HEALTH INSURANCE AND CHILD HEALTH: EVIDENCE FROM MEXICO

Gabriella Conti* Rita Ginja‡

December 19, 2016

Abstract

We present the first comprehensive evidence on the health impacts and mechanisms of a large expansion in non-contributory health insurance in Mexico. As source of identifying variation, we exploit the staggered rollout of Seguro Popular across municipalities over the years 2002-2010, which provided access to health services without co-pays. Our intent-to-treat estimates show that SP reduced child mortality by 7% in poor municipalities, saving 783 children per year. The decline is driven mainly by deaths due to preventable causes, such as diarrhea and respiratory infections. In the same municipalities, we document an increase in the use of hospital care of 9% for children under 5 years old, also driven by admissions due to diarrhea and respiratory infections.

JEL Codes: H10, I12, I13, J13, O18.
Keywords: Health Insurance, Child Mortality, Health Care Utilization, Mexico.

*University College London, Department of Economics, Drayton House, 30 Gordon Street, London WC1H 0AX, United Kingdom. Tel.:+(0)2076794696. Email: gabriella.conti@ucl.ac.uk.

†Uppsala University, Department of Economics, Box 513 SE-751 20, Uppsala, Sweden. Tel.: +46(0)18 471 15 91. Email: rita.ginja@nek.uu.se.

‡We thank Nelly Aguilera, Douglas Almond, Orazio Attanasio, Sandra Black, Richard Blundell, Pedro Carneiro, Janet Currie, Alberto Diaz-Cayeros, James Heckman, Victor Lavy, Costas Meghir, and seminar participants at the University of Bergen, Bristol, Chicago, Lund, University of California-San Diego, Institute for Fiscal Studies, Banco de México, Uppsala University, University of Southern Denmark, Nordic Labor Institute, Norwegian School of Economics, Institutet för Näringslivsforskning, 2014 Meetings of the American Economic Association, SOLE 2014, 2014 Meetings of the European Economic Association, 2014 Northeast Universities Development Consortium Conference, 2015 CIREQ Applied Economics Conference, and 2015 Labour Economics Workshop at the University of Warwick for valuable comments. We thank Manuel Davila, Cecilia Gustafsson and Carolina Perez for research assistance. Last but not least, we are extremely grateful to all the people at the Mexican Health Ministry who facilitated access to the data and shared with us much valuable information on the program, in particular Salomon Chertorivski, Francisco Caballero, Jose Manuel del Rio Zolezzi, Isai Hernandez Cruz and Rosa Sandoval. This paper is part of a project financially supported by the Swedish Research Council (Vetenskapsrådet), Grant No. 348-2013-6378.

1 Introduction

In recent years, many countries have moved towards universal health coverage (UHC) with various degree of success (Boerma et al., 2014; Reich et al., 2015; WHO, 2015). In particular, many developing nations in Latin America and elsewhere (Atun et al., 2014) have increased the funding for voluntary health insurance programs like the Mexican *Seguro Popular* (hereafter, SP), which we study in this paper. Economists from 44 countries have recently signed a call on global policy makers to prioritise a pro-poor pathway to universal health coverage as an essential pillar of development (Summers, 2015). The relevance of this type of policies is unprecedented especially for those countries, like Mexico, which are undergoing a rapid epidemiological transition, with the burden of disease shifting from infectious towards metabolic conditions, such as obesity and diabetes. SP, with its comprehensive package of both preventive and curative interventions providing a "continuum of care", constitutes an important attempt to meet the complex health needs emerging in such epidemiological landscapes.[1] Are these policies an effective mean to improve the health of the population? If so, why and for whom? In this paper we address these questions in the context of the recent Mexican experience.

The *Seguro Popular* is an ambitious non-contributory health insurance program for unprotected individuals in Mexico. Given that the main eligibility requirement for SP is to have no access to employment-based health insurance, half of the country's population was to be enrolled. The Ministry of Health introduced the program as a pilot in 2002 with the aim of transforming the existing health services into a national health insurance system. Individuals affiliated to SP are guaranteed access to a comprehensive package of health services without co-payments, within a dedicated network of hospitals and health centers (i.e., the medical units of the Ministry of Health). In exchange, affiliated individuals are required to pay a subsidized premium; in practice, nearly all affiliates are exempted from it.

Our identification strategy exploits the staggered rollout of *Seguro Popular* across all municipalities in Mexico. Our paper is the first to study the impact on health of SP using intensively administrative data on deaths, the universe of admissions to public hospitals and the registry of the human and physical resources of all medical units administered by the Health Ministry. We also use for the first time the microdata on all individuals affiliated to SP, which allows us to characterize individuals enrolled at different points in time of the expansion of the program, and relate the characteristics of early entrants to the impacts found. We provide complementary evidence on mechanisms from the Mexican health survey. All the data sets we use have the advantage of covering several years, since before the introduction of SP (2002), up to until the program had reached

[1] This is in contrast with other health insurance schemes recently introduced in countries at a similar stage of the epidemiological transition, such as the Indian RSBY (Rashtriya Swasthya Bima Yojna), which is restricted to hospital services (secondary and/or tertiary care), i.e. it excludes primary care.

full coverage (2012).

We focus on child mortality, since that is a key target of the Millennium Development Goals, and SP offered generous coverage of the conditions for children below the age of five since its pilot years. We perform our analysis by the poverty status before the introduction of the program, since we expect larger gains from the reform for poorer municipalities with higher child mortality rates. Our main finding is that the introduction of SP reduced child mortality by 7% in poor municipalities, which corresponds to 0.34 deaths per 1000 livebirths, or 783 children saved per year. These impacts are detected after three years since the implementation of SP in a municipality and are robust to a variety of alternative specifications, namely state-year trends, municipality level trends in pre-program characteristics and linear municipality trends. The reduction in deaths is concentrated among preventable and communicable conditions - mainly intestinal and respiratory infections - which have been covered by the program since its inception. Finally, the impacts on child mortality allow to reduce in 39% the gap in pre-program mortality between eligible and non-eligible to SP in poor municipalities.

We then examine potential mechanisms through which SP reduced child mortality, by investigating the role played by demand and supply factors. We show that the introduction of SP led to an increase in hospital admissions for children with the same conditions for which we find a decline in deaths, and to a reduction in the severity of diarrhea and in the incidence of respiratory infections.

Our paper provides several contributions. First, we contribute to the literature on the effects of health insurance expansions for low SES individuals, as are uninsured in developing countries; our findings are also relevant for the undergoing reforms in developed countries like US.[2] In particular, in the Mexican context, no previous paper has comprehensively examined the impact of SP on health outcomes, utilization of medical services and supply of health care, using the rich array of data we exploit here. The evidence to date is mixed and limited in both temporal and geographic analysis. Thus, the jury is still out about the impacts on health and there is still no understanding about the timing and the mechanisms underlying the observed effects. Furthermore, ours is the only paper to date which exploits the quasi-exogenous variation arising from the staggered rollout of the program across *all* municipalities in the country, constructed *directly* from registry data on millions of beneficiaries with exact affiliation date. Given the substantial degree of heterogeneity which exists among municipalities in Mexico, results based on a subsample of them might provide a misleading picture of the impacts of the program at the national level. Second, we add to the growing interdisciplinary literature on intervening in early childhood to promote health across the

[2]Contrary to the Mexican experience, in the United States universal health coverage has not been reached yet, despite the remarkable progress obtained with the Affordable Care Act (ACA): affordable care insurance is still out of reach for many, in particular poor individuals, minorities and unemployed (Gostin et al., 2015) – all categories which have been covered by *Seguro Popular*.

lifecourse (see e.g. Conti and Heckman, 2013, and Currie and Rossin-Slater, 2015).

The paper proceeds as follows. Section 2 presents the institutional background and the main features of the program, and Section 3 reviews the pertinent literature. Section 4 describes the data used and Section 5 details the empirical strategy. The results are presented in Section 6. Section 7 concludes.

2 Background

The Health Care System before *Seguro Popular* Before SP, health care in Mexico was characterized by a two-tiered system. About half of the population was covered through a contributory system (still in place today) guaranteed by the Social Security Institutions: the Mexican Social Security Institute (*Instituto Mexicano del Seguro Social*, IMSS), covering the private sector workers; the Institute for Social Security and Services for State Workers (*Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado*, ISSSTE), covering the civil servants; and Mexican Petroleums (*Petroleos Mexicanos*, PEMEX), covering the employees in the oil industries. Health coverage was provided by these institutions in public hospitals; however, individuals could also pay for care in private hospitals, or buy private health insurance. In 2000, IMSS covered 40%, and ISSSTE 7% of the population, respectively (Frenk et al., 2006).[3]

Health care was also available to the poor through two programs. The first one was the Coverage Expansion Program (*Programa de Ampliacion de Copertura*, PAC), which started in 1996 and consisted of health brigades visiting the more rural and marginalized areas of the country. The other program was the Program for Education, Health and Nutrition (*Programa de Educacion, Salud y Alimentación*, Progresa), that was launched in 1997 in rural areas as the main anti-poverty program in Mexico, and renamed *Oportunidades* and expanded to urban areas in 2002.[4]

The uninsured population not covered by PAC or *Progresa* could seek health care either in public health units run by the Ministry of Health (*Secretaria de Salud*, SSA) or in private ones. In both cases, payment was at the point of use and patients had to buy their own medications. Hence, in 2000, approximately 50% of health expenditures was classified as "out-of-pocket expenses" (Frenk et al., 2009), and 50% of the Mexican population - about 50 million individuals - had no guaranteed health insurance coverage.

[3] A more detailed description of the Mexican health system is provided in Appendix C.

[4] *Progresa* has a health component: the beneficiaries receive free of charge the Guaranteed Basic Health Package (*Paquete Básico Garantizado de Salud*), which covers a set of age-specific interventions, including the monitoring of the nutrition of children and pregnant women through monthly consultations. Information on preventive health behaviors is provided through community workshops, and emergency services are secured by the Ministry of Health, IMSS-Oportunidades (the dedicated network of medical units for families enrolled in the program) and other state institutions. See `http://www.normateca.sedesol.gob.mx/es/NORMATECA/Historicas` (accessed May 10th 2015).

The Implementation of *Seguro Popular* SP was launched as a pilot program in 2002 in 26 municipalities (in 5 states: Campeche, Tabasco, Jalisco, Aguascalientes, Colima) under the name Health for All (*Salud para Todos*). During 2002, 15 additional states[5] implemented the program, by agreeing with the federal government to provide the health services covered by SP. By the end of the pilot phase, on 31st December 2003, six additional states[6] had joined. The System of Social Protection in Health (*Sistema de Protección Social en Salud*, SPSS) was officially introduced on January 1st 2004 to extend health coverage and financial protection to the eligible population. The expansion prioritized states with: (1) low social security coverage; (2) large number of uninsured in the first six deciles of income; (3) ability to provide the services covered by the program; (4) potential demand for enrollment; (5) explicit request of the state; and (6) existence of sufficient budget for the program. In 2004, three more states introduced the program (Nayarit, Nuevo Leon and Querétaro). The last three states (Chihuahua, Distrito Federal and Durango) joined SP in 2005.

Eligibility and Enrolment Individuals who are not beneficiaries of social security institutions are eligible to enroll in SP. Enrollment in the program is voluntary, and is granted upon compliance with simple requirements.[7] The basic unit of protection is the household. Within ten years since the piloting of SP, by April 2012, 98% of the Mexican population was covered by some health insurance (Knaul et al., 2012). The main reasons for affiliation in SP were access to free medicines and to primary care at reduced costs (Nigenda, 2009).

Funding Before 2004, the public health expenditure on the insured was twice that on the uninsured, but the gap was substantially closed after 2004 (see figure A.1 in Appendix). Hence, the program seems to have been successful in accomplishing one of its goals, that of redistributing resources from the insured to the uninsured. SP is a non-contributory health insurance system, funded by revenues from general taxes, on the basis of a tripartite structure similar to that adopted by the two major social insurance agencies in Mexico, IMSS and ISSSTE. More precisely, it is funded by contributions from the federal government, the states, and the families.[8]

Coverage of Health Services Once a family is enrolled in SP, it is assigned a health center (which, in turn, is associated to a general hospital) and a family doctor for primary care, and has

[5]Baja California, Chiapas, Coahuila, Guanajuato, Guerrero, Hidalgo, Mexico, Morelos, Oaxaca, Quintana Roo, San Luis Potosi, Sinaloa, Sonora, Tamaulipas and Zacatecas.

[6]Baja California Sur, Michoacán, Puebla, Tlaxcala, Veracruz and Yucatán.

[7]The requirements are: proof of residence in the Mexican territory; lack of health insurance, ascertained with self-declaration; and possession of the individual ID (*Clave Unica de Registro de Población*, CURP).

[8]The family contribution was based on the position of the average household income in the national income distribution. In 2010, 96.1% of the enrolled families were exempted from paying the family contribution, on the basis of their low socioeconomic status; in practice, very few households ever contributed at all (Bonilla-Chacin and Aguilera, 2013).

access to a package of health services. The number of interventions covered increased yearly, from 78 in 2002 to 284 in 2012, and was listed in a 'Catalogue of Health Services' (since 2006 called *Catalogo Universal de Servicios de Salud*, CAUSES) revised annually (see Knaul et al., 2012).

A wide range of services were included, from prevention, family planning, prenatal, obstetric and perinatal care, to ambulatory, emergency and hospital care, including surgery. The bulk of the services covered since 2002 were preventive age-specific interventions. In particular, for children under five years of age, SP covered vaccinations, comprehensive physical check-ups (including measurement of height and weight, and nutritional advice for parents), and diagnosis and treatment (e.g. up to seven days of medicines) of acute intestinal and respiratory infections. The package of services for children under five underwent a further expansion in 2006 with the introduction of Health Insurance for a New Generation (*Seguro Medico para una Nueva Generación*, SMNG).[9] The services are delivered in the hospitals and clinics run by the Ministry of Health, which has a completely separate network from that of the contributory systems.

Supply of Health Care One of the main objectives of the health reform was to increase investment in health care infrastructure and to achieve a more equitable distribution of health care resources. In addition, medical facilities could only enter in the SP network upon receiving accreditation, which was granted only in case they had in place the required resources to provide the covered interventions (Frenk et al., 2009). Coherently with this objective, the proportion of the Ministry of Health budget devoted to investment in health infrastructure increased from 3.8% in 2000 to 9.1% in 2006, with the construction of 2,284 outpatient clinics and 262 (community, general and specialized) hospitals between 2001 and 2006 (see Table B.1 in the Appendix);[10] as a consequence, the number of municipalities covered by each hospital declined from an average of 7 in 2000 to an average of 5 in 2010.[11] As a result, the gap between individuals covered and not by Social Security was reduced in terms of the availability of general and specialist doctors, nurses and beds (Knaul et al., 2012 and Table B.2 in the Appendix, which shows a bigger increase in medical personnel in SSA than non-SSA units). Further redistribution was achieved by prioritizing the resources in poor municipalities: Table B.3 in the Appendix shows a bigger growth in the number

[9]For adults 20-59 years of age, the coverage included vaccinations, check-ups for pregnant women, and regular check-ups every three years after the age of 40. Among those over 60, it included medical checks-up with blood tests for cholesterol and lipids detection every three years, annual checks for hypertension, and regular cervical cystology and mammography every other year up to age 69.

[10]In the public sector as a whole, 1,054 outpatient clinics and 124 general hospitals were built in the same period (Frenk et al., 2009).

[11]Source: own calculations based on the Health Ministry discharges data. Table B.1 in the Appendix shows that there was an increase in the total number of medical units under the SSA umbrella by about 21%, from 11,824 in 2001 to 14,374 in 2010. The increase in the number of units varied by type, with an increase by about 20% in the number of outpatient units, and by about 60% in the number of inpatient units. This latter increase was mainly driven by the community hospitals (*hospitales integrales/comunitarios*).

of hospitals and beds in poor than in rich municipalities. A municipality is defined poor by the Mexican authorities if the 2000 marginalization index is high or very high, as opposed to very low, low or medium. About half of the municipalities in Mexico are poor and these municipalities are defined as priority in the launch of social programs (for example, the Progresa-Oportunidades; see CONAPO, 2001).[12] We return to the role of the supply in section 6.2.

3 Related Literature

While economic theory provides unambiguous predictions about the effects of health insurance on the demand for medical care, whether it has any effects on health is still a fundamental and debated question, especially in less developed countries, where the evidence is scanter and the mechanisms at play might be different.

