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# ABSTRACT

## The Effects of Access to Health Insurance for Informally Employed Individuals in Peru*

Many developing countries have recently increased health insurance coverage at a large scale. While it is commonly believed that this has positive effects, to date, it is not well understood through which channels health insurance coverage contributes to the well-being of individuals. More generally, the effects are usually not quantified at the individual level. There are two main reasons for this. First, we lack detailed data on health care utilization and health outcomes, and second, it is not easy to control for selection into insurance. The second problem means that a regression of utilization or outcome measures on insurance coverage will yield biased results and will not estimate the causal effects of health insurance. In this paper, we make progress in both directions. We use rich survey data to evaluate the impact of access to the Peruvian Social Health Insurance called "Seguro Integral de Salud" for individuals outside the formal labor market on a variety of measures for health care utilization, preventive care, health expenditures, and health indicators. We address the second concern by exploiting a fuzzy regression discontinuity design. A household is eligible for the program if a welfare index that is calculated from a number of variables is below a specific threshold. We base our analysis on a natural experiment that is generated by variation in the index around the threshold. We interpret our results through the lens of a simple model. As expected, and in contrast to studies for a number of other countries, we find strong effects of insurance coverage on measures of health care utilization, such as visiting a doctor, receiving medication and medical analysis. The program does not strongly incentivice individuals or health care providers to invest into preventive care. In line with this, in general, we find no effects of insurance coverage on preventive care. The only exceptions to this are our findings that, controlling for selection into insurance coverage, women of fertile age with insurance are more likely to receive pregnancy care and that insured individuals are more likely to be vaccinated. This is in line with the stark decrease in maternal and child mortality that was observed after the program was introduced. As for health care expenditures, we generally find positive effects on the mean and the variability. We complement these findings with quantile treatment effect estimates that show increases at the high end of the distribution. Our interpretation is that insured individuals are encouraged by health care professionals to undertake important treatments and pay for this themselves. At the same time, we find no clear effects on health outcomes at the micro level.

JEL Classification: I13, O12, O17

Keywords: public health insurance, informal sector, health care utilization, health, regression discontinuity design

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# 1 Introduction

In developing countries, a large number of individuals is not covered by health insurance (Banerjee et al., 2004; Banerjee and Duflo, 2007). The reasons for this are manifold. On the one hand, individuals are often used to relying on informal forms of risk-sharing instead of being covered by formal health insurance and therefore do not demand insurance.[1] On the other hand, it has in the past not been seen as the role of the government to provide health insurance. Moreover, the World Health Organization and the World Bank stress that even when there is public health insurance then it often does not reach large parts of the population and especially not the poorest families because it is only provided to the minority of employees in the formal sector (WHO, 2010; Hsiao and Shaw, 2007). For instance, until recently, less than 20 percent of the individuals in Peru have been covered by health insurance programs.

This may be a cause of concern, because health insurance does not only protect individuals against catastrophically high health expenditures (Wagstaff and Doorslaer, 2003). It may also encourage them to see a doctor instead of simply buying medication, and thereby promotes appropriate treatment of illnesses that is often argued to be lacking (Commission on Macroeconomics and Health, 2001; International Labour Office et al., 2006).

In reaction, many low and middle income countries have recently introduced Social Health Insurance (SHI) targeted to the poor, with the goal to improve their health and to provide them with financial protection against the financial consequences of health shocks. Typically, coverage by SHI may or may not be free and implies that individuals receive medical attention from a service provider. The costs are usually paid out of a designated government budget that is completely or partially funded by taxes.

However, to date, it is not well understood through which channels health insurance coverage contributes to the well-being of individuals and how this relates to the incentives provided to health care providers and patients.[2] In particular, it is not well understood to what extent it is possible to encourage individuals to invest into preventive care, and to seek medical attention rather than simply buying medication, and what the effects of preventive care and medical attention are on health outcomes.

One reason why we lack a deeper understanding is because it is challenging to quantify the effects of insurance coverage at the individual level. There are two main reasons for this. First, we lack detailed data on health care utilization and health outcomes, and second, it is not easy to control for selection into insurance. The second problem means that a regression of utilization or outcome measures on insurance coverage will yield biased results and will not estimate the causal effects of health insurance. In this paper, we make progress in both directions. We use rich survey data from the National Household Survey of Peru ("Encuesta Nacional de Hogares", ENAHO) for the year 2011 to evaluate the impact of access to the Peruvian Social Health Insurance called "Seguro Integral de Salud" (SIS) for individuals outside the formal labor market on a variety of measures for health care utilization and health indicators.

The Peruvian case is interesting because SIS resembles European public health insurance systems in that it covers health care expenditures, but does not strongly incentivice individuals to invest into preventive care. Coverage is for free for eligible individuals, and those who are not covered by SIS typically lack insurance coverage.[3] SIS was created in 2001 and subsequently reformed. *Prima facie*, these reforms have been successful, as coverage by SIS is substantial and enrollment has increased

[1] See for instance Fafchamps (1999), Jowett (2003), Chankova et al. (2008), Giné et al. (2008) and Dercon et al. (2008).

[2] See for instance Abel-Smith (1992), International Labour Office et al. (2006), Pauly et al. (2006), and Acharya et al. (2013).

[3] The latter may, however, seek medical attention on a pay-as-you-go basis and buy medication without a prescription.

from 20 percent in 2006 to almost 50 percent of the total population in 2011, reaching a relatively high enrollment rate among the SHI programs in low and middle income countries (Acharya et al., 2013). Yet, even though aggregate data suggest that some health outcomes improved since the program has been implemented—between 2000 and 2010 total maternal and child mortality rates decreased from 185 to 93 and 33 to 17, per 100,000 and 1,000 thousands of children born alive, respectively[4]—to date there is no study evaluating the effects of insurance coverage on preventive care, health care utilization and health outcomes at the micro level that controls at the same time for selection into insurance.[5]

In this paper, we use rich individual-level data to provide such an evaluation. We control for selective uptake of insurance by exploiting the institutional setup in Peru that gives rise to a Regression Discontinuity Design (RDD). The reform was passed in 2009 and, since the end of 2010, a household is eligible for the program if a welfare index called Household Targeting Index (Índice de Focalización de Hogares, IFH) that is calculated by Peruvian authorities from a number of variables is below a specific threshold. Variation in this index around the threshold provides a natural experiment that we exploit to conduct our analysis. Importantly, households do not know how the index is calculated, and hence the incentive to manipulate it—a common threat to studies based on such a RDD—is not present here. We, however, have access to this information and use it to re-calculate the composite index of economic welfare.

Our analysis is for individuals working in the informal sector. As in many other developing countries, formally employed individuals constitute a smaller group and are covered by a different scheme. For informally employed individuals the IFH index is the most important criterion to determine eligibility. The analysis focuses on individuals from the Lima Province because the regulatory framework mandates that the eligibility evaluation using the IFH index should be first applied in this area. In 2012, almost one third of the population lived in the Lima Province and half of Peru's GDP was generated there. This part of the country is very densely populated and therefore there are enough health care centers so that we can exclude that either a large distance or absence of the staff explain that individuals do not demand health care.[6]

Exploiting the unusually rich data from the ENAHO of Peru on health care utilization and health outcomes, as well as the discontinuity generated by the institutional rules, we find that insurance cov-

[4]National Institute of Statistics and Informatics (INEI)-National series, http://series.inei.gob.pe:8080/sirtod-series/. Dow and Schmeer (2003) perform an analysis of the effect of health insurance in Costa Rica on infant and child mortality. They use aggregate level data at the county level and control for fixed effects. As in Peru, increases in insurance coverage over time went along with decreases in infant and child mortality.

[5]There are other studies relating enrollment to health care utilization and outcomes. For instance, Parodi (2005) finds that SIS enrollment increases the probability that poor pregnant women give birth in a formal institution. However, he does not control for selection into insurance. Bitrán and Asociados (2009) find that SIS increases utilization for both preventive and curative services (with biggest impacts on treatments for diarrhea and acute respiratory infections for children) and that SIS reduces the likelihood that insured individuals incur in out of pocket health expenditures. The authors control for selection into insurance but they do not use the mean test used by SIS at the period of analysis. Instead, they use consumption per capita to evaluate eligibility. On the other hand, there are also studies that are more public policy oriented. For example, Arróspide et al. (2009) explore the design and effectiveness of the SIS's institutional budget and provide policy recommendations; whereas Francke (2013) analyzes whether the implementation of the SIS program has played a role in extending health coverage in Peru.

[6]According to Banerjee et al. (2004) these are two prime reasons why households in Rajasthan in India spend a considerable fraction of their budget on health care, essentially buying drugs. In other parts of Peru, utilization of health services has been limited by supply constraints. The Office of the Ombudsman reports that most of the 4,500 health care centers around the country are not sufficiently equipped to provide inpatient care (Defensoría del Pueblo, 2013). An official technical committee concludes that the biggest challenge faced by the Peruvian health system between 2009 and 2011 is the shortage of supply of health services in many parts of the country, because it lacks adequate capacity infrastructure, equipment and human resources (Comité Técnico Implementador del AUS, 2010). Finally, also statistics from the World Bank shows that, while the average of hospital beds per 1,000 people is 1.83 for Latin America, it is only 1.55 for Peru. This also occurs with other measures of supply health services, including the number of health workers such as physicians, nurses and midwives (World Bank, 2013).

erage has positive effects on the utilization of health services. Being insured increases the probabilities of visiting a doctor by 51.5 percentage points, of receiving medicines by 52.7 percentage points, and of requiring medical analysis by 20.6 percentage points. Regarding curative use, we find that insured individuals are 56.4 percentage points more likely to seek medical attention (i.e. in public hospitals and health care centers) and 25.7 percentage points more likely to have access to a surgical procedure. SIS does not provide strong incentives to invest into preventive care. Nevertheless, we find that insured women of childbearing age are more likely to control their pregnancy than uninsured women and individuals are more likely to be vaccinated. This is in line with the stark decrease in maternal and child mortality that was observed after the program was introduced. At the same time, as could be expected, we find no effects of insurance coverage on other forms of preventive care. As for health expenditures, we find that health insurance coverage goes along with increases in health expenditures and their variability. Moreover, using an estimator of quantile treatment effects, we find that the effect is particularly pronounced in the top end of the distribution. Our interpretation of this finding is that individuals health insurance coverage results in individuals seeking professional medical advice more often and then become convinced that they also should spend more on their health themselves. Finally, as is common in such studies, we do not find clear effects on health outcomes at the micro level. Our interpretation of this, in part, is that on the one hand these are longer term effects that are not measurable yet. On the other hand, it has to do with the subjectivity of the health report that may be influenced by the increased inclination of insured individuals to see a doctor. We interpret our findings in more detail by looking at them through the lens of a simple conceptual framework, or model, that we present in Section 2 below.

The literature on the impact of SHI for informally employed individuals in low and middle income countries is scarce, but growing.[7] Table 1 provides an overview over a selection of related studies, ordered by country, that are most closely related to ours. Our overall interpretation of the evidence on the effects of insurance is that as of now, more is known about the potential pitfalls than about the effects of a successful SHI program and in particular on how they depend on details of the implementation. The results presented in this paper suggest that SIS in Peru is an exception and belongs to the latter category, as does the Colombian program.[8] Interestingly, the supply-side incentives between those two countries differ in important ways. For that reason, it will be particularly interesting to compare our findings to the ones for Colombia.

Turning first to the other countries, Thornton et al. (2010) find that initial take-up of subsidized, but for-pay insurance "Seguro Facultativo de Salud" among informally employed individuals in Nicaragua was as low as 20 percent. Moreover, after the subsidy expired most who previously signed up cancelled their insurance. The specific reason they give for this is that convenience and quality of care were not adequately addressed, which means that at the margin, the price of insurance—the cost side from the perspective of individuals—plays a role, but that the bulk of individuals does not buy insurance because

[7] The selection of papers we discuss here is necessarily incomplete, but we believe it is to some extent representative. Acharya et al. (2013) systematically examine 64 papers on the effects of health insurance and present a review on the 19 papers that correct for selection into insurance. The review concludes that there is little evidence on the impact of insurance on health status, some evidence on utilization, weak evidence on out-of-pocket health expenditures, and unclear effects for the poorest. However, arguably, given the large variation in incentives provided by the respective institutions, it is not surprising that there is heterogeneity in the effect across countries. Giedion et al. (2013) also provide a comprehensive review classifying papers according to findings and research design. They also conclude that specific features of the design have a large impact on the likelihood that specific goals, such as increasing access or improving health, are reached. See also Abel-Smith (1992), International Labour Office et al. (2006), Pauly et al. (2006) and Dercon et al. (2008), and the references therein, for a review of the more policy-oriented literature.

[8] We provide a more in-depth discussion of the institutional details in Section 3.

Table 1: Selected Studies on the Effects of Health Insurance for Informally Employed Individuals in Developing Countries

| | country | research design | findings |
|---|---|---|---|
| Thornton et al. (2010) | Nicaragua | random assignment of premiums and enrollment location, then instrumental variables estimation | low take-up, substitution towards services provided at covered facilities, reduction in out-of-pocket expenditures, but increase in total individual health expenditures |
| Barros (2008) | Mexico | use variation in program intensity across time and space | reduction in out-of-pocket expenditures, shift from private to public providers, negligible effect on health |
| King et al. (2009) | Mexico | random assignment, encouragement to enroll into health insurance program | negative effects on medical spending, no effects on medication spending, utilization and health outcomes; reduction in catastrophic expenditures |
| Sosa-Rubi et al. (2009) | Mexico | latent class model, parametric identification | positive effect on obstetric utilization; negative effect on utilization in non-accredited state-run clinics, negative effect on private clinics, positive effect on utilization in accredited state-run clinics |
| Wagstaff (2010) | Vietnam | triple-differencing | reduction of out-of-pocket spending, no impact on utilization |
| Bauhoff et al. (2011) | Georgia | sharp discontinuities at two regional eligibility thresholds | no effects on utilization, health behavior, management of chronic illnesses, and patient satisfaction; decrease in out-of-pocket expenditures, no reduction of risk of high outpatient expenditures, but reduction of risk of high inpatient expenditures |
| Miller et al. (2013) | Colombia | fuzzy regression discontinuity design | positive effect on preventive care and health, reduction of financial risk |

the associated benefits are too low. This could also be because resources were wasted either in the administration or at the health care providers. Another reason why the program did not reach its goal was that over the course of the evaluation of the program, there was a drastic change in government, and with it the design of the program. The results for the few who did sign up and kept their insurance suggest that insurance could have a positive effect in the sense that average health care expenditures, which are generally seen as too low, increased. This could, however, also be the case because those who bought insurance and kept it constitute a negative selection of risks for whom the effect of insurance is particularly high.

All three papers for Mexico investigate the effects of the "Seguro Popular" program, whose aim it is—as the SIS's in Peru—to improve access to health insurance for the poor. Unlike in the Peruvian, but like in the Nicaragua program, coverage in the Mexican program is not for free. Turning to the effects of introducing the program in Mexico, it is remarkable that the findings in all three papers consistently suggest that the demand for medical care has shifted to providers that are part of the system, and in line with this, individuals health care expenditures have been reduced, including catastrophic health expenditures. In that sense, the program was successful in being a transfer program, but less so in encouraging individuals to seek care when ill. Interestingly, as it is the case in Peru with the SIS program, policy makers have also targeted pregnant mothers, and consequently, as in Peru, there is a positive effect on obstetric utilization. At the same time, the findings do not suggest that utilization has increased for other types of care.

The design of the program in Georgia is very similar to the one in Peru. However, and in contrast to our findings, Bauhoff et al. (2011) find no effect of insurance coverage on utilization. They argue that this is due to the fact that individuals were not aware of the fact that they were covered or that there were administrative problems that caused them to indeed not be covered, that they did not make use of the services because the program did not cover drugs, and because the perceived quality of the services was low. Therefore, it is not surprising that their findings are different from ours for Peru.

Turning to Colombia, and comparing the results to the ones in this paper for Peru, it becomes clear that the effects of insurance coverage depend on the design of the system. In Colombia, private insurers mainly receive a capitation fee and therefore have incentives to increase preventive services on the one hand and to limit total medical expenditures on the other. And indeed, Miller et al. (2013) mainly find effects on preventive care. In Peru, SIS covers both preventive and curative services and doctors are reimbursed on the basis of the treatments they provide. Hence, participating hospitals and health care facilities do not have an incentive to discourage curative treatments or medical procedures in favor of preventive services. This explains why in Peru most of the effects are on curative use.

We proceed as follows. After outlining our conceptual framework in Section 2, Section 3 discusses the institutional background and provides details on the SIS program. In Section 4 we provide information on our data and in Section 5 we formally describe the econometric approach. Results are presented in Section 6 and results of a sensitivity analysis are presented in Section 7. Section 8 concludes that on the one hand, the evidence suggests that the program was well-designed in the sense that—unlike in most other countries—enrollment was high and the effects on utilization were positive and sizable, but that on the other hand, measuring the effect of the program on health remains a challenge—as it also is in the western world.

## 2 Conceptual Framework

In this section, we lay out a simple framework, or model, that we use to interpret our results. It is inspired by the model of moral hazard and consumer incentives in health care by Zweifel and Manning (2000), but tailored towards our setup.[9] Our framework is also related to the Grossman (1972) model of health investment, the model of health behavior by Gilleskie (1998), and the dynamic panel data model by Adams et al. (2003) who find a causal effect of health on wealth for elderly health-insured Americans, but no effect of wealth on health. We keep the presentation informal.

At any point in time, individuals are endowed with a health stock and face the risk of being hit by a negative health shock. The corresponding arrival rate and intensity, respectively, depend on whether individuals have invested into their health by means of healthy behavior, their level of health, as well as their life style, including which job they work in. Arrival rate and intensity also depend on the level of care they exercise, for example to prevent accidents from happening.[10]

Individuals may enroll into social health insurance. If they are sufficiently poor, i.e. if a welfare index is below a certain threshold, then this is for free. Otherwise, they can buy coverage for a monthly premium. Although there is no economic reason why there should be a substantial difference between a zero price and a small positive price, this may have important behavioral implications, as pointed out by Shampanier et al. (2007).[11]

Social insurance covers a list of treatments at specified locations. The prime reason for buying insurance is that it provides access to care and changes its price.[12] Individuals can always buy private insurance that may or may not be more generous. Regular dependent employees are covered by another social insurance scheme, independent of whether or not they are poor.

One reason not to enroll is the perception that even though health insurance buys individuals access to doctors this is is not valuable because advice obtained from them is often of low quality, and therefore insurance is not worth its (opportunity) cost, including the time it takes to enroll.[13] But individuals may

[9] Zweifel and Manning (2000) provide a more formal model. See also Cutler and Zeckhauser (2000) on the optimal design of health insurance. Both papers provide excellent reviews of the respective relevant, partially overlapping literature.

[10] A reduction of preventive effort or care that is due to them being covered by health insurance is commonly termed *ex ante* moral hazard. Conversely, the increase in the demand for medical care once we control for the risk is termed *ex post* moral hazard. If higher risk types, in the absence of moral hazard, buy insurance, then one speaks of adverse selection in the Akerlof (1970) sense. See for instance Zweifel and Manning (2000). The empirical literature on moral hazard and adverse selection is still scarce, but growing. Arguably, this is because it is very hard to measure either of the two. Chiappori (2000) provides a broad review of the early literature. Chiappori and Salanié (2000), Abbring et al. (2003), and Abbring et al. (2003) investigate moral hazard in the market for car insurance. Finkelstein and Poterba (2004), Bajari et al. (2006), Fang et al. (2006), Aron-Dine et al. (2012) and Einav et al. (2011) study adverse selection and moral hazard in the context of health insurance in developed countries.

[11] This could also be part of the reason why take-up was low in Colombia, for instance, as pointed out above. If this is indeed the case, then there is a clear policy implication: if it is desired to have high enrollment rates, then small fees are likely dominated by zero fees, because small fees will not help finance the insurance scheme, but will have a substantial negative effect on enrollment.

