compare OLS estimates from observational data with our experimental results. In Appendix B, we present the OLS results of equation (1) without instrumenting for the decision to enroll in health insurance, but include the same list of control variables. This may shed light into the degree of selection into this insurance market, which our instrumental variables strategy corrects. Results in Panels A (ever visit) and B (number of visits) are largely consistent with our IV estimates from Table 2. Children of enrolled parents in potentially endogenous regressions report a statistically higher probability of visiting any provider with the probability of ever visiting a covered provider of 0.26, a magnitude roughly equivalent to Table 2. Results in Panel B show that the number of visits to EMPs is 0.67 higher among children of insured parents, which is roughly equivalent to the total number of provider visits. The point estimates for EMP usage are approximately the same, whereas the OLS estimates are slightly lower than in Table 2.[5]

Turning to expenditures on health, the point estimates presented in Panels C and D demonstrate that there are no statistically significant effects on either having any expenditure or logged expenditures resulting from parental health insurance enrollment. In each column of Panel C, results are small in magnitude with large standard errors. Similarly, Panel D demonstrates no statistically significant differences for expenditures at any provider or at all providers in total. Across each column except for covered EMP providers, the coefficients are consistently negative although at times large in magnitude. For example, the coefficient on total visits indicates that children of insured parents spent 47% less overall than uninsured children; similarly, expenditures at pharmacies and private hospitals are lower by approximately 30% and 20%, respectively. The exception to this pattern is covered providers.

Table 3 turns to the impact of health insurance on health outcomes as measured by reported being sick in the previous year, times sick, and some information about the last illness (among those reporting being sick). Panel A indicates no statistically significant effect on having a parent with insurance on likelihood of having a checkup in the past year, days missed at school, or any other measures of health. The point estimate for whether a child was sick at all in the past year is not statistically different between children with insured parents and those without; however, children with insured parents do report being sick *0.7 more times* on average throughout the year than children with uninsured parents; this is

[5] We performed Durbin-Wu-Hausman tests based upon Davidson and MacKinnon (1993), where residuals from the first stage equation are included in the second stage equation and tested for statistical significance. These tests indicate little endogeneity in regressions of number of visits on insurance, whether or not a provider was ever visited on insurance, or measures of health on insurance status. However, this DWH test indicated endogeneity in regressions of forgone treatment in the past year and the number of days of school missed due to last illness (not shown).

significant at the 5% level. This result falls slightly in magnitude, but maintains the same sign and significance in a wide range of specifications: count (both Poisson and negative binomial regressions), Tobit models,(22% of the sample report never being sick in the past year), and trimming high outlying observations. Interestingly, if instead of utilizing the instrumentals variables strategy, one simply estimates the OLS effect of insurance on the health outcome measures, the sign of the coefficient changes (Panel B). This finding highlights the importance of randomized evaluation both in health insurance specifically, and also more generally at not biasing results by confirming existing hypotheses.

The positive coefficient of having insurance on reported times sick has several plausible interpretations. The first is that health insurance actually makes individuals sicker. Our instrumental variables strategy accounts for adverse selection, or preexisting differences between insured and uninsured children in a manner fundamentally different from observational studies, and so preexisting conditions cannot be the case. However, germs in the waiting room or other iatrogenic illness – meaning illness caused by a physician – may be at play.[6] The medical literature has been familiar with this phenomenon; in a "classic paper" on the subject first done in 1981, authors found that "36% of 815 patients had an iatrogenic illness" (Steel et al, 2004). Although counterintuitive at first, this explanation highlights the reality that for the average person, health insurance generally, or improved access to medical care more broadly, may not necessarily correspond with improved health for everyone.

A second possible related explanation for this result is in terms of moral hazard after the time of the health insurance contracting. In this context, it may be that those who were insured took fewer precautions and preventive action with their children, thus making them more at risk. Our survey asked several questions regarding moral hazard which allow us to pursue this explanation. For example, we asked the number of days the parent waited prior to taking them to the doctor for their last illness, and estimated that insured parents waited 0.163 days less before taking their children to the provider. This

[6] 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).

coefficient, although with a sign consistent with moral hazard, is small in magnitude and statistically insignificant (p-value=.870). This does not strongly support the conclusion that moral hazard is driving our results.

