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Noelia Bernal
Universidad del Pacífico

Joan Costa-Font
LSE, CESIfo and IZA

Patricia Ritter
University of Connecticut

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ISSN: 2365-9793

IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

The Effect of Health Insurance on Child Nutritional Outcomes. Evidence from a Regression Discontinuity Design in Peru*

We study the effect of health insurance expansion on nutrition-related children's health outcomes. We exploit quasi-random variation from an insurance expansion targeted at poor households in Peru. We find that access to insurance reduces childhood obesity and exerts positive and economically significant effects on some preventive health care utilization and behaviours, such as children's regular growth checks-ups and deworming treatments, the duration of breastfeeding, and a substitution of foods rich in carbohydrates for other foods rich in proteins. In contrast, we do not find any effect on other outcomes typically related to other interventions.

JEL Classification: 118, J13

Keywords: children's health, obesity, overweight, public health insurance, health behaviors, nutrition, breast-feeding

Corresponding author:
Joan Costa-Font
Department of Health Policy
London School of Economics and Political Science
Houghton Street, WC2A 2AE
United Kingdom
E-mail: j.costa-font@lse.ac.uk

* We are grateful to Paola Villa-Paro, Lucía Valdivieso and Yadiraah Iparraguirre for their excellent research assistance. We also thank the helpful comments provided by Jessica Goldberg, Yohnny Campana, Luis Miguel Robles, Naveen Sunder, Vasupranda Shandar and participants at the seminars of the Eastern Economic Association Conference 2022 and Universidad del Pacífico. We are grateful as well to the financial support provided by the Consorcio de Investigacion Economica y Social (CIES; Grant PMAT1-1131-087)..

1 Introduction

Close to half the world's population lacks access to essential health care services (WHO, 2020), leading to both behavioral and financial consequences among lower-income individuals (e.g, limited prevention, catastrophic health expenditures). Several studies have established that the expansion of subsidized health insurance increases health care access and utilization (Einav and Finkelstein, 2018). However, these studies have mainly targeted higher-income countries; the evidence for the effectiveness of health care access on children's health in lower and middle-income countries is limited and mixed. This paper contributes to this gap in the literature, especially focusing on preventive and nutritionally related child health outcomes.

The welfare effects of insurance expansions on health are contentious. Although, the main expected utility gain from access to insurance stems from a reduction in both the variability and the catastrophic nature of health care expenditures (Einav and Finkelstein, 2018), in settings where baseline prevention and general literacy are low, health insurance can lead to improvements in health through the utilization of high-value treatments. In these settings, access to insurance play an important role in encouraging individuals to see a physician (instead of simply buying medication), thereby promoting appropriate changes in preventable behaviors, which are made more salient by trusted health care providers, who are likely to deliver high valuable information. Such effects are especially important among the poor where health care might be underused due to credit constraints. In these situations, insurance can also steer present-biased individuals to consume additional care. Besides, access to insurance might reduce the effect of cognitive biases, which give rise to negative behavioral hazards (Baicker et al., 2015), typically driving the under-utilization of (misperceived) high-value health care (i.e. the demand for a treatment is below its marginal personal gain). Hence, access to insurance can open up a series of opportunities to improve children's health by making more salient the high-value of some treatments and therefore, shifting the demand closer to the marginal personal gain. In a low-income setting such as the one studied in this paper, significant child health improvements can result from the adoption of certain high-value preventive (e.g., health growth check-ups and regular weighting) or medical care (e.g., deworming) and indirectly through changes in other behaviors that can impact children's health (e.g., breastfeeding).

In this paper, we exploit quasi-random variation coming from the introduction of the Peruvian Public Social Health Insurance (Seguro Integral de Salud, SIS), which targets lower-income households, to study the effect on nutritionally related child health outcomes (e.g., child obesity), alongside a series of other health indicators and behaviors such as the use of high-value medical care and some preventive health practices. We control for selection into insurance by exploiting the institutional setup, which offers quasi-natural variation that we analyze using a Regression Discontinuity Design (RDD) for the years 2012 to 2014. During that period examined, households where individuals not formally employed became eligible for free public insurance provided that their given official welfare index fell below a specific regional-poverty threshold. The computation of the index by public authorities draws on household's information from variables verified by government officials but collected before 2012, and therefore difficult to manipulate. Using data from the Demographic and Health Survey, we re-calculate the index and exploit the variation around the threshold as a natural experiment.

Our estimates suggest that access to insurance significantly reduces child obesity in 1.5 percentage points.[1] Next, we document that this effect is driven by changes in preventive health care utilization and healthy behaviors. First, we find that access to SIS increases the probability that a child undergoes regular growth check-ups at public health facilities. Given that the vast majority of health visits in general, and in growth check-ups in particular, health providers take the height and the weight of the child, further access to health care opens up a new form of reliable and potentially salient information (e.g., overweight status). Second, we observe an important effect on the use of child deworming treatments, which has been shown to help to reduce the prevalence of child obesity (Angeles-Agdeppa and Arias, 2020). Third, we report a significant increase in the duration of breastfeeding above the median, which is very important for preventing child obesity (Victora et al., 2016).[2] Finally, we also find that access to SIS reduces the intake of food rich in carbohydrates and

[1] We also find evidence of a reduction in overweight, but this effect is less precisely estimated.

[2] We also find an effect on the probability of mothers receiving breastfeeding training, but the effect is only marginally significant.

increases the intake of food rich in proteins, which improves the child's quality of nutrition, typically made more salient by lower costs of access care after health insurance expansions.

In addition, we report the following results, which are consistent with our hypothesized mechanisms. First, our results are driven by children living at a close vicinity to the primary public health centers. Second, our estimates are robust to a manipulation test over the welfare index, other specifications and a set of placebo tests examining effects on several observable variables that are typically related to children's nutritional status but should not be affected by access to the insurance, such as the height of the mother. Finally, additional placebo tests suggest no effect of SIS eligibility in the period preceding our analysis (2008-2010), or when we change the official thresholds.

Our findings add to a growing literature on the effects of access to health insurance on child health, but certain aspects distinguish our paper from previous studies. First, we focus on the effects of insurance expansion on children's nutritional outcomes. Previous studies have investigated effects on infant mortality and some other health outcomes (Currie and Gruber (1996b, a), Currie and Gruber (1996a, b), Dow and Schmeer (2003), King et al. (2009), Thornton et al. (2010), Fink et al. (2013), Gruber et al. (2014), Wherry and Meyer (2016), Haushofer et al. (2020), among others), but only a small set of studies have analyzed effects on children's nutritional outcomes. Although infant mortality is certainly an important outcome, early life nutrition has been shown to be critical in the long-term formation of human capital (Almond et al., 2018), and there is evidence that early access to health insurance has long term benefits, especially among poor families (Miller and Wherry, 2019; Goodman-Bacon, 2021).

Next, we estimate the effects of SIS on some forms of high-value medical care utilization. Studies that exploit similar institutional settings as SIS, both in developed and developing countries, generally document an increase in utilization measured by inpatient and outpatient visits (Einav and Finkelstein, 2018). Such findings are unsurprising, given that health insurance expansions primarily entail a reduction in the out-of-pocket cost of using health care (Cutler and Zeckhauser, 2000). That said, the evidence indicates non-negligible effects on the number of inpatient and outpatient visits, yet they are agnostic with respect to the value of these services and its potential effect on health outcomes, especially on child nutritional indicators.[3] Important studies for Peru are the papers by Neelsen and O'Donnell (2017) and Bernal et al. (2017), who find positive effects of introducing SIS on health care utilization and out-of-pocket health expenditures, but they do not focus on health outcomes, nor on effects on childhood obesity and the potential heterogeneous effects of living close to health care facilities as we do here. We then estimate the impact of SIS on important high-value medical care services focused on children, which include a series of essential preventive care programs such as breastfeeding training, growth check-ups, as well as some high-value treatments such as deworming treatment.

Third, our paper contributes to a growing literature investigating the effect of information on healthy behaviors and children's health; for example, Hoddinott et al. (2017); Bennett et al. (2018); Anttila-Hughes et al. (2018). If health insurance increases the intensive and extensive margin of health care use, we examine whether contact with health providers who play the role of information gatekeeper in a low-income setting, does manage to steer individuals to change their behavior with regard to their children's care. This should be particularly observable when prevention failures result from cognitive biases common when navigating the health system, or in the salience of information which pave the way to so-called "behavioral hazards". So far, only a few studies have documented some evidence of changes in behavior or in the demand for health care. For example, Abrigo et al. (2022) document that insurance increases household per capita health expenditures, and this increase is driven by an outward shift in the medical demand curve. Similarly, Bernal et al. (2017) assert that access to SIS increases the out-of-pocket expenditures; this is mainly explained by information about health problems, which leads to a potentially desirable form of supplier-induced demand.[4] In this study, we argue that contact with health providers has impact on healthy behaviors that improve children's health: breastfeeding duration and quality of nutrition (WHO, 2020).

[3] A small number of studies focus on effects of insurance on high-value preventive care, such as in the take up of screening tests for adults (Baicker et al., 2013; Wherry and Miller, 2016; Simon et al., 2017), obstetrical services and growth check-ups (Sosa-Rubi et al., 2009; Miller et al., 2013).

[4] Aiyar et al. (2020) find that access to a health insurance policy that subsidizes reproductive services increased both postnatal care use and child immunizations.

Taken together, our results give rise to important considerations for insurance policy design in lower-income settings. First, it seems that the relative success of the Peruvian SIS in comparison with experiences in other countries, where little effect on health outcomes have been found, is partially related to the institutional setup. However, the uptake of SIS, unlike other schemes, was very smooth, since enrollment takes place directly at the healthcare center, is typically confirmed within one day, and does not require the payment of premiums or hefty reimbursement applications. In many of the previous studies, insurance schemes and health providers are independent, and entail a partial subsidization (for example in the case of Mexico (King et al., 2009) and Nicaragua (Thornton et al., 2010)), or entail significant transaction and inconvenient costs to overcome the limitations in the access and trust of information (for example in the case of Nicaragua, (Thornton et al., 2010)). Other cases may entail some reimbursement design (as in Kenya, for example (Haushofer et al., 2020)), which diminishes both the program take-up and its consequent effects on health. In addition, in some settings, subsidized health insurance programs have included incentives for health providers to reduce costs and overuse, which has, in some cases (for example in Burkina Faso (Fink et al., 2013), and Colombia (Miller et al., 2013)), limited the effect of the insurance on utilization and health. In this respect, the Peruvian SIS is more similar to the Thailand "30 Baht", which reduces copays of the poor by increasing the funding available to hospitals. In this case, there is evidence of a significant reduction in infant mortality (Gruber et al., 2014).

A second policy consideration is that a reduction of both the price of health insurance and the resulting out-of-pocket expenditure are constrained by other costs and barriers. In our study, we only document significant effects on some nutritional outcomes, rather than all possible effects. These results might reflect the limitations of the supply to deal with more complicated medical conditions, or institutional challenges related to transfers of resources to facilities. As Bernal et al. (2017) discuss, even though SIS offers a comprehensive package of benefits, supply limitations and institutional problems have prevented some medicines and treatments from being fully available and free for the insured. In contrast, in our case, diagnosing weight problems is relatively costless, simple, and requires little equipment and basic skills; in addition, medical personnel in Peru seem to be well trained in advising parents on how to improve this situation. Other diagnoses and treatments require more than simple medical care or information to be effective.