Health insurance in developed countries Most of the evidence on developed countries comes from the United States, where two major health insurance experiments have taken place. The first evidence, from the RAND Health Insurance Experiment, showed that free care (vs. 95% co-pay) increases the likelihood of any annual usage of health care by almost 20p.p. (86.7% vs. 68%) (Manning et al., 1987); however, it has limited impacts on health, with the exception of few conditions, such as hypertension (Newhouse et al., 1993). More recent evidence from the 2008 Medicaid expansion in Oregon has shown that access to subsidized care for the poor is associated with higher health care utilization, lower out-of-pocket expenditures and debt, increased E.R. use (Taubman et al., 2014), higher probability of diagnosis and treatment of diabetes, better self-reported physical and mental health (Finkelstein et al., 2012), and lower probability of diagnosis of depression (Baicker et al. 2013). In their comprehensive review, Levy and Meltzer (2008) conclude that health insurance is effective mostly for the poorest and most vulnerable individuals, partially because of the crowd-out of private care by publicly provided care among the less vulnerable and poor (Card and Shore-Sheppard, 2004). A classical example is provided by Currie and Gruber (1996a, 1996b), who find that increased eligibility for free health insurance through Medicaid led to improvements

[12]The marginalization index is used in the planning process and in the allocation of budgetary resources of federal and state governments to public policies aimed at improving the living conditions of the most disadvantaged population. The index is obtained by principal component using information collected in the 2000 CENSUS in four areas: lack of access to education, inadequate housing, insufficient income and residence in small localities. Within the four broader areas, nine indicators are used to construct the index for a given geographic area: (1) percentage of population living in homes without piped water, (2) percentage of population in dwellings without sewage or sanitation for exclusive use of the house, (3) percentage of population living in housing with earthen floor, (4) percentage of population living in homes without electricity, (5) percentage of population in housing with some level of overcrowding, (6) percentage of employed population with income of up to two minimum wages, (7) percentage of the population aged 15 or over who are illiterate; (8) percentage of population aged 15 years or more without full primary, (9) percentage of population living in localities with less than 5,000 inhabitants (ie, rural localities).

in infant mortality.

Health insurance in less developed countries As mentioned in the introduction, many less developed countries have increased the funding for voluntary health insurance programs over the last decade. Here we review the evidence mostly in relation to the Latin American experience. Chile and Brazil both undertook health reforms in the 1980s. Chile introduced a dual system in 1981, which requires workers and retirees to affiliate with either the National Health Fund (FONASA), or with private health insurance institutions (ISAPRES). The public system, FONASA, is a universal health plan that resembles SP and suffers from long waiting times, poor quality and shortage of specialists (Savedoff, 2011). Despite these issues, Bitran et al. (2010) find that the program increased access and coverage, and reduced hospital case-fatality rate for some diseases, such as hypertension, diabetes and depression. Brazil created the Unified Health System (*Sistema Único de Saúde*) in 1988. This is a publicly funded health care system serving more than 80% of the population (Paim et al., 2011), which has also been associated with long waiting times and physicians shortages (Harmeling, 1999). The anchor of the system is the Family Health Program, which was adopted in 1994 to provide primary care services, and it has been consistently associated with a reduction in infant mortality (Macinko et al., 2006; Aquino et al., 2009). Colombia introduced the *Regimen Subsidiado*, a publicly-funded insurance program targeted to the poor, in 1993. Miller et al. (2013) find that the program was successful in protecting from financial risk, increasing the use of preventive services, and improving health. Lastly, Peru underwent a public health insurance expansion in 2006. Bernal et al. (2014) present evidence of impacts on out-of-pocket health expenditures, visits to doctors, prescription of medicines and diagnostic testing, but not on preventive care, with the exception of women in fertile age. Outside Latin America, the evidence more relevant to our study comes from the universal health care reform of 2001 in Thailand, which increased health care use and reduced postneonatal mortality and out-of-pocket medical expenditure (Gruber et al., 2014; Limwattananon et al., 2015).

We now turn to the evidence on Mexico. To date, a large part of the SP literature has focused on the labor market impacts, in relation to a potential distortion of workers' incentives to operate in the informal sector. The evidence on this issue is mixed: some studies do not find any impact (Gallardo-García, 2006; Barros, 2011), while others find relatively small increases in the share of informal workers among the less educated and those with children (Aterido et al. 2011; Azuara and Marinescu, 2013; Bosch et al., 2014; del Valle, 2015).[13]

The literature on the health impacts of SP is more recent, but vast. In table B.4 in Appendix we summarize the evidence on the health impacts of SP; here we present the main findings. King

[13]The differences in the impacts do not seem driven by the identification strategy employed, but rather by the period studied - with smaller effects found in studies that have examined the earlier period.

et al. (2009), Barros (2011) and Grogger et al. (2015) focus on out-of-pocket expenditures, and unanimously show that SP has been effective in substantially reducing them. The existing studies of the impacts of SP on health care use and health present, instead, mixed results. Sosa-Rubi et al. (2009) find an increased use of prenatal care among those affiliated to SP, while King et al. (2009) and Barros (2011) find no effect on the population at large. Bernal and Grogger (2013a,b) merge the experimental data from King et al. (2009) with administrative data from the SSA hospital discharges, and find an increase in obstetric services and hospital visits – mostly births that would have taken place outside the health system in the absence of SP. Knox (2015) uses the panel of urban *Oportunidades* and finds an increase in the use of health services provided by SP among the poorest urban population. Barros (2011), Knox (2015) and King et al. (2009) are unable to detect any health impact of SP, using experimental or survey data. Pfutze (2014), instead, finds that SP led to a reduction in infant mortality by 5 deaths per 1,000 livebirths, using data from the 2010 Census.

In summary, the evidence available to date has provided a fragmented and partial picture of the health impacts of SP. Importantly, the vast majority of the papers have based their analyses on subsets of municipalities implementing the program in different years (as in, for example, Aterido et al., 2011, Azuara and Marinesco, 2013, and Knox, 2015), and have not relied on administrative registry data to study the health impacts of SP. Our work overcomes most of the limitations of previous studies and provides the most comprehensive evidence to date on the health impacts of SP.

4 Data

We combine rich administrative and survey data to provide complementary evidence on the health impacts of SP and the mechanisms through which they occurred.

Administrative Data We use four administrative data sources. First, for this project, we were granted access to the registry of *all* families with a valid enrolment in Seguro Popular by December 31^{st} of each year, since 2002 until 2010, which is called the *Padrón*. This is the key source used by the Federal Government and the States to decide the amount of funds to allocate to the program. In addition to the exact affiliation date, the *Padrón* contains information on the demographic and socioeconomic characteristics of the enrolled families, on their address of residence, and on the identifiers of the health center and of the general hospital assigned at the time of enrolment. The exact date of affiliation of each family is used to construct the treatment indicator: the date of implementation of the program at the level of the municipality. For the years 2002 and 2003 (in which the program ran as a pilot), only information on the date of enrolment and on the state of

residence was recorded. Since each family has a unique identifier, we have been able to identify the exact date of implementation of SP in a given municipality by backtracking the relevant information from the subsequent years. We have then confirmed the accuracy of the implementation date obtained with this procedure by cross-checking it against the official list of municipalities which adopted SP in the pilot period.

Second, to analyze the impact on mortality we use the death certificates for the whole country between 1998 and 2012. The data contains information on the date, place and cause of death (ICD10 classification), its registration date, and on the date of birth, gender, type of health insurance and residence of the deceased. We use this data to construct municipality-year counts of deaths before age 5.[14] We then construct the child mortality rate by dividing the deaths counts by the population less than 5 years of age in that municipality, which we obtained from the CONAPO.[15]

Third, we use two data sources on hospital discharges. The first is the universe of discharges from any public hospital in Mexico, which is available for the years 2004-2012. This data includes limited information: gender and age of the patient (banded in categories), main medical condition at admission, state in which the medical unit is located and the entity managing it (i.e., IMSS, ISSSTE, IMSS-Oportunidades or Health Ministry). The second is the universe of discharges from the Health Ministry hospitals, which is available for the years 2000-2012.[16] This data includes more detailed information: the identifier of the medical unit, demographic characteristics of the patient (age, gender, state and municipality of residence), the dates of admission and discharge, the main conditions diagnosed, and the medical procedures applied during the hospitalization. We use this data to examine the impact of SP on hospital admissions (total and by cause), mode of entry and length of stay. We focus on admissions to general or integrated hospitals, speciality hospitals and clinics, excluding psychiatric hospitals and federal health institutes.[17] In Mexico, SSA hospitals are present in 544 of the 2454 municipalities.

Fourth, we use two data sources on the supply of health care. The first is the universe of the human resources for all inpatient and outpatient units providing health services for the years 1996-2011. This data is obtained from the State and Municipal System Databases (*Sistema Es-*

[14]We downloaded the data from the DGIS (*Direccion General de Informacion en Salud*, National Information System for the Health) website: `http://www.dgis.salud.gob.mx/contenidos/basesdedatos/bdc_defunciones.html`. This is assembled by the civil registry and the public prosecutor (in case of accidental or violent death).

[15]CONAPO stands for *Consejo Nacional de Poblacion* (National Population Council); see `http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos`.

[16]We downloaded the data from `http://www.sinais.salud.gob.mx/egresoshospitalarios/basesdedatoseh.html`.

[17]These are medical units specialized for the treatment of cancer or cardiovascular diseases, pediatric care or geriatric care. They are mostly located in the Distrito Federal, but serve the whole country.

tatal y Municipal de Bases de Datos, SIMBAD),[18] and contains information at the level of the municipality on the medical personnel (doctors and nurses) and the number of outpatient visits for each public providers of health services (i.e., IMSS, ISSSTE, PEMEX, IMSS-Oportunidades, SSA and others such as military or local providers), including both health centers and hospitals. The second is the registry of the physical and human resources for each outpatient and inpatient unit administered by the Health Ministry for the period 2001-2010.[19]

Health Survey Lastly, we use data from the Mexican Health Survey, for which three waves of data collection have been carried out as repeated cross-sections. The National Health and Nutrition Survey (*Encuesta Nacional de Salud y Nutrición*, ENSA/ENSANUT) was fielded in 2000, late 2005/early 2006, and late 2011/early 2012, i.e. before, in the middle and at the end of the SP rollout.[20] The data includes both self-reported and objective health measures, and age-specific modules. Unfortunately, several variables are not consistently collected across the three waves, which limits the use of this data to study the impact of SP on child health.

5 Empirical Strategy

Our identification strategy exploits the quasi-exogenous variation in the timing of implementation of SP at the level of the municipality. Given its scale and the constraints imposed by financial resources and availability of infrastructure, the SP was gradually introduced across the Mexican states, and across municipalities within each state. As mentioned in section 2, while the state-level rollout was regulated by law, the municipality-level expansion was unregulated. As specified in section 4, we use information from the *Padrón* on the date in which each household in Mexico enrolled in SP to construct the treatment variable. In the absence of a formal definition, we consider that SP is introduced in a municipality when the number of families affiliated to the program is at least 10. We adopt this number for a variety of reasons. First, we prefer an absolute to a percentage measure since we want to capture the fact that the residents of a municipality can use the services provided by SP (and not the fact that a certain proportion of the population had been covered). This low threshold aims to capture the exogenous rollout determined by the authorities, rather than endogenous individuals sign-ups which could arise if the threshold was set as a proportion of the population in the municipality. In Appendix, we show that our results are robust to the choice of threshold, and we show that the results are unchanged if we use a definition based on 5, 15 or

[18] It was downloaded from `http://sc.inegi.org.mx/sistemas/cobdem/`.

[19] It was downloaded from: `http://www.sinais.salud.gob.mx/basesdedatos/recursos.html`.

[20] This survey includes 45,711, 47,152 and 50,528 households living in 321, 582 and 712 municipalities for the years of 2000, 2006 and 2012, respectively. In our analysis, we restrict the sample to municipalities observed at least twice in data (that is, 432 municipalities out of the 990 ever surveyed).

20 families. Second, we do not use smaller figures such as 1 or 2 households since these could be more prone to measurement error[21]. Third, we use a definition which has become relatively common in the SP-related literature, see e.g. Bosch and Campos-Vazquez (2014) and Del Valle (2015).

Figure A.2 in Appendix displays the year of implementation of SP in each municipality in Mexico, between 2002 and 2010 (see also Panel A of table B.6 of the number of municipalities implementing SP per year). This graph (together with its zoomed state-level version reported in Figures A.3-A.5) shows that there is considerable variation across municipalities in the timing of implementation of SP. We exploit the staggered timing of implementation of SP by comparing changes in outcomes for municipalities that introduced it in different years between 2002 and 2010, i.e. earlier vs. later entrants, within an event-study framework. In particular, we estimate the following equation:

$$y_{mst} = \sum_{k=-K}^{-2} \beta_k^B SP_{mst} \mathbf{1}\left[t - T_m = k\right] + \sum_{k=0}^{L} \beta_k^A SP_{mst} \mathbf{1}\left[t - T_m = k\right] + \mu_{ms} + \pi_t + \varepsilon_{mst} \quad (1)$$

where SP_{mst} is an indicator variable equal to 1 if the municipality of residence m in state s offers SP in year t. For most of the analysis we use registry data on deaths and hospital discharges aggregated at the level of the municipality of residence m in year t, which refers to the time of the death and of the admission to the medical unit, respectively.[22] In all our models we include fixed effects for the municipality of residence μ_{ms}, to account for time-invariant municipality-level unobserved heterogeneity; and year fixed effects π_t to account for common shocks; ε_{mst} are idiosyncratic shocks. The standard errors are clustered at the municipality level to account for autocorrelation in the outcomes (Bertrand et al., 2004), and all estimates are weighed by the population under age 5 in the municipality in 2000 (as e.g. in Almond et al., 2011, and Bailey and Goodman-Bacon, 2015).

The impact of being exposed to SP is captured by the coefficients β_k, where k is the difference between the year of observation t and the year of implementation T_m.[23] Thus, the estimated β_k^B and β_k^A coefficients describe the evolution of the outcome in (eventually) treated municipalities before SP, and the divergence in outcomes t years after its introduction, respectively, relative to the year prior to the implementation (since $t = -1$ is omitted). We use $t = -1$ as the control year as Hoynes and Schanzenbach, 2009, and Bailey and Goodman-Bacon, 2015, who use strategies similar to our and in a similar context (introduction of Food Stamps and Community Health Centers

[21]For example, a municipality in the state of Aguascalientes (Asientos) has one family enrolled in September of 2002, and the subsequent families that enrolled in the program were four families who did it in January 2004.

[22]The date of death refers to the date of occurrence.

[23]The exact values of k depend on the number of years available in the data, before (K) and after (L) the implementation of SP.

across counties in the US, respectively). Additionally, throughout of the year of implementation of SP ($t = 0$), some municipalities may fulfill the 10-families threshold in either January or in December, meaning that for those municipalities who launched the program early in the year $t = 0$ may effectively includes some of the program immediate impacts.[24] This event-study framework allows to test for the presence of pre-treatment trends (rather than assuming that $\beta_k^B = 0$ for $k < 0$). It further allows for dynamics in the treatment effects, which might arise for several reasons: individuals may not be immediately aware of the availability of SP in their municipality of residence,[25] and/or medical units may take time to adjust their technology of provision of care to the potential new demand.

When we present the results in figures we display all the estimated coefficients of equation (1), but for the sake of precision, for most of our analysis we group them into three categories, according to the following specification:

$$y_{mst} = \beta_1 SP_{mst} \mathbf{1}\left[t - T_m \leq -2\right] + \beta_2 SP_{mst} \mathbf{1}\left[0 \leq t - T_m \leq 2\right] +$$

$$+\beta_3 SP_{mst} \mathbf{1}\left[t - T_m \geq 3\right] + \mu_{ms} + \pi_t + \varepsilon_{mst}. \tag{2}$$

Here β_1 subsumes the impact up to 2 years before the introduction of SP, β_2 captures the short run impact (up to 2 years after the introduction of SP), and β_3 captures the impact of exposure for 3 years or more. We interpret the coefficients as intention-to-treat effects (ITT), since our regression model estimates the reduced form impacts on implementing SP in the post-reform period. This parameter averages the SP effects over all individuals in the municipality, although not all are affected by the health reform.

The timing of implementation of SP The key identifying assumption underlying our empirical strategy is that the timing of implementation of SP at the municipality level is uncorrelated with unobserved time-varying determinants of the outcomes. To provide suggestive evidence on the validity of this assumption, we examine whether the year of implementation of SP can be predicted by baseline municipality characteristics.[26] By December 2010, 2,443 municipalities in Mexico had implemented the program. Throughout the paper, we use a sample of 2,424 municipalities which existed in 2000 and implemented SP by 2010 and for which there is non-missing data on baseline characteristics.