It may also be that being insured changed the severity of what the definition of “sick” was, specifically lowered the threshold that distinguishes a cough from the flu, for example. Similarly, being insured or having increased contact with healthcare professionals may bring knowledge of health status. If one only realizes the degree of sickness by diagnosis, then only those that are diagnosed will report being sick. There is some suggestive evidence of the latter two explanations in comparing the estimated treatment effects of health insurance on total visits and reported number of times sick. Figure 1 graphs the effect of health insurance on total times sick and total number of provider visits for each age. The estimated treatment effect on total number of times sick follows roughly the same pattern as the total number of visits and suggests that being sick may have been thought of as simply going to the doctor. However, this is by no means conclusive, and does not rule out confounding factors.

5. Heterogeneous Effects by Reason for Last Illness

The main results imply that while the total number of visits increase, expenditures are unchanged and measures of health are not improved. We first caution that the length of time that families were insured was short, providing coverage for only 6 months. Similarly, we also are unable to measure long-term effects on health outcomes with the follow-up survey taking place one year after the baseline. Another possibility could be that the services provided to individuals – ie. the reasons for visits to the health provider – had little impact on overall health as measured by the survey. For example, the majority of visits to a health provider at the last illness among children are common minor ailments such as cough and flu.

We examine this further by using the child’s last reported illness and which provider the child went to for their last illness, if at all. First, the effect of insurance on overall provider visit at last illness is similar to the effect of insurance on total provider visits in Table 2. We report this in Appendix C. Because this estimate can only be calculated on individuals who reported having an illness in the past year, we account for this selection through the use of Lee bounds (Lee 2008).[7] We examine heterogeneous effects of having insurance based upon what type of last illness was reported, namely whether it was "Cold and Flu" or not. 46% of eligible children who were sick reported "Cold or Flu" as their last illness. Table 4 reports these results. Generally, those who reported suffering from cold or flu reported spending more on average (120%) for their last illness, but costs of illness was not different between insured and uninsured patients. One explanation for this is in Column 2, which measures whether the last provider the child attended was an EMP. Children with parents enrolled in health insurance were more likely to attend the EMP for their last illness, insured children with cold and flu were 16 percentage points *less* likely to attend EMPs for their last illness, significant at the 5% level.[8] Additionally, there was no difference in reporting cold and flu between insured and uninsured children (not shown).

These results casts doubt on the plausible explanation that individuals lowered their threshold for what they considered sick, which would predict the opposite effect of going to covered providers more. In fact, it supports the explanation of an increased threshold for being sick, perhaps as a result of physician

[7] Column 1 of Table 3 replicates our result that individuals with health insurance do not differentially report ever being sick in the past year as a baseline case; this is the same as the estimates in Table 3. The Lee bounds procedure essentially uses the results of Column 1 to determine a probability of whether or not individuals who were offered 6 month subsidies report a last illness. Then, "best" and "worst" case scenarios are constructed for individuals in the non-subsidy group and individuals below and above the calculated cutoffs in the subsidy group to bound the degree of selection. Columns 2-8 report the likelihood of attending various providers for the last illness, conditional on reporting a last illness. Column 4 shows that the only provider for which insured patients attended differentially was EMPs, the covered providers: conditional on having an illness in the previous year, being insured increased the likelihood of going to a covered provider by 14.5 percentage points. The Lee bounds on this coefficient are small, and around 15 percentage points. Coefficients and bounds in all other columns are generally small in magnitude and insignificant. Therefore, this gives us confidence that our results of health insurance being associated with worse health outcomes are not a result of insured individuals just not using their insurance. This is because our results seem to be driven by sick patients actually attending covered providers.

[8] The effects of visiting all other providers are not significantly different from zero (not shown).

knowledge. It also supports the hypothesis that when individuals believe that they have an "everyday" illness, they use their insurance *less.* Put differently, our results indicate that insured individuals go to covered providers overall upon being enrolled, but the magnitude of the effect depends upon the type of illness. Specifically, insured individuals do not utilize their insurance for everyday illnesses like cold and flu. This may also explain our finding of worsening health outcomes for insured children: those diseases for which insurance is used are disproportionately severe illnesses, which are now diagnosed. Additionally, if individuals prefer to self-medicate or use the convenience of pharmacies or free clinics for everyday illnesses then this may explain the negligible difference in expenditures between insured patients sick with cold and flu compared to those sick with other illnesses.