The rest of the paper is organized as follows: Section 2 provides an overview of the SIS program; Section 3 describes the data and variables used; Section 4 presents our identification strategy to find the effects of the insurance in the RDD analysis; Section 5 presents our results, including an analysis of heterogeneous effects by access to health care facilities; Section 6 implements and discusses various robustness checks for the assumptions behind our design, and for our main findings. Lastly, Section 7 concludes.

2 Institutional Background

2.1 Seguro Integral de Salud

The Peruvian health system is highly fragmented, with three main insurance agencies: the Ministry of Health (MINSA), the national social security system (EsSalud), and the private sector. These three insurers cover different segments of the population, work independently and do not coordinate their activities among themselves (Cetrangolo et al., 2013; Francke, 2013). MINSA provides services to all citizens through decentralized public facilities located throughout the country. These services are mainly utilized by poor individuals who have to pay for each service in absence of other insurance. EsSalud provides health insurance to formally employed individuals and maintains its own facilities and prices for the provision of care. The private sector is administered by private health insurance agencies *(*Entidades Promotoras de Salud - EPS), which provide services through private clinics on a market basis.[5]

The Seguro Integral de Salud (SIS) was introduced in 2002 with the goal of reducing user fees in MINSA facilities and improving access to health care services for individuals who lack health insurance, giving priority

[5]There are other minor providers, such as the military and police force health service. Enrollment into these schemes as well for EsSalud and EPS health insurances is mandatory for dependent formal employees and voluntary for the self-employed.

to vulnerable population groups who live in poverty, such as women and children. The SIS implemented a new financial mechanism to pay for care and drug delivery, through which the government transfers funds to facilities under a fee-for-service basis. Hence, each MINSA facility is reimbursed by SIS on the basis of the treatments it provides. Reimbursement rates are calculated based on the variable costs plus a markup, and do not cover medical staff or equipment or infrastructure costs.[6]

Subsequent reforms led to a substantial increase of SIS coverage over time. For instance, in 2012, coverage of children between 0 and 4 years old was about 48 percent, increasing to about 70 percent in 2016[7]. In April 2009, an important reform took place, with two important goals: first, expanding insurance and simultaneously improving selection, and second, enhancing the health care benefits package. This was done mainly by increasing the funding dedicated to SIS and by applying a more strictly eligibility rule including only vulnerable people, based on the so-called 'Household Targeting System' (Sistema de Focalización de Hogares, SISFOH) rules.[8]

The SISFOH is a unified household registry maintained and used to calculate targeting indicators for social programs at the household level. Data were collected mainly during the period 2005-2010, by government officials using a standardized form. It gathered information about housing characteristics, assets, human capital endowments and other factors. An essential tool of the SISFOH is a composite index of economic welfare called Household Targeting Index (Índice de Focalización de Hogares - IFH). This index is computed using a defined algorithm, essentially a weighted sum of characteristics taken from the information gathered and differentiated by geographic area (Metropolitan Lima, urban regions excluding Lima, and rural). Once the index is computed, the outcome is a continuous welfare variable, with low values for households living under poor conditions and higher values if not. A household is eligible for SIS if the index is below a specific geographic threshold.[9]

Initially, the government delayed the use of the index eligibility rule due to financial constraints, and mandated its implementation on a gradual basis beginning at the end of 2010. First, the use of the rule started in Lima and specific districts, and then was gradually extended to the rest of the country during the period 2012 to 2014. At the end of 2014, however, the government passed a new regulation relaxing eligibility for SIS for all pregnant women and children under 5 years of age, regardless of poverty status, which implied that the IFH rule was not longer applicable to this population.[10]

In this paper, we use information from a household survey to recompute the IFH index for the period 2012 to 2014, for which we strictly follow the SISFOH methodology ((SISFOH, 2010)). Appendix G shows descriptive statistics of the simulated IFH, including the complete list of variables, weights and geographic thresholds. Our results indicate that our index is a good instrument for evaluating eligibility. The SISFOH also uses (besides the IFH index) three additional variables to evaluate eligibility: formal labor income, water expenditure and electricity expenditure[11]. If these variables are above specific thresholds, households may become ineligible to SIS. We do not have these variables in the survey, so we cannot directly control for them and we use only the

[6] In addition, the government transfers funds to MINSA to cover fixed costs. See (Francke, 2013) and Appendix F for more detail.

[7] Appendix A shows the evolution of SIS coverage of children and the total population from 2012 to 2016. The coverage of children between 0 and 4 years old is defined as insured children by SIS as a proportion of children population at those ages. Similarly, coverage for the total population is defined as the number of insured individuals as a proportion of the total population.

[8] See Law 29344, Ley Marco de Aseguramiento Universal en Salud, for details about the reform; and (SISFOH, 2010), Law 29626, Decreto de Urgencia 048-2010 and Resolución Jefatural 063-2011/SIS for specific regulations that mandate to use SISFOH's rules for eligibility to SIS.

[9] Before the reform established by the Law 29344, eligibility for SIS was based on another rule, the so-called 'Household Welfare Index' (Índice de Bienestar de Hogares, IBEH). However, this criterion was not strictly applied, because information used to construct this index was based on the individual's self-reported socioeconomic status, and therefore, endogenous (Arróspide et al., 2009).

[10] See Decreto Legislativo 1164 and Decreto Supremo 305-2014-EF for specific regulations about the extension of SIS coverage to pregnant women and children under 5 years of age.

[11] (SISFOH, 2010) divides the potential eligible households into independent groups based on availability of information. The first group is composed of households whose labor income is not trackable by authorities because they work in the informal sector. Among these households, it is possible to identify two subgroups: households with available information regarding water and electricity services expenditures, and those without it. For the former subgroup, a household is eligible if the IFH index, water expenditures and electricity expenditures are all below specific thresholds. IFH threshold values are area-specific, water consumption threshold value is about US$8 and electricity threshold value is about US$10. For the group of households without information about services consumption, the IFH index is the only criterion to determine eligibility: a household is eligible if the index is below an specific threshold. The second group is composed of households with observable labor income, that is, those working in the formal sector. The eligibility rule is relatively complex for them. If wages are greater than US$ 600, the household is not eligible for a social program. Otherwise, there are two possible scenarios: if the IFH index is below the threshold, the household is eligible; if the IFH index is above it, they may still be eligible provided that services expenditures fall below their thresholds.

IFH index, which is sufficient for our identification strategy since the index is the main assignment variable to determine eligibility to insurance.

If eligible, individuals can enroll themselves (and their children) into SIS in any health care facility. They are covered as soon as eligibility is confirmed; during our period of analysis (2012 to 2014) often occurs the next day. They are then able to receive the health services that are offered at MINSA facilities and covered by the SIS benefit package. For this reason, we assume that eligibility means coverage.[12]

Importantly, individuals are unaware of the eligibility rules considered by SISFOH: They do not know the variables used for the computation of the IFH index, the weights or the thresholds. SISFOH keeps the index information confidential and only provides the result of the eligibility evaluation to facilities. Hence, we assume that individuals do not have control over the welfare index values or at most, only partial control. The answers supplied by households used in the SISFOH registry were collected before the change in the eligibility rule, so manipulation of the index would be very unlikely. We nevertheless test for manipulation in Section 6.

Since the reform, SIS has offered a very generous package of health care benefits. This package is composed of a basic plan called PEAS and two supplementary plans. The PEAS plan is based on a wide-ranging list of care procedures that both public and private insurance plans must address, including preventive care, obstetric and gynecological care, as well as care related to pediatric conditions. Similar to the change in the eligibility rule, the PEAS plan has been implemented on a gradual basis. Care included in PEAS cannot be subject to exclusions, waiting times or latent periods. Furthermore, there are no co-payments, coinsurance, deductibles, or similar fees. However, PEAS includes limits as to the number of times an individual can receive care; in practice, these limits are offset by the two SIS supplementary plans.[13]

Overall, during our period of analysis, 2012 to 2014, SIS offered a very generous package of benefits. It is estimated that it covers 65 percent of the total disease burden (Francke, 2013).

2.2 The National Sanitary Strategy for Healthy Feeding and Nutrition

An important consideration when attempting to understand the effects of the SIS on child health outcomes are the policies implemented by MINSA through its decentralized public facilities. One important policy is the National Sanitary Strategy for Healthy Feeding and Nutrition (Estrategia Sanitaria de Alimentación y Nutrición Saludable - ESNANS). This policy was developed in 2004 with the objective of improving the nutritional status of the population, but technical implementation started only in 2011, with the approval of the official guidelines (MINSA, 2011b). Importantly for our analysis, the goals include specific targets for the year 2021 related to the reduction of childhood malnutrition, anemia prevalence and childhood overweight and obesity.

According to this policy, to achieve these goals, one important step is to deal with two main challenges: inadequate food consumption and the high prevalence of infectious diseases and parasites. More specifically, in terms of health services, the guidelines highlight the need to increase regular checkups, vaccinations, and iron supplements. In terms of household practices the guidelines highlight the need to promote breastfeeding, improve the quality of the food consumed (reduce consumption of refined carbohydrates while increasing consumption of fiber-rich and iron-rich food), increase physical activity and improve hygiene practices.[14]

ESNANS also includes such key components as the training of health professionals and its goals were consistent with the fiscal policy named "Budget by Results" from the Ministry of Economics and Finance. The latter implies that government institutions receive more funding depending partially on how well they meet these

[12] This assumption is similar to that of Bernal et al. (2017), a very plausible assumption given that enrollment in SIS does not require any payment of fees and can be made rapidly at any facility where care is sought. Regarding how long the eligibility decision is valid and whether un-enrollment is possible, the regulations indicate that, in urban areas, the eligibility evaluation is valid for 3 years, whereas in rural areas is valid for 4 years. Re-enrollment after a year is automatic if individuals are not covered by other health insurance, and exclusion of individuals after a period of enrollment is uncommon. It might occur if individuals ask to be disenrolled, change address or if there is evidence of fraud.

[13] See Bernal et al. (2017) and Decreto Supremo 016-2009/SA for more information about the benefits covered by the "Plan Esencial de Aseguramiento en Salud", PEAS.

[14] These guidelines are complemented by more specific nutritional guidelines (MINSA, 2012c). In these guidelines the focus continues to be on the excessive consumption of carbohydrates (in the form of grains and processed grain products, corn, tubers, beans and legumes), the need to consume more animal based food, and to encourage, and provide training in, breastfeeding and good hygiene habits.

goals. So, importantly for our analysis, MINSA and its healthcare facilities had sufficient resources to provide care services included in the ESNANS policy. Moreover, ESNANS is fully integrated into the SIS supply. As such, hospitals and health providers were fully reimbursed for the provision of such services as growth check-ups, breastfeeding training, deworming treatments, among many others, as explained above. However, some services were free of charge for SIS non-eligible children such as vaccines, which were free for all children during our entire period of analysis (MINSA, 2011a), and iron supplements, which were free for all children under three since December 2012 (MINSA, 2012a).