[12] Another reason to enroll is risk-aversion. Alderman and Paxson (1992) provide an early synthesis of the related literature. Gertler and Gruber (2002) analyze the extent to which poor households in Indonesia are able to smooth consumption when they are hit by a health shock. They infer that health problems have large welfare costs, and conclude that public disability programs and subsidized healthcare could improve consumption insurance. Chetty and Looney (2006) present a model that illustrates that consumption fluctuations can underestimate the welfare costs of health shocks if households are highly risk averse. Pauly et al. (2008) use data from the World Health Survey for 14 developing countries and show that risk averse individuals may benefit from having access to health insurance, out of a pure consumption motive. Mohanan (2013) shows that households faced with shock-related expenditures are able to smooth consumption on food, housing, and festivals, with small reductions in educational spending, and that debt was the principal mitigating mechanism households used, leading to significantly larger levels of indebtedness.

[13] Das et al. (2008) provide evidence pointing towards such low quality advice, at least in other low-income countries.

also choose not to enroll for other, non-economic reasons.[14]

Individuals may not know themselves which treatment is optimal. They can seek medical attention at a doctor's office or in a hospital. Certain treatments are covered by the social health insurance, which means that then they pay nothing for the visit. But there are also services that are not covered. In that case, going to the doctor may go along with an increase in out-of-pocket expenditures.[15] This is a form of what has been termed supplier-induced demand (McGuire, 2000)—something that may or may not be beneficial to the individual. In Peru, doctors are reimbursed for the treatments they provide. In that sense, there is no explicit incentive for them to encourage the individuals to invest into preventive care—possibly even to the contrary. In contrast, in Colombia, doctors mainly receive a capitation and therefore have a higher incentive to invest in preventive care.

Importantly, and in contrast to what is common in developed countries, individuals can buy all drugs at the pharmacy. That is, there are no prescription drugs. Not seeing a doctor may be reasonable if individuals know about their condition and which drugs will help them. However, individuals may be wrong or lack a diagnosis to buy the right drugs, and the pharmacist may not be able to help them with their choice. Therefore, not seeing a doctor has potentially adverse effects on health.[16] Conversely, if they do see a doctor and he prescribes a drug, then the individual will obtain it for free if he has insurance coverage and the drug is in the list of drugs that are covered.

Finally, when asked about their health, individuals may answer that they are of worse health when covered by the insurance. Strauss and Thomas (1998) argue that the reason for this is that insurance coverage encourages them to see a doctor more often, and that he then makes them more aware of their health problems. Sen (2002) distinguishes in this context between "internal" and "external" views of health and stresses that "the patient's internal assessment may be seriously limited by his or her social experience", such as seeing a doctor or not.[17]

To summarize, in the simple model outlined above, not all individuals may enroll into health insurance. Once covered, they are likely to see a doctor more often, which is a pure price effect because the price for doing so is either unchanged for the doctors where they cannot receive treatment for free, or the treatment is now free, which increases demand for this service. By the same token, we also expect utilization of other services to increase, including inpatient care. We expect out-of-pocket expenditures to decrease for covered treatments and medication, but it may be that it increases or decrease for non-covered treatments and medication, because of supplier-induced demand. Finally, for the reasons given above, preventive care may increase or decrease, and also health reports may be affected in either way.

[14] Non-enrollment into free (net of the opportunity cost of time) state-provided schemes is a well-documented phenomenon in the U.S. See, for instance, Blank and Card (1991), Blank and Ruggles (1996), and Currie and Gruber (1996). Also in other contexts, it is argued that individuals make dominated choices (see for example Choi et al., 2011, and the references therein).

[15] Wagstaff and Lindelow (2008) focus on the effects of health insurance on financial risk in China and find that health insurance coverage increases the risk of incurring high and catastrophic spending, respectively. They argue that this is because insurance encourages individuals to seek care and this ultimately leads to higher expenditures that they then cover themselves.

[16] Laing et al. (2001) discuss the scarce evidence on this and provide suggestions on how to improve the use of medicines in developing countries.

[17] See also the discussion of various biases in self-assessed health measures that are discussed in Murray and Chen (1992).

## 3 Institutional Background

### 3.1 The Bigger Picture

Before 2001, health services were provided by the Ministry of Health (MINSA), the social security system (“EsSalud”), as well as private clinics and practices. Generally speaking, these providers catered to different groups of the population and did not cooperate with one another (Cetrangolo et al., 2013; Francke, 2013).[18]

MINSA runs a network of hospitals and health care centers that serve the general public. These are the services poor individuals demand and pay for if they are not insured. Next to that, EsSalud provides health insurance to formally employed individuals and maintains its own facilities for the provision of care. Enrollment into health insurance, either EsSalud or private insurance, is mandatory for dependent employees and voluntary for self-employed. Finally, the private sector offers services at relatively high prices. Consequently, these services are only affordable to more wealthy individuals who are also able to buy private health insurance.

The welfare program "Seguro Integral de Salud" (SIS), whose effect we evaluate in this paper, was introduced in 2001. Its goal is to improve access to health care services for individuals who lack health insurance, giving priority to vulnerable population groups that live in extreme poverty (Arróspide et al., 2009). In 2009, an important reform took place. There were two goals. The first was to improve the eligibility evaluation process. The second was to provide health insurance to a larger part of the population. To achieve these goals, among others, the budget dedicated to SIS was increased and eligibility rules were changed.[19]

The creation of SIS and subsequent reforms led to a substantial increase of health insurance coverage over time. Bitrán and Asociados (2009) and Francke (2013) provide an interesting analysis of the SIS’s coverage evolution and its relevance within the Peruvian health system in general. In our case, we used data from the ENAHO to characterize the evolution over time. Figure 1 shows that SIS coverage increased from 20.0 percent of the population in 2006 to 44.7 percent in 2011, which means that by then SIS was the main health insurance provider. In contrast, the coverage of EsSalud and private providers remained stable over the years. However, 32.4 percent of the population did still not have any type of insurance coverage in 2011.

### 3.2 Seguro Integral de Salud

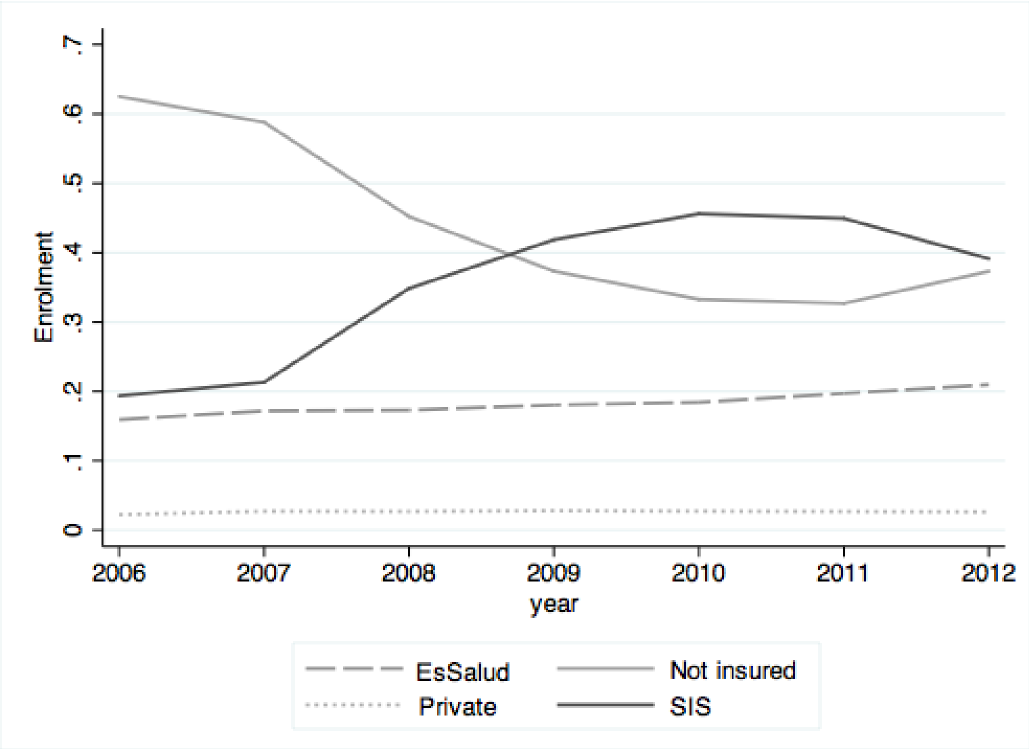
If eligible, individuals have the possibility to enroll into SIS at a number of places, including MINSA facilities. They are covered as soon as eligibility is confirmed, which is usually a matter of days. Then, they receive the health services that are offered at MINSA facilities and that are part of the benefit package.

The aim of the government was to target particular, poor groups in the population. Ideally, eligibility should be based on accurate information on income at the level of the individual or family. However, such information is typically not available in developing countries because a large part of the population

[18] In principle, MINSA is responsible for the regulation of the whole health system. However, in practice, it does so in a relatively passive way (World Bank, 2006).

[19] Before April 2009, in principle, SIS used a Household Welfare Index (“Índice de Bienestar de Hogares”, IBEH) to determine eligibility. However, the IBEH criterion was not strictly applied in practice.

Figure 1: Health Insurance Coverage in Peru over Time




Notes: Own calculations based on ENAHO survey for the years 2006-2012. See Section 4 for details on the data set and in particular our estimation sample for the year 2011. Here, we use the entire sample.

works outside the formal sector and therefore does not pay income taxes and social security contributions. Eligibility for SIS is therefore based on the so-called Household Targeting System ("Sistema de Focalización de Hogares", SISFOH). For this, a unified household registry is maintained and is used to calculate targeting indicators at the level of the family (see SISFOH, 2010). Data are collected by government officials using a standardized form. It includes questions on, amongst other things, housing characteristics, asset possessions, human capital endowments and other factors.

The most important targeting indicator for SIS is the IFH index.[20] It is a linear combination of the variables in the household registry that takes on lower values for households that are more poor. Appendix C explains in detail how the IFH is constructed, including the complete list of variables and their weights.

A household is eligible for SIS if the IFH index, water expenditures and electricity expenditures are all below respective regional-specific thresholds.[21] If no information for water and electricity expenditures is available, then a household is eligible if its IFH index is below the threshold. In case one of the

[20] Something important to mention is that SISFOH was established in 2004 and, by 2008, three main results were expected: i) a national, complete and updated Household Registry with the corresponding eligibility status using the IFH index; ii) three social programs (including SIS) would fully adopt this criterion to select their beneficiaries and; iii) the rest of social programs would begin using it. However, administrative and political barriers postponed reaching these results as planned. Only in the year of 2010, the Household Registry and eligibility status (including index's weights) were finished and became available for authorities. At the end of that year, SIS was the first social program to adopt the new criterion (see Llanos and Rosas, 2010 and Regulation RJ-N063-2011 for more details).

[21] For Lima, these thresholds are 55 for the IFH, 20 Soles for water expenditures and 25 Soles for electricity expenditures. This corresponds to 7.6 and 9.5 U.S. dollars, respectively. Table 17 of Appendix C provides the complete set of thresholds by geographic areas.

household members works in the formal sector, then eligibility is related to income. Moreover, if the monthly wage is greater than 1,500 Soles, or 570 U.S. dollars, then the household is not eligible for a social program, unless either water or electricity service expenditures are below their thresholds.

Importantly, potential beneficiaries are not aware of the exact details of the eligibility rules. Whereas they intuit the importance of their answers to the questions of the government official, they do not know how exactly the IFH index is calculated and what their cutoff value for eligibility is. SISFOH does not inform households about the value of their index and only provides the result of the eligibility evaluation.

SIS offers a comprehensive package of health care benefits. It is estimated that SIS covers 65 percent of the total disease burden in the country (Francke, 2013). Table 11 and 12 in Appendix A provide a detailed list of services covered by SIS together with the maximum levels of coverage. Coverage includes obstetric and gynecology interventions, pediatric interventions, neoplasm or tumor interventions, transmittable and non-transmittable disease's interventions, chronic and degenerative disease's interventions and emergency care. It also includes outpatient medical-surgical intervention and hospitalization, as well as coverage of high-cost diseases. There are no waiting times or latent periods. But there are maximum levels of coverage in terms of the number of medical attentions. For instance, for preventive care, SIS covers up to 10 treatments to control pregnancy, ultrasounds, lab tests and supplements of iron and folic acid. Regarding curative use of outpatient services, doctor visits and minor surgeries are covered without any limit (including its medications). In the case of inpatient services (with or without surgeries), extra diagnosis and maximum levels are applied.

There are two additional plans for self-employed individuals and to employees of small firms, respectively. The latter are not seen as dependent employees and therefore do not have to be enrolled in EsSalud. Both plans are not free of charge, but involve enrollment at a rate below the actual cost. Moreover, they involve a slightly different benefit package. However, these two additional plans are not important in practice. Administrative statistics from SIS show that the main plan targeted to the poor reaches 12.7 million individuals, or 99.8% of the entire SIS population.[22] In this paper, we focus on the effects of the first plan and refer to it simply as the SIS plan.

MINSA is reimbursed for the services it provides. This is done out of the SIS budget and at fixed rates that are based on estimates of the costs plus a markup. The rates are approved by MINSA in the form of regulation that is updated on a regular basis. This means that, as opposed to Colombia, the system offers no incentives to health care providers that are related to preventive care. At the same time, it does also not provide incentives that limit curative use.

In our study period, some of the treatments and services that are covered by SIS suffered from a number of substantial supply limitations. First, there was a lack of equipment in MINSA hospitals. According to Defensoría del Pueblo (2013), which performed a supervision of a sample of hospitals at a national level in 2012, 20 percent of them lack at least one piece of equipment required for inpatient surgery and 15 percent report to have problems with at least one other input needed for performing surgery. Second, there has been a shortage of dentists and ophthalmologists. The rate of odontologists per ten thousand inhabitants is one of the lowest among all medical professionals (Giovanella et al., 2012) and it is even lower when they work as providers for SIS (Defensoría del Pueblo, 2013). Likewise, only a small number of ophthalmologists provides services to SIS participants, which in turn limits the use of ophthalmological care. Only recently, and after our study period, the National Ophthalmological

[22] See SIS Statistic Report, available at http://www.sis.gob.pe/Portal/estadisticas/index.html, accessed September 2013.

Insitute, the largest provider in Peru, joined the list of SIS providers. Third, even though drugs are officially covered by SIS, according to the information in the ENAHO 2011, 37 percent of the covered individuals report to have paid for drugs received at the hospital level and 9.7 percent report to have paid for it at the health care centers level (Defensoría del Pueblo, 2013). This may be related to a cut that SIS experienced in its budget, which resulted in a failure to transfer resources to MINSA, which in turn motivated some hospitals to charge for hospitalization, regardless of insurance status. Patients are referred from health care centers to hospitals when the formers do not have specific medical specialties to perform proper diagnosis or treatments. Once at the hospitals, patients are less aware about the services they are freely entitled to as participants of SIS or they are not able to find all the medications they need. Taken together, the supply limitations imply that some patients were not able to receive some treatments and may have been asked to pay for other treatments that were actually formally included in the SIS package, especially when they received treatment in a hospital.

## 4 Data

The paper uses cross-sectional data from the ENAHO for the year 2011, which is representative at the level of each of the 24 departments that comprise the country. This survey fits our purpose because it provides information on health care utilization, health expenditures, health outcomes, insurance status, and the information needed to re-compute the IFH index. Information is collected using face-to-face interviews with one or more respondents per household, who are also asked to provide information on the other household members.

SIS is targeted to individuals who work in the informal sector. Therefore, for our analysis, we select individuals that belong to a household in which no member is formally employed.[23] This group comprises approximately 60 percent of the entire sample. Second, we focus on individuals from the Lima Province because, as described in Section 3, the regulatory framework mandates that the IFH targeting rule should be applied in this area in 2011 and afterwards to the rest of the country. Our sample contains information on 4,161 individuals after the two exclusions criteria are applied.

We construct our treatment variable using information on enrollment in SIS and in EsSalud. The reason is that some individuals who were actually enrolled in SIS may have wrongly stated to have been enrolled in EsSalud, because both are public insurance programs. While in principle SIS enrollment is at the household level, there are households in our data in which some members state that they are enrolled and other members state that they are not. For the results presented here we use this information as stated by the individuals, because we believe that this corresponds most closely to what individuals actually base their decisions on.[24] Participation in EsSalud is also recorded in the survey. Similar as in

[23]We define formality as having monetary income from any wage activity. This does not include any monetary income or income from self-employment. This definition is closest to the one used by the authorities. They distinguish between those individuals whose wage is observed, who are mainly employees with a formal contract, and others. We have also explored other definitions, including being a wage worker in the main occupation, any indication of having a formal contract in the main occupation, and working in an enterprise that keeps accounting books and is affiliated to a pension system. Results remain qualitatively the same.

[24]We also explored another variable for participation status in SIS. The variable was constructed at the household level and was a dummy equal to one for individuals that belong to a household where at least one member reported to be enrolled to SIS. The coverage of SIS increased from 13 percent to 28 percent with this second variable. The main results, which we discuss in Section 6 below, did not change qualitatively. However, the magnitude was smaller. This is related to the econometric approach, which basically calculates the local average treatment effect as the change in the outcome divided by the change in the fraction of individuals who were insured. See also Section 5.

the case of SIS, we consider individuals (not households) enrolled into EsSalud as it is reported in the survey.

Table 2 and 3 provide summary statistics for the main variables that we use in the analysis. We distinguish between three sets of variables. The first one is the participation variable defined as having public health insurance. The second set contains variables related to utilization of health services including health expenditures, and the third set comprises variables of health report. The columns in the two tables contain the summary statistics for the whole sample and for the sample broken down by participation status and eligibility.

In 2011, 38.0 percent of the sample population was either enrolled in SIS or EsSalud. On average, individuals in the sample are 33.0 years old, half of them are woman, individuals have around 8 years of education, and average annual household income is 30,620 Soles, or 11,636 U.S. dollars. Participants are slightly older, more likely to be female, and are less educated than nonparticipants. This is not surprising since the SIS program is targeted to the poor. When we compare eligibles to ineligibles, we find similar patterns.

Turning to utilization of health services, we find that, on average, 31.9 percent of the individuals has visited a doctor in the last month, 45.6 percent have received medicines and 6.3 percent have had medical analysis in the same period. 4.1 percent of the individuals have received an intervention or have undergone surgery in the last 12 months. Focusing on women, we observe that those who received pregnancy care in the last 12 months represent 7.4 percent of the sample of the women who are in fertile age. Utilization is generally higher for individuals who are covered by health insurance and for eligible individuals.

Shifting attention to health reports, when individuals in the full sample are asked if they experienced any symptom in the last month, 39.6 percent provide an affirmative answer. At the same time, only 14.4 of the individuals report that they suffered from illnesses. However, as already pointed out in Section 2, we should be cautious when interpreting this finding. After all, such reports can depend on whether or not individuals are being told by a doctor about their health. Therefore, even if they are objectively less healthy, they may report to be of better health if they do not see a doctor.

Regarding health expenditures, Table 3 shows that 57.1 percent of the individuals had some health expenditures in the last 12 months. The average annual expenditures are around 401.1 Soles, or 152 U.S. dollars.

## 5 Econometric Approach

In this paper, we estimate the impact of SIS coverage on a host of variables characterizing health care utilization, expenditures and health. Based on the institutional setup described in Section 3.2 we do this by means of a fuzzy RDD using the IFH index as the continuous forcing variable.[25] An individual is eligible for public insurance if she lives under poor conditions, which is measured at the household level. In Lima Province, the condition for this is that the IFH index is below or equal to a value of 55. The usual assumption we will make is that variation in this variable around its threshold provides a natural experiment that randomly assigns eligibility to households and thereby individuals. This assumption is

[25]This approach goes back to at least Thistlethwaite and Campbell (1960). See Hahn et al. (2001) for a more modern exposition and Imbens and Lemieux (2008) for a discussion of practical issues.