6. Heterogeneous Effects by Age

Examining differential effects by age help to provide more insight into what demographics are driving our usage and illness results. Table 5 presents the estimated coefficients of parental health insurance on visits to various providers by age category at baseline, where categories were chosen to equalize the number of ages per grouping (These results are also illustrated in Figure 1). Panel A shows that there is a roughly stable effect of increasing the probability of ever going to an EMP of 23 percentage points for children 2 and under, 20 percentage point increase for children 3-5, a 30 percentage point increase for 6-8 year olds, and 15 percentage points for 9-11 year olds. Interestingly, Panel B indicates a monotonically decreasing effect of parent's insurance on the number of EMP visits with increasing child age categories. The largest effects of parent insurance on EMP visits are among children age 2 and under, who report an average of approximately one additional EMP visit (0.786, significant at the 1% level). For those insured children between the ages of 3 and 5, there were 0.636 additional visits to the EMP on average, a result significant at the 5% level, and insured children ages 6 to 8 have 0.628 more visits to EMPs on average, significant at the 1% level. Children age 9-11 have 0.184 more visits to EMPs on average; these results are insignificant though.

Although there is a clear age trend for EMP usage, there are no other clear age patterns for other providers. Among children with insured parents, total visits for toddlers 6-8 year olds, and 9-11 year olds are a reported 0.22, 1.2, and 0.134 more visits respectively, although these values are not different from zero. Visits at other providers for all age groups are almost uniformly not different from zero. The exception is for children ages 3-5 at baseline, who have an average of one full more reported visit to the pharmacy and 0.6 more visits to private doctors. The differences across age categories could be related to the types of illnesses or health needs (such as vaccinations), that children of differing ages face. For example, in Nicaragua, the legal starting age for first grade is approximately 7, so children in the 3-5 age group at baseline may be preparing for first grade or kindergarten the next year.[9] Alternatively, a comparison of the probabilities of being sick in the past year at baseline demonstrates that younger children are much more likely to be sick: 88% of children under 2, and 83% of children 3-5 report being sick in the past year at baseline. For the 6-8 age group, this drops to 76%, and for the 9-11 group it declines further to 66%. However, our data cannot rule out differential investments that parents give children; within insured families, investing in the health of insured children may have a higher return than investing in uninsured children.

7. Heterogeneous Effects by Baseline Health

We can also examine differential usage of insurance by baseline health status, as measured by whether or not the child was reported being sick in the past year. Results are in Table 6. Panel A reports estimates from the sample of children who were not sick at baseline. The small sample size of children in these subgroups will somewhat mechanically increase standard errors, but point estimates indicate that insured children not sick at baseline utilize all providers less by nearly 2.2 visits (p-value=.107) but EMP usage is higher by 0.24 visits and pharmacy visits are lower by 0.89 visits (p-value=.178) and private doctor visits are 0.54 fewer visits than uninsured children (p-value=.162). These results support lower healthcare utilization overall, and substitution from other providers towards covered services for relatively healthy

[9] Approximately 77% of the 5 year olds reported being enrolled at a school at baseline.

children.

Panel B reports a different pattern among children sick at baseline (N=1729). Those who have parents enrolled in health insurance report nearly 2 more visits overall to all providers, significant at the 1% level, driven by 0.57 more visits to pharmacies (significant at the 10% level), and .6 more visits to EMPs (significant at the 1% level). All other point estimates are positive, indicating that children of insured parents who were sick at baseline experienced a true increase in healthcare utilization following enrollment.