3 Data

We use cross-sectional data from the Peruvian Demographic and Health Survey (DHS) ("Encuesta Demográfica y de Salud Familiar", ENDES), which is representative at the regional level (INEI, 2014). We use rounds for the years 2012 to 2014, given that the IFH index was a valid instrument for computing eligibility during that period of time. This period also matches the triennial sampling design of the ENDES, so we pool the data for the analysis.

The survey reports detailed health and socioeconomic information of children and fertile age women, and it is representative at the regional level. It includes children's health outcomes, nutritional measurements taken by trained professionals, as well as caregiving and nutritional practices reported by the caregiver, including breastfeeding, diet quality and preventive care for children. It also provides the information necessary to re-compute the IFH index, although it does not include labor income or healthcare expenditures information. Appendix B contains details on the way we define our variables.

The initial sample has 29,295 observations consisting of children 5 years old and under, and their mothers, aged 15 to 49 years. We consider children living in urban areas with information about their nutritional status, diet quality, with complete information for re-computing the welfare index, and those who can be linked to their caregiver's practices and preventive care within the household. We leave out rural areas, because the IFH is constructed differently and we have a much smaller sample size in these areas[15]. We also exclude children living in districts where the "Juntos" cash transfer program started to use the IFH index for the evaluation of eligibility. We do this in order to isolate the effect of SIS instead of having the effect of both interventions[16]. Our final sample contains 12,856 observations.

Table A3 in the Appendix shows the descriptive statistics. We note that, on average, children in our sample are 2 years old, half of them are girls (49 percent), and live in relatively large households with 5.43 members. Mothers are, on average, 30 years old, most of whom have reached a primary and secondary level of education. A large percentage of them are married or cohabiting and the majority are employed. Eligible mothers and children are slightly younger, less educated and report to work a bit less than ineligible ones. This is not surprising, since the SIS program is intended to reach the poor.

Turning to health outcomes, we report that, on average, 9.2 percent of children are found to be with overweight, 2 percent obese and 9.9 percent are found to be stunted. Overweight and obesity are less pronounced among eligible children in comparison to ineligible ones, whereas stunting is more pronounced among eligible children. Focusing on behaviors and nutritional practices reported by their mothers, we observe that, on average, 60 percent reported giving breast milk to children above the median time (from those who are currently giving it). This behavior is slightly more pronounced among eligible mothers as compared to ineligible ones. Regarding diet quality, we observe that average consumption of protein and carbohydrate stands at 87 and 81 percent, respectively; the reported consumption of eligible children being significantly less than that reported for ineligible ones. Section B in the Appendix provides the variable definitions and Tables A3 and A4 show additional descriptive statistics.

[15] In urban areas, the computation of the index uses 14 variables and shows sufficient variability of the index values. In contrast, in rural areas, the computation uses only 7 variables and there is not sufficient variability among households. See Appendix G for more detail.

[16] The Juntos program is a conditional cash transfer program that was initiated in 2005 in 70 districts in Peru and then was gradually expanded up to 1,144 districts in 2014. Since 2012, this program has also used the IFH index in some districts to evaluate eligibility of households. Therefore, we exclude these districts from our analysis.

4 Empirical Strategy

In this paper we study whether coverage of SIS has an impact on children's health outcomes and determine through which mechanisms insurance might be affecting them. Based on the institutional rules in force for the period 2012-2014, a child is eligible for insurance if he/she lives under poor conditions, as measured by the IFH index. Variation in this index around its poverty-threshold provides a natural experiment that randomly assigns child eligibility, which we exploit by implementing a Sharp RDD using the index as the continuous forcing variable as in Bernal et al. (2017). The main assumption is that eligibility implies coverage and, therefore, our estimate of interest is not only the effect of eligibility, but also the potential effect of the insurance coverage.

To implement this strategy, we reconstructed the welfare index at the household level using our data and compared its values to specific poverty-regional thresholds to classify children's households into the eligible or ineligible group. Those children who live in households below the corresponding threshold compose the eligible group (poor) and those who live in households above the threshold compose the ineligible group (non-poor). By comparing the average effect of those just below with that of those just above, we identify the effect of being covered by insurance, so, any difference in the dependent variables between the two groups can be attributable to insurance coverage.

By assuming linearity around the eligibility threshold, we estimate the effects using the Ordinary Least Squares (OLS) estimator with the following equation:

$$Y_{ic} = \beta_0 + \beta_1 elig_{ic} + \beta_2 elig_{ic} * Z_{ic} + \beta_3 Z_{ic} + X_{ic}^{'}\beta + \varphi_c + \epsilon_{ic} \quad (1)$$

where, Y_{ic} represents a vector with the health variables of child i living in cluster c, and Z_{ic} is the welfare index deviated from its respective threshold at a cluster level. The variable $elig_{ic}$ is an eligibility indicator based on the index, which takes the value of 1 when $Z_{ic} \leq 0$ (poor) and 0 otherwise. Therefore, β_1 is our parameter of interest. The control variables are included in the vector X_{ic} and are child's age, mother's age and number of household members. We also include fixed effects by cluster associated to the corresponding geographic IFH thresholds, φ_c, and the error term, ϵ_{ic}.

A key aspect for the success of health insurance is the existence of a health care supply that is both easy access and of good quality. Even though SIS offers a comprehensive package of health care benefits, supply limitations related to the distance to health care facilities can make it such that some services and treatments are not fully available for the insured. It is then an empirical question of how this would affect care consumption and health outcomes. We turn to this question in our analysis by including a variable of distance to primary public health care facilities defined in periods of 30 minutes of travel time using a similar definition estimated by Carrasco-Escobar et al. (2020) at a district level.[17] To capture whether or not the effects change due to accessibility to health care facilities, we use the following equation:

$$\begin{aligned} Y_{ic} = {} & \beta_0 + \beta_1 elig_{ic} + \beta_2 elig_{ic} * Z_{ic} + \beta_3 Z_{ic} + \beta_4 T_{ic} + \beta_5 elig_{ic} * T_{ic} \\ & + \beta_6 Z_{ic} * T_{ic} + \beta_7 T_{ic}^2 + \beta_8 elig_{ic} * T_{ic}^2 + \beta_9 Z_{ic} * T_{ic}^2 + X_{ic}^{'}\beta + \varphi_c + \epsilon_{ic}. \end{aligned} \quad (2)$$

[17] The authors estimate that the Peruvian average travel distance to the nearest primary MINSA health care facility is about 168 minutes, and the median is 126 minutes. However, these values are influenced by extreme observations, which come mainly from rural districts. For this reason, they measure accessibility to facilities in relative terms, according to the location of a district and using the median values as thresholds. For instance, in the Metropolitan area of Lima, the capital of Peru, the median average travel time is about 25 minutes. Thus, all districts in this area whose average travel time is lower than or equal to 25 minutes are classified as districts with high relative accessibility to health care; and, those with an average travel time greater than 25 minutes, are classified as districts with low relative accessibility. The districts located in the rest of the urban areas (excluding Lima) are classified in a similar way, with a median of 49 minutes. We use a similar definition but using a threshold of 30 minutes for all districts in urban areas.

where T_{ic} is a variable of travel time to health care facilities defined in periods of 30 minutes. The effect of insurance for those children with a short travel time (less than 30 minutes) to a health care facility will then be captured by β_1. The change in this effect for every additional 30 minutes of travel time will be captured by β_5. Finally, the potential deceleration in the effect of access to insurance and time travel will be captured by β_8, that is, we account for the fact that an increase in travel time from 30 minutes to 1 hour should have greater effect than from 4 hours to 4.5 hours, for example.

The estimates are very local, in the sense that we run our OLS regressions on children with index values that are within 0.9 index points above or below the respective threshold. This bandwidth size is the median value of the optimal bandwidths for our main variables following Altmejd et al. (2021), which are computed using the methodology of Calonico et al. (2014). See Appendix D.3 for more details.[18]

Our strategy has three assumptions. First, we assume that in the absence of insurance or if insurance would be assigned to all children around the threshold, the conditional expectation of the health outcome would be a smooth function of the forcing variable Z_{ic} around the threshold. Then, β_1 is indeed the effect of insurance. This cannot be tested and is therefore our central assumption. A second assumption is that insurance status is monotone in eligibility. This holds automatically given our sharp RDD, in which changing from a higher to a lower value of IFH than the threshold will directly make a child eligible for insurance. The final assumption is an exclusion restriction, which requires that, in a small bandwidth around the threshold, the mean of the index Z_{ic} must be independent of the outcome, and the error term. This also holds in our analysis, because households cannot manipulate their answers to determine the value of the welfare index. Moreover, answers given to government officials by households were collected before the eligibility rule took place. We nevertheless test for manipulation in section D.3 in the Appendix.

It is worth mentioning that our strategy uses a reduced form analysis and not an IV-regression, which involves a first stage. We assume that all eligible children in our data period have insurance coverage or will have it, a plausible assumption given that enrollment does not require fees, can be done quickly at the health facilities, and administrative data shows a substantial increase in children being covered over time. Consequently, β_1 is not only the effect of becoming eligible due to crossing the threshold, but also the potential effect of insurance coverage. This is as if the first stage is one, which is the case in a sharp RDD (Hahn et al., 2001).[19]

Finally, an important difference between our study and Bernal et al. (2017) is that in our regressions we cannot control for those children who are anyway not eligible and hence not covered by the insurance because of the high water and electricity expenditures of their households, as explained in Section 2. The DHS data we use do not have such information. For this reason, we cannot fully rule out the potential effect of these ineligible children, although the institutional rules indicate that the IFH index is the most important criterion to for evaluating eligibility and we do control for wealth using the index, which would be correlated to these expenditures.

In section 6, we also conduct a sensitivity analysis to assess whether our results are sensitive to particular specifications and whether the identifying assumptions can be supported by additional evidence.