Table 2: Descriptive Statistics 1/2

| Variable | Dummy | (1) Total $N = 4,161$ | | (2) Participants $N = 1,581$ | | (3) Non-participants $N = 2,580$ | | (4) Eligibles $N = 1,786$ | | (5) Ineligibles $N = 2,375$ | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Std. |
| Participation | | | | | | | | | | | |
| Health Insurance | D | 0.380 | - | 1.000 | - | 0.000 | - | 0.400 | - | 0.365 | - |
| Demographics | | | | | | | | | | | |
| Woman | D | 0.511 | - | 0.533 | - | 0.498 | - | 0.507 | - | 0.514 | - |
| Age | | 33.014 | 22.250 | 34.366 | 24.737 | 32.185 | 20.540 | 28.292 | 20.695 | 36.564 | 22.718 |
| Years of education | | 8.126 | 4.854 | 7.758 | 5.068 | 8.351 | 4.705 | 6.633 | 4.485 | 9.248 | 4.819 |
| Number household members | | 4.607 | 2.101 | 4.491 | 1.992 | 4.678 | 2.163 | 4.661 | 1.917 | 4.566 | 2.229 |
| Woman head of household | D | 0.251 | - | 0.256 | - | 0.248 | - | 0.254 | - | 0.250 | - |
| Annual household income (thousand Soles) 1/. | | 30.62 | 27.07 | 31.94 | 28.69 | 29.74 | 25.93 | 20.33 | 14.40 | 38.19 | 31.39 |
| Utilization | | | | | | | | | | | |
| Any doctor visits | D | 0.319 | - | 0.372 | - | 0.287 | - | 0.339 | - | 0.305 | - |
| Medicines | D | 0.456 | - | 0.507 | - | 0.426 | - | 0.465 | - | 0.450 | - |
| Analysis | D | 0.063 | - | 0.091 | - | 0.047 | - | 0.059 | - | 0.067 | - |
| X-rays | D | 0.037 | - | 0.054 | - | 0.028 | - | 0.033 | - | 0.041 | - |
| Other tests | D | 0.013 | - | 0.019 | - | 0.009 | - | 0.010 | - | 0.016 | - |
| Dental care | D | 0.118 | - | 0.125 | - | 0.113 | - | 0.096 | - | 0.134 | - |
| Ophthalmological care | D | 0.054 | - | 0.054 | - | 0.053 | - | 0.025 | - | 0.075 | - |
| Glasses | D | 0.041 | - | 0.040 | - | 0.041 | - | 0.019 | - | 0.058 | - |
| Vaccines | D | 0.109 | - | 0.133 | - | 0.094 | - | 0.138 | - | 0.087 | - |
| Kids check 2/. | D | 0.263 | - | 0.270 | - | 0.258 | - | 0.253 | - | 0.276 | - |
| Birth control | D | 0.060 | - | 0.063 | - | 0.058 | - | 0.065 | - | 0.056 | - |
| Other treatments | D | 0.234 | - | 0.255 | - | 0.222 | - | 0.201 | - | 0.259 | - |
| Hospital | D | 0.060 | - | 0.088 | - | 0.042 | - | 0.057 | - | 0.062 | - |
| Intervention/Surgery | D | 0.041 | - | 0.055 | - | 0.032 | - | 0.039 | - | 0.042 | - |
| Pregnancy care 3/. | D | 0.074 | - | 0.129 | - | 0.044 | - | 0.102 | - | 0.052 | - |
| Child birth 3/. | D | 0.033 | - | 0.067 | - | 0.014 | - | 0.045 | - | 0.023 | - |
| Any of the above | D | 0.687 | - | 0.739 | - | 0.655 | - | 0.677 | - | 0.695 | - |
| Other medical attention | D | 0.199 | - | 0.258 | - | 0.162 | - | 0.195 | - | 0.201 | - |

Notes: Data from the ENAHO 2011. See Table 13 for variable definitions. 1/. Question applied at household level: total $N = 1,129$, $N = 449$ participants, $N = 680$ non-participants, $N = 479$ eligible, $N = 650$ ineligible. 2/. Question applied for kids under 10: total $N = 649$, $N = 289$ participants, $N = 360$ non-participants, $N = 363$ eligible, $N = 286$ ineligible. 3/. Question applied for women in fertile age: total $N = 1,182$ (total), $N = 417$ participants, $N = 765$ non-participants, $N = 532$ eligible, $N = 650$ ineligible.

Table 3: Descriptive Statistics 2/2

| Variable | Dummy | (1) Total | | (2) Participants | | (3) Non-participants | | (4) Eligibles | | (5) Ineligibles | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Std. | Mean | Std. |
| Health report | | | | | | | | | | | |
| Any symptom | D | 0.396 | - | 0.394 | - | 0.397 | - | 0.444 | - | 0.356 | - |
| Illness | D | 0.144 | - | 0.156 | - | 0.136 | - | 0.147 | - | 0.141 | - |
| Chronic illness | D | 0.415 | - | 0.457 | - | 0.390 | - | 0.351 | - | 0.464 | - |
| Relapse | D | 0.097 | - | 0.123 | - | 0.080 | - | 0.086 | - | 0.104 | - |
| Accident | D | 0.023 | - | 0.025 | - | 0.022 | - | 0.026 | - | 0.020 | - |
| num. days with symptom | | 0.134 | 1.122 | 0.159 | 1.299 | 0.118 | 0.998 | 0.162 | 1.263 | 0.112 | 1.003 |
| num. days with illness | | 0.144 | 1.099 | 0.154 | 1.126 | 0.137 | 1.083 | 0.151 | 1.069 | 0.138 | 1.122 |
| num. days with relapse | | 0.250 | 2.295 | 0.345 | 2.701 | 0.191 | 2.004 | 0.208 | 1.987 | 0.281 | 2.501 |
| num. days with accident | | 0.069 | 1.123 | 0.124 | 1.567 | 0.035 | 0.727 | 0.079 | 1.111 | 0.061 | 1.133 |
| Health expenditures | | | | | | | | | | | |
| Any health expenditures | D | 0.571 | - | 0.547 | - | 0.586 | - | 0.548 | - | 0.588 | - |
| Health expenditures | | 401.133 | 1154.340 | 0.547 | 1294.957 | 394.735 | 1059.202 | 248.033 | 710.470 | 516.265 | 1387.277 |
| Var expenditures | | 539.212 | 1020.595 | 568.610 | 1163.354 | 521.197 | 922.040 | 429.187 | 586.629 | 621.951 | 1245.203 |
| Abs expenditures | | 530.172 | 1007.187 | 559.612 | 1144.685 | 512.132 | 912.521 | 324.440 | 629.826 | 684.883 | 1193.124 |
| Sqre expenditures | | 1295264 | 1.16e+07 | 1622640 | 1.52e+07 | 1094651 | 8778272 | 501719 | 5000706 | 1892010 | 1.47e+07 |
| Expenditures 50 | D | 0.495 | - | 0.488 | - | 0.499 | - | 0.448 | - | 0.530 | - |
| Expenditures 75 | D | 0.250 | - | 0.250 | - | 0.249 | - | 0.196 | - | 0.290 | - |
| Share expenditures | | 0.057 | 0.187 | 0.057 | 0.191 | 0.057 | 0.184 | 0.056 | 0.187 | 0.058 | .187 |
| Var share | | 0.076 | 0.170 | 0.077 | 0.174 | 0.075 | 0.168 | 0.076 | 0.171 | 0.076 | .170 |
| Abs share | | 0.076 | 0.170 | 0.077 | 0.174 | 0.075 | 0.168 | 0.073 | 0.172 | 0.078 | .170 |
| Sqre share | | 0.035 | 0.478 | 0.036 | 0.488 | 0.034 | 0.472 | 0.035 | 0.483 | 0.035 | .475 |
| Share 50 | D | 0.500 | - | 0.500 | - | 0.500 | - | 0.485 | - | 0.511 | - |
| Share 75 | D | 0.250 | - | 0.250 | - | 0.250 | - | 0.246 | - | 0.253 | - |
| Catastrophic 5% | D | 0.231 | - | 0.223 | - | 0.235 | - | 0.227 | - | 0.233 | - |
| Catastrophic 10% | D | 0.136 | - | 0.131 | - | 0.140 | - | 0.135 | - | 0.137 | - |
| Catastrophic 15% | D | 0.096 | - | 0.094 | - | 0.098 | - | 0.092 | - | 0.100 | - |
| Catastrophic 20% | D | 0.069 | - | 0.067 | - | 0.071 | - | 0.065 | - | 0.072 | - |
| Catastrophic 25% | D | 0.051 | - | 0.051 | - | 0.051 | - | 0.046 | - | 0.055 | - |

Notes: Data from the ENAHO 2011. See Table 14 and Section 6.2.3 for variable definitions.

obviously motivated by the cutoff value of 55 for the index and the institutional rules in general. We will formalize this assumption below.

As explained in Section 4, our treatment is coverage by public health insurance, which is defined as being enrolled in either SIS or EsSalud. It follows from the institutional rules that there is no reason to expect EsSalud coverage to change discontinuously when the threshold is crossed. Based on this, we will attribute such discontinuous changes to enrollment in SIS.

As described in Section 3.2, the IFH index is not the only variable that is related to eligibility. Other variables that are important in that respect are labor income, as well as water and electricity consumption. However, the IFH index is the most important criterion for eligibility. Moreover, and importantly, as for Essalud enrollment, we do not expect a discontinuity in any of those variables when crossing the eligibility threshold for the IFH index. Therefore, discontinuities around the eligibility threshold are plausibly related to the IFH index only.

Once we impose linearity, we can estimate the effects using the standard two-stage least squares instrumental variables estimator. Formally, we specify the first-stage equation that describes the relationship between enrollment into health insurance for individual $i$, $d_i$, as a linear probability model

$$d_i = \beta_0^d + \beta_1^d z_i^c + \beta_2^d elig_i + \beta_3^d z_i^c elig_i + \varepsilon_i^d,$$

where $z_i^c$ is the IFH index centered at its threshold and $elig_i$ is an indicator for eligibility. The second-stage equation for outcome variables $y_i$ is, accordingly,

$$y_i = \beta_0^y + \beta_1^y z_i^c + \beta_2^y d_i + \beta_3^y z_i^c elig_i + \varepsilon_i^y.$$

When we use the two-stage least squares instrumental variables estimator with $elig_i$ as the instrument for $d_i$ and controlling for the index $z_i^c$ and its interaction $z_i^c elig_i$ with eligibility, then we will estimate the ratio $\beta_2^y/\beta_2^d$. This can then be interpreted as a local average treatment effect, as proposed by Imbens and Angrist (1994), provided that three assumptions hold. The local average treatment effect is the average effect of insurance coverage on the outcome, for those individuals who enroll when becoming eligible by crossing the threshold.

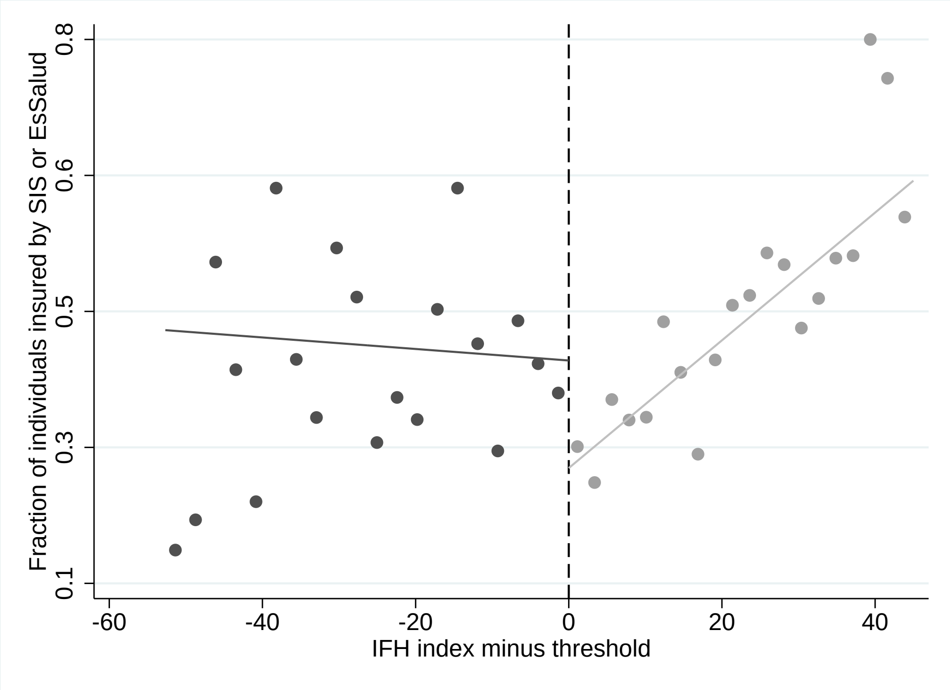
The first assumption we need to make is that if no insurance would be assigned to everybody around the threshold, then the distribution of the outcome conditional on the index would be smooth in the index $z_i$ around zero.[26] This assumption cannot be tested directly and is therefore the main assumption we will make. As we have argued before, the institutional rules suggest that it holds. We provide further, supportive evidence below.

The second assumption is that insurance status is monotone in eligibility. This holds by construction, as changing from a value of the index slightly higher than the threshold value to a value lower than the threshold value will make an individual eligible for insurance coverage.[27] The final, third assumption is an exclusion restriction. It is that the value of the index, $z_i$, is independent of the outcomes, and in

[26] This is slightly stronger than needed. Usually, it is enough to assume that the conditional expectation of $y_i$ given $z_i$ is smooth around the threshold. We make a slightly stronger assumption here in order to be able to estimate quantile treatment effects as well, as described below.

[27] The assumption would be violated if an individual would buy insurance if she is not eligible, but not if she is eligible. See Battistin and Rettore (2008a) and Klein (2010) for related discussions.

Figure 2: Health Insurance Coverage




Notes: This and the following figures are based on ENAHO data for the year 2011 for Lima Province. See Section 4 and Appendix C for details on the data and on how the IFH index is computed.

particular $\varepsilon_i^y$.[28] It would be violated if households would manipulate their answers to the government official in order to influence the value of the IFH index. As discussed in Section 3 this is unlikely to be the case. We nevertheless test for manipulation in Section 7.1.

Under the same assumptions, it is also possible to estimate quantile treatment effects, as described in Frandsen et al. (2012). In Section 6.2.3 we estimate the quantiles of the distribution of expenditures with and without insurance. The underlying idea is straightforward. While the local average treatment effect is an average, the quantile treatment effect is the change in, say, the median of the distribution an outcome that results from being covered by public health insurance for those who select to enroll when becoming eligible.

# 6 Results

## 6.1 Graphical Analysis

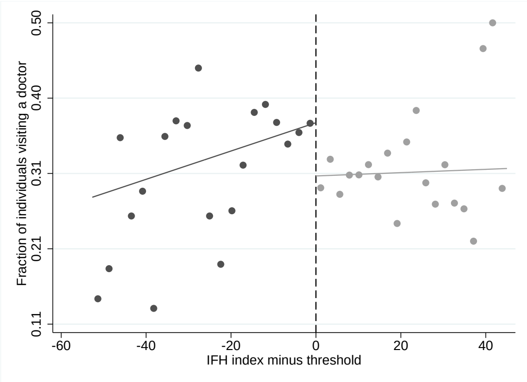
We first graphically examine how enrollment into public health insurance is related to the IFH index. Figure 2 shows the fraction of individuals enrolled into either SIS or EsSalud plotted against the IFH index centered at its threshold. The figure shows a discrete increase in the probability to be covered at the threshold, when moving from the right to the left, providing evidence on the importance of the IFH index as a criterion to determine whether an individual is eligible for the SIS program.[29]

[28] Again, for the same reason as above, mean independence usually suffices, but we make a stronger assumption in order to also estimate quantile treatment effects.

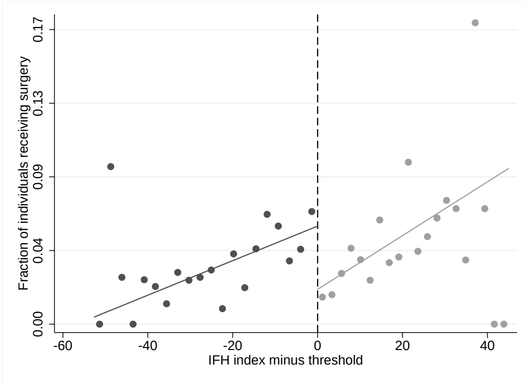
[29] As explained before, we use this definition because individuals may have confused those two public insurance programs when answering the respective survey questions. It follows from the institutional rules that any discontinuity in the probability to be enrolled in either of those, at the threshold, can be attributed to individuals becoming eligible for SIS. It is, however,

Figure 3: Health Care Utilization

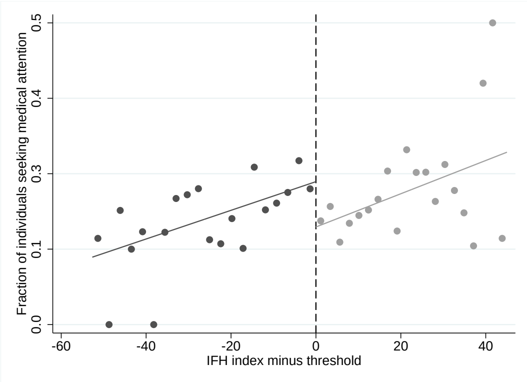
(a) Doctor visits



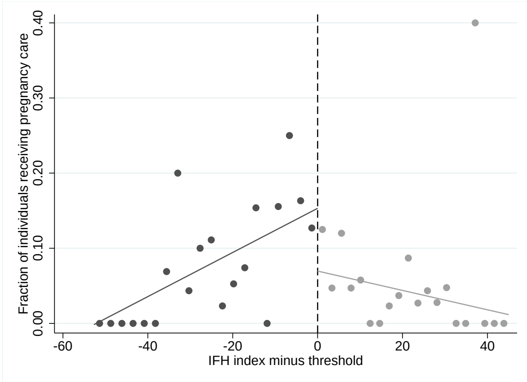

(b) Surgery




(c) Medical attention




(d) Pregnancy care




Besides, the figure shows that the probability to be enrolled into a public insurance is slightly decreasing in the welfare index among eligible individual to the left of the threshold. This means that poorer individuals are slightly more likely to be enrolled, which is in line with the government's goal to target the poor. To the right of the threshold, we see that the probability to be covered by public insurance is increasing in the welfare index. This is due to the fact that dependent employees are more likely to have a higher value of the index and are more likely to be covered by EsSalud. Besides, EsSalud offers voluntary paid plans for self-employed, which is a more common choice among individuals with a higher value of the welfare index.

Next, we investigate how four of the most important measures of health care utilization are related to insurance status.[30] Figure 3a plots the probability that an individual has visited a doctor in the last four

likely that even if insurance status was perfectly measured we would not observe that the probability to be insured in SIS is zero for individuals with a welfare index above the threshold. There are two reasons for this. First, there is a certain level of leakage in the targeting strategy of SIS, which means that some individuals who are formally ineligible may still be able to obtain insurance. What is important for our identification strategy is that there is a discontinuity in the probability to be insured at the threshold. This is not a concern in that respect if at least some individuals are properly classified according to our index. Second, we construct the IFH index using survey data from the ENAHO rather than using the official data collected by SISFOH that is used to determine eligibility in practice. This may give rise to measurement error in the running variable. It is not a cause of concern as long as there is a positive probability for each individual that the index is measured correctly. Battistin and Rettore (2008b) show that then, the observed discontinuity can be attributed to those individuals for whom the index is observed without error. See also Hullegie and Klein (2010) for an alternative parametric approach to estimating treatment effects in a regression discontinuity design with measurement error.

[30] The survey contains a wealth of variables related to health care utilization and outcomes. We provide a more comprehensive analysis using regressions below.