We also examined health outcomes for these subgroups of children (results not shown). Children who were not sick at baseline overall reported a lower likelihood of ever being sick (-0.513), and fewer times sick (-0.158), although these results were not close to statistically significant. They also report a .093 increased likelihood of forgoing treatment due to lack of money, although this is also not different from zero. Children who were sick at baseline reported a higher likelihood of ever being sick (0.042), not significant at conventional levels, and reported being sick 0.859 times more often, significant at the 5% levels. Interestingly, children sick at baseline also report a lower likelihood of forgoing treatment due to lack of money (-0.11, p-value =.104), supporting the hypothesis that increased utilization, and diagnoses, may influence how sick parents report that their children are.

8. Conclusion

We presented analysis of a study of child's health insurance in Nicaragua. We find that similar to the results on the impact of this program on adults (Thornton et al. 2010): children who were covered by their parent's insurance have more visits to free health centers, driven by younger children. We find neither health impacts nor changes in expenditures among children although the time in which they were covered was short. In particular, we find that on the intensive margin, those who enrolled in health insurance reported being sick significantly more often. We explored this finding, showing that insurance is not utilized for when individuals have common illnesses, such as cold and flu.

As many governments, including that of the United States is moving towards covering children on health insurance programs, it is important to understand the benefits and the costs of health insurance on children's health outcomes. However, when considering the utilization of health insurance, it is important to consider the positive as well as the negative effects that spillover can have on health service utilization of insured families. This program was short term and the retention rate was low over time, however, other research on this subject is needed.

The effects of adult coverage on children is especially interesting given that before school age, children may be accompanying their parents on medical visits due to a lack of child care. Parents may be taking advantage of those visits to have their children seen by doctors for either preventative or curative care. This result was possible because clinics covered by the INSS insurance were full service clinics that included both pediatric and adult services. The findings of our research have interesting implications for debates on providing families with insurance rather than individual insurance for children or adults with the goal of increasing medical utilization. In the case of Nicaragua, insurance did greatly increase medical utilization of children. However, there were little changes in improving overall measures of health.

Lastly, our results should be taken in the context of the Nicaraguan health system (specifically its free clinics), and among our sample: middle-class urban entrepreneurs in the formal sector. 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, before the true effects can be known.

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Figure 1: Treatment Effects by Age

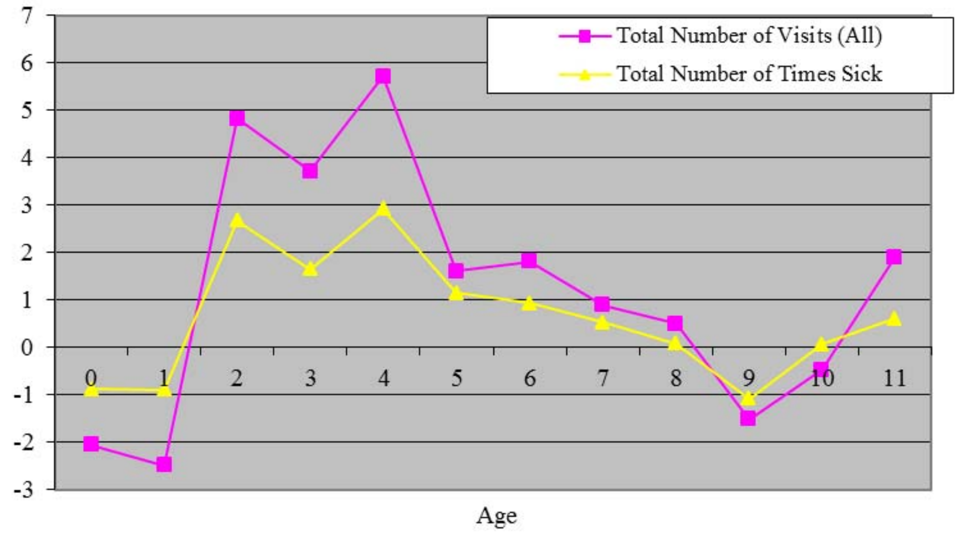

Table 1: Baseline Characteristics of Households and Children 11 and Under

Panel A: 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
Parent MFI	0.38	0.38	0.38	0.00
Median Parent Income	3752	3752	3752	0.00
Parent Married	0.81	0.82	0.81	-0.03
Years of Education	9.49	9.36	9.62	-0.26
Parent Age	34.58	34.25	34.87	-0.62
Family's Total Health Costs	1960.83	1951.27	1969.43	-18.16
Family's Total Last Health Cost	718.64	728.76	709.54	19.22
Family's Total Number of Visits	12.51	12.73	12.31	0.42
Family's Total Times Sick	7.13	7.32	6.96	0.36
Households (N)	1334	632	702	--