[24] Panel B of table B.6 in Appendix presents the number of municipalities introducing the program in the first, second, third or fourth quarter of the year.

[25] This might occur either because they are not exposed to the relevant sources of information, or because people tend to become affiliated at the time they use medical services.

[26] We use 2000 as our baseline year for the socio-demographic and health characteristics, with the exception of the resources allocated to the public health care sector, for which information is only available since 2001. A detailed list of the variables used as determinants of the rollout is provided in Table B.5 in the Appendix.

We study the determinants of the timing of implementation by estimating the following equation:

$$Year_{ms} = \eta \mathbf{X}_{ms,t0} + \pi_s + \chi_{ms} \tag{3}$$

where $Year_{ms}$ is the year of implementation of SP in municipality m of state s, $\mathbf{X}_{ms,t0}$ is a vector of pre-SP municipality-level socio-demographic and political characteristics, health care resources and health indicators, and π_s are state fixed effects.

The results are reported in Table 1. Column (1) presents estimates for a version of equation 3 without state fixed effects. It shows that, across states, earlier implementation of SP took place in more populous and less poor municipalities, with a smaller share of eligible individuals and of population working in the primary sector, more hospitals,[27] health centers and doctors per eligible,[28] a lower child mortality rate, and alignment between the party of the mayor and that of the governor of the state. When we study the determinants of the time of entry within states in column (2),[29] we find that child mortality is no longer a significant predictor of the rollout, and that the program was implemented earlier in municipalities with a greater share of children; all the other estimated coefficients are reduced in magnitude but still significant. Column (3) shows that, after conditioning on the socio-demographic determinants, the availability of health centers (but not of hospitals or doctors) and the political alignment between the mayor of the municipality and the governor of the state are the two key factors determining the timing of the rollout. A comparison of the magnitude of the coefficients reported in column 3 of Table (1) reveals that the alignment between the party of the mayor and that of the state governor predicts an earlier implementation of SP by almost 1 year; and an increase by one standard deviation in the number of health centers predicts an earlier implementation by about 3 months.[30] When we split the sample by poverty status (cols. 4 and 5), we do not find significant differences in the determinants of the timing of the rollout between rich and poor municipalities.

Finally, we investigate whether the SP establishment timing is correlated with the trend in pre-SP child mortality rate. For example, this could be the case if municipalities with decreasing trend

[27]Figure A.6 in Appendix shows that the program was rolled out first in those municipalities with the presence of a hospital. We also studied the strategy that the states followed to rollout SP. We found a negative relationship between the share of eligible families when the program was launched in a municipality (defined as the number of families served by SP during the first three months of operation divided by the total number of families served in 2010) and the proportion of municipalities in the state that launched SP. This suggests that the states launched the program with a relatively high intensity of coverage in a restricted number of municipalities.

[28]We present in Table 1 health supply indicators measured by eligible since the information used on the number of hospitals, health centers and doctors is for medical units administrated by the SSA-Health Ministry, which is the dedicated network for the uninsured and where SP health services are offered.

[29]Unobserved time-invariant state-level characteristics explain about 50% of the variation in the timing of entry of a municipality.

[30]In results not reported here, we also show that child mortality does not predict the timing of implementation of SP, even after conditioning on the pre-existing supply of health care services.

of child mortality or with successive increases in child mortality prioritized the implementation of the program. This is not the case: Table 2 shows that both short (1-year) and longer (3-years) differences in child mortality rate (our primary outcome variable) do not predict the year of implementation of SP in a municipality.

In addition to providing the evidence above in support of the validity of the assumptions underlying our identification strategy, we also run a battery of robustness checks for all the models we estimate. First, we control for linear trends (as in Acemoglu et al., 2004) in the year of death/admission to the hospital and the following characteristics of the municipality of current residence: socioeconomic indicators measured in 2000 (quadratic of the index of marginalization, log of total population, and share of population of ages 0-4); labor market indicators measured in 2000 (share of uninsured individuals, share of individuals employed in the primary, secondary and tertiary sectors); health care indicators measured in 2001 (number of hospitals, health centers, and doctors in hospitals, all per uninsured). Second, we control for the number of years since the implementation of *Oportunidades* in the municipality, since the program underwent the urban expansion in the same years in which SP was rolled out. Third, we control for the political alignment between the governor of the state and the mayor of the municipality, which we have shown in Table 1 to be a significant determinant of the timing of the rollout. Fourth, we control for a state flexible trend (quadratic) to account for the fact that the yearly transfers of SP-funds from the federal government to the states can be affected by performance measures of the expansion of SP (see section 2 and Appendix C for the details about the funding of SP). Lastly, we include municipality-level pre-reform linear trends, to account for omitted trends in outcomes that might be correlated with the introduction of SP.[31] We show that our results are robust to this full battery of checks in the next section.

Another concern is selective migration of uninsured individuals to municipalities not yet providing SP to municipalities already offering SP, and we do not find evidence of migration induced by the SP. We investigate this possibility using data from the extended questionnaire of the 2010 CENSUS, which surveys 2.9 millions households. We use the sample of male heads of household of working age (25 to 60 years old), and we regress an indicator for whether the individual moved between 2005 and 2010 to a municipality that start offering the program between 2002 and 2004. After controlling for an extended set of characteristics, such as individual characteristics

[31] We estimate municipality-specific trends using data before the implementation of SP, and we obtain a slope estimate λ_{ms} for each municipality. We then extrapolate the pre-expansion time trends to the post-reform period as follows (see also Bhuller et al., 2013):

$$y_{mst} = \beta_1 SP_{mst}\mathbf{1}\left[t - T_m \leq -2\right] + \beta_2 SP_{mst}\mathbf{1}\left[0 \leq t - T_m \leq 2\right] + \beta_3 SP_{mst}\mathbf{1}\left[t - T_m \geq 3\right] + \widehat{\delta\lambda_{ms}}t + \mu_{ms} + \pi_t + \varepsilon_{mst}.$$

(a quadratic for the age of the individual, an indicator for whether the head is married or living in partnership and his level of education), characteristics for the current municipality of residence taken in 2000 (quadratic of the index of marginalization, the log of the population in the municipality, the share of individuals without Social Security coverage and the share of population between ages 0 and 4) and fixed effects for the municipality of residence in 2005. Our results show that we cannot reject the null of no correlation between the implementation of SP in a municipality and individual-level mobility (results available upon request).

6 Results

6.1 Impacts on Child Mortality

We now present our main results on the impacts of SP on child mortality in Table 3, where we report estimates of equation (2) by the level of poverty of the municipality. Column (1) shows a reduction of 0.34 deaths per 1,000 livebirths in poor municipalities 3 or more years after the implementation of SP, which, given a baseline mortality rate of 4.72 deaths per 1,000 livebirths, corresponds to a 7% decline. Column (2) shows that in rich municipalities, instead, there was a pre-SP declining trend in mortality. The full event study estimates from equation (1) are plotted in Figure 1, panels (a) and (b) for the poor and rich municipalities, respectively. Figure (1a) shows that, for poor municipalities, there is no significant evidence of a differential trend in mortality in treated locations before the introduction of SP. Instead, after the introduction of SP, the child mortality rate fell sharply in poor municipalities, with statistically significant impact detectable already after two years. On the other hand, we detect no significant impact of SP on child mortality in rich municipalities (Figure 1b). Hence, in the remainder of the paper we restrict our analysis to the subsample of poor municipalities.

Given that eligibility itself can be affected by the introduction of the program,[32] we do not restrict our estimation sample to eligible individuals. Instead, we examine whether the reduction in child mortality in poor municipalities is driven by the sample of children eligible to SP, i.e. those in families without access to Social Security. The results, presented in Table 4, show that the decrease in child mortality is indeed concentrated among the eligibles, and that SP has no impact among the non eligibles.[33] Importantly, they show that the reduction in child mortality among the eligibles amounts to 0.467 and 0.533 child deaths per 1,000 livebirths soon after the introduction

[32] In Section 3 we have reviewed that the literature on the effects of SP on informality finds small impacts, especially for less educated individuals with children.

[33] An alternative interpretation of this finding is the absence of spillover effects on the non-eligibles. This is not unexpected, given that the two systems (SP and IMSS/ISSSTE) delivered care in two completely separate networks of hospitals and health centers, so there was no scope for contamination. Additionally, we study a sample of children who do not attend school yet, so that also this channel of potential contagion can be ruled out.

of the program and after three years since its implementation, respectively. This corresponds to a reduction by 11-12 percent, given the baseline of 4 deaths per 1,000 livebirths among eligibles. While throughout the paper we mostly refer to the ITT estimates, i.e. to the average effect of SP among *all* children in the municipality, since the program achieved universal coverage in 2012, the effect on the eligibles is indeed the implied average treatment effect on the treated (ATT) on child mortality.

Sensitivity Analysis We now investigate the robustness of our findings to different specifications of equation (2). The results are displayed in Table 5. Column (1) reports our baseline estimates of column (1) in Table 3. Columns (2) to (8) of Table 5 show that the results are robust to a full battery of specification checks. In column (2) we present our baseline specification but clustering the standard errors by state-year to account for the within state-year in the allotment of funds across municipalities. We then add the following: state quadratic trend (col. 3); linear trends in baseline characteristics of the municipalities (cols. 4-8); an indicator of alignment between the party ruling in the municipality and in state (cols. 5, 6, 7 and 8); linear pre-intervention municipality trends (cols. 6, 7 and 8); and, indicators for the number of years since the introduction of *Oportunidades* in the municipality (col. 8). The fact that our estimates are virtually unchanged across the various columns of Table 5, and that the coefficients for the post-reform period across the various specifications are jointly significant, provides robust evidence that the decline in mortality in poor municipalities was driven by SP and not by local shocks or underlying trends. Table B.7 in Appendix presents also estimates using three alternative thresholds to assign SP to a municipality: 5, 15 and 20 families enrolled in the program.

Lastly, it is possible that child deaths are measured with error in the administrative records, in particular that they are under-reported. We consider two cases. First, if under-reporting is systematically correlated with permanent local conditions which also affect mortality, then this is accounted for by the municipality fixed effects. Second, a more serious concern would arise if the introduction of SP affected the quality of reporting; more precisely, if it led to an improvement in the recording of deaths. We assess this by testing whether the proportion of missing information about the place of reported child death is influenced by the introduction of the program, and we find no evidence of a significant impact of SP.

6.2 Mechanisms: Understanding the Reduction in Child Deaths

After having established that the introduction and expansion of SP led to a significant decline in child mortality, we investigate possible mechanisms through which this reduction might have occurred.

First, we re-estimate specification (2) separately by type of condition, to understand what is driving the reduction in child mortality in poor municipalities. Table 6 shows that SP led to a significant reduction in intestinal and malnutrition-related conditions (ICD10 codes A and E, respectively) and respiratory infections (ICD10 codes J, predominantly influenza and pneumonia), which represent 29% of all deaths in 2000 (col. 2).[34] Importantly, both sets of conditions have been covered by SP since its introduction: the *Catalogos de Beneficios Medicos (CABEME)* (2002-2003) includes, among others, "diagnosis and treatment of acute respiratory infections", "diagnosis and treatment of acute diarrhea", and "monitoring of nutrition, growth and well-baby visits". Indeed, Knaul et al. (2012) report that, between 2000 and 2006, coverage and effective coverage of SP have increased for a variety of conditions, including *treatment of diarrhoea and acute respiratory infections in children*, concentrated in the poorest states and income deciles. Reassuringly, column (3) shows no impact of SP on deaths due to external causes (e.g., accidents).

Second, we turn to investigate possible mechanisms through which SP might have led to a reduction in child mortality, starting from its effects on access to medical care. Dafny and Gruber (2005) notice that greater access to care may increase hospitalizations, however improved efficiency of care for newly eligible children might also reduce them. Using data from the universe of SSA hospital discharges, Table 7 shows that the introduction of SP led to an immediate 9% increase in hospital admissions for children 0-4 years old in poor municipalities, from a pre-program mean of 22 admissions/municipality in 2000 (column 1). Table B.8 in the Appendix shows that this effect of SP is robust to a variety of alternative specifications. Thus, as in Dafny and Gruber (2005), the access outweighs the efficiency effect as consequence of the introduction of SP. Complementary evidence from the universe of discharges from any public hospital in Mexico presented in Figure 2 shows that the increase in hospital admissions for children 0-4 years old is only detectable in the Ministry of Health units.[35] Column (2) of Table 7 also shows that SP had a larger impact on admissions due to intestinal and malnutrition-related conditions and respiratory infections, and no impact on admissions due to external causes - consistently with the evidence we find for child mortality. The last two columns show that the introduction of SP led to no detectable change in the length of stay, and to a significant increase in admissions through E.R.

Third, we examine whether the introduction of SP led to an increased burden in outpatient care. Using again data from the SIMBAD, Table B.9 in the Appendix shows that, in poor municipalities, the health reform was not associated with an increase in the number of outpatient visits per medical

[34] In Table 6, we pool together ICD10 codes A and E since they are strictly related, however, given that only the main cause of death/admission is reported in the Mexican data, malnutrition is less likely to be cited (see e.g. Rice et al., 2010).

[35] This alternative data source only contains information on the post-reform period (from 2004 onward), hence it does not allow us to control for pre-SP trends. Additionally, it only contains information at state level, so we cannot report two separate figures for rich and poor municipalities.

personnel in the SSA sector. In sum, this evidence suggests that municipalities choose to enrol families in SP in adequacy to the available supply of health care services.

To understand why we detect immediate impacts of the program, we resort on the *Padrón* and examine the association between several household characteristics and the year of entry of SP. The results, reported in Table B.10 in the Appendix, show that the households who enroll earlier in the program within a municipality are more likely be among the poorest (i.e., in the 1st decile of the national income distribution), headed by a female with less than primary education, with a disabled member, a larger family and a greater number of children 0-4 years old, and to be enrolled in *Oportunidades*.[36] In other words, earlier entrants are in a condition of disadvantage with greater potential benefits from access to health care.

Lastly, we complement the analysis based on the administrative data with evidence from the health surveys. The results, reported in Table B.11 in Appendix, show that SP is also associated with a decrease in the prevalence of respiratory infections in the two weeks prior to the survey among children living in poor municipalities (column 2), and with a decrease in the likelihood of a doctor visit in case of diarrhea (column 3), which suggests a reduced severity of such condition, likely due to the increased awareness, screening, and availability of basic medicines.[37] Notice that an analogous mechanism is reported in Bailey and Goodman-Bacon (2015) in explaining the impact of Community Health Centers (CHCs) on the mortality of older Americans. Hence, the evidence from the health survey complements and supports the evidence on the reduction in child deaths from the mortality registries.

7 Conclusion

In this paper, we have contributed to the ongoing debate on universal health coverage (UHC) by estimating impacts and mechanisms of the Mexican health insurance program *Seguro Popular* on child health. Differently from the previous literature, we have used a unique combination of administrative and survey data and exploited the temporal and spatial variation arising from the introduction of SP in *all* the municipalities in Mexico.

Our intent-to-treat estimates show that the introduction of SP led to a significant reduction in child mortality by 7% in poor municipalities. This amounts to avoiding the deaths of approximately 783 children before age 5 per year. The impact of SP is detected 3 years after the introduction of the

[36]Of the total of 17.6 million families observed in the data, about 816,000 are assigned to IMSS-Oportunidades centers when they enroll in SP (less than 5% of the families), among the 3.7 million of those families that entered SP through the Oportunidades program (about 22% of the total).

[37]The quality of primary health care management of children with diarrhoea and acute respiratory infections was very low before SP, especially in case of private doctors: 66% and 58% of them have been reported to make a wrong decision in the prescription of antimicrobial and symptomatic drugs, see Bojalil et al. (1998).

program in a municipality and it is robust to a variety of alternative specifications. The reduction in child mortality is mostly driven by preventable conditions, namely respiratory and intestinal infections, which can be cured with timely access to medicines, and which have been covered by the program since 2002.

We have also examined potential mechanisms which might have driven these impacts, investigating the role played by demand and supply factors. We have showed that the introduction of SP led to an increase in hospital admissions for respiratory and intestinal infections, the same conditions for which we find a reduction in deaths. Complementary evidence from the health surveys also reveals that SP led to a reduction in the severity of diarrhea infections and in the prevalence of respiratory conditions in poor municipalities. Additionally, we provide evidence that the program was rolled out gradually starting in municipalities which had adequate pre-existing supply. Our findings remark the importance of the provision of primary care for promoting population health, and emphasize the need of improving basic infrastructures in the countries undergoing health insurance expansions.