Table 4: Effect of Health Insurance on Health Care Utilization

| | | Estimates | Ste. |
|---|---|---|---|
| Participation (first stage) | | | |
| 0 | Health Insurance | 0.1403*** | (0.0257) |
| | | | $F = 29.8023$ |
| Utilization | | | |
| 1 | Any doctor visit | 0.5149*** | (0.1954) |
| 2 | Medicines | 0.5271*** | (0.2045) |
| 3 | Analysis | 0.2056** | (0.0921) |
| 4 | X-rays | 0.1297* | (0.0712) |
| 5 | Other tests | 0.0508 | (0.0413) |
| 6 | Dental care | 0.0660 | (0.1231) |
| 7 | Ophthalmological care | 0.0356 | (0.0841) |
| 8 | Glasses 1/. | -0.0305 | (0.0693) |
| 9 | Vaccines | 0.2884** | (0.1317) |
| 10 | Kids check 2/. | 0.0678 | (0.2610) |
| 11 | Birth control | -0.1443 | (0.0934) |
| 12 | Other treatments | 0.1763 | (0.1616) |
| 13 | Hospital | 0.1484 | (0.0931) |
| 14 | Surgery | 0.2567*** | (0.0881) |
| 15 | Pregnancy care 3/. | 0.6504** | (0.2931) |
| 16 | Child birth 3/. | 0.1900 | (0.1593) |
| 1-16 | Any of the above | 0.4377** | (0.1860) |

Notes: Except for kids check, pregnancy care and child birth $N = 4,161$. See Table 13 for variable definitions. 1/. Not covered by SIS. 2/. Question applied for kids under 10, $N = 649$. 3/. Question applied for women in fertile age, $N = 1,182$. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$.

weeks against the welfare index. We see that becoming eligible for health insurance, that is moving from the right to the left of the threshold, is related to an increase in utilization. Figure 3b, 3c and 3d show that also the probability to undergo surgery, to receive medical attention and to receive pregnancy care increase, respectively.

### 6.2 Main Analysis

Next, we analyze more formally how insurance status and outcome variables are related to eligibility. For this, as described in Section 5 above, we use two-stage least squares instrumental variables regression. Throughout, we control for age, gender, whether the head of the household is female, the number of household members, and years of education.[31] We first use the full sample and control for separate linear relationships between insurance status and outcomes, respectively, to the left and to the right of the eligibility threshold. The endogenous variable is enrollment into public insurance and the instrument is eligibility according to the welfare index.

Table 4 shows the results.[32] We estimate the local effect of eligibility to be a 14 percent increase in insurance enrollment. This corresponds to the size of the discontinuity in Figure 2. The effect is highly statistically different from zero.

[31] See Section 7.4 for results without controlling for covariates.

[32] In Table 18 in Appendix D.1 we provide ordinary least squares estimates corresponding to the ones reported here and in the following two tables.

### 6.2.1 Health Care Utilization

We examine the effect of SIS on the use of 16 health services, including those in Figure (3). We find that it has a large and significant effect on six of them. In particular, being covered by health insurance increases the probability of visiting a doctor in the four weeks prior to the interview by 51.5 percentage points. The probability of obtaining medicines in the same four weeks increases by 52.7 percentage points. Moreover, health insurance increases the probability of performing at least some medical analysis by 20.6 percentage points. Taken together, these three results suggests that covered individuals are more likely to see a doctor who then performs an analysis or prescribes a drug, in line with the idea that covered individuals receive medical care that caters better to their needs. This is remarkable because Peru is a country in which poor individuals are accustomed to not receiving any professional diagnosis and where drugs can also be bought in a pharmacy without a prescription.

We also find health insurance coverage to have significantly positive effects on two measures of preventive care. The probability of being vaccinated in the three months prior to the interview increases by 28.9 percentage points, and women at fertile age are 65.0 percentage points more likely to control their pregnancy in the previous twelve months.[33]

The effect on the likelihood to receive surgery is also positive. It increases by 25.7 percentage points. In Section 6.2.3 below we show that at least some individuals pay themselves for these surgeries, which suggests that health insurance coverage increases the likelihood that they find it worthwhile to do so.

At the same time, Table 4 shows that health insurance coverage has no significant effects on utilization of dental and ophthalmological care during the previous three months, and also not on hospitalization. This can be explained by supply limitations. The health care centers of MINSA provide only basic services. Individuals are sent to hospitals in order to visit a specialist, which also includes dentists and ophthalmologists. This, together with the shortage of dentists and ophthalmologists described in Section 3.1 explains our finding. As for hospitalization, as described in the same section above, hospitals lacked equipment and there were budget problems that led to hospitals charging for services that are formally covered by the health insurance. This likely explains why we do not find any positive effect for hospitalization.

Eyeglasses are not included in the list of health insurance benefits. We nevertheless estimated the effects of insurance on the probability to obtain glasses, because in principle, being insured could have an effect because a doctor, for instance, could advise the individual to get new glasses when performing another treatment. We find that insurance coverage has no significant effect on this.[34]

It is interesting to complement these results with statistics on reasons stated by individuals for why they did not visit a health care center for those individuals who had a health incident. Table 5 shows that the most important reasons were that individuals do not have money, consider the health incident not big enough, and lack time. Instead, they seem to resort to self-medication, which likely means that they buy some drugs at the pharmacy. This suggests that coverage by SIS may directly affect the 14 percent of the individuals who state that they do not have money to visit a health care center and possibly also the 43 percent who state that the health incident is not big enough. It may have less of an impact on the individuals who state that they lack time to seek medical attention, as SIS does not cover foregone

[33] We do not observe whether a woman is pregnant. Therefore, in principle, this includes the effect of insurance on becoming pregnant.

[34] One can also see this as a placebo test in addition to the tests we perform in Section 7 below.

Table 5: Stated Reasons for not Visiting a Health Care Center

| Stated reason | Percentage |
|---|---|
| Do not have money | 0.1401 |
| Live far | 0.0088 |
| Attention takes too much time | 0.0641 |
| Do not trust doctors | 0.0320 |
| Health incident not big enough | 0.4322 |
| Prefer using homemade medicines | 0.0327 |
| Do not have insurance | 0.0182 |
| Use self-medication | 0.1677 |
| Lack of time | 0.1954 |
| Abuse of health staff | 0.0113 |
| Other reasons | 0.0333 |

Notes: Out of the 4,161 individuals in our sample 2,418 report of a health incident. The question was asked to the 1,592 individuals who did not visit a health care center. Multiple answers were possible.

wages.

#### 6.2.2 Curative versus Preventive Use

In Section 2 we have argued that health insurance coverage may have positive effects on curative and preventive care and that it depends on the institutional details where effects will be stronger. We have argued that we expect the effects on preventive care to be relatively modest because the system does not provide any incentive to do so.

Ideally, in order to shed light on this, we would observe whether, for instance, a doctor was visited for preventive or curative reasons. However, out of the 12 health services in Table 4, five may either have a curative purpose or a preventive one: doctor visits, medicines, analysis, X-rays and other tests. A second group of three variables is more likely related to curative use: hospitalization, receiving surgery and birth delivery.

An important question of the survey is whether the individual experienced any symptom of an illness or a health problem during the last 4 weeks. We will also use this question as an outcome in Table 8.[35] We also construct an indicator from this information and interact it with the first five variables in Table 4.[36] This means that the outcome is the joint event of experiencing a health problem and going to the doctor. Proceeding in that way allows us to only consider doctor visits, for instance, for those individuals with health problems, which we then interpret as curative use. Panel A in Table 6 shows the results. Insured individuals are 56.4 percentage points more likely to receive medical attention than uninsured ones. Coverage also increases the probability of visiting a doctor with curative purposes by 55.5, the probability of obtaining medicines by 51.4 percentage points and the probability to conduct medical

[35] For those who reported any problem, there is a question on where they went for help. The variable “0’ Medical attention” in Table 6 is equal to 1 if the individual went to a health institution such as a MINSA hospital or a private doctor, and equal to 0 otherwise, for instance when the individual went to a drug store and basically did not receive any professional advice. The variable is also 0 if the individual did not report any health problem.

[36] To be precise, in the questionnaire, individuals are asked whether they saw a doctor, for instance. On top of that, they are asked whether they experienced health problems and then, if they answer with "yes", again whether they saw a doctor. In our data, the answer to the first, general question is always yes if the one for the more specific question is yes. This concerns outcomes 1 to 5 in Table 6.2.

Table 6: Effect of Health Insurance on Curative and Preventive Use

| | | Estimates | Ste. |
|---|---|---|---|
| A. Curative | | | |
| 0' | Medical attention | 0.5635*** | (0.1741) |
| 1' | Doctor visits | 0.5554*** | (0.1729) |
| 2' | Medicines | 0.5135*** | (0.1676) |
| 3' | Analysis | 0.1788** | (0.0863) |
| 4' | X-rays | 0.0926 | (0.0667) |
| 5' | Other tests | 0.0382 | (0.0319) |
| 13 | Hospital | 0.1484 | (0.0931) |
| 14 | Surgery | 0.2567*** | (0.0881) |
| 16 | Child birth | 0.1900 | (0.1593) |
| 1'-5',13,14,16 | Any of the above | 0.7402*** | (0.1981) |
| B. Preventive | | | |
| 9 | Vaccines | 0.2884** | (0.1317) |
| 10 | Kids check | 0.0678 | (0.2610) |
| 11 | Birth control | -0.1443 | (0.0934) |
| 15 | Pregnancy care | 0.6504** | (0.2931) |
| 6' | Planning 1/. | -0.0412 | (0.2447) |
| 7' | Iron 2/. | 0.6127 | (0.4954) |
| 8' | Preventive campaign 3/. | 0.0344 | (0.0696) |
| 6'-8', 9-11,15 | Any of the above | 0.2743* | (0.1626) |

Notes: Total: $N = 4,161$, kids check: $N = 649$, pregnancy care: $N = 1,182$, planning: $N = 1,181$, iron: $N = 343$. Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01. 1/. Family planning for women at fertile age. 2/. Reception of iron supplements for pregnant women and children less than three years old. 3/. Information on prevention of sickness.

analysis by 17.9 percentage points. When we group these variables together, then we find that insurance increases the probability of using at least one curative service by 74.0 percentage points.

A third group of four variables clearly has a preventive nature: reception of vaccines, growth controls of healthy children, reception of birth control methods and pregnancy care (variables 9-11 and 15 in Table 4). On top of that, the survey includes specific questions on preventive uses in the last 3 months. It is related to family planning for women at fertile age, reception of iron supplements for pregnant women and children under three years old, and information on prevention of sicknesses.

In line with our expectations, effects on preventive care are weaker. We do, however, find positive effects on pregnancy care and on receiving vaccines. We find that women of fertile age are 65.0 percentage points more likely to control their pregnancy relative to their uninsured peers.[37] Moreover, we find a 28.9 percentage point increase in the probability to be vaccinated.[38]

The picture that emerges is—in line with expectations formed by the conceptual framework in Section 2 and the institutional details in Section 3—that insurance coverage has a strong positive effect on the use of curative services and a less strong positive effect on the use of preventive care. It is particularly interesting to compare these results to the ones by Miller et al. (2013) for Colombia, where the system

[37] Parodi (2005) finds positive effects of SIS on pregnant women and especially those who live in urban areas. However, his evaluation does not control for selection into insurance.

[38] The last variable indicates whether there was any preventive use. Clearly, in theory, the effect on this probability has to be at least as big as the effect on vaccines, say, because an effect on vaccines implies an effect on any use. We did not impose this here and indeed find that the effect on any use is slightly smaller than the effect on receiving vaccines. However, the difference could also be due to estimation error.

Table 7: Effect of Health Insurance on Health Expenditures

| | | Estimates | Ste. |
|---|---|---|---|
| 1 | Any health expenditures | 0.2916 | (0.1955) |
| | | | |
| 2 | Health expenditures | 1018.8250** | (440.8071) |
| 3 | Absolute deviation expenditures | 809.5140** | (385.2883) |
| 4 | Absolute value residual expenditures | 608.7793* | (369.3996) |
| 5 | Sqre residual expenditures | 8.555e+06* | (4.77E+06) |
| 6 | Expenses 50 | 0.2862 | (0.1958) |
| 7 | Expenses 75 | 0.2716 | (0.1655) |
| | | | |
| 8 | Share expenditures | 0.1107 | (0.0799) |
| 9 | Absolute deviation share | 0.0702 | (0.0730) |
| 10 | Absolute value residual share | 0.0698 | (0.0730) |
| 11 | Sqre residual expenditures | 0.1422 | (0.2277) |
| 12 | Share 50 | 0.5308** | (0.2107) |
| 13 | Share 75 | 0.3474** | (0.1760) |
| | | | |
| 14 | Catastrophic 5% | 0.4059** | (0.1777) |
| 15 | Catastrophic 10% | 0.2907** | (0.1407) |
| 16 | Catastrophic 15% | 0.1750 | (0.1148) |
| 17 | Catastrophic 20% | 0.1448 | (0.0998) |
| 18 | Catastrophic 25% | 0.0485 | (0.0856) |

Notes: . Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

provides larger incentives for preventive care, as already discussed in Section 1. And indeed, Miller et al. obtain a positive effect on preventive use and no effect on curative use, we obtain effects mainly in curative use. Nevertheless, we do find some effects on preventive care, in particular on the probability to be vaccinated and to receive pregnancy care.

### 6.2.3 Expenditures

Given our previous finding of positive effects in usage mainly for curative purposes, it is interesting to ask what the effect of health insurance coverage is on out-of-pocket health expenditures. We have argued in Section 2 that it is unclear whether the effect is negative or positive. Obviously, it could be negative because coverage means that individuals do not have to pay for certain treatments anymore. But it could also be positive if medical attention convinces individuals to actually spend more on their health themselves.

The literature has used a number of measures of health expenditures. These either attempt to measure expected health expenditures, their variability—health risk—, or the likelihood to incur catastrophic health expenditures.

Table 7 presents the effect of SIS on a number of variables constructed from annual health expenditures at the individual level.[39] The first dependent variable is a dummy equal to one if the individual incurs in annual health expenditures. We find no significant effect.

[39] See also the variable descriptions in Table 14. We also experimented with more sophisticated variability measures and found similar results.

The second variable is the level of annual health care expenditures. The results suggests that insurance actually increases the mean annual spending by about 1,000 Soles, which corresponds to around 380 U.S. dollars,—in line with the idea that individuals are motivated to spend more on their health when using medical services more often. We also examine a possible effect on the variability of medical spending. Our variability measure in the third specification, similar to the one used by Miller et al. (2013), is the mean absolute deviation of health expenditures, calculated separately by insurance status. Specification 4 and 5 are based on residuals obtained from a regression of health expenditures on the value of the index, insurance status and the interaction of these two variables. The former uses the absolute value of the residual and the latter the square. Effects are only significant at the 10 percent level. We find no effects on the probability that health expenditures exceed the 50th or 75th percentile of the distribution of health expenditures in the entire population.

In order to control for a possible income difference between the control and treatment groups, we also analyze the effect of insurance on the share of annual health expenditures at the individual level on annual household income per capita. The results are presented in row 8 to 13 and correspond to those in row 2 to 7. Now we find a positive effect on the probability to incur high expenditures.

We also analyzed whether SIS changes the probability of an individual incurring catastrophic health expenditures. Health spending are defined as catastrophic if share expenditures exceeds a certain threshold. The cutoffs for this are manifold. On the one hand, we calculate the 50th and 75th percentile of the distribution of the share and find that SIS increases the probability that this share exceeds the 50th and 75th percentile by 53.1 and 34.7 percentage points respectively. On the other hand, following Wagstaff and Lindelow (2008), we use the thresholds 5, 10, 15, 20 and 25 percent. We find that health insurance coverage increases the probability that individual health expenditures exceed 5 and 10 percent of the per capita household income by 40.6 and 29.1 respectively. We do not find significant effects for higher cutoffs. These results are similar to those obtained by Wagstaff and Lindelow (2008) for China, who found that insurance increases the risk of incurring high and catastrophic spending.

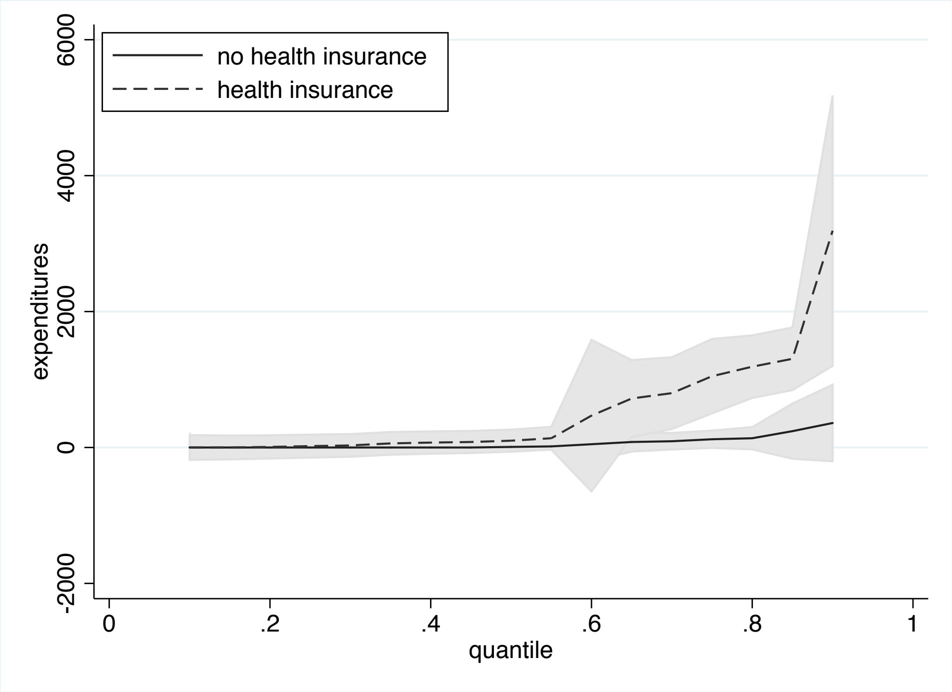
Overall, it is remarkable that we never find a negative effect on either expected health expenditures or measures of variability or risk of high expenditures. Miller et al. (2013), in contrast, find for Colombia that insurance lowers both mean inpatient medical spending and its variability.

In addition, we quantify the effects of health insurance coverage on the entire health expenditure distribution. We follow Frandsen et al. (2012) for this. Figure 4 shows the estimates of the quantiles of the distribution of health expenditures with and without health insurance coverage, as well as the confidence intervals. Overall, we find that insurance has positive effect only on the higher end of the distribution. This could be due to the fact that insured individuals usually receive free medical care from SIS and uninsured individuals are not aware of their health status or who might give up on care because of its price. In that sense, it is surprising that we do not see health expenditures to be higher for uninsured individuals. This finding, however, is in line with our finding of stark differences in health care utilization—uncovered individuals may simply not receive much attention or treatment of any kind.

Coming back to the finding that insurance coverage has a positive effect on the higher end of the distribution, one explanation could be that individuals pay for part of the medical services because SIS includes maximum levels of coverage or, as we have previously discussed in Section 3.2, because some MINSA hospitals have charged for some services that are formally covered by the insurance.

In order to explore further why the effect of SIS on health spending is positive only for individuals

Figure 4: Health Expenditures by Quantile




Notes: The figure shows the percentiles of the distribution of expenditures with and without health insurance, along with 95 percent confidence intervals. See Frandsen et al. (2012) for details on the implementation.

with high health expenditures, we select individuals whose welfare index is close to the threshold, the 20 percent closest to the left and the 20 percent closest to the right. We then divide individuals into four groups, those who are eligible and those who are not and at the same time into those with low health expenditures, defined as those below 50 percent, and those with high health expenditures, defined as those above 80 percent. The idea is that by comparing eligible to ineligible individuals with high expenditures, for instance, we can get an indication for which expenditures actually increased for the high-spenders.

In Table 22 in Appendix D we report statistics for those four subgroups.[40] First, consistently with our general results, in almost all cases the utilization of medical services is larger for eligible individuals, as compared to ineligible individuals. Second, we see that the differences between eligible and non-eligible individuals are larger for individuals with high expenditures as compared to those with low expenditures in the case of doctor visits, analysis, X-rays and surgery. This finding is consistent with the idea that individuals reach maximum levels of coverage and pay themselves for getting complex treatments, as already discussed in Section 2. Additionally, as explained in Section 3 above, some MINSA hospitals may have charged for services that are usually covered by SIS.

Such rises in health care expenditures are usually seen in a critical way. However, one may also argue that it is an open question whether this is justified here. On the one hand, the increase in expenditures can be seen as an additional burden to the individuals, possibly also increasing the volatility of expenditures. On the other hand, it could also indicate increased accessibility to health care, in response to them getting the idea of using medical services in response to being insured. Finally, as some treatments are at least partly covered by SIS, one may argue that the overall price of a treatment is lower when they insured by

[40] Birth control is excluded from the analysis because it contains only a few observations.