Panel B: Child Characteristics	(1)	(2)	(3)	(4)
Child Age	6.01	6.00	6.02	-0.02
Female	0.48	0.48	0.47	0.01
Child in School	0.93	0.93	0.94	0.00
Doctor in Past Year	0.28	0.27	0.28	-0.01
Sick in Past Year	0.80	0.79	0.80	-0.02
Times Sick in Past Year	2.34	2.36	2.32	0.04
Forgone Treatment in Past Year	0.24	0.26	0.21	.04*
Last Health Cost in 2007	231.42	217.55	244.20	-26.65
Total Health Costs for Child	627.23	570.17	679.85	-109.68
Children (N)	2170	1041	1129	--

Notes: Panel A uses one observation per household for respondents with at least one child age 12 and under at baseline. Panel B uses as the child-level observations, for all children age 11 and under, and clusters standard errors by family. (**) indicates difference is significant at the 5% level; (*) indicates the difference is significant at the 10% level. All income and expenditure data are in 2008 Cordobas. Valid income data are not available for 174 families. "Control" refers to parents who were randomly assigned to the Information Only or Brochure group and "Treatment" refers to parents who were randomly assigned to the 6-month subsidy group. Currently attending school was calculated for children age 5 and older. Children who were not sick in the past year are included as zeros for number of times sick, days of school missed due to illness, and all visit/spending variables. Whether or not the child was in school is only asked of children age 5 and older, and forgone treatment in past year due to lack of money was only asked among children who were sick in the past year.

Table 2: 2SLS Results on Visits and Expenditures, Children 11 and Under

	Total Visits	Pharmacy	EMP	Free Clinic	Public Hospital	Private Hospital	Private Doctor	Laboratory
Panel A: Ever Visit A Provider	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent Enrolled in Health Insurance	0.006	0.014	0.227***	0.054	0.004	-0.013	0.018	0.024
	(0.066)	(0.081)	(0.046)	(0.076)	(0.045)	(0.063)	(0.057)	(0.059)
Panel B: Number of Visits to A Provider								
Parent Enrolled in Health Insurance	1.323**	0.349	0.566***	0.213	0.010	0.200	-0.063	0.049
	(0.625)	(0.295)	(0.149)	(0.263)	(0.130)	(0.224)	(0.168)	(0.126)
Panel C: Ever Expenditures								
Parent Enrolled in Health Insurance	-0.049	-0.031	0.006	-0.012	-	-0.026	-0.008	-0.062
	(0.080)	(0.081)	(0.004)	(0.009)	-	(0.063)	(0.056)	(0.049)
Panel D: Log Expenditures								
Parent Enrolled in Health Insurance	-0.473	-0.297	0.028	-0.022	-	-0.203	-0.137	-0.287
	(0.470)	(0.462)	(0.019)	(0.029)	-	(0.325)	(0.295)	(0.257)

Notes: Sample is children of respondents aged 11 and younger at date of baseline survey (N=2416). Above regressions are 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status (First-stage F-statistic above 200 in all regressions). Dependent variable is whether the child ever visited a particular provider over the past year. Regressions control for round and market fixed effects. All income and expenditure data are reported in 2008 Cordobas. Individuals in households without income data were imputed to be the median and regressions were run with a dummy variable indicating the missing value. Individuals who were never sick in the past year were recorded as zero visits and zero expenditures. Panels C and D omit estimates of visits to public hospitals, which were uniformly zero among our sample. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 3: 2SLS Estimates of Health Outcomes, Children 11 and Under