Of course, health insurance is not the only input in the production of health, and successful health policies need to consider the wider social determinants. Additionally, while reaching full coverage in only nine years of operation has been a major achievement, the implementation of SP at state level still faces significant challenges (Nigenda et al., 2015). Nonetheless, our results suggest that universal health coverage (UHC), by providing access to preventive care and to cheap timely treatment, can significantly contribute to reduce the gap in mortality for poor children in less developed countries.

References

[1] Acemouglu, Daron, David Autor and David Lyle. 2004. "Women War and Wages: The Impact of Female Labor Supply on the Wage Structure at Mid-Century". *Journal of Political Economy*, 112(3): 497-551.

[2] Almond, Douglas, Hilary W. Hoynes and Diane W. Schanzenbach. 2011. "Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes". *The Review of Economics and Statistics*, 93(2): 387-403.

[3] Aquino, Rosana, Nelson F. de Oliveira, and Mauricio L. Barreto. 2009. "Impact of the family health program on infant mortality in Brazilian municipalities". *American journal of public health*, 99(1): 87-93.

[4] Aterido, Reyes, Mary Hallward-Driemeier and Carmen Pages. 2011. "Does Expanding Health Insurance Beyond Formal-Sector Workers Encourage Informality? Measuring the Impact of Mexico's Seguro Popular". *IZA Discussion Papers*, No. 5996.

[5] Atun, Rifat, Luiz Odorico Monteiro de Andrade, Gisele Almeida, Daniel Cotlear, T. Dmytraczenko, Patricia Frenz, Patrícia Garcia et al. 2015. "Health-system reform and universal health coverage in Latin America". *The Lancet*, 385(9974): 1230-1247.

[6] Azuara, Oliver and Ioana Marinescu. 2013. "Informality and the Expansion of Social Protection Programs: Evidence from Mexico". *Journal of Health Economics*, 32(5): 938-950.

[7] Baicker, Katherine, Sarah L. Taubman, Heidi L. Allen, Mira Bernstein, Jonathan H. Gruber, Joseph P. Newhouse, Eric C. Schneider, Bill J. Wright, Alan M. Zaslavsky, and Amy N. Finkelstein. 2013. "The Oregon experimenteffects of Medicaid on clinical outcomes". *New England Journal of Medicine*, 368(18): 1713-1722.

[8] Bailey, Martha J., and Andrew Goodman-Bacon. 2015. "The War on Povertys Experiment in Public Medicine: Community Health Centers and the Mortality of Older Americans". *The American economic review*, 105(3): 1067-1104.

[9] Barham, Tania. 2011. "A healthier start: the effect of conditional cash transfers on neonatal and infant mortality in rural Mexico". *Journal of Development Economics*, 94(1): 74-85.

[10] Bhuller, Manudeep, Tarjei Havnes, Edwin Leuven and Magne Mogstad. 2013. "Broadband Internet: An Information Superhighway to Sex Crime?", *The Review of Economic Studies*, 80(4): 1237-1266.

[11] Barros, Ricardo. 2011. "Wealthier but not much Healthier? Effects of a Health Insurance Program for the Poor in Mexico". Unpublished manuscript.

[12] Bernal, Noelia, Miguel A. Carpio, and Tobias J. Klein. 2014. "The Effects of Access to Health Insurance for Informally Employed Individuals in Peru". *IZA Discussion Papers*, No. 8213.

[13] Bernal, Pedro, and Jeffrey Grogger. 2013a. "The effect of health insurance on health care utilization: combining administrative data with an experimental design". Unpublished manuscript.

[14] Bernal, Pedro, and Jeffrey Grogger. 2013b. "Maternal Care and Health Insurance: Evidence from a Randomized Experiment". Unpublished manuscript.

[15] Bertrand, Marianne, Esther Duflo, and Sendhil Mullainathan. 2004. "How Much Should We Trust Differences-in-Differences Estimates?" *The Quarterly Journal of Economics*, 119(1): 249-275.

[16] Bitran, Ricardo, Liliana Escobar, and Patricia Gassibe. 2010. "After Chiles health reform: increase in coverage and access, decline in hospitalization and death rates". *Health Affairs*, 29(12): 2161-2170.

[17] Boerma, Ties, Patrick Eozenou, David Evans, Tim Evans, Marie-Paule Kieny, and Adam Wagstaff. 2014. "Monitoring Progress towards Universal Health Coverage at Country and Global Levels". *PLoS Medicine*, 11(9).

[18] Bojalil, Rossana, Hctor Guiscafré, Patricia Espinosa, Homero Martínez, Miguel Palafox, Romero Guillermina, and Gonzalo Gutiérrez. 1998. "The quality of private and public primary health care management of children with diarrhoea and acute respiratory infections in Tlaxcala, Mexico". *Health policy and planning*, 13(3): 323-331.

[19] Bonilla-Chacin, Maria Elena, and Nelly Aguilera. 2013. "UNICO Studies Series 1: The Mexican Social Protection System in Health". The World Bank: Washington DC.

[20] Bosch, Mariano and Raymundo M. Campos-Vázquez. 2014. "The Trade-offs of Welfare Policies in Labor Markets with Informal Jobs: The Case of the Seguro Popular Program in Mexico". *American Economic Journal: Economic Policy*, 6(4): 71-99.

[21] Bosch, Mariano, Maria Belen Cobacho and Carmen Pages. 2014. "Taking stock of eight years of implementation of Seguro Popular in Mexico". in Markus Frolich, David Kaplan, Carmen Pages, Jamele Rigolini and David Robalino (ed.), 2014. "Social Insurance, Informality, and Labor Markets: How to Protect Workers While Creating Good Jobs," OUP Catalogue, Oxford University Press.

[22] CABEME, 2002, "Catálogo de beneficios médicos", Comision Nacional de Proteccion Social en Salud.

[23] Card, David, and Lara D. Shore-Sheppard. 2004. "Using discontinuous eligibility rules to identify the effects of the federal medicaid expansions on low-income children". *Review of Economics and Statistics*, 86(3): 752-766.

[24] CONAPO - Consejo Nacional de Poblacíon. 2001. "Índices de marginacin, 2000". `http://www.conapo.gob.mx/work/models/CONAPO/indices_margina/indices/pdfs/IM2000_docprincipal.pdf`

[25] CASES, 2004, "Catálogo Explicito de Servicios Esenciales de Salud (CASES) 2004", Comision Nacional de Proteccion Social en Salud.

[26] Conti, Gabriella, and James J. Heckman. 2013. "The developmental approach to child and adult health". *Pediatrics*, 131(2): S133-S141.

[27] Currie, Janet, and Jonathan Gruber. 1996a. "Saving Babies: The Efficacy and Cost of Recent Changes in the Medicaid Eligibility of Pregnant Women". *Journal of Political Economy*, 104(6): 1263-1296.

[28] Currie, Janet, and Jonathan Gruber. 1996b. "Health Insurance Eligibility, Utilization of Medical Care, and Child Health". *The Quarterly Journal of Economics*, 111(2): 431-466.

[29] Currie, Janet, and Maya Rossin-Slater. 2015. "Early-Life Origins of Life-Cycle Well-Being: Research and Policy Implications". *Journal of Policy Analysis and Management*, 34(1): 208-242.

[30] Del Valle, Alejandro. 2015. "From Caring to Work: The Labor Market Effects of Non-contributory Health Insurance". Unpublished manuscript.

[31] Dafny, Leemore, and Jonathan Gruber. 2005. "Public insurance and child hospitalizations: access and efficiency effects". *Journal of Public Economics*, 89(1): 109-129.

[32] Finkelstein, Amy, Sarah Taubman, Bill Wright, Mira Bernstein, Jonathan Gruber, Joseph P. Newhouse, Heidi Allen, and Katherine Baicker. 2012. "The Oregon Health Insurance Experiment: Evidence from the First Year". *The Quarterly journal of economics*, 127(3): 1057-1106.

[33] Freedman, Seth, Haizhen Lin, and Kosali Simon. 2015. "Public health insurance expansions and hospital technology adoption". *Journal of Public Economics*, 121: 117-131.

[34] Frenk, Julio, Eduardo González-Pier, Octavio Gmez-Dants, Miguel Lezana and Felicia Knaul. 2006. "Comprehensive reform to improve health system performance in Mexico". *The Lancet*, 368: 1524-34.

[35] Frenk, Julio, Octavio Gomez-Dantes, and Felicia Marie Knaul. 2009. "The democratization of health in Mexico: financial innovations for universal coverage". *Bulletin of the World Health Organization*, 87: 542-548.

[36] Gakidou E., Lozano R., González-Pier E. et al. 2006. "Assessing the effect of the 200106 Mexican health reform: an interim report card". *The Lancet*, Health System Reform in Mexico 5, 368: 1920-35.

[37] Gallardo-García, J.R. 2006. “Health insurance and pregnancy outcomes: An analysis of fertility, prenatal care and employment in Mexico.” PhD Dissertation.

[38] Gostin, Lawrence O., Mary C. DeBartolo and Daniel A. Hougendobler. 2015. “King v Burwell. Subsidizing US Health Insurance for Low- and Middle-Income Individuals”. *JAMA*, 314(4): 333-334.

[39] Grogger, Jeffrey, Tamara Arnold, Ana Sofía León, and Alejandro Ome. 2015. “Heterogeneity in the effect of public health insurance on catastrophic out-of-pocket health expenditures: the case of Mexico”. *Health policy and planning*, 30(5): 593-599.

[40] Gruber, Jonathan, Nathaniel Hendren, and Robert M. Townsend. 2014. “The great equalizer: Health care access and infant mortality in Thailand”. *American economic journal. Applied economics*, 6(1): 91-107.

[41] Harmeling, Susan. 1999. “Health reform in Brazil”. Case study for Module 3.

[42] Harris, J.E. and Sosa-Rubí, S.G. (2009). ”Impact of Seguro Popular on Prenatal Visits in Mexico, 2002-2005: Latent Class Model of Count Data with a Discrete Endogenous Variable. The National Bureau of Economic Research, NBER Working Paper No.14995

[43] Hernández-Torres, J., Ávila-Burgos, L., Valencia-Mendoza, A. and Poblano-Verástegui, O. 2008. ”Seguro Popular’s initial evaluation of household catastrophic health spending in Mexico. Revista de Salud Pùblica, 10(1), 18-32.

[44] Hoynes, Hilary W. and Diane Whitmore Schanzenbach. 2009. ”Consumption Responses to In-Kind Transfers: Evidence from the Introduction of the Food Stamp Program”. *American Economic Journal: Applied Economics*, 1(4): 109139.

[45] Jasso-Gutiérrez, Luis, Luis Durán-Arenas, Samuel Flores-Huerta, and Gabriel Cortés-Gallo. 2012. “Recommendations to improve healthcare of neonates with respiratory insufficiency beneficiaries of Seguro Popular”. *Salud Pblica de Mxico*, 54: s57-s64.

[46] King, Gary, Emmanuela Gakidou, Kosuke Imai, Jason Lakin, Ryan T Moore, Clayton Nall, Nirmala Ravishankar, Manett Vargas, Martha María Téllez-Rojo, Juan Eugenio Hernndez Ávila, Mauricio Hernández Ávila and Héctor Hernández Llamas. 2009. “Public policy for the poor? A randomized assessment of the Mexican universal health insurance program”. *The Lancet*, 273: 1447-1454.

[47] Knaul, Felicia Marie, Arreola-Ornelas, H., Méndez-Carniado O. et al. 2006. ”Evidence is good for your health system: policy reform to remedy catastrophic and impoverishing health spending in Mexico”. *The Lancet*, Health System Reform in Mexico 4, 368: 1828-41.

[48] Knaul, Felicia Marie, Eduardo Gonzalez-Pier, Octavio Gomez-Dantes, David Garcia-Junco, Hector Arreola-Ornelas, Mariana Barraza-Llorens, Rosa Sandoval et al. 2012. "The quest for universal health coverage: achieving social protection for all in Mexico". *The Lancet*, 380(9849): 1259-1279.

[49] Knox, Melissa. 2015. "Seguro Popular: Health Insurance or Income Transfer Program? A Difference in Differences Evaluation of Health, Utilization, and Employment, Five Years after Program Introduction." Unpublished manuscript.

[50] Levy, Helen, and David Meltzer. 2008. "The impact of health insurance on health". *Annu. Rev. Public Health*, 29: 399-409.

[51] Limwattananon, Supon, Sven Neelsen, Owen O'Donnell, Phusit Prakongsai, Viroj Tangcharoensathien, Eddy van Doorslaer, Vuthiphan Vongmongkol. 2015. "Universal coverage with supply-side reform: The impact on medical expenditure risk and utilization in Thailand", *Journal of Public Economics*, 121: 7994.

[52] Macinko, James, Frederico C. Guanais, and Maria de Fatima Marinho de Souza. 2006. "Evaluation of the impact of the Family Health Program on infant mortality in Brazil, 19902002". *Journal of epidemiology and community health*, 60(1): 13-19.

[53] Manning, Willard G., Joseph P. Newhouse, Naihua Duan, Emmett B. Keeler, and Arleen Leibowitz. 1987. "Health insurance and the demand for medical care: evidence from a randomized experiment". *The American Economic Review*, 77(3): 251-27.

[54] Miller, Grant, Diana Pinto, and Marcos Vera-Hernández. 2013. "Risk Protection, Service Use, and Health Outcomes under Colombia's Health Insurance Program for the Poor". *American Economic Journal: Applied Economics*, 5(4): 61-91.

[55] Newhouse, Joseph P. and Rand Corporation Insurance Experiment Group. 1993. "Free for all? Lessons from the RAND health insurance experiment". Harvard University Press.

[56] Nigenda, Gustavo. 2009. "Evaluación del Sistema de Protección Social en Salud 2009: Informe Final", Instituto Nacional de Salud Pública.

[57] Nigenda, Gustavo, Veronika J. Wirtz, Luz Mara González-Robledo and Michael R. Reich. 2015. "Evaluating the Implementation of Mexico's Health Reform: The Case of Seguro Popular". *Health Systems & Reform*, 1(3): 217-228.

[58] Paim, Jairnilson, Claudia Travassos, Celia Almeida, Ligia Bahia, and James Macinko. 2011. "The Brazilian health system: history, advances, and challenges". *The Lancet*, 377(9779): 1778-1797.

[59] Pfutze, Tobias. 2014. “The Effects of Mexicos Seguro Popular Health Insurance on Infant Mortality: An Estimation with Selection on the Outcome Variable”. *World Development*, 59: 475-486.

[60] Reich, Michael R., Joseph Harris, Naoki Ikegami, Akiko Maeda, Keizo Takemi, and Timothy G. Evans. 2015. “Moving towards universal health coverage: lessons from 11 country studies”. *The Lancet*, 387(10020): 811-816.

[61] Rice, Amy L., Lisa Sacco, Adnan Hyder, and Robert E. Black. 2000. “Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries”. *Bulletin of the World Health Organization*, 78(10): 1207-1221.

[62] Savedoff, William D., and Amy L. Smith. 2011. “Achieving universal health coverage: learning from Chile, Japan, Malaysia and Sweden”. Washington, DC: Results for Development Institute.

[63] Scott, John. 2006. ”Seguro Popular Incidence Analysis”. In Decentralized Service Delivery for the Poor, Washington, D.C., World Bank Publications. Vol. II, pp. 14766. `http://siteresources.worldbank.org/INTMEXICOINSPANISH/Resources/VolIIChapter3.pdf`

[64] Sosa-Rubi, Sandra G., Omar Galarraga, and Jeffrey E. Harris. 2009. “Heterogeneous impact of the seguro popular program on the utilization of obstetrical services in mexico, 20012006: a multinomial probit model with a discrete endogenous variable”. *Journal of Health Economics*, 28(1): 20-34.

[65] Spenkuch, J.L. 2012. ”Moral hazard and selection among the poor: evidence from a randomized experiment.”, *Journal of Health Economics*. 2012 Jan; 31(1):72-85.

[66] Summers, Lawrence H. 2015. “Economists’ declaration on universal health coverage”. *The Lancet*, 386(10008): 2112-2113.