Table 8: Effect of Health Insurance on Health

| | | Estimates | Ste. |
|---|---|---|---|
| 1 | Symptom | 0.2655 | (0.1942) |
| 2 | Illness | 0.3158** | (0.1465) |
| 3 | Chronic illness | 0.0754 | (0.1736) |
| 4 | Relapse | 0.0601 | (0.1113) |
| 5 | Accident | 0.0714 | (0.0591) |
| 6 | Num. days with symptom | 0.4004 | (0.4898) |
| 7 | Num. days with illness | 0.6078* | (0.3607) |
| 8 | Num. days with relapse | 0.8262 | (0.9162) |
| 9 | Num. days with accident | 0.5295 | (0.4494) |

Notes: $N = 4,161$. Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.01.

SIS. In that case, the law of demand would also predict an increase in usage.

#### 6.2.4 Effects on Health

We have argued in Section 2 that it is unclear how the effect of health insurance on health measures that are reported by the individuals themselves can be interpreted. The reason for this is that individuals who are covered and who see a doctor more often are more aware of their health problems. Therefore, even if the effect on objective health measures is positive, it could be that the effect on subjective health measures is negative of not significantly different from zero.

Table 8 nevertheless reports our estimates of the effects of insurance coverage on health reports. We do find positive effects on reports of illnesses and a less strong effect on the number of days individuals could not perform normal activities due to an illness. These results are well in line with the literature (see for instance Acharya et al., 2013).

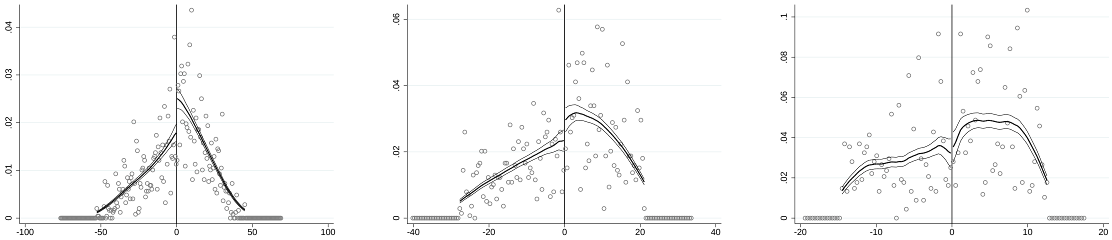
## 7 Sensitivity Analysis

In this section, after having presented the main results, we assess whether the results are sensitive to the particular specifications we have and whether the assumptions we have made can be supported by additional empirical evidence. We start by examining whether individuals have manipulated the IFH index in order to become eligible for public insurance. Then, we assess whether there were discontinuities at other values of the welfare index. Third, we conduct more local analysis by selecting subsamples of observations that are closer to the threshold. After that, we conduct a non-parametric analysis. And finally, we assess whether other programs could challenge the validity of our results.

### 7.1 Manipulation Tests

A common threat to studies based on a RDD is the incentive to manipulate the running variable. In our case, this means that an important number of households has access to how the IFH is calculated and, as far as they are interested in being eligible, they may try to manipulate their answers to qualify for SIS. We believe this is not the case for two reasons. First, households do not know the complex algorithm behind IFH calculation. Second, the set of variables included in the IFH construction are verifiable by

Figure 5: McCrary Test



(a) Full Sample (b) Sample 75 (c) Sample 50

Notes: The figures show estimates of the density of the IFH index around the threshold. The left figure is for the full sample. The figure in the middle is for the sample in which we keep the 75 percent of the observations that are closest to the threshold in terms of the IFH index, separately to the right and to the left. In the right figure we do the same for the 50 percent closest observations to the left and to the right. Full sample: bin size of 0.59 and bandwidth of 23; sample 75: bin size of 0.44 and bandwidth of 12 and sample 50: bin size of 0.32 and bandwidth of 4.8.

questionnaire takers and difficult to manipulate. In this context, the manipulation of the running variable would be at most partial, which typically does not lead to identification problems. However, this section analyzes this potential thread.

We use the McCrary (2008) test for this. If manipulation is possible, the running variable will be discontinuous at the cutoff. In our context, the density function would show many individuals barely qualifying for SIS, that is, to the left of the cutoff, and surprisingly few failing to qualify, that is, to the right of the cutoff. The formal procedure is twofold: firstly a finely gridded histogram is obtained and then this histogram is smoothed with a local linear regression for each side of the cutoff.

Figure 5 presents the results. The three panels show the results of the McCrary test for the full sample, for a sample of the 75 and 50 percent individuals with an IFH index closest to the threshold, separately on each side. Formally, the test for the full sample rejects smoothness of the density around the threshold. However, the result is not robust to choosing smaller subsamples and in any case would hint at manipulation towards becoming ineligible, as the density is higher above the threshold.[41]

## 7.2 Jumps at Non-Discontinuity Points

If having public insurance (which we instrument it by using eligibility into SIS program) is associated with positive effects on health outcome indicators, we should not find effects by using other "thresholds". Since the threshold to determine eligibility is 55, we should find zero effects in settings where it is known that there are non-discontinuity points. Following Imbens and Lemieux (2008) we do this by conducting a parallel RDD analysis at the medians of the subsample distribution at either side of the official threshold. For example, the subsample at the left of the threshold would be comprised by those with $z_i(IFHindex) < 55$ and we test for a jump at the median. By only using data on the left of the official threshold, we avoid conducting the regressions at a point where it is known to have a discontinuity. We proceed similarly for the subsample at the right of the threshold. Splitting each subsample at its median increases the power to find discontinuities.

Results are presented in Table 23 and 24 in the Appendix. In general, we observe no significant

[41] It could be that, for budgetary reasons, the government set the threshold in a way such that a bulk of individuals is just not eligible for SIS. We are, however, not able to test this hypothesis. Importantly, it would not threaten our identification strategy as long as the variation in the index around the threshold is still random.

effects on health outcome variables when we run the regressions at the medians of the subsamples. The only exception is, however, the participation variable (health insurance) in the subsample at the right of the official threshold; there is a significant jump when we use the IV-2SLS regressions on the 75 percent observations closer to the median. However, this disappears when we use local linear regressions.

### 7.3 More Local Analysis

It can be argued that the linearity assumption is strong and therefore the analysis should be conducted on the population with IFH index values closer to the threshold. To see whether results are sensitive to that, we reduce the sample to the 75 and 50 percent of the population with IFH index values closest to the threshold, separately for each side.

Tables 25, 26 and 27 show the results for these reduced samples. Some of the coefficient estimates increase in magnitude while the precision of the estimates decreases. For instance, for the 75 percent sample, we find that the effects on the likelihood to visit a doctor, receiving medicines, conducting analysis and having access to surgery increase from 51.5, 52.7, 20.6 and 25.7 reported in Table 4 to 76.1, 88.3, 36.3 and 44.1 percentage points, respectively. At the same time, due to the decreased number of observations, the precision of the estimates decreases, as expected. The estimates of the effects of insurance on receiving vaccines and pregnancy care are therefore no longer significantly different from zero.

### 7.4 Controlling for Covariates

It is standard practice to test whether the expectation of covariates such as age or gender is a continuous function in the welfare index around the eligibility threshold. When it it is found not to be, then one may be concerned that the assumptions underlying our analysis do not hold. This could be because there is selection on observables, which makes it more or less likely that data are observed for a given individual. While this could be addressed by controlling for covariates, one may then be concerned that there is also selection on unobservables, which could not easily be addressed. Likewise, one may then be concerned that there are other discontinuities at the same threshold and therefore the estimated effect cannot be attributed to SIS only.

We first conduct a graphical analysis and then a formal one in which we replace the dependent health variables by the observed covariates age, gender, whether the woman is the head of the household, the number of household members, years of education and household expenditures. In Section 6.2, we use the first five covariates as controls in order to be able to obtain more precise estimates.

Figure 6 and Table 9 summarize the results. The latter reports instrumental variables estimates of the effect of insurance on the covariates. We do not find evidence for a discontinuity in the expectation of the covariates except for one, which is the variable number of household members. Figure 6 shows that the expected number of households changes by about 0.5, or 10 percent, which (roughly) gives the estimated effect in Table 9 if we divide it by the change in the probability of about 0.14 reported in the first column of Table 25. This means that the effect is significantly different from zero and of substantial size.

If selection on observables is present, then we should control for it in the main analysis. However, we also conducted the main analysis without controlling for covariates, hence also not for the number of household members. Tables 25, 26 and 27 show that the main conclusions we have drawn remain the

Figure 6: Graphical analysis of covariates

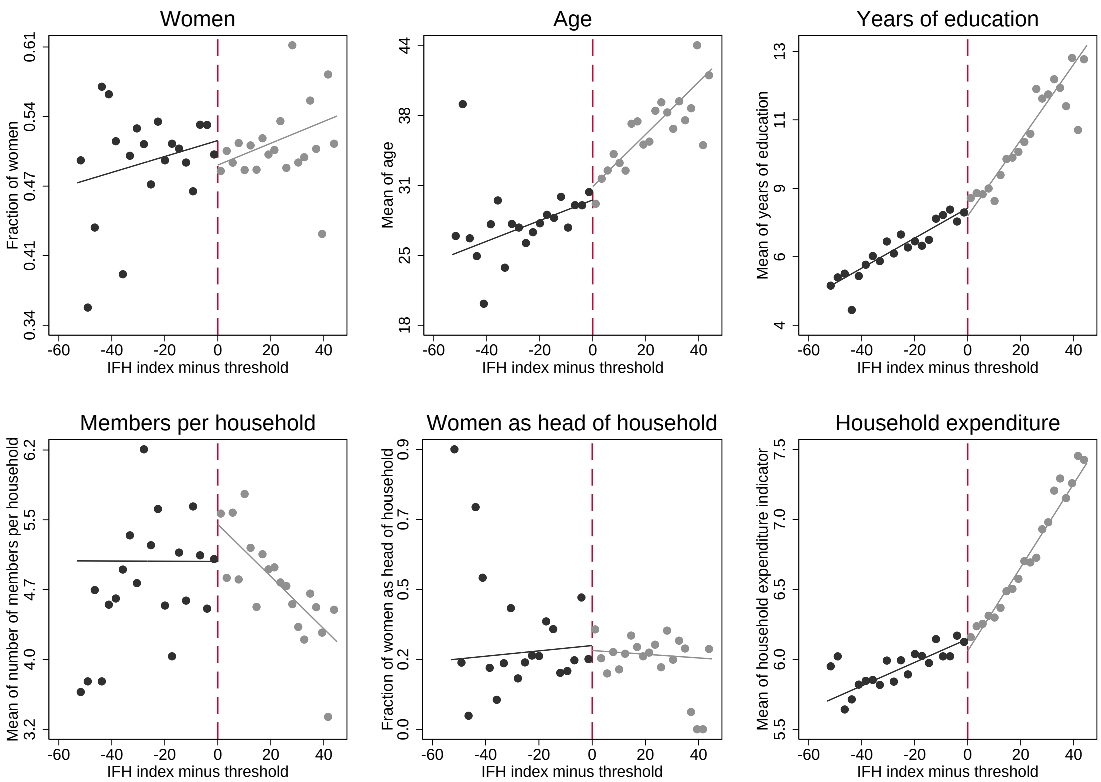



Table 9: Effect of Insurance Coverage on Covariates

| IV-2SLS | (1) Full sample | | (2) Sample 75% | | (3) Sample 50% | |
|---|---|---|---|---|---|---|
| | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| Woman | -0.0438 | (0.1956) | -0.2057 | (0.3028) | 0.0769 | (0.4240) |
| Age | -7.3244 | (8.4632) | 6.9167 | (12.6805) | -0.5141 | (17.9161) |
| Years of education | 2.1508 | (1.8593) | 0.1840 | (2.7045) | -6.5433 | (4.5075) |
| Number household members | -3.5275*** | (1.0520) | -5.5418*** | (1.9892) | -3.8927 | (2.3943) |
| Women as head of household | -0.0149 | (0.1692) | 0.3951 | (0.2793) | 0.6886 | (0.4523) |
| Household's expenditure 1/. | 0.2645 | (0.1736) | 0.0281 | (0.2403) | -0.5288 | (0.4069) |

Notes: $N = 4,161$. Standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.00.

same. It is comforting to see that while we find a discontinuity in the number of household members, our results do not seem to be sensitive to whether or not we control for it in our analysis.[42]

### 7.5 Non-Parametric Analysis

To address the concern that linearity is too strong of an assumption we conduct a non-parametric analysis. For this, we use local linear and local quadratic regressions to predict the expected outcome and the probability to be covered by insurance using only data to the left or to the right of the discontinuity, respectively. We then calculate the difference between the prediction for the outcome from the right and from the left and divide it by the difference in the probability to be covered by SIS. This leads an estimate of the local average treatment effect that can be compared to the ones reported above.[43]

Table 10 shows the results. Generally speaking, estimates are less precise, but point estimates are similar. This suggests that the linear specification we use is appropriate.

### 7.6 Juntos and Food Aid Program

Our identification strategy is based on the assumption that discontinuities at the eligibility threshold can be attributed to SIS. There are some programs whose presence could in principle challenge this assumption.

One of them is Juntos, a conditional cash transfer program. It combines a geographic targeting of the poorest districts with individual targeting, based on the IFH index and the presence of children up to the age of 14. However, Juntos is a rural program and our study focuses on the Lima Province, and our data confirm that no individual in the sample belongs to Juntos.

Besides, there is a number of food aid programs oriented to the poor. To be precise, they are oriented to different groups of the population, such as mothers, children and school students. Our data show that 29 percent of the individuals of our sample receive at least support from one of them.[44] Importantly, since these programs do not use SISFOH's targeting rules and in particular not the IFH index, it is unlikely that a discontinuity at the eligibility threshold can be attributed to them. Our finding in Section 7.4 that household expenditures do not exhibit a discontinuity at the insurance threshold provides additional support for this interpretation.

[42] One may nevertheless wonder why we find such an effect. We could also think of the number of household members as an outcome that is negatively affected by having insurance because insurance has a positive effect on using birth control products, which leads to reduced fertility. We, however, do not find such effects that could explain the reduction of birth control methods, also not in the specifications that do not control for covariates. Taken together with the finding that results do not depend on whether or not we control for covariates including the number of household members, leads us to conclude that the number of household members does not play an important role here and that the effects we find are likely effects of insurance coverage on reporting behavior. It is possible that after being covered by insurance, respondents to the survey use a more strict definition of the household that includes only those members that are covered by health insurance.

[43] It is in principle possible to also control for covariates. This, however, would involve estimating partially linear models where we impose that they enter linearly. We do not do so here because this goes along with a large increase in the computational burden when we bootstrap the standard errors. Therefore, the results are closest to the ones in Tables 25, 26 and 27. Arguably, since these have in turn be close to the main results where we control for covariates and since we have found that only one covariate exhibits a moderate jump at the discontinuity, this seems a reasonable way to proceed given that this is meant to be a robustness check.

[44] The percentage of individuals that receive food aid is 29 percent among those not covered by SIS and 51 percent among those who are covered. There is no information on the reception of food aid for 874 individuals, or 20 percent of our sample.

Table 10: Local Linear Regressions

| Variable | Estimated | Degree 1 | | | | Degree 2 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | bw 10 | bw 20 | bw 50 | bw 100 | bw 10 | bw 20 | bw 50 | bw 100 |
| Health Insurance | Coefficient | 0.0831** | 0.1282*** | 0.1373*** | 0.1382*** | 0.1171** | 0.0986** | 0.1033*** | 0.1032*** |
| | Bootstrap Std. Err. | (0.0368) | (0.0280) | (0.0247) | (0.0248) | (0.0492) | (0.0400) | (0.0287) | (0.0327) |
| Doctor visits | Coefficient | 0.7595 | 0.5358 | 0.5007*** | 0.4983** | 0.4633 | 0.8347 | 0.7054 | 0.6970 |
| | Bootstrap Std. Err. | (0.5882) | (0.3286) | (0.1938) | (0.2163) | (86.7429) | (0.7480) | (8.4927) | (0.4620) |
| Medicines | Coefficient | 1.0387 | 0.6290*** | 0.5168** | 0.5074** | 0.5701 | 1.0279 | 0.9759 | 0.9744* |
| | Bootstrap Std. Err. | (2.1575) | (0.2328) | (0.2605) | (0.2141) | (0.6690) | (1.1001) | (0.7157) | (0.5811) |
| Analysis | Coefficient | 0.3332 | 0.2225** | 0.2088** | 0.2069** | -0.0970 | 0.3367 | 0.3416 | 0.3429 |
| | Bootstrap Std. Err. | (0.2437) | (0.1130) | (0.1010) | (0.0900) | (0.2369) | (1.2037) | (0.2940) | (3.4432) |
| Surgery | Coefficient | 0.5280 | 0.3180*** | 0.2694** | 0.2650*** | 0.3862 | 0.4717 | 0.4726 | 0.4745* |
| | Bootstrap Std. Err. | (1.4463) | (0.1063) | (0.1068) | (0.0980) | (1.3371) | (2.8475) | (0.8522) | (0.2608) |
| Vaccines | Coefficient | 0.5348 | 0.3151* | 0.2890** | 0.2882** | 0.5700 | 0.4987 | 0.3622 | 0.3534 |
| | Bootstrap Std. Err. | (3.7619) | (0.1642) | (0.1319) | (0.1331) | (1.1554) | (2.2913) | (0.3966) | (1.3567) |
| Pregnancy care | Coefficient | 0.7876 | 0.6095 | 0.6033 | 0.6030 | 0.0445 | 0.5770 | 0.5082 | 0.5066 |
| | Bootstrap Std. Err. | (5.4355) | (1.6750) | (0.5286) | (0.5409) | (1.8262) | (3.0906) | (35.4400) | (6.5831) |
| Illness | Coefficient | 0.4034 | 0.3207 | 0.3139** | 0.3140* | 0.5729 | 0.4906 | 0.3933 | 0.3852 |
| | Bootstrap Std. Err. | (0.6860) | (0.2060) | (0.1374) | (0.1806) | (1.0985) | (0.6135) | (1.7819) | (0.4200) |

Note: Bootstrap standard errors in parentheses. * p<0.10 ** p<0.05 *** p<0.00.

## 8 Conclusions

Until recently, large parts of the population in developing countries did not have access to public health insurance. While it is commonly believed that the effects of health insurance coverage are positive, we still lack empirical evidence on its impact on health care utilization, health expenditures, and health outcomes. Besides, it is not yet understood enough through which channels health insurance coverage ultimately leads to better health outcomes and to what extent it is possible to encourage individuals to invest into preventive care.

In this paper, we use rich survey data from Peru to study the effects of the large-scale social health insurance program called "Seguro Integral de Salud" (SIS). The SIS program is targeted to poor individuals working in the informal labor market. Coverage has increased since 2006 and by now about 40 percent of the population are covered by SIS. We make use of the institutional details that give rise to a regression discontinuity design. We estimate the effect of insurance coverage on a wealth of measures for health care utilization, health expenditures and health.

We find strong effects of insurance coverage on measures of health care utilization, such as visiting a doctor, receiving medication and medical analysis. We also find effects on preventive care, but they are much less pronounced. We find positive effects on health care expenditures, most likely at the high end of the distribution, and no clear effects on self-reported health measures.

Our interpretation of these results is that the Peruvian health insurance program was able to encourage poor individuals to seek medical attention. They receive treatments when they need them, but are less inclined to invest in preventive care, with the exception of vaccination and pregnancy care. This is not surprising, as the system does not provide any incentives to actually do so.

The effect of insurance coverage on health care expenditures is small for most individuals. However, in light of the remaining findings this is not indicating that the program has no effects. To the contrary, individuals who are covered and can relatively easily be treated receive treatment at no or very low cost to them, while individuals who are not covered are simply not treated and therefore have low expenditures. Taken together with our finding that there is a positive effect on the health care expenditures at the higher end of the distribution, our results suggest that once individuals get in touch with the health care system, they are even willing to pay themselves for the services when they are important.

Overall, the evidence suggests that when compared to health care systems in other developing countries, the Peruvian one is a notable exception. It seems to reach its goal to provide access to medical care to a sizable fraction of the poor. As of now, there is no evidence on the effects it will have on health, but it is imaginable that increased access will ultimately lead to better health outcomes. We discuss in the paper why it remains a challenge for the future to measure those, but the institutional features make this a more promising endeavor than it is in many other countries.