5 Results

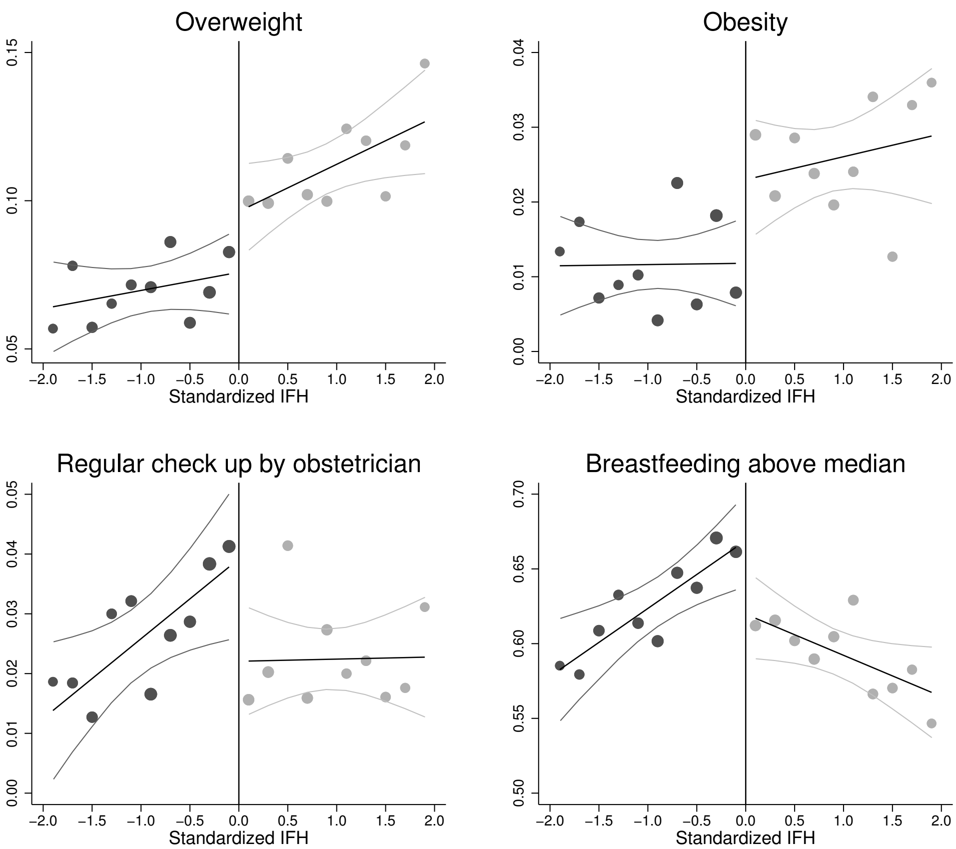
We start by showing the relationship between selected health outcomes and the IFH index around the eligibility threshold. Figure 1 plots the IFH index centered at zero (i.e. the index minus its eligibility threshold), so that values of the x-axis lower than zero belong to poor individuals, i.e. those eligible for the SIS, and values above zero belong to non-poor individuals. The plots show that eligibility for insurance is associated with

[18] The methodology employed by Calonico et al. (2014) makes two corrections compared to parametric methodologies: first, the bias of the estimated coefficient, which arises from the lack of knowledge of the functional form of the data generating process, is corrected; the effect of this first correction is then incorporated to adjust the variance of the estimators.

[19] Alternatively, our estimates can also be interpreted as intent-to-treat (ITT) effects. To see this, note that our effects will also consider the potential null effects for those who wrongly believe that they are not covered (those who never go to any facility but we assume they are eligible). Hence, our results can be interpreted as ITT of the actual effects. For more details see Bernal et al. (2017).

reductions in overweight and childhood obesity, and an increase in regular growth check-up visits and duration of breastfeeding above the median (14 months).[20]

Figure 1: Effects of insurance on child health outcomes and mechanisms



Notes: The dots denote averages for equidistant cells of 0.2 points. The regression lines and the 95% confidence intervals stem from separate linear regressions to the left and to the right of the threshold using the individual-level data. The bandwidth size is 2 points of the running variable in the left side and right side of the cut-off.

Next, Tables 1 and 2 report the effects of eligibility to SIS for three sets of outcomes: nutritional indicators, high-value medical care utilization, and health behaviors. Column 1 shows the overall effects and Column 2 shows the mean outcomes of children in the control group. Since transportation and opportunity costs can attenuate the effects of the health insurance, we then show the estimates for the heterogeneous effects by accessibility to health care facilities, as we describe in equation 2. Column (3) displays the estimates for those children who have a health facility relatively nearby (travel time less than 30 minutes) and Column (4) shows the change in the estimate for every additional 30 minutes of travel time. Column (5) captures the deceleration in the interaction term between access to insurance and travel time, given that an increment in the travel time from half an hour to one hour should have a stronger effect than an increment in the travel time from four hours to four and a half hours. We control for the value of the index, the child's age, the mother's age, the number of household members and a group fixed effects (geographic areas with different thresholds).

Our results in Table 1 indicate that access to SIS improves child nutritional status by reducing the obesity rate by 1.5 percentage points (p.p.). The overweight rate gets also reduced by 2.9 p.p., but this effect is only significant at the 90 percent confidence interval. The estimates are larger (in absolute value) for those children with good access to health care facilities: access to SIS reduces the overweight rate by 4 p.p. and obesity rate by 1.9 p.p., but these effects are less precisely estimated. In contrast, we find no significant effects on other outcomes such as stunting, which is likely to be the result of focusing on urban areas where this

[20]The plots of other health outcomes and mechanisms are shown in the Appendix.

condition is relatively less salient compared, for example, to rural areas.[21] In contrast, child obesity is a core public health problem in urban areas of many low and middle-income countries, which generally results from parental deprivation and has life course consequences on adult health. Therefore, the observed reduction in this condition point towards the expansion of the Peruvian insurance made more salient health information (as a result of accesing health providers), which in turn exerted an effect on the quality of nutrition of children living in more deprived urban areas. Consistently, we document that this effect was stronger among children living close to primary health facilities.

It is worth mentioning that we find no significant effects on other outcomes such as anemia, diarrhea episodes or having fever or cough recently (see Table A5 in the Appendix). It is not surprising that we do not observe any significant discontinuity because such conditions are influenced by other events and circumstances typically that fall outside the scope of the SIS (e.g., access to clean water and adequate sewage might have impact on diarrheal diseases (Clasen et al., 2007)). Furthermore, treatments for some of such conditions were also available for free for ineligible children (e.g., iron supplements).[22]

Table 1: Effect of SIS on child health outcomes

	Overall effects				By travel time (TT) to health care		
	Estimates	Baseline	Model p-values	Adjusted p-values	Eligible (TT<30')	Elig.*TT	Elig.*TT^2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Nutritional indicators							
Overweight	-0.029*	0.102	0.069	0.098	-0.039*	0.001	0.000
	(0.016)				(0.022)	(0.005)	(0.000)
Obesity	-0.015**	0.028	0.049	0.098	-0.019*	0.001	-0.000
	(0.007)				(0.010)	(0.002)	(0.000)
Stunting	0.000	0.095	0.989	0.422	0.007	-0.004	0.000
	(0.017)				(0.021)	(0.005)	(0.000)

Notes: The column *Estimates* reports the estimated coefficient β_1 of equation 1. The column *Baseline* reports the mean of the variable in the control group. The column (4) reports adjusted p-values according to Anderson (2008) for all outcomes listed in Tables 1 and 2. The column *Eligible (TT≤30min)* reports the estimated coefficient β_1 of equation equation 2, the column *Elig*TT* reports the estimated coefficients β_5 and the column *Elig*TT^2* reports the estimated coefficients β_8. All models control for age of mom, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

To shed more light on the underlying mechanisms, Table 2 shows the effects of insurance on health care utilization and behaviors. We start by looking at forms of care utilization focused on children, typically provided by easily accessible health care centers. We find that health insurance coverage has a positive effect on the probability that a child has a growth check-up by an obstetrician in 2.5 p.p., and on the probability of receiving deworming treatment in 6.3 p.p.. In the vast majority of health visits in general, and in growth check-ups in particular, health professionals take the height and the weight of the child. Hence, the information related to nutritional status of the children and ways to improve this are likely one of the most frequent types of information caregivers receive when engaging with a health professional, which in turn might have potential effects on weight and obesity. Similarly, when visiting facilities to have the child receive the deworming treatment, caregivers most likely get the treatment and also information about healthy nutrition.[23] Note that in the case of both check-ups and deworming treatments, the effect is larger (in absolute values) for children with good access to health care facilities.[24] Therefore, the picture that emerges is that SIS exerted an

[21] Moreover, stunting might be the result of cumulative interventions that might reveal effects only in longer periods of time.

[22] Table A5 in the Appendix also shows that access to SIS reduces the weight-for-height score by 0.095 standard deviations, which is consistent with the effect found in the obesity rate, but it is significant only at the 90 percent confidence interval. As before, estimates are larger for those children with good access to health care facilities: reduction tof the weight-for-height score by 0.17 standard deviations. The estimates of the interaction terms between access to insurance and travel time are for the most part not statistically significant, but the point estimates are in the direction we expected.

[23] There is also some evidence that deworming can help reduce the prevalence of obesity through a healthier digestive system (Angeles-Agdeppa and Arias, 2020).

[24] We also find a positive effect on breastfeeding training but it is only marginally significant and not statistically significant for children with good access to health care facilities.

improvement on nutritional health (lower obesity), and especially among children living in the close vicinity of accessible MINSA health care centers. Importantly, such effects are the result of access to preventative health care at a relatively low cost, such as regular check-up visits and deworming treatments, which are services that are free to the insured patients.[25]

In terms of behaviors, we focus on the most recommended healthy practices according to the Peruvian ESNANS analyzed in Section 2. Table 2 first shows a significant increase in the duration of breastfeeding in 6.9 p.p., which is important, because evidence has shown that breastfeeding might prevent the likelihood of child obesity (Victora et al., 2016). Second, we find that access to SIS reduces the probability of the intake of at least one food rich in carbohydrates in 4.5 p.p. and again, the effect is larger (6.9 p.p.) for children living close to health care facilities. We also find an increase in the likelihood of the intake of at least one food rich in proteins in 10 p.p. among children living close to a health center, but we do not observe a significant effect on the consumption of vegetables. These changes in food intake are consistent with the observed reduction on obesity and the nutritional guides of the MINSA described in Section 2, which argue that substitution of carbohydrates for proteins can promote weight loss through an increase in satiation, among other benefits.

Our results are consistent with the effects of the SIS on other variables of utilization found by Neelsen and O'Donnell (2017) and Bernal et al. (2017), but the effect on childhood obesity and the heterogeneous effects of living close to health care centers is novel with respect to these studies. Neelsen and O'Donnell (2017) study the effects of introducing a previous version the SIS benefit plan by means of a differences-in-differences analysis and find positive effects on the likelihood of receiving ambulatory care and medication, but no impact on inpatient care and average out-of-pocket expenditures. The study of Bernal et al. (2017) exploits the same eligibility rule we use in this paper, but only for Lima, the capital of Peru (we instead cover all urban areas), and finds that access to insurance increases the likelihood of doctor visits, medical tests, surgeries, reception of medicines and the out-of-pocket expenditures. These effects are mainly explained by information about health problems that individuals receive when seeing a doctor, which they argue leads to a potentially desirable form of supplier-induced demand: that is, individuals deciding to pay themselves for services that are in short supply at health care centers.[26]

We concur with this argument in the sense that insurance allows caregivers to receive valuable information and increase awareness about health conditions of children. Caregivers receiving child growth check-ups and deworming treatments that are typically provided by easily accessible professionals at health care centers leads to increased knowledge about child health problems and generates changes in behavior: they increase the duration of breastfeeding, and substitute the provision of food rich in carbohydrates for food rich in proteins, which ultimately leads to improvements on nutritional outcomes by reducing childhood obesity. This interpretation is consistent with the notion that access to SIS in Peru might lead not only to a supply-induced demand, but also to a supply-induced behavior.

This explanation is also consistent with the presence of negative behavioral hazards (Baicker et al., 2015). That is, we find that access to insurance allows accesing valuable information from trusted health providers that make more salient the child specific gain of preventive interventions among low income households (i.e. parents aware of the private gain of a preventive visit to a child's health). Hence, our results suggest that SIS seems to shift outwards the demand for some services and behaviors where individuals have a potential marginal gain.

Taken together, our findings also suggest that, in low-income settings such as the one we studied here, insurance expansion can significant improve child health outcomes (e.g. reduction in obesity); both by increasing the utilization of certain high-value preventive care and information (e.g., health growth check-ups and regular weighting) and medical care (e.g., deworming treatments) and, by steering changes in parental behaviors that can impact child nutrition (e.g., more breastfeeding and better diet quality).