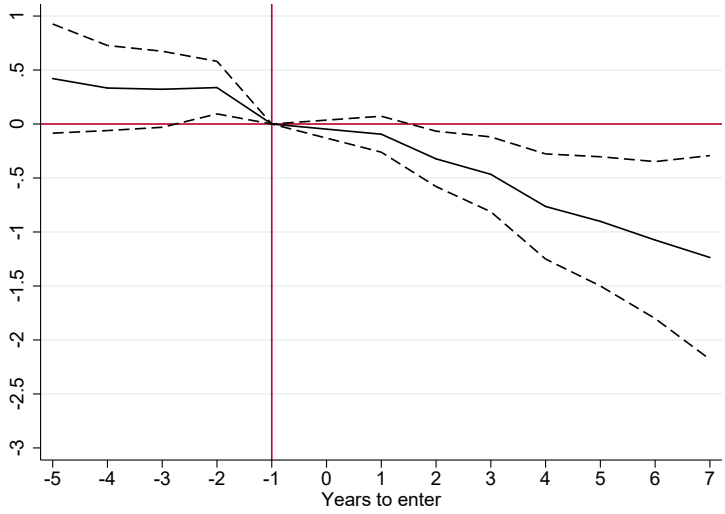
[67] Taubman, Sarah L., Heidi L. Allen, Bill J. Wright, Katherine Baicker and Amy Finkelstein. 2014. “Medicaid Increases Emergency-Department Use: Evidence from Oregon’s Health Insurance Experiment”. *Science*, 343(6168): 263-268.

[68] World Health Organization and World Bank. 2015. Tracking Universal Health Coverage. First Global Monitoring Report.

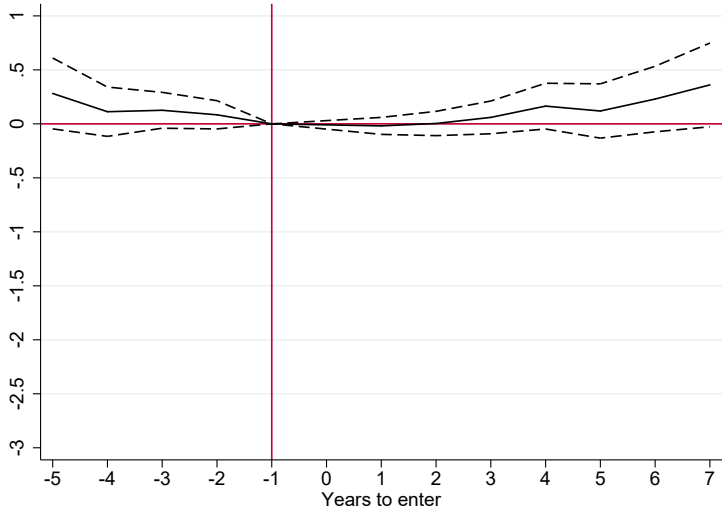
8 Figures and Tables

Figure 1: Impact of SP on Child Mortality, by Poverty of the Municipality

(a) Poor Municipalities

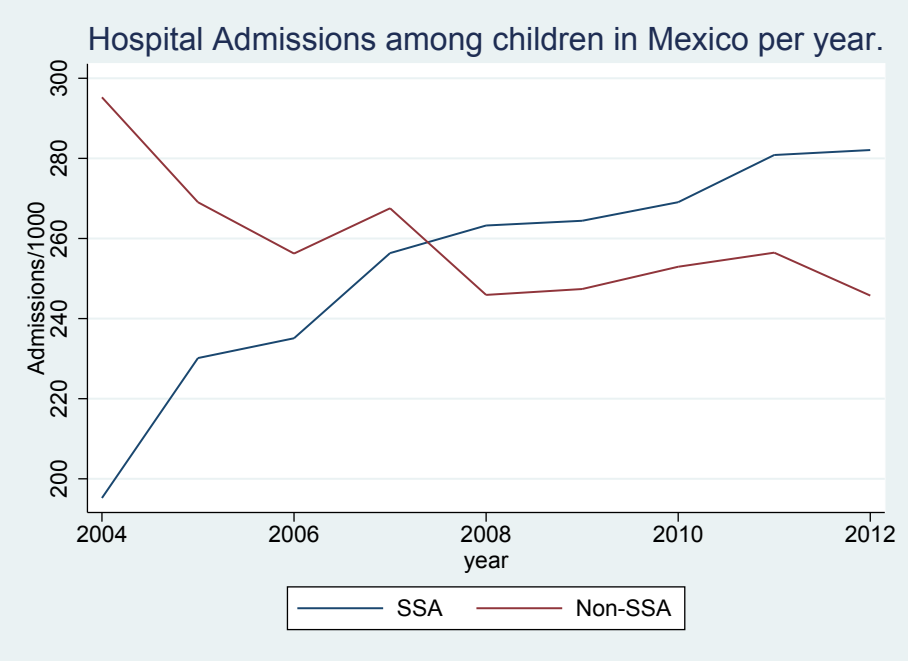


(b) Rich Municipalities



Note: The figures plot weighted least square estimates of β from specification (1). The dependent variable is the child mortality rate. The dashed lines are 90% confidence intervals. Data source: Mortality Registry 1998-2012.

Figure 2: Hospital Admissions in SSA and non-SSA Hospitals for Children <5 years of age



Note: This graph shows the number of hospital admissions in all public hospitals in Mexico between 2004 and 2012 for children less than 5 years old. "SSA" includes all hospital admission in SSA (Ministry of Health) units. "Non-SSA" includes all hospital admissions in hospitals not run by SSA (IMSS, IMSS-Oportunidades, ISSSTE, PEMEX and the military). Note that, even if IMSS-Oportunidades provides medical services to *Oportunidades* people covered by SP, in this figure we bundle them into the "Non-SSA" category since they are not included in the hospital discharges data - so to make the two categories comparable.

Table 1: The Determinants of the Timing of the Municipality Rollout of SP (Levels)

	(1)	(2)	(3)	(4)	(5)
Sample of municipalities	All	All	All	Rich	Poor
Socio-demographic and Political Indicators (2000)					
Log population	-0.390***	-0.329***			
	[0.022)	(0.024)			
Marginalization Index	0.464***	0.203***			
	(0.030)	(0.037)			
% of population 0-4 years of age	0.030**	-0.033**			
	(0.015)	(0.014)			
% eligible population	0.018***	0.006***			
	(0.002)	(0.002)			
% of employed population working in:					
the primary sector	0.018***	0.010***			
	(0.001)	(0.002)			
the secondary sector	-0.014***	-0.005*			
	(0.003)	(0.003)			
the tertiary sector	-0.031***	-0.020***			
	(0.002)	(0.002)			
Alignment b/w party in power in	-1.409***	-0.786***	-0.722***	-0.647***	-0.812***
municipality and state at entry year	(0.072)	(0.088)	(0.083)	(0.094)	(0.144)
Supply of Health Care (2001) and Health (2000)					
No. Hospitals (per 100,000 eligible)	-0.065***	-0.036**	-0.010	-0.003	0.024
	(0.018)	(0.017)	(0.016)	(0.020)	(0.030)
No. Health Centers (per 100,000 eligible)	-0.003***	-0.001**	-0.006***	-0.004***	-0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
No. Doctors in Hospitals (per 100,000 eligible)	-0.003***	-0.002***	-0.000	-0.001*	-0.002
	(0.001)	(0.000)	(0.000)	(0.001)	(0.002)
Child Mortality Rate	0.035***	0.008	0.003	-0.023	0.009
	(0.008)	(0.009)	(0.008)	(0.017)	(0.009)
No. of observations	2,424	2,424	2,424	1,144	1,280
State fixed effects	No	Yes	Yes	Yes	Yes
Controls for socio-demographic	No	No	Yes	Yes	Yes

Note: Each cell in column 1 presents the estimated coefficient from a linear regression of the year of entry of SP in a municipality on a pre-program characteristic. Column 3 controls for a quadratic in the index of marginalization, the log of population, the share of population 0-4 years old, the share of eligible population, and the share of population employed in the primary, secondary and tertiary sectors. Robust standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table 2: The Determinants of the Timing of the Municipality Rollout of SP (Trends)

	(1)	(2)	(3)	(4)	(5)	(6)
Sample of municipalities	All	Rich	Poor	All	Rich	Poor
		$t-1$			$t-3$	
Child Mortality Rate	-0.0001	0.0102	-0.0036	-0.0002	0.0034	-0.0013
	(0.0063)	(0.0117)	(0.0070)	(0.0036)	(0.0045)	(0.0075)
No. of observations	2,424	1,144	1,280	2,424	1,144	1,280

Note: Each cell presents the estimated φ coefficient from the following linear regression:

$$Year_{ms} = \varphi \Delta x_{ms,t-k} + \gamma \mathbf{Z}_{mst} + \pi_s + \chi_{ms} \tag{4}$$

where $Year_{ms}$ is the year of implementation of SP in municipality m of state s; $\Delta x_{ms,t-k}$ is the change in pre-SP municipality-level child mortality rate between year t (the year prior to the introduction of SP in a municipality) and $t-k$ ($k = 1, 3$); $\mathbf{Z}_{mst}$ is a vector which includes the log of population and a quadratic in the index of marginalization of the municipality in 2000; and π_s are state fixed effects. Robust standard errors in parentheses. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table 3: Impact of SP on Child Mortality (ages 0-4)

Sample of Municipalities	(1) Poor	(2) Rich
Up to 2 years (inclusive) before SP (β_1)	0.057	0.145***
	(0.083)	(0.055)
0 to 2 years after SP (β_2)	-0.082	-0.008
	(0.070)	(0.041)
3 or more years after SP (β_3)	-0.340***	0.099
	(0.114)	(0.067)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.004	0.039
Mean in 2000	4.721	3.747
SD in 2000	4.981	2.939
No. of Observations	19,200	17,160
No. of Municipalities	1,280	1,144

Note: This table displays weighted least squares estimates of our baseline specification (2) on the deaths data, aggregated at municipality-year level. The model estimated is the following (see equation 2):

$$y_{mst} = \beta_1 SP_{mst}\mathbf{1}\left[t - T_m \leq -2\right] + \beta_2 SP_{mst}\mathbf{1}\left[0 \leq t - T_m \leq 2\right] + \\ + \beta_3 SP_{mst}\mathbf{1}\left[t - T_m \geq 3\right] + \mu_{ms} + \pi_t + \varepsilon_{mst}$$

where the dependent variable y_{mst} is the child mortality rate in municipality m of state s in year t. Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. Controls include fixed effects for year (π_t) and municipality of residence (μ_{ms}). Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Mortality Registry 1998-2012.

Table 4: Impact of SP on Child Mortality, by Eligibility (Sample of Poor Municipalities)

Sample	(1) Eligible	(2) Non-Eligible
Up to 2 years (inclusive) before SP (β_1)	-0.246	-0.816
	(0.229)	(0.955)
0 to 2 years after SP (β_2)	-0.467**	-0.163
	(0.226)	(1.030)
3 or more years after SP (β_3)	-0.533**	-0.396
	(0.261)	(0.840)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.115	0.717
Mean in 2000	4.019	2.662
SD	3.881	6.531
No. of observations	19,147	14,864

Note: This table displays weighted least squares estimates of our baseline specification (2) on the deaths data, aggregated at municipality-year level. The dependent variable is the child mortality rate. Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. Controls include fixed effects for year and municipality of residence. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Mortality Registry 1998-2012.

Table 5: Impact of SP on Child Mortality, Robustness (Sample of Poor Municipalities)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 2 years (incl.) before SP (β_1)	0.057	0.057	0.093	0.056	0.092	0.028	0.047	0.085
	(0.083)	(0.112)	(0.078)	(0.084)	(0.084)	(0.089)	(0.085)	(0.085)
0 to 2 years after SP (β_2)	-0.083	-0.083	-0.089	-0.082	-0.117*	-0.061	-0.073	-0.077
	(0.070)	(0.099)	(0.072)	(0.070)	(0.071)	(0.070)	(0.070)	(0.073)
3 or more years after SP (β_3)	-0.340***	-0.340**	-0.275**	-0.338***	-0.422***	-0.291***	-0.314***	-0.258**
	(0.114)	(0.159)	(0.111)	(0.107)	(0.109)	(0.105)	(0.107)	(0.112)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.004	0.035	0.026	0.001	0.000	0.003	0.002	0.033
Observations	19,200	19,200	19,200	19,200	17,920	19,200	19,200	17,920
Controls								
Year FE	x	x	x	x	x	x	x	x
Municipality Fixed Effects	x	x	x	x	x	x	x	x
State-Year Quadratic Trend			x					x
Trends in 2000 Municipality's Xs				x	x	x	x	x
Political Alignment at entry in SP					x			x
Pre-SP Municipality Linear Trend						x		x
Pre-2002 Municipality Linear Trend							x	
Dummy for years since *Oportunidades*								x
Cluster of SE	Mun.	State-Year	Mun.	Mun.	Mun.	Mun.	Mun.	Mun.

Note: This table displays weighted least squares estimates of our baseline specification (2) on the deaths data, aggregated at municipality-year level. The dependent variable is the child mortality rate. Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. The baseline municipality Xs for which we include trends are: socioeconomic indicators measured in 2000 (quadratic of the index of marginalization, log of total population, and share of population of ages 0-4); labor market indicators measured in 2000 (share of uninsured individuals, share of individuals employed in the primary, secondary and tertiary sectors); health care indicators measured in 2001 (number of hospitals, health centers, and doctors in hospitals, all per uninsured). Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Mortality Registry 1998-2012.

Table 6: Impact of SP on Child Mortality, By Condition (Sample of Poor Municipalities)

	(1)	(2)	(3)
	All	Bacterial/Intestin. Malnutrition Respiratory (ICD10 A, E, J)	External Causes (ICD10 V, W, X)
Up to 2 years (inclusive) before SP (β_1)	0.057	0.041	0.008
	(0.083)	(0.041)	(0.017)
0 to 2 years after SP (β_2)	-0.082	-0.038	0.020
	(0.070)	(0.034)	(0.016)
3 or more years after SP (β_3)	-0.340***	-0.102*	0.016
	(0.114)	(0.056)	(0.023)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.004	0.193	0.408
Mean in 2000	4.721	1.383	0.335
No. of observations	19,200	19,200	19,200
% of all PNM (2000)	100%	29%	7%
Covered by SP by 2002?	20%	59%	1%
Covered by SP by 2006?	50%	74%	7%
Covered by SP by 2010?	67%	74%	8%

Note: This table displays weighted least squares estimates of our baseline specification (2) on the deaths data, aggregated at municipality-year level. The dependent variable is the child mortality rate. Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Mortality Registry 1998-2012.

Table 7: Impact of SP on Child Hospital Admissions, by Condition (Sample of Poor Municipalities)

	(1)	(2)	(3)	(4)	(5)
	All (log)	Bacterial/Intestin. Malnutrition Respiratory (ICD10 A, E, J)	External Causes (ICD10 V, W, X)	# of Days	Share E.R.
Up to 2 years (inclusive) before SP (β_1)	-0.001	0.020	0.016	0.007	0.001
	(0.024)	(0.037)	(0.032)	(0.122)	(0.008)
0 to 2 years after SP (β_2)	0.087***	0.113***	0.033	0.059	0.016*
	(0.026)	(0.038)	(0.032)	(0.119)	(0.009)
3 or more years after SP (β_3)	0.092**	0.144**	0.041	0.036	0.040***
	(0.042)	(0.060)	(0.045)	(0.166)	(0.014)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.004	0.013	0.584	0.842	0.007
Mean in 2000	22.282	8.062	1.534	6.152	0.741
No. of observations	16,640	16,640	16,640	14,903	14,912

Note: This table displays weighted least squares estimates of our baseline specification (2) on the discharges data, aggregated at municipality-year level. The dependent variable is the log number of discharges in columns (1)-(3), the number of days in column (4), and the share of admissions through E.R. in column (5). Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Registry of Admissions to SSA Hospitals 2000-2012.