	Sick in Past Year			-----Last Illness, If Reported-----					
	Ever Sick in Past Year	Times Sick in Past Year	Checkup in Past Year	Forgone Treatment in Past Year	Days of Work/ School Missed (ages >5)	Received Medicine?	Received Antibiotics?	Days Waited Before Seeking Treatment	Minutes Waited At Provider
<u>Panel A: IV Estimates</u>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Parent Enrolled in Health Insurance	0.013	0.702**	-0.039	-0.080	2.21	0.006	0	-0.164	-4.761
	(0.065)	(0.337)	(0.071)	(0.065)	(1.800)	(0.026)	(0.084)	(1.004)	(10.384)
<u>Panel B: OLS Estimatse</u>									
Parent Enrolled in Health Insurance	-0.025***	-0.112**	-0.018*	0.015	-0.018	-0.002	0.007	-0.212	0.84
	(0.009)	(0.047)	(0.010)	(0.010)	(0.261)	(0.003)	(0.013)	(0.161)	(1.507)
Observations	2170	2170	2170	1679	1024	1679	1679	1628	1619
Mean of Dependent Variable	0.774	2.045	0.207	0.134	3.656	0.976	0.613	1.922	41.39

Notes: Sample is children of respondents aged 11 and younger at date of baseline survey(n=2416). Above regressions are 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status. Dependent variable is various measures of health outcomes for the child over the past year. Regressions control for round and market fixed effects. All columns refer to outcomes as measured over the entire year; Columns 4-13 were only asked of children who reported being sick or going for a checkup over the past year. Column 5 exludes respondents who responded "Don't Know". Column 6 (Days of School Missed) were only asked of children age 5 and over. All income and expenditure data are reported in 2008 Cordobas. Individuals without valid income or expenditure data were imputed to be the median and regressions were run with a dummy variable indicating the missing value. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Cold and Flu Heterogeneous Effects

	Log cost of last health visit	EMP visit during last illness
	(1)	(2)
Parent Enrolled in Insurance	-0.403	0.218***
	(0.516)	(0.060)
Parent Enrolled in Insurance*Cold and Flu	-0.65	-0.156**
	(0.741)	(0.080)
Cold and Flu	1.200***	0.006
	(0.178)	(0.019)
Constant	2.637***	-0.100
	(0.555)	(0.066)
Observations	2170	1679
R-squared	0.142	0.09
Lee Lower Bound For Interaction Term	-0.832	-0.165**
	(0.513)	(0.081)
Lee Upper Bound For Interaction Term	-0.28	-0.159**
	(0.516)	(0.080)

Notes: Regressions are 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status. Robust standard errors in parentheses, clustered at the family level. Regressions control for household size, logged family income, age, age-squared, number of times sick, a dependent variable at baseline, never sick in 2006, child gender, round and market fixed effects. Regressions control for round and market fixed effects. *** p<0.01, ** p<0.05, * p<0.10

Table 5: Comparison of Visits By Age Category

Panel A: Ever Visit	Total	Pharmacy	EMP	Public Clinic	Public Hospital	Private Hospital	Private Doctor	Laboratory
Age at Baseline	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0-2 (N=395)	-0.115	-0.147	0.230**	-0.029	0.013	0.044	-0.005	-0.126
	(0.108)	(0.142)	(0.096)	(0.147)	(0.106)	(0.136)	(0.123)	(0.146)
3-5 (N=524)	0.012	0.048	0.198**	0.058	0.024	0.022	0.126	0.213**
	(0.097)	(0.127)	(0.080)	(0.119)	(0.076)	(0.105)	(0.096)	(0.097)
6-8 (N=663)	0.024	0.036	0.297***	0.079	-0.018	-0.041	-0.089	-0.042
	(0.115)	(0.132)	(0.068)	(0.116)	(0.073)	(0.093)	(0.090)	(0.100)
9-11 (N=588)	0.079	0.067	0.153**	0.077	0.026	-0.050	0.062	-0.009
	(0.140)	(0.146)	(0.072)	(0.120)	(0.082)	(0.090)	(0.086)	(0.094)
Panel B: Number of Visits								
Age at Baseline	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
0-2 (N=395)	0.221	-0.283	0.786**	-0.091	0.297	0.125	-0.531	-0.081
	(1.540)	(0.703)	(0.368)	(0.564)	(0.402)	(0.464)	(0.403)	(0.348)
3-5 (N=524)	3.542***	1.080**	0.636**	0.276	-0.023	0.688	0.661*	0.223
	(1.285)	(0.542)	(0.250)	(0.445)	(0.254)	(0.665)	(0.346)	(0.219)
6-8 (N=663)	1.182	0.509	0.628***	0.281	0.020	0.115	-0.357	-0.014
	(0.905)	(0.426)	(0.194)	(0.431)	(0.162)	(0.238)	(0.229)	(0.204)
9-11 (N=588)	0.134	-0.123	0.184	0.294	-0.108	-0.057	-0.063	0.006
	(0.924)	(0.461)	(0.236)	(0.328)	(0.212)	(0.210)	(0.233)	(0.168)