[25]We find no significant effects on other forms of preventive care such as vaccines and iron supplements (not shown but available upon request). These results, which were also found by Bernal et al. (2017), are not unexpected, since these services are also free for non-eligible children for most of the time period we analyze.

[26]In addition, Carpio et al. (2021) and Gomez (2018), focusing only on Lima in 2011, find that access to SIS has a positive effect on anemia among children and adult women.

Table 2: Effect of SIS on health care utilization and behaviors

	Overall effects				By travel time (TT) to health care		
	Estimates	Baseline	Model p-values	Adjusted p-values	Eligible (TT<30')	Elig.*TT	Elig.*TT^2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
High-value medical care							
Regular check up by obstetrician	0.025**	0.018	0.031	0.098	0.032*	-0.000	-0.000
	(0.012)				(0.017)	(0.006)	(0.000)
Deworming	0.063***	0.258	0.006	0.065	0.073**	-0.006	0.000
	(0.023)				(0.031)	(0.008)	(0.000)
Mother received breastfeeding training	0.052*	0.559	0.057	0.098	0.049	-0.004	0.000
	(0.027)				(0.037)	(0.009)	(0.000)
Behaviors							
Breastfeeding above median	0.069**	0.610	0.028	0.098	0.071*	-0.003	0.000
	(0.031)				(0.042)	(0.011)	(0.000)
Protein consumption	0.035	0.840	0.289	0.122	0.100**	-0.035***	0.002***
	(0.034)				(0.045)	(0.012)	(0.000)
Carbohydrate-rich food consumption	-0.045*	0.814	0.067	0.098	-0.069**	0.007	-0.000
	(0.025)				(0.033)	(0.008)	(0.000)
Green leafy vegetables consumption	0.003	0.305	0.945	0.422	0.048	-0.025	0.001**
	(0.046)				(0.061)	(0.015)	(0.001)

Notes: The column *Estimates* reports the estimated coefficient β_1 of equation 1. The column *Baseline* reports the mean of the variable in the control group. The column (4) reports adjusted p-values according to Anderson (2008) for all outcomes listed in Tables 1 and 2. The column *Eligible (TT≤30min)* reports the estimated coefficient β_1 of equation equation 2, the column *Elig*TT* reports the estimated coefficients β_5 and the column *Elig*TT^2* reports the estimated coefficients β_8. All models control for age of mom, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

It is worth mentioning that we only document significant effects of SIS on some nutritional outcomes, rather than all possible effects. These results might be explained by different factors. One possibility is the existence of supply limitations and institutional challenges related to transfers of resources to facilities. As Bernal et al. (2017) document, even though SIS offers a comprehensive package of benefits, there were institutional problems at that time that prevented some medicines and treatments from being fully available and free for the insured. In contrast, in our case, the diagnosis of being overweight is relatively costless, simple and requires little equipment and basic skills. Therefore, the supply limitations are unlikely to have a significant impact on the provision of this information. Second, other diagnoses and treatments to be effective might require not only information but further resources, investment, skills or other type of interventions.[27] For example, it is difficult to reduce diarrheal diseases without improvements in sanitation (Clasen et al., 2007), and stunting rates seem to respond to information mostly only when it is complemented with cash transfers (Manley et al., 2020).

6 Robustness Checks

In this section we analyze the robustness of our estimates to different specifications, alongside additional evidence we present to support our assumptions. First, we analyze whether households might have some control over the IFH index and might try to manipulate it to become eligible for the insurance. Second, we test whether eligible children who are eligible only because they have an index value below the threshold are indeed similar to those ineligible children who have a value just above it. We also relax our preferred specification by conducting the analysis without covariates, including mother's education variables and using a more reduced bandwidth size. Third, we explore whether the outcomes jump discontinuously when we change the thresholds.

[27] In addition, medical care fees are only part of the total costs of medical care, which include transportation and opportunity costs (Syed et al. 2013).

6.1 Continuity of the running variable

An important feature of the RD design is the possibility that households manipulate the running variable. A direct consequence of this feature is that the variation in treatment around the threshold is no longer random (Lee and Lemieux (2010)). In our case, this would take place if households had access to information about how the IFH is calculated and attempted to precisely manipulate their answers to qualify for the insurance. However, we believe that manipulation is unlikely for three reasons. First, households do not know precisely how the algorithm behind IFH computation works; they might have access to the methodology in general terms, but understanding it fully is a complex matter. Second, the majority of variables included in the index construction are verifiable by government officials and therefore difficult to manipulate. Third, households' responses employed in the SISFOH registry were collected before the change in the eligibility rule. Therefore, manipulation - if it were to take place at all - would be at most partial, which does not lead to identification problems.

We use the (Cattaneo et al., 2018) test to evaluate whether the density of the running variable is continuous at the eligibility threshold. Figure 4 in the Appendix E.1 presents the results. We do not find evidence for any significant discontinuity around the threshold.

6.2 Control variables, placebos and other specifications

In Section 4, one of our main assumptions is that, in absence of insurance, the outcome is a smooth function of the IFH. This means that eligible children whose IFH value falls just just below the threshold are similar to those ineligible children who have a value just above it. To support this assumption, we further explore whether the expectation of covariates such as child's age, mother's age, and number of household members are continuous functions of the index around the eligibility threshold. We use them as control variables in our main specification. Next, we also test the continuity on other variables such as the mother's level of education in years, her height, whether she is married or cohabiting, and whether she is currently working. Table A7 in the Appendix E.2 summarizes the results. We do not find evidence for any significant discontinuity.

Next, we also explore the sensitivity of our results conducting an analysis of placebo and using other specifications. This is important because it supports the validity of our identification strategy. First, we conduct our analysis using another time period, 2008-2010, when the eligibility rule using the IFH index was nonexistent meaning we should not expect any significant effect of the insurance. Table A8 in the Appendix E.3 reports the results. Our estimates do not suggest any significant discontinuity around the threshold. Therefore, the effects shown in terms of nutritional health measures, duration of breastfeeding, and substitution of carbohydrates for proteins are associated with the implementation of the eligibility rule in the period 2012-2014 using the IFH index.

Next, we run more regressions using other specifications. We start by conducting OLS regressions without covariates to look at whether there is any discontinuity on the outcome variables at all. We then run regressions with additional controls and different bandwidths. Our estimation strategy already uses a very small bandwidth size (0.9 index points), but we conduct an even more local analysis by reducing the bandwidth size to around half. Finally, we relax our linearity assumption by conducting a non-parametric analysis in the form of local polynomial regressions using the same covariates as in our main specification. Table A9 in the Appendix E.4 shows the results. The effects on the obesity rate, growth check-ups, deworming treatment and breastfeeding duration are very robust to different specifications. The reduction in the intake of food rich in carbohydrates remains only for the more local and non-parametric analysis, whereas the increase in the intake of food rich in proteins disappears.

6.3 Changes in the thresholds

Finally, we study whether our main effects are sensitive to potential changes in the threshold. We compute the treatment effect derivatives (TED) suggested by Dong and Lewbel (2015). This analysis helps to estimate the impact on our estimated effects when there is a small discrete change in the thresholds. The sign of the estimates is suggestive of the average effectiveness of SIS eligibility, which can vary if the threshold is marginally changed. We implement this analysis by running an OLS regression using equation 1 and a bandwidth size of 0.9 index points, where β_2 captures the TED. The magnitude and significance of our estimates suggest evidence of stable results. A high TED estimate indicates that slight changes in the running variable greatly affect the results. A positive (negative) and significant TED estimate would mean that the effects of being covered with the insurance by just crossing the threshold on eligible children will be higher (lower) compared to those shown in Tables 1 and 2.

Table A10 in the Appendix E.5 shows the results. As we observe, none of the TED estimates are statistically significant, meaning that all of our results are stable when we change the thresholds.

7 Conclusion

This paper has examined the effect of insurance expansion on child health and related nutritional outcomes (child obesity). We draw on quasi-experimental variation resulting from the eligibility of children to enroll in Peru's Public Social Health Insurance, SIS, targeted to poor households. We document that SIS expansion has given rise to a non-negligible reduction in childhood obesity. This finding is consistent with the evidence of significant and economically relevant effects in high-value preventive health care utilization and behaviors. More specifically, we find that access to SIS increases the probability that a child undergoes a growth check-up and a deworming treatment, alongside the duration of breastfeeding. Furthermore, we find some effects on children diet, namely it reduces the intake of food rich in carbohydrates, and increases the intake of food rich in proteins. Our estimates do not indicate an effect on stunting rates, given that stunting is mainly the result of other cumulative interventions that might reveal effects in the longer term.

Taken together, our findings are consistent with the presence of negative behavioral hazards (Baicker et al., 2015), and we document that insurance expansion changes the demand for types of high-value health care for children that require typically access to a health care provider, and are commonly less salient to households with low levels of income. It is important to take into consideration that these effects are very local and lower bound estimates, as we make the analysis in a small bandwidth around to the threshold and insurance expansion might exhibit longer term effects on other outcomes that are not observed yet. However, our findings also suggest that there are still barriers to fully access to high-value preventive care in lower-income settings, probably due to both financial constraints as well as limited literacy. As we show here, the latter can be reduced by improving the access to highly trusted health providers that make more salient the gain of preventive interventions (i.e. parents aware of the private gain of a preventive intervention to a child's health).

Finally, our study suggests two important potential policy implications. First, the evidence points to the relative success of SIS in comparison to insurance expansions in other countries, where very limited evidence has been established on effects in child health outcomes. The success of SIS compared to other insurance expansion programs may be attributed to the institutional design of the health insurance system. Indeed, the take up of SIS was designed to be extremely convenient for patients and to avoid common hassle costs of other insurance designs: enrollment happens directly in the health center, and is typically confirmed within one day. Moreover, it does not require the upfront payment of premiums and it does not work with reimbursement mechanisms, which reduces the barriers related to liquidity constraints. A second important policy implication is that insurance expansion only impact on a few health related child nutritional outcomes. Improving other outcomes might need other types of interventions, including improvements in health infrastructure to reduce the transaction costs of accessing health care, as well as other interventions addressing pockets of poverty and depreviation.

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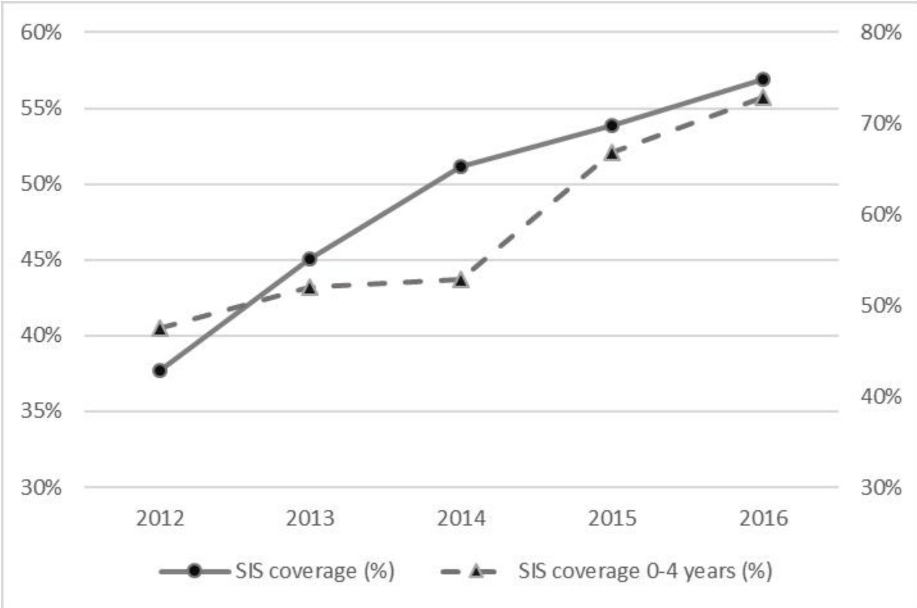
Appendix

A Coverage of SIS

Figure 2: Percentage of total population and children population covered by SIS 2012-2016



Source: SIS website, available in http://www.sis.gob.pe/Portal/estadisticas/Estadistica.
Note: SIS coverage is defined as enrolled individuals as a proportion of total population, and SIS coverage 0-4 years as a proportion of population of children between 0 and 4 years old.