HEALTH INSURANCE AND CHILD HEALTH: EVIDENCE FROM MEXICO

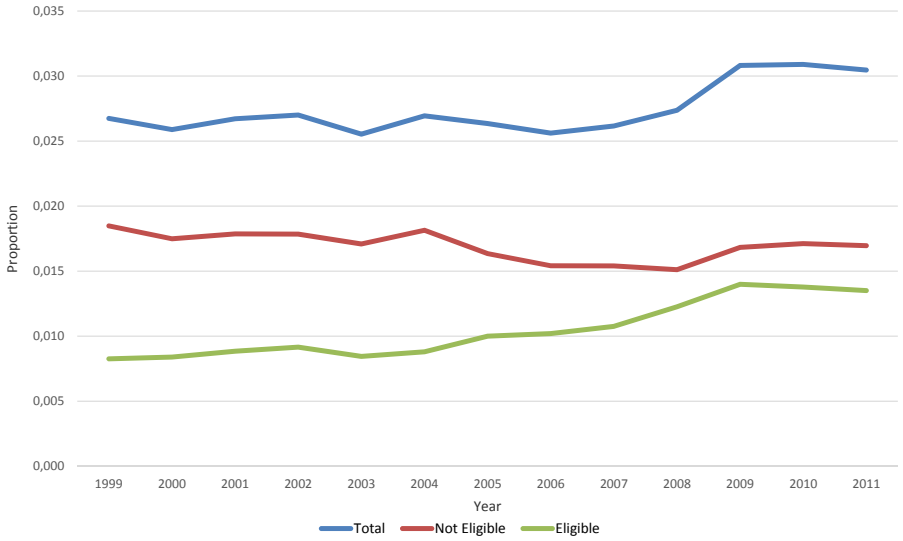
Gabriella Conti & Rita Ginja

ONLINE APPENDIX

NOT FOR PUBLICATION

A Additional Figures

Figure A.1: Public Expenditure on Health, Overall and by SP Eligibility Group

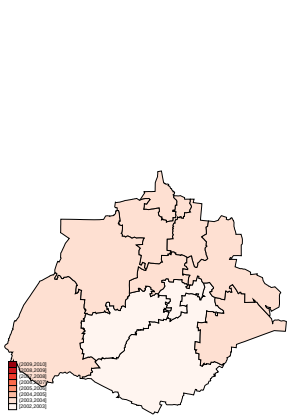


Note: The figure shows the ratio of public expenditure on health to GDP, overall and by SP eligibility group. The total public expenditure on health is the sum of the public expenditure for the insured population (not eligible to SP), i.e. those affiliated with IMSS (*Instituto Mexicano del Seguro Social*), ISSSTE (*Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado*) and PEMEX (*Petróleos Mexicanos*), and for the uninsured population (eligible to SP). This latter includes both federal and state expenditures, while the former combines resources assigned to (1) the Ministry of Health (*Ramo 12*), (2) the FASSA (*Fondo de Aportaciones para los Servicios de Salud, Ramo 33*) - these two constitute the *Aportaciones Federales* - or other health services funds; and (3) the IMSS-Oportunidades (*Ramo 19*). Source: own calculations from the official budget.

Figure A.2: Year of Implementation of SP in a Municipality

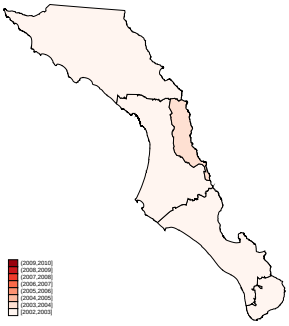
Note: A municipality is defined as having implemented SP if there are at least 10 households enrolled. Source: own elaborations using the *Padrón* data.

Figure A.3: Year of Introduction of SP in a Municipality, By State

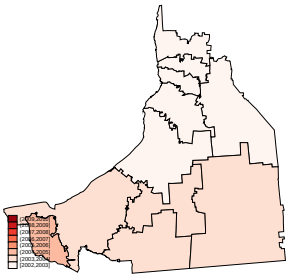


(a) Aguascalientes

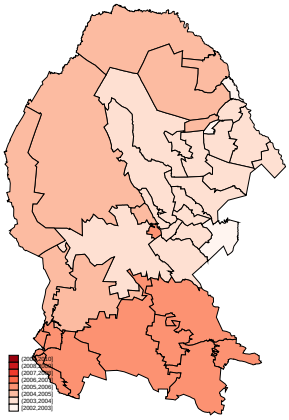
(b) Baja California



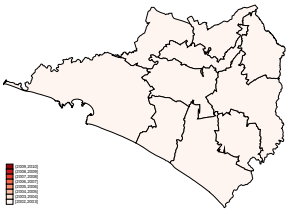
(c) Baja California Sur



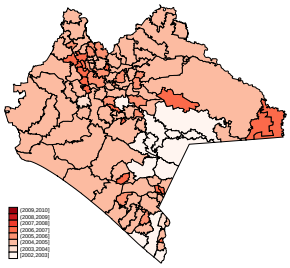
(d) Campeche



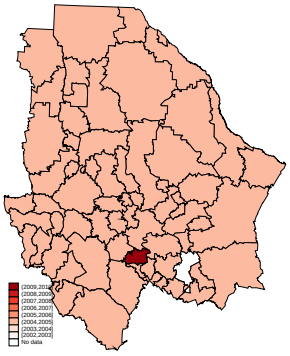
(e) Coahuila



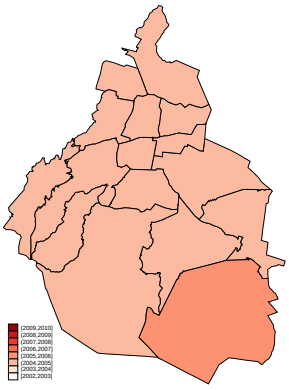
(f) Colima



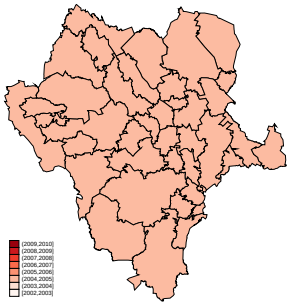
(g) Chiapas



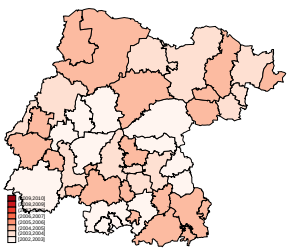
(h) Chihuahua



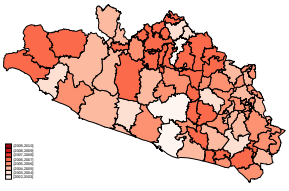
(i) Distrito Federal



(j) Durango

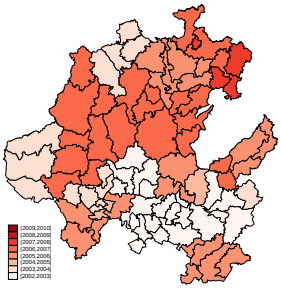


(k) Guanajuato

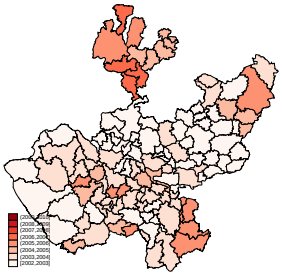


(l) Guerrero

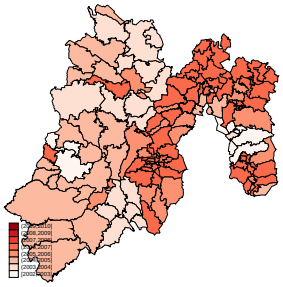
Figure A.4: Year of Introduction of SP in a Municipality, By State (cont.)



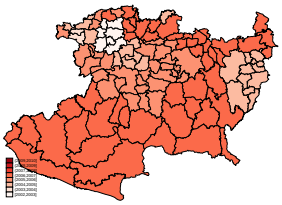
(a) Hidalgo



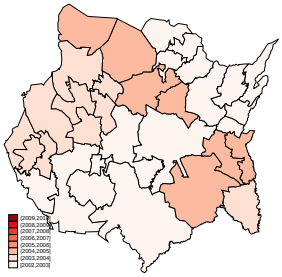
(b) Jalisco



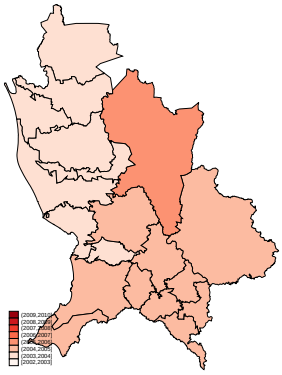
(c) México



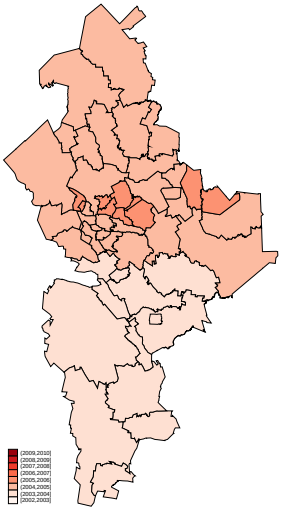
(d) Michoacán



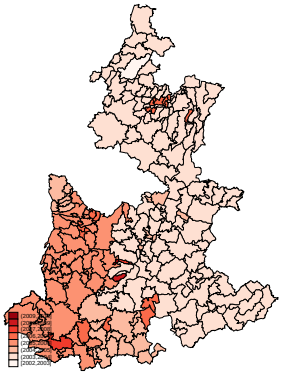
(e) Morelos



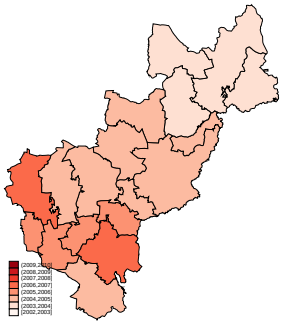
(f) Nayarit



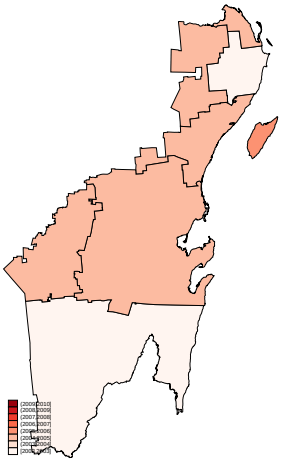
(g) Nuevo León



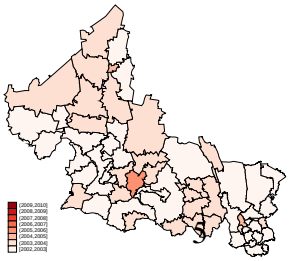
(h) Puebla



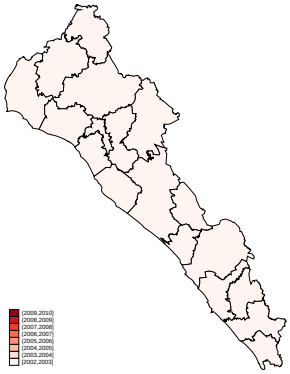
(i) Querétaro



(j) Quintana Roo

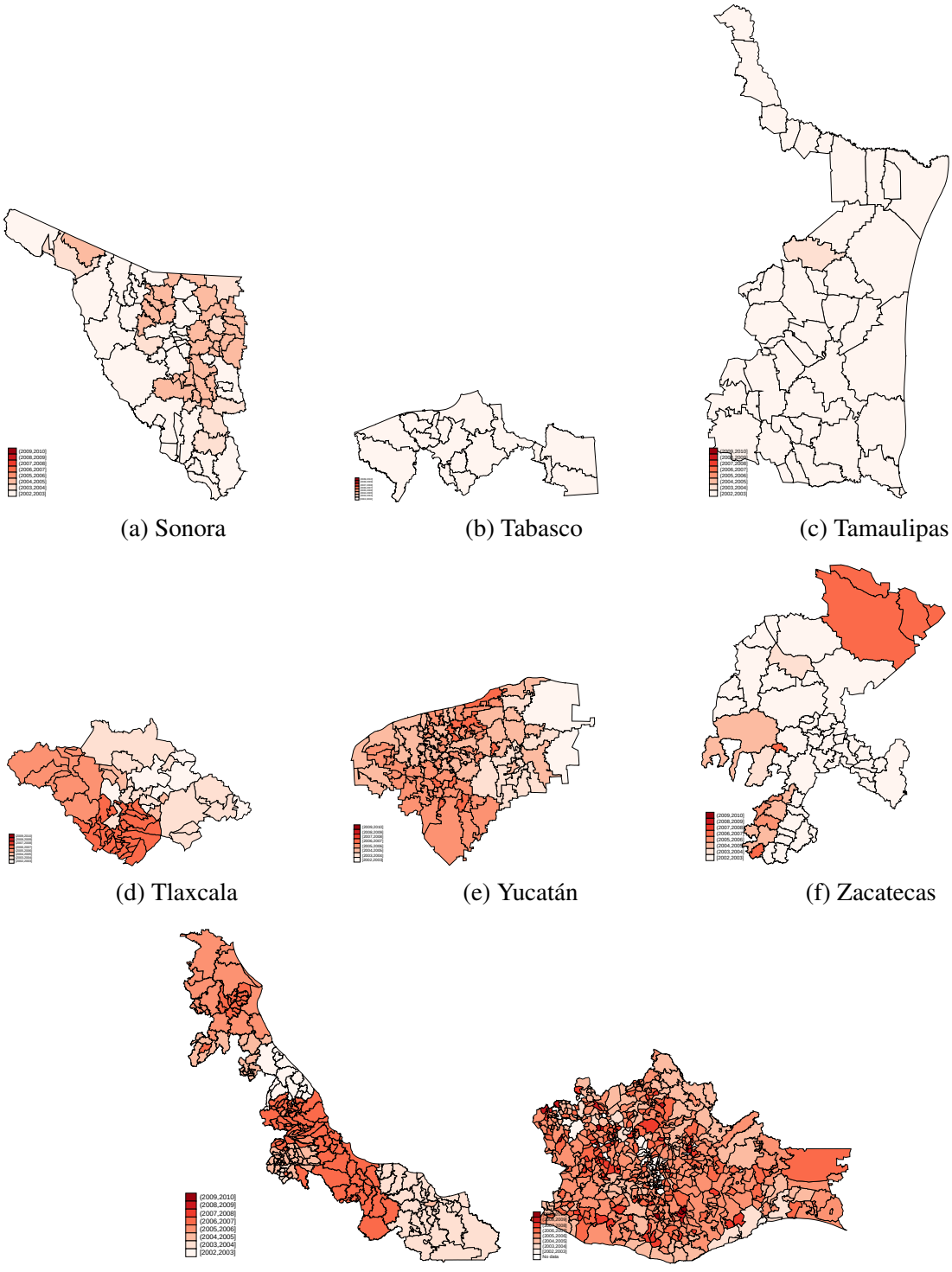


(k) San Luis Potosí



(l) Sinaloa

Figure A.5: Year of Introduction of SP in a Municipality, By State (cont.)

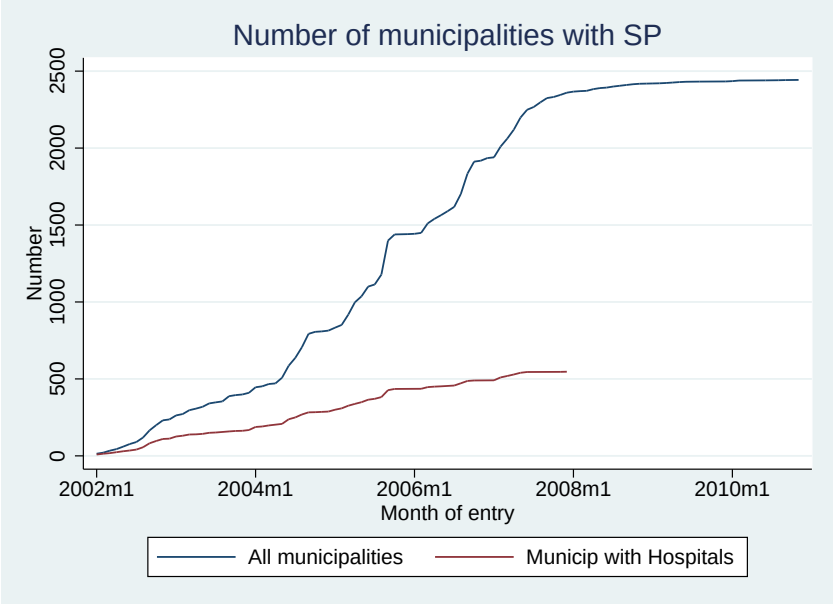


(a) Sonora (b) Tabasco (c) Tamaulipas

(d) Tlaxcala (e) Yucatán (f) Zacatecas

(g) Veracruz (h) Oaxaca

Figure A.6: Number of municipalities with access to SP, by month



Note: This graph shows the cumulative number of municipalities which have implemented SP in each month between 2002 and 2010. A municipality is defined as having implemented SP if there are at least 10 households enrolled. Source: own elaboration using the *Padrón* data.