Notes:Above regressions are estimated coefficients of "Parent Enrolled in Health Insurance" from 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status on subsamples of children within each age category. Dependent variable is various measures of health outcomes for the child over the past year. Regressions control for household size, logged family income, age, age-squared, number of times sick, a dependent variable at baseline, never sick in 2006, child gender, round and market fixed effects. All income and expenditure data are reported in 2008 Cordobas. Individuals without valid income data were imputed to be the median and regressions were run with a dummy variable indicating the missing value. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Table 6: 2SLS Estimates by Baseline Sick Status

	Total	Pharmacy	EMP	Free Clinic	Public Hospital	Private Hospital	Private Doctor	Laboratory
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Children Not Sick at Baseline (N=441)								
Parent Enrolled	-2.210	-0.887	0.239	-0.175	-0.194	-0.319	-0.540	-0.334
	(1.371)	(0.658)	(0.258)	(0.644)	(0.232)	(0.289)	(0.386)	(0.269)
Constant	5.728***	1.507*	0.177	1.962	0.399	0.472	0.172	1.038*
	(2.128)	(0.806)	(0.345)	(1.269)	(0.302)	(0.512)	(0.414)	(0.569)
Mean of Dependent Variable	2.381	0.989	0.113	0.515	0.102	0.227	0.252	0.184
Panel B: Children Sick at Baseline (N=1729)								
Parent Enrolled	1.963***	0.569*	0.622***	0.280	0.047	0.305	0.024	0.117
	(0.688)	(0.322)	(0.164)	(0.278)	(0.149)	(0.253)	(0.180)	(0.140)
Constant	4.816***	2.504***	-0.074	1.242***	0.535**	0.634**	-0.088	0.064
	(1.047)	(0.488)	(0.208)	(0.471)	(0.261)	(0.282)	(0.250)	(0.179)
Mean of Dependent Variable	3.868	1.608	0.282	0.677	0.213	0.412	0.333	0.341

Notes: Above regressions are estimated coefficients of "Parent Enrolled in Health Insurance"*"Baseline Sick Status" from 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status*whether the child was sick in the past year at baseline. Dependent variable is visits to various providers for the child over the past year. Regressions control for household size, logged family income, age, age-squared, number of times sick at baseline, ever sick in 2006, child gender, and market and round fixed effects. All income and expenditure data are reported in 2008 Cordobas. Individuals without valid income data were imputed to be the median and regressions were run with a dummy variable indicating the missing value. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Appendix A: First Stage for EMP Visits

Baseline Variables	Parents (1)	Children 11 and Under (2)
Six-Month Subsidy	0.327***	0.307***
	(0.017)	(0.015)
Household Size	-0.018	-0.016**
	(0.009)	(0.007)
Household Size Squared	0.000	0.000
	(0.000)	(0.000)
Logged Parent Income	0.010	0.011*
	(0.008)	(0.006)
Parent's Years of Education	0.002	0.001
	(0.002)	(0.002)
Age in 2007	-0.006	0.001
	(0.009)	(0.009)
Age-Squared in 2007	0.000	0.000
	(0.000)	(0.001)
Female	0.001	-0.008
	(0.019)	(0.015)
Number of Times Sick in Past Year	0.003	-0.002
	(0.003)	(0.003)
Missing Income	-0.083***	-0.086***
	(0.024)	(0.020)
Total Number of Visits in Past Year	0.001	0.004**
	(0.002)	(0.002)
Ever Sick in 2007	0.011	0.027
	(0.023)	(0.020)
Constant	0.049	-0.040
	(0.177)	(0.070)
Observations	1614	2170
F-stage of Excluded Instruments	363.671	214.657

Notes: Sample in Column 1 is all parents with at least one child age 15 and younger at baseline. Sample in Column 2 is all children, 15 and younger, and sample in Column 3 is all children eligible for insurance (children age 11 and under). Robust standard errors in parentheses, clustered at the family level. All columns include market and round fixed effects. All income and expenditure data are in 2008 Cordobas. All variables are measured as of the baseline survey. *** p<0.01, ** p<0.05, * p<0.1.