B Variable dictionary

Table A1: Dictionary

Variable	Definition
Nutritional indicators	
Overweight*	Dichotomous. Takes the value of 1 if the standardized weight-for-height is above 2 SD of the WHO growth standards, and 0 otherwise (WHO, 2006).
Obesity	Dichotomous. Severe overweight. Takes the value of 1 if the standardized weight-for-height is above 3 SD from the WHO growth standards, and 0 otherwise (De Onis and Lobstein, 2010; WHO, 2006, 2008).
Stunting*	Dichotomous. Takes the value of 1 if the standardized height-for-age is below 2 SD of the WHO growth standards, and 0 otherwise (WHO, 2006).
High-value medical care	
Regular check up by obstetrician	It takes the value of one if the growth and development control that the child received during the first month of birth was done by the obstetrician, and 0 otherwise.
Deworming	Dichotomous. Takes the value of 1 if the mother reported that the child took any deworming medicine during the past year, and 0 otherwise.
Child's mother received breastfeeding training during pregnancy	It takes the value of 1 if the mother received some training about breastfeeding during pregnancy, and 0 otherwise.
Behaviors	
Breastfeeding duration above median	Dichotomous. Takes the value of 1 if the total breastfeeding months are above the median level of the main sample for each year (11 months in 2012, 13 in 2013 and 14 in 2014), and 0 otherwise.
Protein consumption	Dichotomous. Takes the value of 1 if the mother reported giving the child at least 2 out of the 4 animal protein food groups in the last 24 hours, and 0 otherwise. Protein food groups considered are: 1) dairy products, 2) meat and 3) eggs 4) breastmilk. Subsample of the youngest children between 6 and 24 months of age.
Carbohydrate- rich food consumption (given to child 6-36 m.)	Dichotomous. Takes the value of 1 if the mother reported giving the child at least 1 of 4 carbohydrate-rich product groups. Carbohydrate-rich products considered: 1) cereals 2) bread, noodles, other made from grains 3) tubers 4) porridge from social programs.Subsample of the youngest children between 0 and 36 months of age.
Green leafy vegetable consumption	Dichotomous. Takes the value of 1 if the mother reported giving the child any dark green leafy vegetables. Subsample of the youngest children between 6 and 24 months of age.

Notes: Missing cases are not taken into account in the calculations.
* Coded according to the "Guide to DHS Statistics (version 2)" (Trevor Croft et al., 2020).

Table A2: Dictionary (continued)

Variable	Definition
Other health indicators	
Weight for age zscore*	Continuous, in standard deviations. Weight-for-age standardized according to the WHO growth standards (WHO, 2006).
Height for age zscore*	Continuous, in standard deviations. Height-for-age standardized according to the WHO growth standards (WHO, 2006).
Anemia*	Dichotomous. Takes the value of 1 if the altitude-adjusted hemoglobin count is less than 11 grams per deciliter (g/dl), and 0 otherwise.
Had diarrhea recently*	Dichotomous. Takes the value of 1 if the child had diarrhea in the 2 weeks preceding the survey, and 0 otherwise.
Had fever or cough recently	Dichotomous. Takes the value of 1 if the child had fever or cough in the 2 weeks preceding the survey, and 0 otherwise.
Other medical care and behaviors	
Regular check up by other health professionals	It takes the value of one if the growth and development control that the child received during the first month of birth was done by other health professionals, and 0 otherwise.
Exclusive breastfeeding (given to child 0-6 m.)*	Dichotomous. Takes the value of 1 if the mother reported the child is being exclusively breastfed, and 0 otherwise. Subsample of the youngest children under 6 months of age.
Handwashing before handling food or feeding the child	Dichotomous. Takes the value of 1 if the mother washes her hands before handling food or feeding the child, and 0 otherwise. Mother-level variable.
Water treatment: boil or add bleach/chlorine	Dichotomous. Takes the value of 1 if the mother boils the water or adds chlorine before the child drinks it. Mother-level variable.
Other variables	
Child's age in completed years	Discrete. Exact age of the child.
Child is female	Dichotomous. Takes value of 1 if the child is female, and 0 otherwise.
Mother's current age	Discrete. Exact age of the mother.
Mother is married or cohabiting	Dichotomous. Takes the value of 1 if the mother is married or cohabiting, and 0 otherwise.
Mother's education years	Discrete. Number of completed years of education.
Mother is currently working	Dichotomous. Takes the value of 1 if the mother is currently working, and 0 otherwise.
Mother's height	Continuous. Mother's height in meters.
Household head's age	Discrete. Exact age of the household head.
Household head's highest education level	Discrete. Highest educational level of the household head.
Number of members in the household	Discrete. Total number of household members.
Travelling hours to a primary health center	Continuous. Total travel hours to the nearest primary health center.

C Descriptive statistics

Table A3: Descriptive statistics

	Total sample	Eligible	Ineligible	Difference	N. Obs.
Nutritional indicators					
Overweight	0.092	0.064	0.117	-0.053***	4,961
	(0.003)	(0.003)	(0.004)	(0.005)	
Obesity	0.020	0.010	0.028	-0.017***	4,961
	(0.001)	(0.001)	(0.002)	(0.002)	
Stunting	0.099	0.145	0.060	0.086***	4,961
	(0.003)	(0.005)	(0.003)	(0.005)	
High-value medical care					
Regular check up by obstetrician	0.024	0.027	0.023	0.004	3,062
	(0.002)	(0.003)	(0.002)	(0.004)	
Deworming	0.284	0.326	0.249	0.077***	5,032
	(0.004)	(0.006)	(0.005)	(0.008)	
Mother received breastfeeding training	0.573	0.562	0.582	-0.021**	5,032
	(0.004)	(0.006)	(0.006)	(0.009)	
Behaviors					
Breastfeeding above median	0.597	0.625	0.574	0.051***	3,732
	(0.005)	(0.007)	(0.007)	(0.010)	
Protein consumption	0.868	0.853	0.882	-0.029***	1,563
	(0.005)	(0.008)	(0.007)	(0.011)	
Carbohydrate-rich food consumption	0.807	0.802	0.811	-0.009	2,904
	(0.005)	(0.007)	(0.006)	(0.009)	
Green leafy vegetables consumption	0.293	0.244	0.336	-0.092***	1,563
	(0.007)	(0.010)	(0.010)	(0.014)	

Table A4: Descriptive statistics (continued)

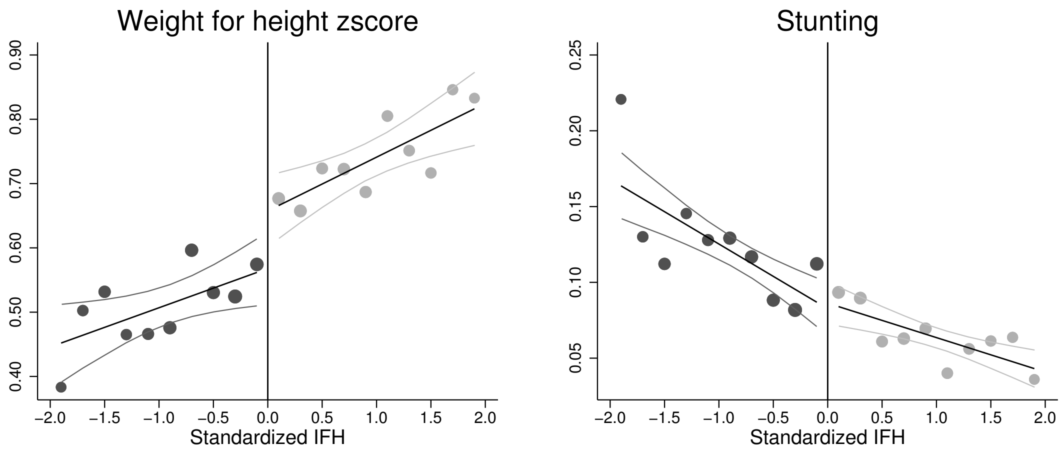
	Total sample	Eligible	Ineligible	Difference	N. Obs.
Other health indicators					
Weight for height zscore	0.624	0.468	0.758	-0.290***	4,961
	(0.009)	(0.013)	(0.013)	(0.018)	
Height for age zscore	-0.727	-0.976	-0.516	-0.460***	4,961
	(0.009)	(0.013)	(0.012)	(0.018)	
Anemia	0.327	0.382	0.280	0.102***	4,427
	(0.004)	(0.007)	(0.006)	(0.009)	
Had diarrhea recently	0.123	0.144	0.105	0.039***	5,024
	(0.003)	(0.005)	(0.004)	(0.006)	
Had fever or cough recently	0.404	0.430	0.382	0.049***	5,027
	(0.004)	(0.006)	(0.006)	(0.009)	
Other medical care and behaviors					
Regular check up by other health professionals	0.980	0.978	0.981	-0.003	3,062
	(0.002)	(0.002)	(0.002)	(0.003)	
Exclusive breastfeeding	0.636	0.691	0.588	0.104***	457
	(0.014)	(0.020)	(0.020)	(0.028)	
Handwashing before handling food/feeding child	0.793	0.805	0.782	0.023***	5,035
	(0.004)	(0.005)	(0.005)	(0.007)	
Water treatment: boil or add bleach/chlorine	0.772	0.684	0.846	-0.162***	5,035
	(0.004)	(0.006)	(0.004)	(0.007)	
Other variables					
Child's age in completed years	2.002	1.988	2.015	-0.027	5,035
	(0.012)	(0.018)	(0.017)	(0.025)	
Child is female	0.489	0.488	0.491	-0.003	5,035
	(0.004)	(0.007)	(0.006)	(0.009)	
Mother's current age	29.802	28.852	30.602	-1.750***	5,035
	(0.060)	(0.089)	(0.081)	(0.120)	
Mother is married or cohabiting	0.838	0.837	0.839	-0.002	5,035
	(0.003)	(0.005)	(0.004)	(0.007)	
Mother's education years	10.808	9.244	12.124	-2.880***	5,024
	(0.031)	(0.043)	(0.036)	(0.056)	
Mother is currently working	0.534	0.494	0.569	-0.075***	5,035
	(0.004)	(0.007)	(0.006)	(0.009)	
Mother's height	1.525	1.515	1.533	-0.018***	4,932
	(0.000)	(0.001)	(0.001)	(0.001)	
Household head's age	41.555	39.468	43.312	-3.845***	5,035
	(0.118)	(0.168)	(0.162)	(0.234)	
Household head's highest education level	2.073	1.781	2.318	-0.537***	5,035
	(0.007)	(0.009)	(0.008)	(0.012)	
Number of members in the household	5.429	5.463	5.400	0.063*	5,035
	(0.019)	(0.028)	(0.025)	(0.038)	
Travelling hours to a primary health center	2.020	2.355	1.738	0.617***	5,035
	(0.023)	(0.038)	(0.028)	(0.047)	

D Complementary Regression Discontinuity results

D.1 Other regression discontinuity graphs

In this section we plot the relationship between selected health outcomes and the IFH index around the eligibility threshold using DHS data from 2012 to 2014. Recall that higher values of the index indicate a higher level of welfare. The Figure 3 plots the IFH index centered at zero (i.e. the index minus its eligibility threshold), so that values of the x-axis lower than zero indicate poverty, i.e. eligibility to the SIS, which is why we expect a jump at zero. The plots of all the rest of outcomes and mechanisms are available upon request.