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# A Details on the Health Insurance Plan

Table 11: Basic Plan of Health Insurance - PEAS

| Variables 1/. | | | | Type | Treatment | SIS's tariff covers: | Maximum Coverage |
|---|---|---|---|---|---|---|---|
| | | | | PREVENTIVE SERVICES | | | |
| MA | | A | M | KC 1 | CRED check on Children | Materials, supplies. | 1 month 2 checks<br>1 year 11 checks<br>2 years 6 checks<br>4 years 8 checks |
| MA | | A | I | KC 2 | Check on newborn weighted less than 2,500 gr. | Consultations, dosage of hemoglobin, iron supplementation. | 15 days 5 checks<br>3 months 4 checks<br>1 year 9 checks |
| | | | M | I 3 | Micronutrient supplementation | Provision of Vitamin A, Iron supplement. Consultation, Printed educational material. | 1 year 3 checks<br>2 years 4 checks |
| | OT | A | | PC 4 | Pregnancy diagnosis | Laboratory procedure. | No limit |
| MA | | | M | PC 5 | Prenatal Care | Materials, supplies. | 10 checks |
| | OT | A | | PC 6 | Complete laboratory tests of pregnant women | Full set of laboratory tests. | No limit |
| | OT | A | | PC 7 | Treatment for pregnant women w/ HIV | ELISA test for HIV during pregnancy, childbirth and postpartum. Prophylactic treatment to HIV positive pregnant women. | No limit |
| | X | | M | PC 8 | Obstetric ultrasound examinations | Materials, supplies. | No limit |
| MA | | A | M | D 9 | Oral health | Supplies. | 2 checks/year |
| MA | | | M | D 10 | Prevention of tooth decay | Materials, supplies. | Dental prophylaxis 2 checks<br>Topical flour coating 4 checks<br>Destartraje 1 check<br>Topical flour gel 2 checks<br>Sealants application 1 checks<br>Restoration practice 4 pieces<br>Ionomer inactivation 4 pieces |
| DV | | BC | M | P 11 | Family planning | Guidance and counseling session. Delivery of contraceptives. | Not decided 4 checks<br>Decided checks |
| DV | | | | O 12 | Visual acuity impairment detection | Full benefit. Excludes provision of lenses. Children and Adolescents. | 1 check/year |
| MA | | | M | 13 | Normal postpartum care | Checks. Includes supplies used in care. | 2 checks |
| MA | | | M | 14 | Prophylactic treatment kids HIV | Provision of artificial milk for 6 months. Monitoring. | No limit |

Notes: 1/. Variables observed in the ENAHO. Doctor Visits (DV); Medical Attention (MA); Medicines (M); Analysis (A); Kids Check (KC); Iron (I); Planning (P); Other tests (OT); Surgery (S); Pregnancy Care (PC); Birth Control (BC); Child Birth (CB); Dental (D); Ophthalmology (O); Hospital (H). See R.M. N° 240-2009/MINSA for more details.

Table 12: Basic Plan of Health Insurance - PEAS (continued)

| Variables 1/. | | | | | Type | Treatment | SIS's tariff covers: | Maximum Coverage |
|---|---|---|---|---|---|---|---|---|
| | | | | | RECUPERATIVE AND REHABILITATION SERVICES | | | |
| MA | | A | M | | 15 | Immediate attention to the normal newborn | Supplies, drugs, lab tests. | No limit |
| MA | OT | | M | H | 16 | Newborn's inpatient care without surgical procedure | Drugs, auxiliary tests, inputs during stay in the health facility. | No limit |
| MA | OT | | M | H | 17 | Newborn's inpatient care with surgical procedure | Drugs, auxiliary tests, inputs during stay in the health facility. | No limit |
| MA | | | M | CB | 18 | Vaginal birth care | Drugs, materials, supplies. | No limit |
| MA | | | M | CB | 19 | Caesarean section | Drugs, auxiliary tests, supplies, materials. | No limit |
| DV | | | M | | 20 | Specialized medical consultation | Drugs, supplies, diagnostic support. | No limit |
| DV | | | M | D | 21 | Ambulatory care: doctor | Drugs, supplies, diagnostic support in health facilities. | No limit |
| MA | | | M | D | 22 | Dental restoration | Materials, portion for replacement equipment and instrumentation. | 3 dental restorations/year |
| MA | | | M | D | 23 | Dental extraction | Materials, portion for replacement equipment and instrumentation. | 3 extractions/year |
| MA | | | M | | 24 | Ambulatory care | Materials, supplies. In health facilities: Level I & II 2/. | No limit |
| MA | | | M | | 25 | Emergency care | Drugs, auxiliary tests, materials, supplies. | No limit |
| | | A | M | | 26 | Diagnostic support | Diagnostic support. No diagnostic capabilities include support not tariffed. | No limit |
| MA | | | M | S | 27 | Medical outpatient surgery | Drugs, auxiliary tests, materials, supplies during surgery and patient's stay in the facility. | No limit |
| MA | | | M | | 28 | Inpatient in health facility without surgery | Drugs, materials, supplies during surgery and patient's stay in the facility. | No limit |
| | OT | | M | S | 29 | Inpatient with surgery | Auxiliary tests, drugs during surgical procedure, expenditures incurred during patience stay until discharge. | No limit |
| | | | M | H | 30 | Admission in ICU | Materials, supplies, drugs. Only in facilities where service can be verified. | No limit |
| MA | | | | D | 31 | Specialized dental care | Procedures pulpectomy, pulpotomy access opening, direct and indirect pulp capping, fixation or splinting of the tooth with composite, Gingivectomy localized extraction of retained piece, enucleation or marsupialization. | 3 checks/year |
| | | | | | 32 | Rehabilitation care | Rehabilitation of fracture or sprain in Level I care. Level II care only for enrolled population. | No limit |
| | | | | | ADMINISTRATIVE Ste.RVICES | | | |
| | | | | | 33 | Emergency Transfer | Displacement road or air according to recognized medical indication. Unrecognized exam for the diagnosis in outpatients. | No limit |
| | | | | | 34 | Food Allocation | Recognized until a day after discharge. | No limit |
| | | | | | 35 | Burial | Niche services, casket, shroud, funeral chapel and transfer of the deceased to the cemetery. | "Directiva de Sepelios" |

Notes: 1/. Variables observed in the ENAHO. 2/. Level I: Health facility & health center. Level II: Doctor Visits (DV); Medical Attention (MA); Medicines (M); Analysis (A); Kids Check (KC); Iron (I); Planning (P); Other tests (OT); Surgery (S); Pregnancy Care (PC); Birth Control (BC); Child Birth (CB); Dental (D); Ophthalmology (O); Hospital (H). See R.M. N° 240-2009/MINSA for more details.

# B Variable Definitions

Table 13: Variable Definitions

| Variable | Definition |
|---|---|
| Participation | |
| Health Insurance | Are you enrolled in SIS or EsSalud? |
| Demographics | |
| Woman | |
| Age | |
| Years of education | |
| Number household members | |
| Woman head of household | |
| Annual household income (thousand Soles) | |
| Utilization | |
| Any doctor visits | Have you visited the doctor in the last 4 weeks? |
| Medicines | Have you received medicines in the last 4 weeks? |
| Analysis | Have you had analysis in the last 4 weeks? |
| X-rays | Have you had X-rays in the last 4 weeks? |
| Other tests | Have you had other tests in the last 4 weeks? |
| Dental care | Have you had dental care in the last 3 months? |
| Ophthalmological care | Have you had ophthalmology care in the last 3 months? |
| Glasses | Have you bought glasses in the last 3 months? |
| Vaccines | Have you received vaccines in the last 3 months? |
| Kids check | Has your child's health been checked in the last 3 months? |
| Birth control | Have you received birth control products in the last 3 months? |
| Other treatments | Have you received other care in the last 3 months? (i.e. orthopedic services) |
| Hospital | Have you been hospitalized in the last 12 months? |
| Intervention/Surgery | Have you had a surgery in the last 12 months? |
| Pregnancy care | Have you received pregnancy care in the last 12 months? |
| Child birth | Have you had child birth care in the last 12 months? |
| Other medical attention | Have you had medical attention in the last 4 weeks? |

Notes: Table 2 in the main text reports summary statistics.

Table 14: Variable Definitions (continued)

| Variables | Definition |
|---|---|
| Health report | |
| Any symptom | Have you had a symptom or health problem in the last 4 weeks? |
| Illness | Have you been ill in the last 4 weeks? |
| Chronic illness | Do you have a chronic illness or health problem? |
| Relapse | Have you had a relapse in your chronic illness in the last 4 weeks? |
| Accident | Have you had an accident in the last 4 weeks? |
| Num. days with symptom | Number of days you could not perform normal activities because of a relapse |
| Num. days with illness | Number of days you could not perform normal activities because of a symptom |
| Num. days with relapse | Number of days you could not perform normal activities because of an illness |
| Num. days with accident | Number of days you could not perform normal activities because of an accident |
| Health expenditures | |
| Any health expenditures | Any annual health expenditures |
| Health expenditures | Annual health expenditures |
| Absolute deviation expenditures | Variability of annual health expenditures |
| Absolute value residual share | Absolute value of residual from regressions for annual health expenditures |
| Sqre residual expenditures | Square of residual from regressions for annual health expenditures |
| Expenditures 50 | Annual health expenditures exceed 50th percentile (median) |
| Expenditures 75 | Annual health expenditures exceed 75th percentile (third quartile) |
| Share expenditures | Share annual health expenditures of annual household per capita income |
| Absolute deviation share | Variability of Share annual health expenditures of annual household per capita income |
| Abs share | Absolute value of residuals from regression for Share annual health expenditures of annual household per capita income |
| Sqre share | Square of residuals from regression for share of annual health expenditures on annual household per capita income |
| Share 50 | Share annual health expenditures of annual household per capita income exceed 50th percentile (median) |
| Share 75 | Share annual health expenditures of annual household per capita income exceed 75th percentile (third quartile) |
| Catastrophic 5% | Share annual health expenditures of annual household per capita income exceed 5% |
| Catastrophic 10% | Share annual health expenditures of annual household per capita income exceed 10% |
| Catastrophic 15% | Share annual health expenditures of annual household per capita income exceed 15% |
| Catastrophic 20% | Share annual health expenditures of annual household per capita income exceed 20% |
| Catastrophic 25% | Share annual health expenditures of annual household per capita income exceed 25% |

Notes: See also Section 6.2.3 for further explanations. Table 3 in the main text reports summary statistics.

# C IFH Index

## C.1 Variables and Weights for IFH Construction

The IFH index is constructed such that it takes on values between 0 and 100. Higher values indicate better living conditions. In the following, we explain how the index is calculated. SISFOH (2010) provides more details.

First, the ENAHO for the year 2009 was used to determine the set of variables that enters into the IFH computation. The Sommers test was used to identify correlation between candidate explanatory variables and a measure of poverty. Then, significant variables were selected and a Principal Component analysis for discrete variables was applied to reduce dimensions and to focus on those variables that mainly explain the variability of the data. The weights that are used to construct the index correspond to the contribution of the respective variables to the first principal component. This was done separately for three geographic areas, the Lima Province, the other urban areas, and all rural areas.

Table 15 and 16 show the variables, the mutually exclusive alternatives and the corresponding weights. There are three independent sets of weight that correspond to households living in different geographic areas. For instance, consider a household from Lima that cooks with carbon, uses water from outside the house and lives in a house with brick walls. Then, the first three addends of the IFX index are -0.33, -0.35 and 0.10.[45]

Using those weights a raw index $ifh_{ij}$ is calculated as a linear combination of household characteristics with cluster-specific weights. Then, it is standardized so that it lies between 0 and 100 in each cluster. The standardized index is

$$ifh'_{ij} = 100 * \frac{ifh_{ij} - ifh_j^{min}}{ifh_j^{max} - ifh_j^{min}},$$

where $ifh'_{ij}$ is the adjusted IFH that lies in the interval $[0,100]$ and $ifh_j^{min}$ and $ifh_j^{max}$ are the minimum and the maximum values of the original IFH index in cluster $j$, respectively.

## C.2 Thresholds for IFH by Cluster

To determine eligibility, there are thresholds for the IFH index by cluster. Individuals and households with an index below or equal to the threshold are eligible for SIS. Table 17 shows the thresholds by cluster. The 15 clusters were defined by identifying areas with similar monetary poverty in the year 2009. In general, each cluster includes several unconnected geographic areas.[46] As an example, consider cluster 2, which includes the rural areas of the jungle of the departments of Ayacucho, Junin, Loreto, Puno, San Martin and Ucayali; and also the rural areas of the northern highlands of the departments of Cajamarca and Lambayeque. The thresholds were determined such that poor individuals, in some sense that is not spelled out, were eligible. They are conservative in the sense that they allow for type 2 errors in the sense that an individual might be declared as eligible even though, according to the criteria that

[45]Importantly, the number of members of the household with health insurance does not include those with either SIS or EsSalud. This is important because otherwise, our third assumption in Section 5, the exclusion restriction, would likely be violated.

[46]Only clusters 1, 14 and 15 include connected geographic areas.

Table 15: Variables and weights for IFH construction

| Variables | Metropolitan Lima | remaining urban areas | rural areas |
|---|---|---|---|
| *Fuel used to cook* | | | |
| Do not cook | -0.49 | -0.67 | -0.76 |
| Other | -0.40 | -0.50 | -0.38 |
| Firewood | -0.37 | -0.33 | 0.05 |
| Carbon | -0.33 | -0.22 | 0.36 |
| Kerosine | -0.29 | -0.19 | 0.37 |
| Gas | 0.02 | 0.12 | 0.52 |
| Electricity | 0.43 | 0.69 | 0.52 |
| *Water supply in the home* | | | |
| Other | -0.78 | -0.58 | |
| River | -0.65 | -0.42 | |
| Well | -0.62 | -0.37 | |
| Water tanker | -0.51 | -0.34 | |
| Pipe | -0.41 | -0.32 | |
| Outside | -0.35 | -0.25 | |
| Inside | 0.10 | 0.12 | |
| *Wall material* | | | |
| Other | -0.70 | -0.80 | |
| Wood or mat | -0.48 | -0.55 | |
| Stone with mud | -0.44 | -0.46 | |
| Rushes covered with mud | -0.41 | -0.43 | |
| Clay | -0.39 | -0.38 | |
| Sun-dried brick or adobe | -0.37 | -0.20 | |
| Stones, lime or concrete | -0.33 | -0.07 | |
| Brick | 0.10 | 0.25 | |
| *Type of drainage* | | | |
| None | -0.89 | -0.68 | |
| River | -0.75 | -0.49 | |
| Sinkhole | -0.59 | -0.40 | |
| Septic tank | -0.46 | -0.30 | |
| Drainage system outside the house | -0.39 | -0.21 | |
| Drainage system inside the house | 0.10 | 0.20 | |
| *Number of members with health insurance* | | | |
| None | -0.26 | -0.25 | -0.10 |
| One | -0.04 | 0.06 | 0.50 |
| Two | 0.06 | 0.17 | 0.59 |
| Three | 0.14 | 0.27 | 0.66 |
| More than three | 0.32 | 0.48 | 0.86 |
| *Goods that identify household wealth* | | | |
| None | -0.47 | -0.35 | -0.11 |
| One | -0.17 | 0.05 | 0.64 |
| Two | 0.02 | 0.25 | 0.83 |
| Three | 0.15 | 0.40 | 0.90 |
| Four | 0.25 | 0.52 | 1.09 |
| Five | 0.47 | 0.75 | 1.09 |
| *Has fixed phone* | | | |
| Yes | -0.32 | | |
| No | 0.20 | | |

Notes: Taken from SISFOH (2010).

Table 16: Variables and weights for IFH construction (Continued)

| Variables | Metropolitan Lima | remaining urban areas | rural areas |
|---|---|---|---|
| *Roof material* | | | |
| Other | -0.86 | -0.90 | |
| Straw | -0.74 | -0.72 | |
| Mat | -0.67 | -0.62 | |
| Woven cane | -0.38 | -0.23 | |
| Tiles | -0.23 | 0.03 | |
| Wood or mat | -0.21 | 0.07 | |
| Concrete | 0.17 | 0.32 | |
| *Education of the Household head* | | | |
| None | -0.51 | -0.57 | -0.59 |
| Preschool | -0.43 | -0.25 | -0.08 |
| Primary | -0.28 | 0.01 | 0.35 |
| Secondary | -0.06 | 0.19 | 0.59 |
| Vocational education (VET) | 0.10 | 0.33 | 0.68 |
| Undergraduate | 0.22 | 0.55 | 0.88 |
| Postgraduate | 0.40 | 0.55 | 0.88 |
| *Floor material* | | | |
| Other | -0.97 | -1.12 | |
| Land | -0.60 | -0.47 | |
| Concrete | -0.16 | -0.01 | |
| Wood | 0.08 | 0.30 | |
| Tiles | 0.16 | 0.40 | |
| Vinyl sheets | 0.28 | 0.51 | |
| Parquet | 0.51 | 0.71 | |
| *Overcrowding* | | | |
| More than six | -0.68 | | |
| Between four and six | -0.51 | | |
| Between two and four | -0.31 | | |
| Between one and two | -0.07 | | |
| Less than one | 0.24 | | |
| *Highest level of education in the house* | | | |
| None | | | -0.35 |
| Primary | | | 0.11 |
| Secondary | | | 0.41 |
| Vocational education (VET) | | | 0.62 |
| Undergraduate | | | 0.83 |
| *Electricity* | | | |
| No | | | -0.29 |
| Yes | | | 0.22 |
| *Floor made of earth* | | | |
| Yes | | | -0.17 |
| No | | | 0.47 |

Notes: Taken from SISFOH (2010).

Table 17: Eligibility Thresholds by Cluster

| Cluster | Threshold | Population | Per capita income 1/. | Per capita spending 1/. | Poverty status |
|---|---|---|---|---|---|
| 1 | 33 | 208,101 | 2,184 | 1,815 | 0.5159 |
| 2 | 36 | 1,907,122 | 2,116 | 1,697 | 0.5994 |
| 3 | 34 | 2,284,876 | 2,332 | 1,937 | 0.5404 |
| 4 | 38 | 2,646,680 | 2,282 | 1,916 | 0.5389 |
| 5 | 35 | 634,472 | 2,067 | 1,595 | 0.6410 |
| 6 | 34 | 212,723 | 5,941 | 4,045 | 0.2606 |
| 7 | 52 | 2,544,448 | 5,141 | 4,260 | 0.2565 |
| 8 | 42 | 2,134,993 | 5,667 | 4,428 | 0.2397 |
| 9 | 44 | 3,740,611 | 6,403 | 5,050 | 0.1352 |
| 10 | 50 | 2,229,638 | 5,997 | 4,673 | 0.1620 |
| 11 | 44 | 490,207 | 5,498 | 4,015 | 0.2725 |
| 12 | 43 | 101,993 | 8,632 | 4,638 | 0.1645 |
| 13 | 43 | 1,636,740 | 5,045 | 4,024 | 0.2116 |
| 14 | 33 | 93,527 | 8,961 | 6,178 | 0.0261 |
| 15 | 55 | 9,342,700 | 8,712 | 6,612 | 0.1546 |
| Peru | - | 30,208,831 | 5,793 | 4,501 | 0.2764 |

Notes: Based on SISFOH (2010), own calculations using the ENAHO 2011. There is no threshold at the national level. 1/. Soles.

are used, is not part of the target population.[47]

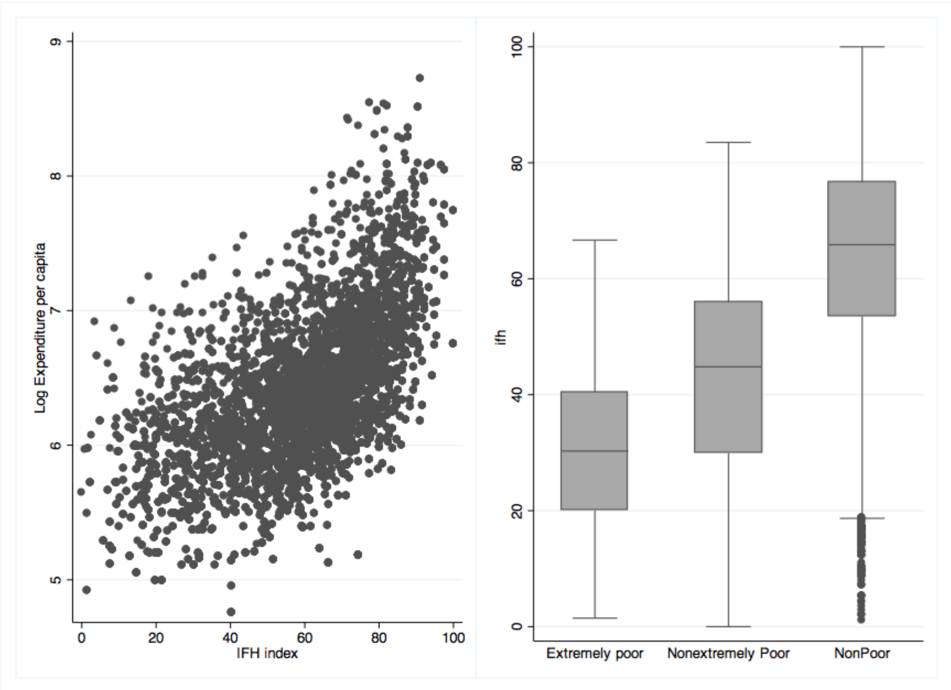
Table 17 also provides some economic indicators obtained from the ENAHO for the year 2011. The variation of the thresholds across clusters reflects the variation in income within Peru. The lower thresholds correspond to the poorer clusters, that is, those with the lowest levels of per capita monetary income (or spending) and the highest proportions of poor individuals.[48] The Lima Province, the city under analysis, is in cluster 15, with a cutoff of 55.