Appendix B: OLS Number of Visits To Providers, Children 11 and Under

	Total Visits	Pharmacy	EMP	Free Clinic	Public Hospital	Private Hospital	Private Doctor	Laboratory
Panel A: Ever Visited Provider	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent Enrolled in Health Insurance	0.048**	0.014	0.264***	-0.006	0.017	-0.065***	-0.015	0.011
	(0.024)	(0.030)	(0.029)	(0.029)	(0.018)	(0.023)	(0.024)	(0.026)
Constant	0.911***	0.781***	-0.020	0.502***	0.128**	0.199**	0.022	0.174**
	(0.094)	(0.110)	(0.059)	(0.113)	(0.062)	(0.090)	(0.075)	(0.079)
Observations	2170	2170	2170	2170	2170	2170	2170	2170
R-squared	0.073	0.058	0.157	0.042	0.012	0.053	0.037	0.043
Mean of Dependent Variable	0.764	0.620	0.091	0.241	0.094	0.159	0.140	0.177
Panel B: Number of Visits to Provider	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent Enrolled in Health Insurance	0.650**	0.107	0.668***	-0.013	0.071	-0.126*	-0.097	0.041
	(0.262)	(0.117)	(0.088)	(0.100)	(0.060)	(0.068)	(0.060)	(0.057)
Constant	4.444***	1.980***	-0.012	1.499***	0.492**	0.347	-0.041	0.179
	(0.941)	(0.433)	(0.175)	(0.455)	(0.215)	(0.264)	(0.217)	(0.168)
Observations	2170	2170	2170	2170	2170	2170	2170	2170
R-squared	0.102	0.069	0.113	0.031	0.017	0.027	0.029	0.045
Mean of Dependent Variable	3.565	1.482	0.248	0.644	0.191	0.375	0.317	0.309

Notes: Sample is children of respondents aged 12 and younger at date of baseline survey (N=2416). Above regressions are 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status (First-stage F-statistic above 200 in all regressions). Dependent variable is the number of visits the child had to a particular provider over the past year. Regressions control for round and market fixed effects. All income and expenditure data are reported in 2008 Cordobas. Individuals in households without income data were imputed to be the median and regressions were run with a dummy variable indicating the missing value. Individuals who were never sick in the past year were recorded as zero visits and zero expenditures. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.1

Appendix C: 2SLS Last Illness with Lee Bounds: Children 11 and Under

		Type of Provider Seen for Last Illness						
	Reported Ever Being Sick	No Provider	Pharmacy	EMP	CS	Public Hospital	Private Hospital	Private Doctor
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Parent Enrolled in Insurance	0.016	-0.014	-0.083	0.146***	-0.019	0.028	-0.041	0.033
	(0.065)	(0.029)	(0.066)	(0.047)	(0.081)	(0.050)	(0.073)	(0.060)
Observations	2170	1679	1679	1679	1679	1679	1679	1679
Lee Lower Bound	0.004	-0.012	-0.074	0.151***	0.000	0.014	-0.063	0.028
	(0.065)	(0.030)	(0.066)	(0.047)	(0.082)	(0.050)	(0.072)	(0.060)
Lee Upper Bound	0.027	-0.012	-0.081	0.150***	-0.032	0.025	-0.036	0.037
	(0.064)	(0.030)	(0.066)	(0.047)	(0.081)	(0.050)	(0.073)	(0.061)

Notes: Regressions are 2SLS-IV estimates where "Parent Enrolled in Health Insurance" is instrumented with random assignment status. Robust standard errors in parentheses, clustered at the family level. *** p<0.01, ** p<0.05, * p<0.10