Figure 3: Effects of insurance on other child health outcomes



Notes: The dots denote averages for equidistant cells of 0.2 points. The regression lines and the 95% confidence intervals stem from separate linear regressions to the left and to the right of the threshold using the individual-level data. The bandwidth size is 2 points of the running variable in the left side and right side of the cut-off.

D.2 Other regression discontinuity results

Table A5: Effect of insurance on other child health outcomes and mechanisms

	Overall effects		By travel time (TT) to health care		
	Estimates	Baseline	Eligible (TT<30')	Elig.*TT	Elig.*TT^2
	(1)	(2)	(5)	(6)	(7)
Other health indicators					
Weight for height zscore	-0.095*	0.666	-0.171**	0.032*	-0.001
	(0.056)		(0.077)	(0.019)	(0.001)
Height for age zscore	-0.010	-0.723	-0.045	0.007	0.000
	(0.054)		(0.071)	(0.018)	(0.001)
Anemia	0.038	0.331	0.030	0.000	0.000
	(0.027)		(0.035)	(0.009)	(0.000)
Had diarrhea recently	0.005	0.112	-0.012	0.006	-0.000
	(0.018)		(0.023)	(0.005)	(0.000)
Had fever or cough recently	-0.020	0.410	-0.047	0.013	-0.000
	(0.027)		(0.037)	(0.009)	(0.000)
Other medical care and behaviors					
Regular check-up by other health professionals	-0.017	0.984	-0.013	-0.003	0.000
	(0.011)		(0.015)	(0.005)	(0.000)
Exclusive breastfeeding	-0.022	0.603	0.197	-0.078*	0.002
	(0.087)		(0.130)	(0.042)	(0.002)
Handwashing before handling food/feeding child	-0.009	0.809	0.005	-0.004	0.000
	(0.022)		(0.029)	(0.007)	(0.000)
Water treatment: boil or add bleach/chlorine	-0.018	0.794	-0.024	0.005	-0.000
	(0.021)		(0.027)	(0.008)	(0.000)

Notes: The column *Estimates* reports the estimated coefficient β_1 of equation 1. The column *Baseline* reports the mean of the variable in the control group. The column *Eligible (TT≤30min)* reports the estimated coefficient β_1 of equation equation 2, the column *Elig*TT* reports the estimated coefficients $\beta_5$and the column *Elig*TT^2* reports the estimated coefficients β_8 . All models control for age of mother, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

D.3 Optimal bandwidths

Table A6: Optimal bandwidths for child health outcomes

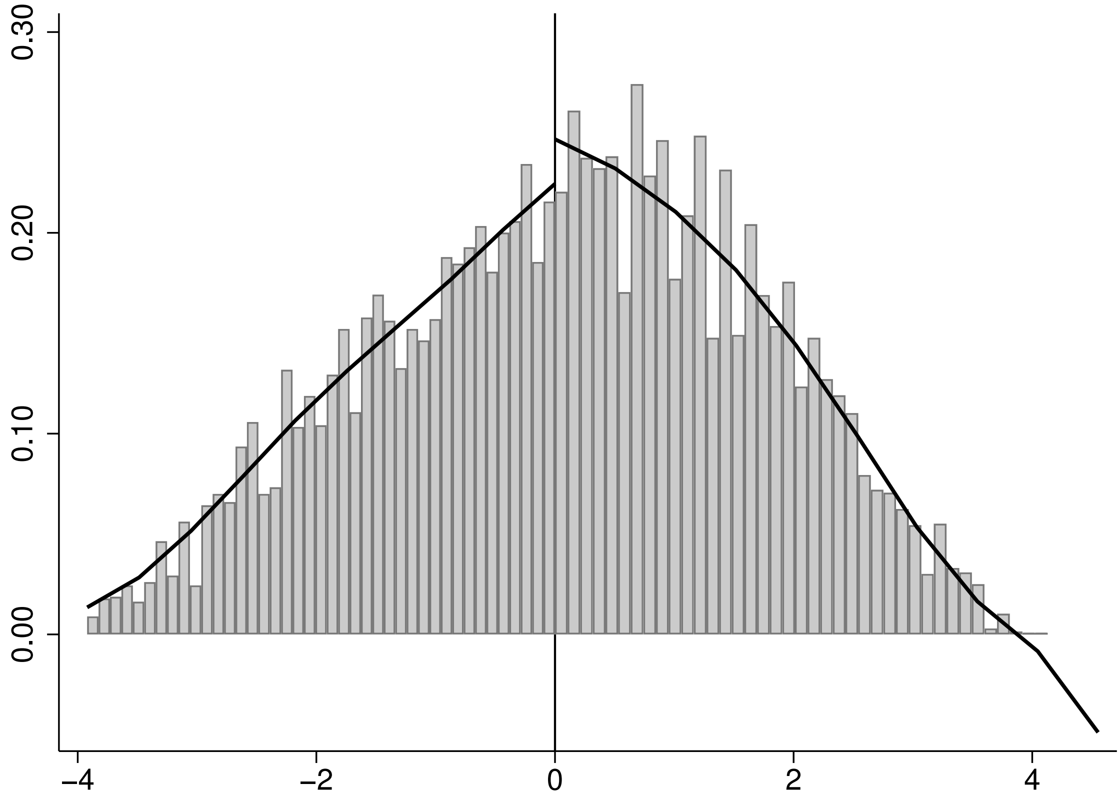
	Bandwidth size	
	Left side	Right side
Nutritional indicators		
Overweight	1.299	0.795
Obesity	0.971	0.925
Stunting	0.948	1.101
Other health indicators		
Weight for height zscore	1.198	0.842
Height for age zscore	1.207	0.954
Anemia	0.72	0.745
Had diarrhea recently	0.894	0.894
Had fever or cough recently	0.968	0.846

Notes: Optimal MSE bandwidths at each side of the threshold, following Calonico et al. (2014) with a uniform kernel distribution. Sample of children under 5 years old from the ENDES 2012-2014, with health information, whose household's IFH could be re-computed and living in urban districts that had not been reached by the program Juntos.

E Robustness check results

E.1 Continuity of the running variable

Figure 4: RD Density test



Notes: Continuity test based on Calonico et al. (2014).The figure shows a local estimation of the discontinuity of the recomputed IFH index density around the threshold using the optimal bandwidth size and uniform kernel distribution. No significant discontinuity is found (P-value is 0.2026). The sample used is made up of children under 5 years of age from the ENDES 2012-2014, with health information, who live in urban districts and not reached by the Juntos program.

E.2 Discontinuity on observable variables

Table A7: Effect of SIS on observable variables

	Overall Effects	
	Estimates	Baseline
Child's age in completed years	-0.017	2.002
	(0.079)	(0.027)
Child is female	-0.027	0.503
	(0.028)	(0.010)
Mother's current age	0.028	29.813
	(0.377)	(0.128)
Mother is married or cohabiting	0.011	0.832
	(0.020)	(0.007)
Mother's education years	-0.127	11.015
	(0.170)	(0.058)
Mother is currently working	0.007	0.521
	(0.028)	(0.010)
Mother's height	0.002	1.525
	(0.003)	(0.001)
Household head's age	-0.377	41.626
	(0.730)	(0.254)
Household head's highest education level	-0.031	2.093
	(0.039)	(0.014)
Number of members in the household	0.051	5.390
	(0.114)	(0.040)

Notes: The column *Estimates* reports the estimated coefficient β_1 of equation 1. The column *Baseline* reports the mean of the variable in the control group. All models control for age of mom, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. The sample used is made up of children under 5 years of age from the ENDES 2012-2014, with health information, who live in urban districts and not reached by the Juntos program. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

E.3 Analysis of placebo with DHS sample 2008-2010

Table A8: Effect of SIS on child health outcomes and mechanisms with DHS sample 2008-2010

	Overall Effects		Obs.
	Estimates	Baseline	
Nutritional indicators			
Overweight	-0.017	0.123	4,337
	(0.018)	(0.007)	
Obesity	-0.009	0.024	4,337
	(0.008)	(0.003)	
Stunting	0.013	0.098	4,337
	(0.019)	(0.006)	
High-value medical care			
Regular check up by obstetrician	-0.021	0.037	2,819
	(0.029)	(0.010)	
Deworming	-0.010	0.240	4,642
	(0.023)	(0.009)	
Mother received breastfeeding training	0.000	0.542	4,642
	(0.029)	(0.010)	
Behaviors			
Breastfeeding above median	-0.000	0.611	3,513
	(0.032)	(0.012)	
Protein consumption	-0.001	0.879	1,504
	(0.034)	(0.012)	
Carbohydrate-rich food consumption	-0.022	0.824	2,700
	(0.026)	(0.010)	
Green leafy vegetables consumption	0.035	0.304	1,504
	(0.046)	(0.017)	

Notes: The column *Estimates* reports the estimated coefficient β_1 of equation 1. The column *Baseline* reports the mean of the variable in the control group. All model controls for age of mom, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. The sample used is made up of children under 5 years of age from the ENDES 2008-2010, with health information, who live in urban districts and not reached by the Juntos program. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

E.4 Alternative specifications

Table A9: Effect of SIS on child health outcomes and mechanisms using other specifications

	(1)	(2)	(3)	(4)	(5)
	No controls	With additional education controls	With additional employment control	With bandwidth of 0.5	Non-parametric regressions
Nutritional indicators					
Overweight	-0.029*	-0.029*	-0.029*	-0.012	-0.020
	(0.016)	(0.016)	(0.016)	(0.020)	(0.018)
Obesity	-0.015**	-0.015**	-0.015**	-0.017*	-0.017**
	(0.007)	(0.007)	(0.007)	(0.009)	(0.008)
Stunting	0.001	0.000	0.000	0.021	0.004
	(0.017)	(0.017)	(0.017)	(0.023)	(0.020)
High-value medical care					
Regular check up by obstetrician	0.025**	0.025**	0.025**	0.036**	0.029**
	(0.012)	(0.012)	(0.012)	(0.018)	(0.014)
Deworming	0.062**	0.065***	0.063***	0.085***	0.079***
	(0.025)	(0.023)	(0.023)	(0.032)	(0.028)
Mother received breastfeeding training	0.052*	0.052*	0.052*	0.084**	0.089**
	(0.027)	(0.027)	(0.027)	(0.037)	(0.039)
Behaviors					
Breastfeeding above median	0.067**	0.069**	0.068**	0.105**	0.093**
	(0.031)	(0.031)	(0.031)	(0.042)	(0.037)
Protein consumption	0.033	0.036	0.035	0.058	0.043
	(0.034)	(0.034)	(0.034)	(0.046)	(0.041)
Carbohydrate-rich food consumption	-0.027	-0.045*	-0.046*	-0.083**	-0.068**
	(0.029)	(0.025)	(0.025)	(0.034)	(0.031)
Green leafy vegetables consumption	0.003	0.004	0.002	0.053	0.042
	(0.046)	(0.046)	(0.046)	(0.062)	(0.058)