We use ENAHO data for the year 2011 as well as the actual weights to re-compute the IFH index for individuals and households in our sample. We cannot directly assess how strongly our index is correlated with the one that was used by the government to determine eligibility. However, as an informal test, we re-produced figures illustrating the correlations between the IFH index and expenditures per capita in SISFOH (2010). Figure 7 shows the figure we obtain for the Lima Province. Generally speaking, the reproduced figures resemble the official ones.

[47]The thresholds are set such that the marginal benefit of expanding five percentage points of coverage of the eligible population generated a marginal increase of one percentage point in that error.

[48]Cluster 14, which corresponds to the urban areas of the jungle of Madre de Dios, is an interesting exception. Informal mining and illegal drugs production have increased income levels during the past years.

Figure 7: Relationship between IFH and Expenditures Per Capita in Lima Province




Notes: Based on ENAHO data for the year 2011, See Appendix C for details on how the IFH index is computed. The right figure shows box plots for expenditures by poverty status.

# D Additional Results

## D.1 Ordinary Least Squares Estimates

Table 18: OLS Results for the Full Sample and by Gender

| | | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|---|
| | | Full sample | | Women | | Men | |
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| Utilization | | | | | | | |
| 1 | Doctor visits | 0.0733*** | (0.0150) | 0.0634*** | (0.0212) | 0.0785*** | (0.0213) |
| 2 | Medicines | 0.0664*** | (0.0157) | 0.0510** | (0.0219) | 0.0785*** | (0.0227) |
| 3 | Analysis | 0.0388*** | (0.0083) | 0.0321** | (0.0125) | 0.0440*** | (0.0107) |
| 4 | X-rays | 0.0232*** | (0.0065) | 0.0147 | (0.0097) | 0.0301*** | (0.0083) |
| 5 | Other tests | 0.0080** | (0.0038) | 0.0079 | (0.0058) | 0.0077 | (0.0050) |
| 6 | Dental care | 0.0151 | (0.0105) | -0.0062 | (0.0144) | 0.0372** | (0.0153) |
| 7 | Ophthalmology | -0.0008 | (0.0072) | -0.0035 | (0.0102) | 0.0020 | (0.0102) |
| 8 | Glasses | -0.0010 | (0.0062) | -0.0040 | (0.0087) | 0.0035 | (0.0090) |
| 9 | Vaccines | 0.0369*** | (0.0101) | 0.0430*** | (0.0146) | 0.0313** | (0.0138) |
| 10 | Kids check | 0.0058 | (0.0292) | -0.0054 | (0.0392) | 0.0179 | (0.0432) |
| 11 | Birth control | 0.0110 | (0.0076) | 0.0311*** | (0.0117) | -0.0108 | (0.0094) |
| 12 | Others | 0.0283** | (0.0136) | 0.0229 | (0.0195) | 0.0303 | (0.0190) |
| 13 | Hospital | 0.0439*** | (0.0081) | 0.0552*** | (0.0128) | 0.0293*** | (0.0095) |
| 14 | Surgery | 0.0214*** | (0.0067) | 0.0240** | (0.0104) | 0.0163** | (0.0080) |
| 15 | Pregnancy care | 0.0856*** | (0.0180) | 0.0856*** | (0.0180) | | |
| 16 | Child birth | 0.0531*** | (0.0130) | 0.0531*** | (0.0130) | | |
| 0’ | Medical attention | 0.0841*** | (0.0131) | 0.0795*** | (0.0189) | 0.0834*** | (0.0179) |
| 1’ | Doctor visits | 0.0834*** | (0.0130) | 0.0795*** | (0.0188) | 0.0821*** | (0.0179) |
| 2’ | Medicines | 0.0819*** | (0.0128) | 0.0798*** | (0.0185) | 0.0793*** | (0.0176) |
| 3’ | Analysis | 0.0338*** | (0.0079) | 0.0261** | (0.0118) | 0.0400*** | (0.0101) |
| 4’ | X-rays | 0.0157*** | (0.0061) | 0.0060 | (0.0091) | 0.0241*** | (0.0078) |
| 5’ | Other tests | 0.0067** | (0.0032) | 0.0076* | (0.0046) | 0.0057 | (0.0043) |
| 6’ | Planning | 0.0654*** | (0.0209) | 0.0654*** | (0.0209) | | |
| 7’ | Iron | 0.0196 | (0.0383) | 0.0520 | (0.0431) | -0.0839 | (0.0829) |
| 8’ | Preventive campaign | 0.0140** | (0.0063) | 0.0238** | (0.0097) | 0.0023 | (0.0079) |
| Health report | | | | | | | |
| 1 | Symptom | -0.0093 | (0.0157) | -0.0155 | (0.0221) | -0.0049 | (0.0223) |
| 2 | Illness | 0.0171 | (0.0113) | 0.0275* | (0.0162) | 0.0037 | (0.0160) |
| 3 | Chronic illness | 0.0423*** | (0.0144) | 0.0237 | (0.0197) | 0.0582*** | (0.0212) |
| 4 | Relapse | 0.0333*** | (0.0097) | 0.0146 | (0.0140) | 0.0509*** | (0.0133) |
| 5 | Accident | 0.0031 | (0.0048) | 0.0035 | (0.0064) | 0.0021 | (0.0074) |
| 6 | Num. days with symptom | 0.0322 | (0.0361) | 0.0109 | (0.0491) | 0.0535 | (0.0580) |
| 7 | Num. days with illness | 0.0103 | (0.0347) | 0.0196 | (0.0567) | -0.0026 | (0.0383) |
| 8 | Num. days with relapse | 0.1092 | (0.0806) | 0.0983 | (0.1197) | 0.0969 | (0.1039) |
| 9 | Num. days with accident | 0.0846** | (0.0420) | 0.1024 | (0.0716) | 0.0608 | (0.0379) |

Notes: OLS regressions of outcome variables on health insurance and covariates (i.e woman, age, years of education, number household members and woman as head of household). Standard errors are denoted by Ste. and reported in parentheses. "* p<0.10 ** p<0.05 *** p<0.01. Full: N=4,161 (total); N=649 (kids check); N=1.182 (pregnancy care); N=1,182 (child birth); N=1,181 (planning); N=343 (iron). Sample 75: N=3,124 (total); N=499 (kids check); N=892 (pregnancy care) N=892 (child birth); N=891 (planning); N=264 (iron). Sample 50: N=2,078 (total); N=347 (kids check); N=618 (pregnancy care) N=618 (child birth); N=617 (planning); N=189 (iron).

Table 19: Effect of Health Insurance on Participation and Utilization by Gender

| | | Women | | Men | |
|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. |
| First stage: Participation | | | | | |
| 0 | Health Insurance | 0.1415*** | (0.0364) | 0.1399*** | (0.0363) |
| | | | $F = 15.1116$ | | $F = 14.8533$ |
| Second stage: Utilization | | | | | |
| 1 | Doctor visits | 0.4448* | (0.2657) | 0.6016** | (0.2881) |
| 2 | Medicines | 0.6602** | (0.2961) | 0.4045 | (0.2835) |
| 3 | Analysis | 0.1705 | (0.1331) | 0.2413* | (0.1262) |
| 4 | X-rays | 0.1583 | (0.1098) | 0.1006 | (0.0899) |
| 5 | Other tests | -0.0253 | (0.0614) | 0.1321** | (0.0619) |
| 6 | Dental | 0.0555 | (0.1703) | 0.0767 | (0.1771) |
| 7 | Ophthalmology | 0.0773 | (0.1213) | -0.0114 | (0.1167) |
| 8 | Glasses 1/. | -0.0593 | (0.0945) | 0.0004 | (0.1024) |
| 9 | Vaccines | 0.2027 | (0.1847) | 0.3862** | (0.1908) |
| 10 | Kids check | -0.6652 | (0.6071) | 0.4167 | (0.3630) |
| 11 | Birth control | 0.0274 | (0.1344) | -0.3181** | (0.1394) |
| 12 | Others | 0.3174 | (0.2464) | 0.0363 | (0.2134) |
| 13 | Hospital | 0.2172 | (0.1563) | 0.0845 | (0.0972) |
| 14 | Surgery | 0.4347*** | (0.1649) | 0.0735 | (0.0845) |
| 15 | Pregnancy care | 0.6504** | (0.2931) | | |
| 16 | Child birth | 0.1900 | (0.1593) | | |
| (1-16) | Any of the above | 0.4198* | (0.2428) | 0.4653* | (0.2823) |

Notes: IV-2SLS regressions. 1/. Not covered by SIS. 2/. Women: N=2,127 (total); N=314 (kids check); N=1,182 (pregnancy care) N=1,182 (child birth). 3/. Men: N=2,034 (total); N=335 (kids check). 4/. Standard errors in parentheses * p<0.10 ** p<0.05 *** p<0.01

## D.2 Differences by Gender

In Tables 19, 20 and 21 we conduct the IV-2SLS regressions but reducing the sample to two subgroups, women and men. In general, we lose significance due to the number of observations but we are able to know more about where effects come from.

Table 19 shows that the positive effects on the probabilities to receive medicines, surgery and pregnancy care are driven by women, whereas the impacts on the probability of being vaccinated comes from the men (probably children). The likelihood of visiting doctor is associated with both men and women.

Table 20 indicates that, conditional on having had a health problem, both women and men, publicly insured, are more likely to seek for medical attention in public hospitals and health care centers and to receive professional attention and medication (estimates for variables medical attention, doctor and medicines are significant at conventional levels). If we disentangle curative and preventive uses, we observe no effects on preventive services whereas we do find effects on curative services for both women and men.

Shifting attention to health report, in general we find no significant effects (see Table 21), but in the case on women we find positive and significant effect on one variable: illness. As we already explained, the public insurance implies a closer relationship between individuals and the health system, hence we

Table 20: Effect of Health Insurance on Curative and Preventive Use by Gender

| | | Women | | Men | |
|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. |
| Second stage: Utilization | | | | | |
| A. Curative (for individuals who had health problems) | | | | | |
| 0’ | Medical attention | 0.6257** | (0.2529) | 0.5070** | (0.2377) |
| 1’ | Doctor visits | 0.6118** | (0.2501) | 0.5045** | (0.2374) |
| 2’ | Medicines | 0.5785** | (0.2433) | 0.4543** | (0.2290) |
| 3’ | Analysis | 0.1427 | (0.1266) | 0.2167* | (0.1161) |
| 4’ | X-rays | 0.1429 | (0.1054) | 0.0397 | (0.0823) |
| 5’ | Other tests | -0.0131 | (0.0427) | 0.0935* | (0.0512) |
| 13 | Hospital | 0.2172 | (0.1563) | 0.0845 | (0.0972) |
| 14 | Surgery | 0.4347*** | (0.1649) | 0.0735 | (0.0845) |
| 16 | Child birth | 0.1900 | (0.1593) | | |
| (1’-5’,13,14,16) | Any of the above | 0.9011*** | (0.3039) | 0.5868** | (0.2553) |
| B. Preventive (for specific groups of individuals) | | | | | |
| 9 | Vaccines | 0.2027 | (0.1847) | 0.3862** | (0.1908) |
| 10 | Kids check | -0.6652 | (0.6071) | 0.4167 | (0.3630) |
| 11 | Birth control | 0.0274 | (0.1344) | -0.3181** | (0.1394) |
| 15 | Pregnancy care | 0.6504** | (0.2931) | | |
| 6’ | Planning 1/. | -0.0412 | (0.2447) | | |
| 7’ | Iron 2/. | 1.1696 | (1.1375) | -0.0862 | (0.5180) |
| 8’ | Preventive campaign 3/. | 0.0515 | (0.1094) | 0.0178 | (0.0844) |
| (6’-8’,9-11,15) | Any of the above | 0.2911 | (0.2404) | 0.2783 | (0.2160) |

Notes: IV-2SLS regressions. 1/. Family planning for women at fertile age. 2/. Reception of iron supplements for pregnant women and children under three years old. 3/. Information on prevention of sickness. 4/. Women: N=2,127 (total); N=314 (kids check); N=1,182 (pregnancy care); N=1,181 (planning); N=255 (iron). 5/. Men: N=2,034 (total); N=335 (kids check); N=88 (iron). 6/. Standard errors in parentheses * p<0.10 ** p<0.05 *** p<0.01

Table 21: Effect of Health Insurance on Health by Gender

| | | Women | | Men | |
|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. |
| Second stage: Health report | | | | | |
| 1 | Symptom | 0.1164 | (0.2670) | 0.4327 | (0.2871) |
| 2 | Illness | 0.4833** | (0.2215) | 0.1400 | (0.1960) |
| 3 | Chronic illness | 0.1366 | (0.2399) | 0.0105 | (0.2504) |
| 4 | Relapse | 0.1307 | (0.1662) | -0.0097 | (0.1485) |
| 5 | Accident | -0.0020 | (0.0700) | 0.1439 | (0.1000) |
| 6 | Num. days with symptom | 0.0950 | (0.4995) | 0.6927 | (0.8642) |
| 7 | Num. days with illness | 0.8062 | (0.5478) | 0.3940 | (0.4673) |
| 8 | Num. days with relapse | -0.1836 | (1.1663) | 1.8964 | (1.4563) |
| 9 | Num. days with accident | 1.0086 | (0.8235) | 0.0057 | (0.3664) |

Notes: IV-2SLS regressions. 1/. Women: N=2,127. 2/. Men: N=2,034. 3/. Standard errors in parentheses * p<0.10 ** p<0.05 *** p<0.01

argue that women in our sample seems to be more aware they have an illness and report it (Strauss and Thomas, 1998; Dow et al., 1997).

## D.3 Health Expenditures

Table 22: Health outcome variables by expenditure groups

| | Low Z1<0 | Low Z1>=0 | High Z1<0 | High Z1>=0 | | Low Z1<0 | Low Z1>=0 | High Z1<0 | High Z1>=0 |
|---|---|---|---|---|---|---|---|---|---|
| Doctor visit | 0.1373 | 0.0998 | 0.7289 | 0.6000 | Medical attention | 0.0892 | 0.0560 | 0.5783 | 0.4970 |
| | 0.3446 | 0.3000 | 0.4459 | 0.4914 | | 0.2853 | 0.2301 | 0.4953 | 0.5015 |
| Medicines | 0.2193 | 0.1557 | 0.8614 | 0.7939 | Doctor visit 1 | 0.0892 | 0.0560 | 0.5663 | 0.4909 |
| | 0.4143 | 0.3630 | 0.3465 | 0.4057 | | 0.2853 | 0.2301 | 0.4971 | 0.5014 |
| Analysis | 0.0361 | 0.0146 | 0.2229 | 0.1697 | Medicines 1 | 0.0867 | 0.0560 | 0.5542 | 0.4909 |
| | 0.1869 | 0.1201 | 0.4174 | 0.3765 | | 0.2818 | 0.2301 | 0.4986 | 0.5014 |
| X-Rays | 0.0145 | 0.0073 | 0.1627 | 0.1152 | Analysis1 | 0.0337 | 0.0122 | 0.1988 | 0.1636 |
| | 0.1195 | 0.0852 | 0.3702 | 0.3202 | | 0.1808 | 0.1098 | 0.4003 | 0.3711 |
| Tests | 0.0024 | 0.0024 | 0.0542 | 0.0364 | X-Rays 1 | 0.0120 | 0.0073 | 0.1506 | 0.1152 |
| | 0.0491 | 0.0493 | 0.2271 | 0.1878 | | 0.1092 | 0.0852 | 0.3587 | 0.3202 |
| Dental | 0.0458 | 0.0341 | 0.2831 | 0.2727 | Tests 1 | 0.0000 | 0.0000 | 0.0361 | 0.0242 |
| | 0.2093 | 0.1816 | 0.4519 | 0.4467 | | 0.0000 | 0.0000 | 0.1872 | 0.1543 |
| Eyes | 0.0193 | 0.0122 | 0.1265 | 0.1697 | Curative | 0.1301 | 0.1022 | 0.6867 | 0.5636 |
| | 0.1377 | 0.1098 | 0.3334 | 0.3765 | | 0.3368 | 0.3033 | 0.4652 | 0.4974 |
| Glasses | 0.0096 | 0.0024 | 0.0723 | 0.1455 | Planning | 0.1188 | 0.0813 | 0.1509 | 0.1020 |
| | 0.0978 | 0.0493 | 0.2597 | 0.3536 | | 0.3252 | 0.2744 | 0.3614 | 0.3058 |
| Vaccines | 0.1422 | 0.0876 | 0.1024 | 0.1273 | Iron | 0.1111 | 0.0294 | 0.2143 | 0.3333 |
| | 0.3496 | 0.2830 | 0.3041 | 0.3343 | | 0.3187 | 0.1715 | 0.4258 | 0.5000 |
| Kids check | 0.1932 | 0.2424 | 0.4286 | 0.1923 | Preventive campaingn | 0.0313 | 0.0268 | 0.0482 | 0.0485 |
| | 0.3971 | 0.4318 | 0.5040 | 0.4019 | | 0.1744 | 0.1616 | 0.2148 | 0.2154 |
| Birth control | 0.0289 | 0.0195 | 0.0663 | 0.0848 | Preventive | 0.2169 | 0.1557 | 0.2590 | 0.2606 |
| | 0.1678 | 0.1383 | 0.2495 | 0.2795 | | 0.4126 | 0.3630 | 0.4394 | 0.4403 |
| Others | 0.1084 | 0.0900 | 0.2952 | 0.4303 | Symptom | 0.2964 | 0.2968 | 0.5602 | 0.4667 |
| | 0.3113 | 0.2866 | 0.4575 | 0.4966 | | 0.4572 | 0.4574 | 0.4979 | 0.5004 |
| Hospital | 0.0434 | 0.0462 | 0.1325 | 0.1152 | Illness | 0.0964 | 0.0365 | 0.2349 | 0.2364 |
| | 0.2039 | 0.2102 | 0.3401 | 0.3202 | | 0.2955 | 0.1878 | 0.4252 | 0.4261 |
| Surgery | 0.0265 | 0.0243 | 0.1265 | 0.0727 | Chronic | 0.2964 | 0.2968 | 0.5843 | 0.6303 |
| | 0.1608 | 0.1543 | 0.3334 | 0.2605 | | 0.4572 | 0.4574 | 0.4943 | 0.4842 |
| Pregnancy care | 0.1287 | 0.0813 | 0.1509 | 0.1020 | Relapse | 0.0506 | 0.0511 | 0.2108 | 0.2121 |
| | 0.3366 | 0.2744 | 0.3614 | 0.3058 | | 0.2194 | 0.2205 | 0.4091 | 0.4101 |
| Child birth | 0.0693 | 0.0569 | 0.0755 | 0.0408 | Accident | 0.0145 | 0.0024 | 0.0663 | 0.0303 |
| | 0.2552 | 0.2326 | 0.2667 | 0.1999 | | 0.1195 | 0.0493 | 0.2495 | 0.1719 |
| Use | 0.4410 | 0.3528 | 1.0000 | 1.0000 | Symptom Num. days | 0.1084 | 0.0973 | 0.1867 | 0.1879 |
| | 0.4971 | 0.4784 | 0.0000 | 0.0000 | | 1.5085 | 1.0384 | 0.7909 | 0.8943 |
| | | | | | Illness Num. days | 0.0651 | 0.0146 | 0.4036 | 0.2545 |
| | | | | | | 0.5367 | 0.1705 | 1.5530 | 1.1876 |
| | | | | | Relapse Num. days | 0.2651 | 0.1338 | 0.7831 | 0.6424 |
| | | | | | | 2.6480 | 1.6789 | 3.8849 | 4.0439 |
| | | | | | Accident Num. days | 0.0169 | 0.0000 | 0.4096 | 0.1030 |
| | | | | | | 0.2641 | 0.0000 | 2.8817 | 0.9476 |
| | | | | | Health expenditure (Soles) | 4.3735 | 2.4161 | 1432.1270 | 1324.7330 |