B Additional Tables

Table B.1: Health Ministry Medical Units, 2001-2010

Type	Year									
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Outpatient Units										
Basic Health Center (Rural)	7,690	7,836	7,933	8,127	8,232	8,307	8,350	8,372	8,334	8,381
Basic Health Center (Urban)	1,458	1,495	1,579	1,602	1,613	1,628	1,636	1,649	1,744	1,783
Health Center with hospitalization	162	149	147	122	121	89	74	65	63	59
Mobile Unit	1,447	1,442	1,420	1,410	1,420	1,406	1,394	1,629	1,849	1,955
Brigada movil (Mobile Brigate)	453	462	453	449	465	478	485	651	625	147
Specialized clinic	72	81	80	86	93	96	93	93	100	98
Consultorio delegacional (Borough Office)	65	65	46	17	17	12	12	15	21	13
Unidad ministerio publico (Public sector unit)	46	48	47	52	52	60	50	51	51	68
Casa de salud (Health Center)	0	0	0	0	17	37	57	134	142	602
Unidad de Especialidades Médicas (UNEMES)	0	0	0	0	0	29	50	108	313	469
Centros Avanzados de Atención Primaria a la Salud (CAAPS)	0	0	0	0	0	29	33	50	63	77
Centros de Salud con Servicios Ampliados (Health Centers with Extended Services)	0	0	0	0	0	0	0	11	18	25
Inpatient Units										
Community Hospital (*Hospital integral/comunitario*)	63	78	86	128	133	182	211	228	237	256
General Hospital	268	274	275	278	288	289	290	301	309	307
Specialized Hospital	70	72	71	73	81	83	89	87	94	100
Psychiatric hospital	30	30	30	32	31	33	33	33	33	34
Total	11,824	12,032	12,167	12,376	12,563	12,758	12,857	13,477	13,996	14,374

Note: Number of medical units in Mexico operated by the Health Ministry. Source: authors' calculations based on data for all physical and human resources for all outpatient and inpatient units administered by the Health Ministry for the period 2001-2010.

Table B.2: Outpatient visits and Medical Personnel in all public providers of health care

	(1)	(2)	(3)	(4)	(5)	(6)
	All Municipalities		Poor Muns		Rich Muns	
Year	Number	%	Number	%	Number	%
	Panel A: Outpatient visits (per 1,000 inhabitants)					
	Panel A1: Non-SSA units					
2001	865		786		954	
2006	961	11%	915	16%	1013	6%
2010	1184	23%	1046	14%	1339	32%
	Panel A2: SSA units					
2001	1098		1167		1020	
2006	1510	38%	1559	34%	1455	43%
2010	1746	16%	1814	16%	1669	15%
	Panel B: Medical Personnel (per 1,000 inhabitants)					
	Panel B1: Non-SSA units					
2001	0.32		0.27		0.38	
2006	0.39	21%	0.31	16%	0.47	25%
2010	0.44	15%	0.33	7%	0.57	20%
	Panel B2: SSA units					
2001	0.50		0.46		0.54	
2006	0.64	28%	0.59	28%	0.70	29%
2010	0.89	38%	0.83	40%	0.96	37%
N	2,424		1,280		1,144	

Note: The table presents the number of (and the % change in) outpatient visits (Panel A), medical personnel (Panel B) and their ratio (Panel C) in SSA and non-SSA units, for the years 2001, 2006 and 2010. The non-SSA providers include IMSS, ISSSTE, PEMEX, IMSS-Oportunidades and any other public provider of health services. Source: authors' calculations using the SIMBAD data for the years 2001, 2006 and 2010.

Table B.3: Health Centers, Hospitals, Beds and Doctors in the SSA sector

	(1)	(2)	(3)	(4)	(5)	(6)
	All Municipalities		Poor Muns		Rich Muns	
Year	Number	%	Number	%	Number	%
			Panel A: Health Centers (SSA)			
2001	11321		4807		6514	
2006	12100	7%	5080	6%	7020	8%
2010	13599	12%	5665	12%	7934	13%
			Panel B: Hospitals (SSA)			
2001	398		77		321	
2006	551	38%	127	65%	424	32%
2010	657	19%	179	41%	478	13%
			Panel C: Hospital beds for 1,000 eligibles (SSA)			
2001	0.17		0.05		0.31	
2006	0.20	17%	0.08	53%	0.34	10%
2010	0.25	23%	0.12	45%	0.39	17%
			Panel D: Hospital doctors for 1,000 eligibles (SSA)			
2001	0.75		0.54		0.99	
2006	1.12	49%	1.09	100%	1.16	17%
2010	1.34	19%	1.21	12%	1.47	27%
N	2,424		1,280		1,144	

Note: The table presents in Panels A-D the number of (and the % change in) health centers, hospitals, beds and doctors in SSA units. Panel E shows the diffusion of SSA medical units across all municipalities in Mexico. Source: authors' calculations using data for all physical and human resources for all outpatient and inpatient units administered by the Health Ministry for the period 2001-2010.

Table B.4: The Impacts of SP on Health Outcomes.

Authors	Data	Methodology	Results
Knaul et al. (2006)	ENIGH 1992-2004 (every 2 years); ENSANUT 2006; ENED 2002-03; ENIGH 2000-2004; Census and Padrón SP 2002-06; Hospital discharges of Health Ministry 2000-05; SICUENTAS and the Health Statistics Bulletin 2000-2005 for health; SEED 1995-2005 for mortality rates; SINERHIAS for the concentration of doctors and nurses	Regression analysis using an indicator for type of insurance provider	Negative association between out-of-pocket health spending/catastrophic spending and coverage of SP.
Gakidou et al. (2006)	ENSA 2000; ENSANUT 2006	Descriptive Statistics; logistic model using affiliation to SP as independent variable	Affiliation is preferentially reaching the poor and the marginalized communities; Federal non-SS expenditure increased by 38% from 2000 to 2005; proportion of individuals paying for medication among SP affiliates is 41.3%, in uninsured people is 73.8% and in individuals in SS is 30.7%; Equity of public-health expenditure across states improved; SP affiliates used more inpatient and outpatient services than uninsured people; effective coverage of 11 interventions has improved between 2000 and 200506; Catastrophic expenditures for SP affiliates are lower than for uninsured people.
Scott (2006)	ENIGH 2004	Descriptive statistics	Higher utilization rates of public health services for SP affiliates than for the rest of the uninsured, and higher for higher income groups; household health expenditures lower for SP beneficiaries; incidence of catastrophic health expenditures lower across deciles for SP beneficiaries.
Gallardo-García (2006)	Mexican Family Life Survey 2002	Dynamic discrete choice model, where SP is introduced as a 0-price health insurance scheme	Positive impact on birth weight.
Sosa-Rubí et al. (2009)	ENSANUT 2006	State year of entry in SP as IV for affiliation in SP	Positive impact of SP on pregnant women's access to obstetrical services.
Harris and Sosa-Rubí (2009)	ENSANUT 2006	Locality coverage of SP among uninsured is instrument for own affiliation in SP	Enrollment in SP is associated with a mean increase in 1.65 prenatal visits during pregnancy; 59% of this treatment effect is the result of increased prenatal care among women who had little or no access to care.
Hernández-Torres et al. (2008)	SP Impact Evaluation Survey 2002 (Campeche and Colima)	Probit model	8% of reduction in catastrophic expenditure on health, independent of the economic level or the kind of service.
King et al. (2009)	Experimental design	Define 12,284 health clusters, of which 7000 are assigned to SP. Baseline survey was conducted around August 2005, follow-up 10 months later	23% of reduction from baseline in catastrophic expenditures. The intention-to-treat effect on health spending in poor households was 426 pesos ; the complier average causal effect was 915 pesos ; no effects on medication spending, health outcomes, or utilization.

The Impacts of SP on Health Outcomes (cont.).

Authors	Data	Methodology	Results
Spenkuch (2012)	Kling et al. (2009) data	Uses Kling et al (2009) randomized design	agents in poor self-assessed health prior to the intervention have, all else equal, a higher propensity to take up insurance; insurance coverage reduces the demand for self-protection in the form of preventive care; individuals do not sort based on objective measures of their health.
Barros (2011)	ENSA 2000; ENSANUT 2006; ENIGH 2000, 2004, 2005, 2006	Triple difference: taking differences over targeted state intensity (in 2006), over time (pre vs post-program), and over individual SP eligibility	SP decreases households health expenditures: 4.2% of increase in savings of non-health expenditures; reduction of 40% of people not seeking care due to financial constraints; negligible effect on health status.
Bernal and Grogger (2013a)	Kling et al (2009) data; Hospital discharges of Health Ministry 2005-06	Uses Kling et al (2009) randomized design	Increase of births in covered facilities
Bernal and Grogger (2013b)	Kling et al (2009) data; Neonatal and Perinatal deaths from Mortality Records for children who were and died between 2002 and 2006	Uses Kling et al (2009) randomized design	Use diagnostic procedures during prenatal care visits, but no impact on utilization of prenatal care. Increase of childbirths in public facilities. No effect on fertility, perinatal or neonatal mortality
Puftze (2014)	CENSUS 2010	Proportion of population in municipality enrolled as fraction of all families enrolled in SP by Sep2011 by month of birth/beginning of pregnancy	SP reduces infant mortality rate in 5 by 1000 births
Grogger et al. (2015)	Kling et al (2009) data; ENIGH (Mexican National Household Income and Expenditure Survey)	Uses Kling et al (2009) randomized design	Catastrophic health expenditures fell for rural households with access to well-staffed health facilities, but they fell little for rural households with access to poorly staffed facilities.
Knox 2015	Encuesta de Evaluación de los Hogares Urbanos (ENCELURB 2002, 2004, 2005, 2009)	Families that are exposed to the program in 2004 vs. 2007, 2008 or 2009 (within family variation)	Increase in use of medical care. Decreased reporting of inability to perform usual daily activities. No health effects were found for children. Decreases in household medical spending for beneficiary families.

Note: The first eight rows of this table are based on Table 2.1 of Bosch, Cobacho and Pages, 2014.

Table B.5: Sources of variables used for to study the determinants of rollout.

Variable	Source
Socio-demographic and political Indicators (2000)	
Log population	CONAPO (http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos)
Marginalization Index	CONAPO (http://www.conapo.gob.mx/es/CONAPO/Datos_Abiertos_del_Indice_de_Marginacion)
% of individuals 0-4 years	CONAPO (http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos)
% eligible population	CONAPO (http://www.conapo.gob.mx/es/CONAPO/Proyecciones_Datos)
% of occupied population working in primary, secondary and tertiary sectors	CENSUS 2000 (locality level data) from the INEGI http://www.inegi.org.mx/est/contenidos/proyectos/ccpv/cpv2000/iter_2000.aspx
Alignment b/w party in power in municipality and state	CIDAC (Centro de Investigacin para el Desarrollo, A.C.) http://elecciones.cidac.org
Supply of Health Care (2001) and Health (2000)	
No. Hospitals, Health Centers, and Doctors in Hospitals (per 100,000 eligible)	Health Ministry data on the physical and human resources per medical unit available at http://www.sinais.salud.gob.mx/basesdedatos/recursos.html
Child Mortality Rate in 2000	Mortality Records http://www.dgis.salud.gob.mx/contenidos/basesdedatos/bdc_defunciones.html

Table B.6: Year and Quarter of Implementation of SP.

	N	Percent
	Panel A: Year of Implementation	
2002	241	9.94
2003	171	7.05
2004	402	16.58
2005	620	25.58
2006	488	20.13
2007	420	17.33
2008	59	2.43
2009	14	0.58
2010	9	0.37
	Panel B: Quarter of Implementation	
1	489	20.17
2	676	27.89
3	961	39.65
4	298	12.29
Total	2,424	100

Table B.7: Impact of SP on Child Mortality and Hospital Admissions in Poor Municipalities (ages 0-4): Robustness to alternative definitions of implementation of SP.

	(1)	(2)	(3)	(4)	(5)	(6)
Definition	5 Families		15 Families		20 Families	
Outcome	Child MR	Admissions	Child MR	Admissions	Child MR	Admissions
Up to 2 years (inclusive) before SP (β_1)	0.056	-0.005	0.067	-0.003	0.077	-0.001
	(0.083)	(0.024)	(0.083)	(0.024)	(0.083)	(0.024)
0 to 2 years after SP (β_2)	-0.068	0.084***	-0.082	0.086***	-0.064	0.088***
	(0.070)	(0.027)	(0.070)	(0.026)	(0.070)	(0.026)
3 or more years after SP (β_3)	-0.303***	0.086**	-0.339***	0.092**	-0.315***	0.094**
	(0.114)	(0.042)	(0.114)	(0.042)	(0.114)	(0.041)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.010	0.005	0.004	0.004	0.006	0.003
Observations	19,200	16,640	19,170	16,614	19,125	16,575
Nb Muns	1280	1280	1278	1278	1275	1275

Note: This table displays weighted least squares estimates of our baseline specification (2) on the deaths data, aggregated at municipality-year level. The dependent variable is the child mortality rate (columns 1, 3 and 5) and the log number of discharges (columns 2, 4 and 6). Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. Controls include fixed effects for year and municipality of residence. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data sources: Mortality Registry 1998-2012 and Registry of Admissions to SSA Hospitals 2000-2012.

Table B.8: Impact of SP on Child Admissions, Robustness (Sample of Poor Municipalities).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Up to 2 years (incl.) before SP (β_1)	-0.001	-0.001	0.030	0.018	0.021	0.012	0.017	0.034
	(0.024)	(0.045)	(0.021)	(0.024)	(0.023)	(0.025)	(0.024)	(0.021)
0 to 2 years after SP (β_2)	0.087***	0.087**	0.054**	0.082***	0.080***	0.084***	0.083***	0.058**
	(0.026)	(0.043)	(0.024)	(0.026)	(0.026)	(0.026)	(0.026)	(0.024)
3 or more years after SP (β_3)	0.092**	0.092	0.031	0.099**	0.094**	0.100**	0.100**	0.040
	(0.042)	(0.058)	(0.034)	(0.041)	(0.040)	(0.041)	(0.041)	(0.035)
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.004	0.132	0.024	0.008	0.010	0.005	0.008	0.020
Observations	16,640	16,640	16,640	16,640	15,360	16,640	16,640	15,360
Controls								
Year FE	x	x	x	x	x	x	x	x
Municipality FE	x	x	x	x	x	x	x	x
State-Year Quadratic Trend			x					x
Trends in 2000 Municipality's Xs				x	x	x	x	x
Political Alignment					x			x
Pre-SP Municipality Linear Trend						x		x
Pre-2002 Municipality Linear Trend							x	
Dummy for years since *Oportunidades*								x
Cluster of SE	Municipality	State-Year	Municipality	Municipality	Municipality	Municipality	Municipality	Municipality

Note: This table displays weighted least squares estimates of our baseline specification 2 on the discharges data, aggregated at municipality-year level. The dependent variable is the log number of discharges. Each column presents results for separate weighted regressions, where the weights are given by the population 0-4 years old in municipality m in state s in 2000. The baseline municipality Xs for which we include trends are: socioeconomic indicators measured in 2000 (quadratic of the index of marginalization, log of total population, and share of population of ages 0-4); labor market indicators measured in 2000 (share of uninsured individuals, share of individuals employed in the primary, secondary and tertiary sectors); health care indicators measured in 2001 (number of hospitals, health centers, and doctors in hospitals, all per uninsured). Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: Registry of Admissions to SSA Hospitals 2000-2012.

Table B.9: Impact of SP on outpatient visits per medical personnel (poor municipalities).

	(1) All public providers	(2) Non-SSA units	(3) SSA units
Up to 2 years (inclusive) before SP (β_1)	-0.005	0.024	0.035
	(0.016)	(0.024)	(0.025)
0 to 2 years after SP (β_2)	-0.057***	-0.039*	-0.025
	(0.019)	(0.022)	(0.023)
3 or more years after SP (β_3)	-0.111***	-0.136***	0.004
	(0.033)	(0.041)	(0.041)
Observations	16,411	9,675	11,466
Mean (# in 2000)	5.621	5.901	4.409
SD	11.42	19.32	7.120
p-value $H_0 : \beta_2 = \beta_3 = 0$	0.003	0.002	0.104

Note: This table presents estimates obtained using the SIMBAD data for the years 1996-2011. The dependent variable is the log of the number of outpatient visits per medical personnel (doctors and nurses per 1,000 individuals) in a municipality in a year. The estimates are presented for three different types of providers of health services: column 1 includes personnel employed at the Health Ministry (SSA), IMSS, ISSSTE, PEMEX, IMSS-Oportunidades and any other public institutions; column 2 includes any public institution other than SSA, and column 3 includes only personnel employed at the SSA. Standard errors are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table B.10: Characteristics of families at entry in SP (Poor Municipalities).