Notes: The column (1) reports the estimated coefficient β_1 of equation 1 without controls and only fixed effects. The column (2) reports the estimated coefficient β_1 of equation 1 with additional mother education controls and fixed effects. The column (3) reports the estimated coefficient β_1 of equation 1 with additional mother employment controls and fixed effects. The column (4) reports the estimated coefficient β_1 of equation 1 using bandwidth of 0.5 points with standard controls and fixed effects. The column (5) reports the estimated coefficient β_1 of equation 1 using non-parametric estimation following Calonico et al. (2014) with triangular kernel and optimal bandwidths at each side of the cut-off. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

E.5 Treatment Effect Derivative

Table A10: Treatment Effect Derivative of SIS on child health outcomes and mechanisms

	Overall Effects		TED
	Estimates	Baseline	
Nutritional indicators			
Overweight	-0.029*	0.102	-0.008
	(0.016)		(0.030)
Obesity	-0.015**	0.028	0.007
	(0.007)		(0.013)
Stunting	0.000	0.095	0.031
	(0.017)		(0.032)
High-value medical care			
Regular check up by obstetrician	0.025**	0.018	0.019
	(0.012)		(0.023)
Deworming	0.063***	0.258	0.044
	(0.023)		(0.045)
Mother received breastfeeding training	0.052*	0.559	0.057
	(0.027)		(0.054)
Behaviors			
Breastfeeding above median	0.069**	0.610	0.044
	(0.031)		(0.060)
Protein consumption	0.035	0.840	-0.092
	(0.034)		(0.065)
Carbohydrate-rich food consumption	-0.045*	0.814	-0.003
	(0.025)		(0.049)
Green leafy vegetables consumption	0.003	0.305	0.048
	(0.046)		(0.090)

Notes: The columns TED report the estimated coefficient β_2 of equation 1. All model controls for age of mom, household size, complete age of child in completed years and fixed effects, and use a bandwidth of 0.9 points. The sample used is made up of children under 5 years of age from the ENDES 2008-2010, with health information, who live in urban districts and not reached by the Juntos program. Robust standard errors are in parentheses. *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$.

F SIS service coverage

F.1 Essential Health Care Plan

The Essential Health Care Plan includes healthcare interventions for all the life-cycle (MINSA, 2009b). Here, we list the ones related to children's health. This include: obstetric, newborn and childhood conditions, as well as health promotion interventions. It includes diagnosis, treatment and follow-up of the conditions.

Obstetric conditions

1. Pregnancy diagnosis, in addition to related follow-up healthcare services.
2. Pregnancy complications, such as trophoblast disease, ectopic pregnancy, bleeding, gestational diabetes, infections, among others.
3. Child delivery, in addition to related preventive, diagnosis and follow-up healthcare services.
4. Delivery complications, such as bleeding, prolonged labor, infections, among others.
5. Puerperium complications, such as infections, inflammation, mastitis, among others.

Newborn conditions

1. Newborn complications from delivery, such as bleeding, fracture, Erb paralysis, among others.
2. Newborn complications from maternal conditions, such as consequences of maternal hypertension, early rupture of membranes, maternal diabetes, among others.
3. Low birth weight and prematurity, including diagnosis, treatment, follow-up and rehabilitation.
4. Newborn infections, metabolic conditions, newborn jaundice, breathing difficulties, among others.

Childhood conditions

1. Acute respiratory infection, with and without complications including whooping cough, pneumonia, bronchitis, lung abscess, among others.
2. Immunization against measles, mumps, rubella, DPT, hepatitis B, BGC, polio, yellow fever and other immunizations against bacterial conditions.
3. Intestinal parasites, undernourishment, nutritional anemia, fever, seizures, hydrocephalus, cleft palate and diarrhea.

F.2 Nutritional counseling

It is a transversal activity for the trained health personnel who interact with pregnant women and children's caregivers, where they give information about the importance of the child's adequate growth, its consequences and how to improve it (MINSA, 2009a). The counseling is given whenever the child's caregiver interacts with the health system, such as when the mother goes to her prenatal controls or when the child is taken for its growth check-ups, vaccinations or to the health center due to illness.

If the child's nutritional state is adequate, the trained health personnel will congratulate the caregiver and encourage him or her to continue with adequate nutritional practices. If the child's nutritional state is inadequate, the health personnel will explain the situation to the caregiver, analyze its possible causes and provide solutions to improve the child's nutrition.

The recommended solutions can include, for example, new forms of food preparation or including other food groups in the child's diet. These recommendations are specific for different age groups and life stages:

1. Nutrition during pregnancy and breastfeeding: Adding a snack to the usual three meals a day, having at least one portion of eggs, meat or cheese every day, eating iron-rich food, consuming vitamin A and C, and taking iron and folic acid supplements.
2. Exclusive breastfeeding practices for children up to 6 months old: Breastfeeding the child as soon as possible, preferably within the first hour of birth, for at least 8 times a day and increasing by demand as the child grows older, do not give the child water or other food within the first 6 months.
3. Complementary feeding from 6 to 11 months old: continue breastfeeding, introducing solid foods gradually to the child, starting with pureed and mashed semi-solid foods and moving onto sliced solid foods from 9 months old, and introducing variety in the child's diet with all the recommended food groups (cereals, tubers, proteins, fruits and vegetables). It also includes supplementing nutrition with iron and vitamin A supplements.
4. Childhood nutrition from 1 to 5 years old: continue breastfeeding when the child demands it, giving the child solid foods and progressively including him into the family diet with all the recommended food groups (cereals, tubers, proteins, fruits and vegetables), coin. It also includes supplementing nutrition with iron and vitamin A supplements up to 23 months old.

F.3 Food preparation lessons

These sessions are aimed at pregnant women, women in the puerperium, and caregivers of children under three years of age (MINSA, 2012b). The sessions are free and the selection of participants is carried out by the health facility. First, all children younger than three and pregnant women whose healthcare services are the responsibility of the health facility are listed. Then, their mothers, fathers or caregivers are identified, and invitations are sent to between 6 and 15 people. In exceptional cases, community leaders and members of popular dining rooms can assist to the lessons.

The sessions aim to teach the caregivers to combine food according to the nutritional needs of their children. Trained health personnel guide the session, which is carried out using the "learning by doing" methodology, which requires small groups. One meal per group is prepared, which can be adequate for infants from 6 to 8 months old, from 9 to 11 months old, for children older than one year and for pregnant or recent mothers.

The recipes for the meals being demostrated are also provided, which privilege nutritious food available in the community. In addition, food safety measures are indicated, such as hand washing, the correct cooking of food, among others. The schedule contemplates a total duration of the session of between 50 to 75 minutes.

G IFH Construction

The calculation of the IFH and the eligibility condition are based on the information provided by the Peruvian DHS and the methodology of the IFH computation (Ministerial Decree N° 320-2010-PCM, 2010). It was carried out in three stages: i) definition and cleaning of variables, ii) score assignment and iii) eligibility condition of the household.

G.1 Definition and cleaning of variables

The variables that make up the IFH vary according to the area of residence, which, for the purposes of the methodology, are three: Metropolitan Lima, urban areas (without Metropolitan Lima) and rural areas. The first step in the reconstruction of the IFH was to locate the respective variables according to this division in the ENDES, as shown in the following table:

Table A11: IFH components by zone

Variable	Capital	Urban	Rural
Fuel type	x	x	x
Number of health insurance affiliates	x	x	x
Assets of wealth	x	x	x
Education of the head of household	x	x	x
Water supply	x	x	
Wall material	x	x	
Drain supply	x	x	
Roof material	x	x	
Floor material	x	x	
Has phone	x		
Overcrowding	x		
Highest educational level at home			x
Has electricity			x
Dirt floor			x

Source: Methodology of the IFH computation (Presidency of the Council of Ministers, 2010). Own elaboration.

Before computing the household's IFH, two filters are used to identify ineligible households: 1) if the monthly household income is greater than 1,500 soles, or 2) if the monthly water and electricity household consumption is over 20 and 25 soles. In either case, the household is automatically classified as "Not poor"; therefore, it is not eligible according to the methodology. The Peruvian DHS does not provide information on income or service expenses, so the IFH was calculated for all households without considering these variables.

G.2 Score assignment

Characteristics related to lower living standards are assigned lower scores, but the same characteristics have different scores depending on the geographic zone the household is located. Next, we show an example for urban areas of possible scores for the variable "type of fuel used in the household". The rest of the scores are available in the methodology.

Table A12: Score assignment by type of fuel in the household

Variable	Capital	Urban
They don not cook	-0.49	-0.67
Other	-0.40	-0.50
Firewood	-0.37	-0.33
Coal	-0.33	-0.22
Kerosene	-0.29	-0.19
Gas	0.02	0.12
Electricity	0.43	0.69

Source: Methodology of the IFH computation (Presidency of the Council of Ministers, 2010). Own elaboration.

G.3 Eligibility condition of the household

The final score for each household is the sum of the scores assigned to each household characteristic. Then, the eligibility condition is determined according to cut-off points established at the level of 15 clusters, which group districts with similar characteristics. If the household has a score lower than the cut-off threshold of its cluster, it is classified as a household in a situation of poverty, and, therefore, it is considered eligible for the SIS.

The following table shows descriptive statistics of the eligibility condition and score assigned for the households of the children with health information and of the mother from the ENDES 2012-2014. That is, those who lived at home and whose mother answered the specific interview for women of childbearing age.

Table A13: Descriptive statistics of applying the IFH methodology to the DHS 2012-2014

Statistic	Capital	Urban
IFH Index		
Mean	-0.31	0.13
Standard deviation	1.42	1.52
Minimum	-4.73	-4.29
Maximum	2.74	4.07
Median	-0.12	0.14
Eligibility condition of households		
Share of eligible	0.49	0.47
Total of eligible	912	5,259
Total of non-eligible	947	5,719

Source: Peruvian DHS 2012-2014. Own elaboration.

These statistics are at the household level, while the analysis in this paper is carried out at the individual (child) level. Likewise, the proportion of eligible households should not be interpreted as the incidence of poverty in Peru, mainly, for three reasons. First, the IFH is not a formal measure of poverty levels, but an approximation of the living conditions of households. Second, the cut-off thresholds were estimated through an optimization process that weights inclusion and exclusion errors. Given the practical uses of the IFH, this process places greater importance on minimizing the exclusion error, subject to a maximum cost of increasing the marginal error. Third, the Peruvian DHS is a representative sample at the level of children under 5 years of age and women of childbearing age, so it is not representative for all peruvian households.