## D.4 Additional Tables for Sensitivity Analysis

Table 23: IV-2SLS at the medians of the subsample distributions

| | Median Z<55 | (1) Full sample | | (2) Sample 75% | | (3) Sample 50% | |
|---|---|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| First stage: Participation | | | | | | | |
| 0 | Health Insurance | -0.0160 | (0.0455) | -0.0067 | (0.0538) | 0.0209 | (0.0651) |
| | | | $F = 0.1237$ | | $F = 0.0155$ | | $F = 0.1031$ |
| Second stage: Utilization | | | | | | | |
| 1 | Doctor visits | 3.1152 | (9.0213) | 14.2173 | (113.2961) | -1.5376 | (5.9184) |
| 2 | Medicines | 2.5642 | (7.5926) | 8.2319 | (65.6629) | -1.1515 | (4.9309) |
| 3 | Analysis | 0.5863 | (2.1066) | 1.6053 | (13.1504) | 0.6894 | (2.5525) |
| 4 | X-rays | 0.7143 | (2.2662) | 0.3760 | (4.1790) | 0.6777 | (2.3516) |
| 5 | Other tests | 0.0669 | (0.6350) | -0.3273 | (3.2590) | -0.2170 | (1.0048) |
| 6 | Dental care | 0.4442 | (2.0624) | -0.1616 | (5.0548) | 2.1758 | (6.9219) |
| 7 | Ophthalmology | 1.6162 | (4.6851) | 4.4831 | (35.9662) | -0.5749 | (1.9599) |
| 8 | Glasses | 1.4392 | (4.2278) | 1.7585 | (14.4648) | -0.0345 | (0.9222) |
| 9 | Vaccines | 4.0881 | (11.6414) | 22.4286 | (179.3428) | -6.8304 | (21.2996) |
| 10 | Kids check | 1.3285 | (6.1547) | -0.9031 | (4.3801) | 0.2555 | (1.6658) |
| 11 | Birth control | -1.6099 | (4.7842) | -3.0300 | (24.6963) | 1.2799 | (4.1810) |
| 12 | Others | 4.7598 | (13.7206) | 10.1690 | (81.5841) | -2.3858 | (7.8533) |
| 13 | Hospital | 1.3865 | (3.9999) | 3.4710 | (27.5809) | -1.2934 | (4.3790) |
| 14 | Surgery | 1.4760 | (4.2762) | 4.5179 | (36.0962) | -1.3853 | (4.5133) |
| 15 | Pregnancy care | -12.3856 | (356.4444) | 1.0199 | (3.6983) | 1.3988 | (12.6485) |
| 16 | Child birth | 3.9812 | (113.6240) | -0.5121 | (2.2735) | -0.2288 | (4.2888) |
| 0' | Medical attention | 1.3966 | (4.2963) | 6.2757 | (49.5992) | -2.8409 | (9.6498) |
| 1' | Doctor visits | 1.8136 | (5.3320) | 6.4686 | (51.1275) | -2.7256 | (9.3072) |
| 2' | Medicines | 2.0428 | (5.9121) | 5.6401 | (44.5245) | -2.8328 | (9.6257) |
| 3' | Analysis | 0.5004 | (1.8910) | 0.8785 | (7.8034) | 0.8804 | (3.0105) |
| 4' | X-rays | 0.7582 | (2.3646) | 0.3034 | (3.7348) | 0.8660 | (2.8609) |
| 5' | Other tests | -0.1090 | (0.4980) | -0.5459 | (4.5190) | -0.0242 | (0.4522) |
| 6' | Planning | 14.7303 | (419.9662) | -2.6319 | (9.5069) | 7.4002 | (65.7071) |
| 7' | Iron | -1.1360 | (1.4227) | -0.7489 | (1.4188) | -0.2569 | (0.7720) |
| 8' | Preventive campaign | 0.5337 | (1.9841) | 1.1240 | (9.6639) | 0.8012 | (2.8689) |
| Health report | | | | | | | |
| 1 | Symptom | -0.8470 | (3.8124) | 0.9297 | (10.6142) | 1.5909 | (5.5726) |
| 2 | Illness | 0.2594 | (2.1987) | 3.1431 | (25.3804) | -0.4516 | (2.8994) |
| 3 | Chronic illness | 1.4699 | (4.7893) | 9.9956 | (80.3271) | -3.3579 | (10.7153) |
| 4 | Relapse | -1.0055 | (3.2326) | 1.4927 | (12.6977) | -1.9782 | (6.3177) |
| 5 | Accident | 1.1493 | (3.4220) | 2.3733 | (19.2548) | -0.7489 | (2.5050) |
| 6 | Num. days with symptom | 2.8030 | (9.5805) | 17.3124 | (139.2717) | -5.2107 | (16.9078) |
| 7 | Num. days with illness | -8.0916 | (24.2102) | -29.8136 | (240.3652) | 10.7701 | (34.5336) |
| 8 | Num. days with relapse | -3.4676 | (12.0192) | -22.5220 | (182.5997) | 0.9482 | (9.7698) |
| 9 | Num. days with accident | 5.3389 | (15.9987) | 18.3468 | (146.8399) | -10.6549 | (34.3236) |

Notes: IV-2SLS regressions. Standard errors are denoted by Ste. and reported in parentheses. "* p<0.10 ** p<0.05 *** p<0.01. Full: N=1,786 (total); N=363 (kids check); N=532 (pregnancy care); N=532 (child birth); N=532 (planning); N=177 (iron). Sample 75: N=1,333 (total); N=269 (kids check); N=392 (pregnancy care) N=392 (child birth); N=392 (planning); N=130 (iron). Sample 50: N=902 (total); N=174 (kids check); N=266 (pregnancy care) N=266 (child birth); N=266 (planning); N=84 (iron).

Table 24: IV-2SLS at the medians of the subsample distributions

| Median Z≥55 | | (1) Full sample | | (2) Sample 75% | | (3) Sample 50% | |
|---|---|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| First stage: Participation | | | | | | | |
| 0 | Health Insurance | 0.0565 | (0.0376) | 0.0962** | (0.0448) | 0.0201 | (0.0605) |
| | | | $F = 2.2580$ | | $F = 4.6110$ | | $F = 0.1104$ |
| Second stage: Utilization | | | | | | | |
| 1 | Doctor visits | 0.4775 | (0.6780) | 0.5318 | (0.4824) | 3.3836 | (10.2383) |
| 2 | Medicines | -0.2016 | (0.6993) | -0.0018 | (0.4704) | 0.1145 | (2.9544) |
| 3 | Analysis | -0.5745 | (0.5287) | -0.3626 | (0.3069) | 0.6739 | (2.4458) |
| 4 | X-rays | -0.4274 | (0.4173) | -0.0856 | (0.2040) | 0.2626 | (1.4581) |
| 5 | Other tests | 0.0862 | (0.1825) | 0.1591 | (0.1449) | 0.0559 | (0.8215) |
| 6 | Dental care | -0.4177 | (0.5419) | -0.3954 | (0.3718) | -0.8443 | (3.2882) |
| 7 | Ophthalmology | -0.5347 | (0.4869) | -0.4431 | (0.3073) | -2.5184 | (7.6159) |
| 8 | Glasses | -0.2632 | (0.3561) | -0.2924 | (0.2547) | -0.5562 | (2.1578) |
| 9 | Vaccines | 1.1538 | (0.8391) | 1.0150* | (0.5260) | 4.1314 | (12.3479) |
| 10 | Kids check | 0.4217 | (1.5673) | 0.0167 | (0.6780) | 0.1586 | (1.6473) |
| 11 | Birth control | 0.2812 | (0.3760) | 0.2137 | (0.2499) | 1.8521 | (5.7011) |
| 12 | Others | 0.5690 | (0.7082) | 0.6265 | (0.5072) | 2.0475 | (6.7097) |
| 13 | Hospital | -0.0852 | (0.3378) | -0.2331 | (0.2598) | -2.5987 | (8.0320) |
| 14 | Surgery | -0.1892 | (0.2907) | -0.1578 | (0.1944) | -1.6656 | (5.1437) |
| 15 | Pregnancy care | -0.3562 | (1.9939) | 0.1614 | (2.1909) | -0.6366 | (2.1904) |
| 16 | Child birth | 0.0468 | (0.7438) | -0.6018 | (4.1688) | 0.0444 | (0.6071) |
| 0' | Medical attention | -0.5308 | (0.6836) | -0.1483 | (0.3968) | 0.0169 | (2.3616) |
| 1' | Doctor visits | -0.4659 | (0.6575) | -0.1038 | (0.3908) | 0.2919 | (2.4170) |
| 2' | Medicines | -0.5996 | (0.7035) | -0.2370 | (0.4010) | -0.3743 | (2.6905) |
| 3' | Analysis | -0.4596 | (0.4584) | -0.2994 | (0.2751) | 0.7427 | (2.5640) |
| 4' | X-rays | -0.2538 | (0.3328) | 0.0032 | (0.1912) | 0.4809 | (1.8283) |
| 5' | Other tests | 0.0666 | (0.1452) | 0.0735 | (0.1009) | 0.1070 | (0.6901) |
| 6' | Planning | -1.9868 | (8.2431) | 3.0745 | (18.4645) | -2.2867 | (7.3510) |
| 7' | Iron | 0.6271 | (1.5691) | -1.0186 | (3.1152) | 0.4311 | (0.6005) |
| 8' | Preventive campaign | 0.1187 | (0.2777) | 0.1202 | (0.1928) | -1.3088 | (4.2166) |
| Health report | | | | | | | |
| 1 | Symptom | -0.3881 | (0.7074) | -0.4038 | (0.5022) | -0.5615 | (3.3525) |
| 2 | Illness | 0.3262 | (0.5334) | 0.1931 | (0.3438) | 1.2619 | (4.3061) |
| 3 | Chronic illness | 0.1146 | (0.6412) | 0.0351 | (0.4484) | 2.4965 | (8.0458) |
| 4 | Relapse | -0.3406 | (0.5205) | -0.3980 | (0.3831) | -0.9860 | (3.8291) |
| 5 | Accident | -0.1475 | (0.2292) | 0.0225 | (0.1384) | 0.6733 | (2.1438) |
| 6 | Num. days with symptom | 0.9274 | (1.0469) | 0.9754 | (1.0353) | -2.3397 | (7.5884) |
| 7 | Num. days with illness | -1.8098 | (1.7281) | -1.3920 | (1.0875) | -10.3284 | (31.8735) |
| 8 | Num. days with relapse | -2.5108 | (4.1129) | 0.0739 | (2.7562) | -6.1205 | (24.5066) |
| 9 | Num. days with accident | -2.6958 | (2.3248) | -1.7203 | (1.3669) | -2.9640 | (12.0069) |

Notes: IV-2SLS regressions. Standard errors are denoted by Ste. and reported in parentheses. "* p<0.10 ** p<0.05 *** p<0.01. Full: N=2,375 (total); N=286 (kids check); N=650 (pregnancy care); N=650 (child birth); N=649 (planning); N=166 (iron). Sample 75: N=1,788 (total); N=215 (kids check); N=478 (pregnancy care) N=478 (child birth); N=478 (planning); N=129 (iron). Sample 50: N=1,176 (total); N=140 (kids check); N=306 (pregnancy care) N=306 (child birth); N=306 (planning); N=78 (iron).

Table 25: Effect of Health Insurance on Utilization: No Controls and Reduced Samples

| | | (1) Full sample no controls | | (2) Sample 75% | | (3) Sample 50% | |
|---|---|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| First stage: Participation | | | | | | | |
| 0 | Health Insurance | 0.1385*** | (0.0257) | 0.1100*** | (0.0314) | 0.0910** | (0.0409) |
| Second stage: Utilization | | | $F = 29.0425$ | | $F = 12.2723$ | | $F = 4.9504$ |
| 1 | Doctor visits | 0.4975** | (0.1965) | 0.7604** | (0.3398) | 0.6378 | (0.5000) |
| 2 | Medicines | 0.5044** | (0.2072) | 0.8826** | (0.3689) | 0.9097 | (0.5781) |
| 3 | Analysis | 0.2063** | (0.0941) | 0.3631** | (0.1640) | 0.1077 | (0.2096) |
| 4 | X-rays | 0.1220* | (0.0715) | 0.2896** | (0.1314) | 0.2117 | (0.1781) |
| 5 | Other tests | 0.0476 | (0.0420) | -0.0134 | (0.0636) | 0.0147 | (0.1097) |
| 6 | Dental | 0.0818 | (0.1249) | 0.2933 | (0.2079) | 0.1092 | (0.3005) |
| 7 | Ophthalmology | 0.0269 | (0.0850) | 0.0255 | (0.1314) | -0.2501 | (0.2416) |
| 8 | Glasses 1/. | -0.0405 | (0.0705) | 0.0042 | (0.1026) | -0.2307 | (0.1891) |
| 9 | Vaccines | 0.2880** | (0.1364) | 0.3220 | (0.2110) | 0.4440 | (0.3667) |
| 10 | Kids check | 0.1645 | (0.2955) | 0.4880 | (1.5819) | -0.8043 | (2.9582) |
| 11 | Birth control | -0.1127 | (0.0941) | -0.1493 | (0.1500) | -0.0092 | (0.2232) |
| 12 | Others | 0.1859 | (0.1653) | -0.0896 | (0.2475) | -0.6426 | (0.4753) |
| 13 | Hospital | 0.1347 | (0.0952) | 0.3110* | (0.1590) | 0.3505 | (0.2574) |
| 14 | Surgery | 0.2637*** | (0.0902) | 0.4407*** | (0.1684) | 0.4062 | (0.2521) |
| 15 | Pregnancy care | 0.6434** | (0.2942) | 0.8070 | (0.5415) | 0.8604 | (1.0486) |
| 16 | Child birth | 0.1787 | (0.1615) | 0.0628 | (0.2654) | 0.1559 | (0.5088) |
| (1-16) | Anyof the above | 0.4282** | (0.1887) | 0.7161** | (0.3274) | 0.3727 | (0.4498) |

Notes: 1/. Not covered by SIS. 2/. Full: N=4,161 (total); N=649 (kids check); N=1.182 (pregnancy care); N=1,182 (child birth). 3/. Sample 75: N=3,124 (total); N=499 (kids check); N=892 (pregnancy care) N=892 (child birth). 4/. Sample 50: N=2,078 (total); N=347 (kids check); N=618 (pregnancy care) N=618 (child birth). 5/. Standard errors in parentheses * p<0.10 ** p<0.05 *** p<0.01

Table 26: Effect of Health Insurance on Curative and Preventive Uses: No Controls and Reduced Samples

| | | (1) Full sample no controls | | (2) Sample 75% | | (3) Sample 50% | |
|---|---|---|---|---|---|---|---|
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| Second stage: Utilization | | | | | | | |
| A. Curative (for individuals who had health problems) | | | | | | | |
| 0’ | Medical attention | 0.5424*** | (0.1747) | 0.7631** | (0.3076) | 0.6714 | (0.4532) |
| 1’ | Doctor visits | 0.5339*** | (0.1736) | 0.7463** | (0.3038) | 0.6081 | (0.4373) |
| 2’ | Medicines | 0.4929*** | (0.1683) | 0.6930** | (0.2930) | 0.5155 | (0.4150) |
| 3’ | Analysis | 0.1794** | (0.0881) | 0.2919** | (0.1476) | 0.0163 | (0.1980) |
| 4’ | X-rays | 0.0868 | (0.0673) | 0.2072* | (0.1160) | 0.1259 | (0.1594) |
| 5’ | Other tests | 0.0377 | (0.0324) | -0.0096 | (0.0485) | 0.0313 | (0.0810) |
| 13 | Hospital | 0.1347 | (0.0952) | 0.3110* | (0.1590) | 0.3505 | (0.2574) |
| 14 | Surgery | 0.2637*** | (0.0902) | 0.4407*** | (0.1684) | 0.4062 | (0.2521) |
| 16 | Child birth | 0.1787 | (0.1615) | 0.0628 | (0.2654) | 0.1559 | (0.5088) |
| (1’-5’,6,7,8) | Any of the above | 0.7069*** | (0.1974) | 1.0279*** | (0.3638) | 0.8655* | (0.5161) |
| B. Preventive (for specific groups of individuals) | | | | | | | |
| 9 | Vaccines | 0.2880** | (0.1364) | 0.3220 | (0.2110) | 0.4440 | (0.3667) |
| 10 | Kids check | 0.1645 | (0.2955) | 0.4880 | (1.5819) | -0.8043 | (2.9582) |
| 11 | Birth control | -0.1127 | (0.0941) | -0.1493 | (0.1500) | -0.0092 | (0.2232) |
| 15 | Pregnancy care | 0.6434** | (0.2942) | 0.8070 | (0.5415) | 0.8604 | (1.0486) |
| 6’ | Planning 1/. | -0.0270 | (0.2455) | 0.0426 | (0.3875) | 0.5890 | (0.8563) |
| 7’ | Iron 2/. | 0.5821 | (0.4075) | 0.8659 | (1.0467) | 0.0934 | (1.0081) |
| 8’ | Preventive campaign 3/. | 0.0403 | (0.0699) | -0.1115 | (0.1046) | -0.3091 | (0.2045) |
| (6’-8’,9-11,15) | Any of the above | 0.2963* | (0.1693) | 0.2075 | (0.2518) | 0.1286 | (0.3956) |

Table 27: Effect of Health Insurance on Health: No Controls and Reduced Samples

| | | (1) | | (2) | | (3) | |
|---|---|---|---|---|---|---|---|
| | | Full sample no controls | | Sample 75% | | Sample 50% | |
| | | Estimates | Ste. | Estimates | Ste. | Estimates | Ste. |
| Second stage: Health report | | | | | | | |
| 1 | Symptom | 0.2655 | (0.1977) | 0.3459 | (0.3118) | 0.4221 | (0.4981) |
| 2 | Illness | 0.3140** | (0.1475) | 0.4533* | (0.2464) | 0.4254 | (0.3835) |
| 3 | Chronic illness | 0.0116 | (0.1904) | 0.1986 | (0.2755) | 0.1592 | (0.4342) |
| 4 | Relapse | 0.0295 | (0.1157) | 0.0756 | (0.1804) | 0.1869 | (0.2917) |
| 5 | Accident | 0.0773 | (0.0603) | 0.1947* | (0.1054) | 0.1381 | (0.1536) |
| 6 | Num. days with symptom | 0.3740 | (0.4603) | 0.8116 | (0.8134) | 1.4127 | (1.4355) |
| 7 | Num. days with illness | 0.6131* | (0.3713) | 0.7287 | (0.5268) | 0.6967 | (0.7140) |
| 8 | Num. days with relapse | 0.7297 | (0.9491) | 1.3831 | (1.5312) | 2.2356 | (2.5425) |
| 9 | Num. days with accident | 0.5432 | (0.4562) | 1.5373* | (0.8913) | 1.4919 | (1.4427) |