Family Charact.	(1) 1^{st} income decile	(2) Male headed	(3) Any member disabled	(4) Head married	(5) In *Oportunidades*	(6) Family size	(7) Children 0-4 present	(8) Head educ. primary/more	(9) Head age
	-0.439***	0.346***	-0.879***	-0.202***	-0.884***	-0.154***	-0.104***	0.105***	-0.011***
	(0.030)	(0.026)	(0.109)	(0.031)	(0.043)	(0.006)	(0.016)	(0.030)	(0.001)
N	4,463,955	4,463,886	4,463,955	4,463,955	4,463,955	4,463,955	4,457,238	4,463,955	4,455,807
Mean	0.731	0.199	0.0356	0.474	0.359	2.805	0.269	0.846	38.090
SD	0.443	0.399	0.185	0.499	0.480	1.825	0.443	0.361	16.830

Note: Each cell presents the estimated coefficient from a linear regression of the year of entry of SP in a municipality on the characteristic of a family. The sample is extracted from the *Padrón* and includes one observation per family, taken the first time she is observed in the registry (thus, the sample includes all families ever enrolled in SP). All estimates control for municipality fixed effects. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%.

Table B.11: Prevalence and Treatment of Infections in Children

	(1)	(2)	(3)	(4)
			Visited doctor if:	
	Diarrhea in past 2 weeks	Respiratory infection in past 2 weeks	had diarrhea	had respiratory infection
1[SP=1] (β_1)	0.013	-0.015	0.034	0.033
	(0.013)	(0.024)	(0.072)	(0.031)
1[SP=1]xPoor (β_2)	0.000	-0.075**	-0.168*	-0.024
	(0.018)	(0.030)	(0.101)	(0.055)
p-value $H_0 : \beta_1 + \beta_2 = 0$	0.505	0.011	0.217	0.865
No. of observations	22,099	22,110	2,514	9,674
Mean in 2000: Poor	0.160	0.470	0.500	0.533
Mean in 2000: Rich	0.116	0.449	0.492	0.598

Note: The sample is restricted to infants less than 5 years old. Controls excluded from the table but included in all the estimated specifications are: an indicator for gender of child, a quadratic in age, an indicator for whether the head of household has at most completed primary education, fixed effects for the quarter of interview and for the municipality of residence. Standard errors (in parentheses) are clustered at the level of the municipality. *** Significant at 1%, ** Significant at 5%, * Significant at 10%. Data source: ENSA2000, ENSANUT2006 and ENSANUT2012.

C Health Services in Mexico

The Health Care System before *Seguro Popular* The reform of the health care system in Mexico was a process which had been maturing for years and then culminated in *Seguro Popular*. The first important health sector reform had been launched as part of the National Development Plan 1995-2000 with the mission to improve the quality and the accessibility of health care. The first action taken by the Ministry of Health within this reform was to complete the decentralization process of the health services for the uninsured population, which had been initiated in 1987; an essential part of this process was the creation of health agencies in all the states, which were accountable to the state government, but had otherwise autonomy for financial management and health care delivery.

Hence, before SP, health care in Mexico was characterized by a two-tiered system.[38] About half of the population was covered through a contributory system (still in place today) guaranteed by the Social Security Institutions: the *Instituto Mexicano del Seguro Social* (IMSS), covering the private sector workers; the *Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado* (ISSSTE), covering the civil servants; and *Petroleos Mexicanos* (PEMEX), covering the employees in the oil industries. Health coverage was provided by these institutions in public hospitals; however, individuals could also pay for care in private hospitals, or buy private health insurance. In 2000, IMSS covered 40%, and ISSSTE 7% of the population, respectively (Frenk et al., 2006).

In addition to the formal sector workers, before the introduction of SP, health care was also available to the poor through two different programs. A first program, the *Programa de Ampliacion de Copertura (PAC)* (Coverage Expansion Program), started in 1996 within the health reform to serve that part of the population with limited or no access to basic health services.[39] This program consisted of brigades visiting the more rural and marginalized areas of the country, with a variable periodicity between every two weeks or once per month, to delivery a basic package of 13 primary care interventions (Secreteria de Salud, 2002). In 2003 PAC was incorporated in the *Programa de Calidad, Equidad y Desarrollo en Salud (PROCEDES)* (Program for Quality, Equity and Development in Health), and successively in SP under the label *Caravanas de la Salud*. In addition to PAC, part of the uninsured population had access to basic health services through the *Programa de Educacion, Salud y Alimentación* (*Progresa*). This was launched in 1997 in rural areas as the main anti-poverty program in Mexico; it was renamed *Oportunidades* in 2002 and expanded to urban areas. The program has some overlap with SP, since it has a health component implemented through different channels.[40]

The part of the uninsured population not covered by PAC or *Progresa* could seek health care either in public health units run by the *Secretaria de Salud* (SSA) or in private ones. In both cases, payment was

[38] This was established with the General Health Law of 1984, which essentially set a national health system made of three types of institutions: public institutions oriented to take care of the needs of the uninsured; social security institutions and social services; and private services, a new system of managed care organizations called *instituciones de seguros especializados en salud, ISES*.

[39] Before the PAC, the *Programa de Apoyo a los Servicios de Salud para la Poblacion Apierta (PASSPA)* (Program in Support of Health Services for the General Population), was already operating in the years 1991-1995 in five states (Chiapas, Guerrero, Hidalgo, Oaxaca and Mexico City). This program provided a first assessment of the health of the population, and of the availability, accessibility, utilization and quality of care of the existing health services.

[40] First, *Progresa* beneficiaries receive free of charge the Guaranteed Basic Health Package (*Paquete Básico Garantizado de Salud*), which includes a set of age-specific interventions; second, the nutrition of both children and pregnant women is monitored through monthly consultations (and nutritional supplements are distributed in case of malnutrition); third, information on preventive health behaviors is provided through community workshops; fourth, emergency services are secured by the Ministry of Health, IMSS-Oportunidades and other state institutions (only in relation to pregnancy and childbirth); lastly, beneficiary families protected by Social Security have also access to second- and third- level care in the units administered by IMSS, while those unprotected have only limited access to second-level care. The legislation of *Oportunidades* was obtained from `http://www.normateca.sedesol.gob.mx/es/NORMATECA/Historicas`. Accessed May 10th 2015.

at the point of use and patients had to buy their own medications. Hence, in 2000, approximately 50% of health expenditures was classified as "out-of-pocket expenses" (Frenk et al., 2009) and 50% of the Mexican population - about 50 millions of individuals - had no guaranteed health insurance coverage. The public per capita health expenditure on the insured was twice as much as that for the uninsured (see Frenk et al., 2006 and figure A.1).

The Implementation of *Seguro Popular* SP was launched as a pilot program in 2002 in 26 municipalities (in 5 states: Campeche, Tabasco, Jalisco, Aguascalientes, Colima) under the name *Salud para Todos*, with the aim to extend it gradually to the rest of the country. Contrary to the plans, already during 2002, 15 additional states[41] implemented the program, by agreeing with the federal government to provide the health services covered by SP. By the end of the pilot phase, on 31 December 2003, six additional states[42] had joined, for a total of 613,938 families enrolled in the program.

The System of Social Protection in Health (SPSS, *Sistema de Protección Social en Salud*) was officially introduced on January 1st 2004 by the General Health Law (*Ley General de Salud, LGS*), with the aim to extend health coverage and financial protection to the eligible population. The Federal Government also created the National Commission for the Social Protection in Health (CNPSS, emphComision Nacional de Proteccion Social en Salud). The rules of operation of the program stated that the expansion should prioritize states with: (1) low social security coverage; (2) large number of uninsured in the first six deciles of income; (3) ability to ensure the provision of services covered by the program; (4) potential demand for enrollment; (5) explicit request of the state authorities; (6) existence of sufficient budget for the program.[43] In 2004, three more states introduced the program (Nayarit, Nuevo Leon and Querétaro). The last three states (Chihuahua, Distrito Federal and Durango) joined SP in 2005.

Eligibility and Enrolment The eligibility criteria are defined in art.77 bis 3 of the LGS "Families and individuals who are not beneficiaries of social security institutions, or who have not otherwise access to health services, are entitled to enroll in SP, on the basis of their place of residence. The basic unit of protection is the household."[44] Enrollment in SP is voluntary, and is granted upon compliance with simple requirements.[45] The effective right to use the system for beneficiaries begins on the first day of

[41] Baja California, Chiapas, Coahuila, Guanajuato, Guerrero, Hidalgo, Mexico, Morelos, Oaxaca, Quintana Roo, San Luis Potosi, Sinaloa, Sonora, Tamaulipas and Zacatecas.

[42] Baja California Sur, Michoacán, Puebla, Tlaxcala, Veracruz and Yucatán.

[43] Diario Oficial, 4 de julio de 2003, *Reglas de operación e indicadores de gestión y evaluación del Programa Salud para Todos (Seguro Popular de Salud)*.

[44] The art. 77 bis 4 further specifies that the household can be made of the following typologies: (i) spouses; (ii) cohabitants; (iii) single parents; (iv) others as determined by the General Health Council, on the basis of their degree of dependency or cohabitation who justify their transitory or permanent assimilation to a household. The law then considers the following as household members: (i) natural and adopted children less than 18 years of age; (ii) children and adolescents aged 18 years or less who are part of the household and have blood relations with the above-mentioned beneficiaries; (iii) direct ancestors older than 64 years, who live in the same home and are financially dependent, as well as sons or daughters until 25 years of age, single, who prove to be students or disabled dependents. Slightly less generous, instead, is the extent of coverage in the case of IMSS: in addition to the main beneficiary, his/her spouse (or partner if cohabiting for at least 5 years) is also covered, and so are his/her children under 16 (or under 25 if studying) and his/her parents if living in the same household.

[45] The requirements are: proof of residence in the Mexican territory; lack of health insurance, ascertained with self-declaration; and possession of the individual ID (*CURP - Clave Unica de Registro de Población*). This information is necessary for the application of the socio-economic assessment tool used to calculate the premium. The unavailability of the required documentation does not prevent enrollment, and families/individuals can be provisionally registered for up to ninety days. However, if the documentation is not provided after this period, they are dropped from the rolls. This means that families cannot fake their residence status to get enrolled in SP. On the other hand, they can still use the health services until the card is revoked after formal ascertainment; since this is in practice unlikely to happen, it implies that the *Padrón* might be

the calendar month following the enrollment date, and it is valid for twelve calendar months; afterwards, the application has to be renewed within 60 days. Information about all individuals affiliated in the system is listed in an administrative registry, called the *Padrón*. At the end of 2010, the *Padrón* included 15,760,805 families, for a total of 43,518,719 individuals. By April 2012, 98% of the Mexican population was covered by some health insurance (Knaul et al., 2012) - a remarkable achievement against the 50% covered only 10 years earlier. According to the official evaluation report (Nigenda, 2009), the main reasons for affiliation in SP were access to free medicines and to primary care at reduced costs.

Funding Between 1999 and 2007, the ratio of the total public expenditures on health to GDP was relatively stable at 2.6% (see Figure A.1). This was one of the lowest figures among OECD countries: the corresponding figures for Denmark (the country with the highest share), US and Brazil in 2004 were 8.2%, 6.9% and 3.4%, respectively. Between 1999 and 2004, the ratio of the total public expenditure on health to GDP for insured (not eligible) and uninsured (eligible) was also stable at 1.8% and 0.9%, respectively. However, after 2004, the ratio for the uninsured (eligible) experienced a steady increase, from 1% to nearly 1.5% in 2009, while that for the insured (not eligible) remained constant after a temporary drop between 2004 and 2008.[46] Hence, the program seems to have been successful in accomplishing one of its goals: redistributing resources between the two groups.

SP is a non-contributory health insurance system, funded by revenues from general taxes, on the basis of a tripartite structure similar to that adopted by the two major social insurance agencies in Mexico, IMSS and ISSSTE: (1) a social contribution (*Cuota Social*) from the federal government; (2) solidarity contributions from both the federal government and the states (*Aportaciones Solidarias*); (3) and a family contribution (*Cuota Familiar*). The *cuota social* is an annual contribution of the federal government for each affiliated family, equal to 15% of the daily minimum wage in Mexico City (about USD200 a year per family) - a figure very similar to the contribution for each employee affiliated with the IMSS. The federal and state solidarity contributions amount to, on average, 1.5 and 0.5 times the *cuota social* per household, respectively.[47] The *cuota familiar* is an annual fee introduced to replace the out-of-pocket payments previously made at the point of use - i.e. a premium; in 2010, 96.1% of the enrolled families were exempted from paying it, on the basis of their low socioeconomic status.[48]

Coverage of Health Services Once a family is enrolled in SP, she is assigned to a health center (which, in turn, is associated to a general hospital) and to a family doctor for primary care, and has access to a package of health services, as detailed in the Charter of Right and Duties received upon affiliation. The number of interventions covered increased yearly, from 78 in 2002 to 284 in 2012, and it was listed in a 'Catalogue of Health Services' (since 2006 called CAUSES, *Catalogo Universal de Servicios de Salud*) revised annually (see Knaul et al., 2012). They include a wide range of services, from prevention, family planning, prenatal, obstetric and perinatal care, to ambulatory, emergency and hospital care, including surgery. The basic coverage was complemented in November 2004 with the introduction of the *Fondo*

an undercount of the number of people actually using the services.

[46]This was due to a failed attempt to increase public revenues to fund SP (Nigenda, 2005).

[47]The federal solidarity contribution is computed based on the following elements: (i) number of beneficiary families; (ii) health needs, proxied by state's indicators of infant and adult mortality; (iii) additional contributions called the "state effort" (*esfuerzo estatal*); and (iv) the performance of health services.

[48]The fee to be paid by each family is progressive and based on the average household income relative to the national income distribution (the verification of the income decile for each affiliated family is held every three years). Families exempted from payment are those (i) with a disposable income in the bottom 20% of the national income distribution; (ii) enrolled in federal programs to combat extreme poverty; (iii) resident in rural areas of very high marginalization with less than 250 inhabitants, and (iv) with other specific requirements set by the CNPSS.

de Protección contra Gastos Catastróficos (FPGC). The FPGC is a reserve fund of unlimited budget with the objective to support the financing of care for high-cost diseases – such as breast and womb cancer, and child leukemia. The conditions covered under this fund were chosen on the basis of the cost-effectiveness of available interventions and the costs associated with premature death and disability. While the interventions included in the CAUSES are paid for by capitation, those covered under the FPGC are paid on a per-case basis. A further expansion took place in 2006 with the introduction of *Seguro Medico para una Nueva Generación* (SMNG), which offers a specific package of services for children under five.

Delivery of Health Services As mentioned above, the non-contributory and the contributory systems have completely separate networks of hospitals and health centers, each to serve its own affiliates. The LGS established that the Federal Government and the states had to share the responsibility for social protection in health, with the former (through the SSA) responsible for regulating, developing, coordinating and monitoring health actions, and the latter for managing the resources allocated by the Federation for the purchase of medicines, staffing and service delivery in general. The official implementation of SP in 2004 established that, in each state, the funding body (the REPSS - *Regimenes Estatales de Protección Social en Salud* - State Regimes of Social Protection in Health) should purchase the health services from public and private providers through management agreements. These bilateral agreements had to specify the number of families to be served in each year,[49] the quality conditions, and the allocation of resources and funds to provide care to the SP beneficiaries, subject to the spending limits mentioned in the funding section. In practice, they led to a large degree of heterogeneity in the provision of services and in the hiring of new physicians contracted to serve under SP.[50]

References

[1] Muñoz, Onofre. 2012. "Propuesta de un Sistema Nacional de Servicios de Salud. Componente de Salud de una propuesta de Seguridad Social Universal", CONEVAL.

[2] Nigenda, Gustavo. 2005. "El Seguro Popular de Salud en Mexico: Desarollo e retos para el futuro", Nota Tecnica de Salud no 2/2005, Banco Interamericano de Desarollo, Departamento de Desarollo Sostenible, Division de Programas de Desarollo Social.

[3] Nigenda, Gustavo. 2013. "Servicio social en medicina en Mxico. Una reforma urgente y posible", Instituto Nacional de Salud Pública.

[49] This number was set so that between 2004 and 2010 14.3% of the uninsured population (as estimated in 2004) was to be enrolled in the program.

[50] Doctors working in SSA units were on average less qualified than those serving in social security institutions. For instance, in 2010 all physicians providing primary care in the IMSS had a university degree and 40% of them had a specialty in family medicine; instead, 41% of the doctors providing primary care in SSA units were medical interns, with a figure as high as 81% for those assigned to work in rural areas (Muñoz, 2012). Another problem was the widespread use of temporary new appointments between 2002 and 2006. Before 2007, the majority of the new hires was on fixed term contracts (on average, for a period of 5,5 months) and with salaries about 50% lower than those for doctors with a regular contract (Nigenda, 2013). There is substantial cross-state variability among the salaries of doctors on temporary contracts: for example, the gross salary for a general practitioner varied in 2008 between 8,950 pesos per month in Zacatecas and 21,673 in Querétaro.