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The role of public health insurance in protecting against the costs of ill health

Evidence from Mexico

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Abstract: In the absence of health insurance, households have to self-insure against the risk of ill health, which may involve the use of mechanisms that have long-term consequences. This study analyses whether Mexican households are able to smooth consumption after severe health shocks, as well as the contribution of public health insurance in the form of social security and, more recently, the Seguro Popular programme. Using data from the Mexican Family Life Survey, a nationally representative longitudinal survey, the results indicate that unexpected health events such as accidents and deterioration in physical capacity are associated with large declines in non-medical consumption. Social security seems to provide protection against both types of shocks, but the endogeneity-corrected estimates indicate that the Seguro Popular programme only protects consumption against accidents. This suggests that income losses associated with disability shocks, for which the programme does not offer protection, are likely larger than medical care expenditures, and poses the question of whether other social security benefits, such as disability insurance, should also be extended to non-beneficiaries.

Keywords: public insurance, consumption, catastrophic risks, health shocks
JEL classification: I13, I38

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1 Introduction

One of the main objectives of health insurance is to protect households against the costs of ill health. In the absence of health insurance, households have to resort to informal mechanisms such as depleting savings, selling assets, or increasing labour supply to address health problems. In some cases, households may employ other mechanisms that have long-term consequences, such as reducing food consumption or school enrolment. If health events affect income earners, the welfare consequences can be even worse as the household's ability to generate income is diminished.

Evidence on the effects of health shocks on welfare is limited. Using data for Indonesia, Gertler and Gruber (2002) showed that households are not able to smooth consumption in the absence of health insurance. In particular, they found that reductions in the ability to perform daily life activities were associated with a 20 per cent drop in consumption. Using other indicators of major illness, such as sizeable drops in the body mass index of the household head, Wagstaff (2007) also showed that Vietnamese families are vulnerable to income shocks. Moreover, he found that these shocks led to large increases in medical spending, even among households with health insurance. On the other hand, Mohanan (2011) found that households who suffered bus accident injuries in India were able to smooth food and housing consumption, but experienced reductions in educational spending. He also found that the main informal insurance mechanism households employed was debt, which led to important levels of indebtedness.

For Latin America, the dearth of studies on the welfare consequences of health shocks is even more marked. Baeza and Packard (2006) analyse some related indicators for six Latin American countries, such as the percentage of households that fall into poverty due to health expenditures. They could not formally examine the impact of health shocks on consumption, however, due to the lack of longitudinal data. Chiapa (2008) provides some evidence using Mexican data, namely the evaluation survey of the conditional cash transfer programme Progresa (renamed Oportunidades and more recently Prospera). He found that having an ill child reduces the consumption of poor, rural households, although that programme helps to mitigate this effect.

On the other hand, most studies on health insurance programmes have focused on the analysis of welfare gains measured by increased utilization of health services and health improvements. There are at least two other ways to measure the benefits of insurance, however. Following the studies of risk in developing countries, health insurance is expected to reduce fluctuations in consumption. But even if consumption is not sensitive to health shocks, Chetty and Looney (2006) show that health insurance can result in important welfare gains if it allows households to substitute costly coping mechanisms. Gruber (1997) is one of the few studies providing evidence of the consumption-smoothing benefit of public insurance. He estimated that in the absence of unemployment insurance in the United States, consumption of the unemployed would fall by 22 per cent.

The Mexican case provides an interesting setting to analyse the welfare consequences of health shocks and the role of public insurance. There are two types of public health insurance in Mexico: social security, which is compulsory for formal workers and their families; and the Seguro Popular programme (SP), more recently introduced to cover those who are excluded

from social security. In particular, the staggered expansion of health insurance that took place in the last decade through the implementation of the SP provides a unique opportunity to identify the welfare effects that may be brought by reducing the health expenditure risk through formal insurance.

In principle, the SP is expected to provide consumption insurance in the event of health shocks, as previous studies have found the programme reduced actual medical care expenditures. According to Knaul et al. (2012), catastrophic and impoverishing health expenditures (30 per cent of the capacity to pay and expenditures that force households below or further below the poverty line, respectively) significantly decreased with the implementation of the SP. Between 2000 and 2010, the first fell from 3.1 per cent to 2 per cent, while the second fell from 3.3 per cent to 0.8 per cent. The evaluation based on the randomized encouragement to enrol in the SP also found health expenditures were reduced after 10 months of implementation of the programme (King et al. 2009). Similarly, using longitudinal data Coneval (2013) found reductions in health expenditures among beneficiaries of the SP. The potential of the SP to mitigate fluctuations in consumption would be reduced, however, if medical expenses were relatively small compared to wage losses. The SP is intended to protect households from large medical expenses but not from reduced earning capacity. Some characteristics of the implementation of the SP could also reduce its potential to smooth consumption in response to health shocks such as insufficient drug supply.

The objectives of this study are to analyse whether Mexican households are able to smooth consumption after severe health shocks and the contribution of formal insurance in the form of social security, especially the SP.

2 Public health insurance in Mexico

As in many other low- and middle-income countries, the Mexican health system is characterized by its fragmentation. Social security institutions created in the 1940s and 1950s, on the one hand, cover formal workers and their families, which account for approximately half of the population. The other half, on the other hand, had access to public facilities run by the Ministry of Health for a fee until the most recent reform, which created the SP. The next two sections briefly explain the main characteristics of both types of public health insurance.

A wide range of private providers also offer health services in Mexico, but since only a small share of the population has private insurance—3 per cent according to the OECD (2005), although less than 1 per cent of the households in the sample used in this study reported having private insurance—these are mainly funded through out-of-pocket expenditure.

2.1 Before the 2004 reform: the divide between formal (insured) and informal (uninsured) workers

The main social security providers in Mexico are the Mexican Institute of Social Security (*Instituto Mexicano del Seguro Social*, IMSS) and the Mexican State's Employees' Social Security (*Instituto de Seguridad y Servicios Sociales para los Trabajadores del Estado*, ISSSTE). The IMSS was created in 1943 to provide health services and other social security benefits to private sector workers and their families, while the ISSSTE was created in 1959 to provide similar benefits to public sector

workers. The Ministry of National Defence (*Secretaría de la Defensa Nacional*, Sedena), the Ministry of Navy (*Secretaría de Marina*, Semar), the state-owned oil company (*Petróleos Mexicanos*, Pemex), and the 31 states that comprise the Mexican federation also provide social security benefits to their employees and their families, but cover a small share of the population.[1] According to administrative records, nearly 60 per cent of the population had access to social security at the beginning of the last decade (Table 1), which implies that the remaining 40 per cent were uninsured. Data from the survey used in this study show similar figures (see Table 2), although other sources such as the 2000 Census indicate that the uninsured could have accounted for at least 55 per cent of the population.[2]

Table 1: Social security beneficiaries (million individuals)

Year	IMSS	ISSSTE	Pemex	Sedena	Semar	States	Total	Beneficiaries as a percentage of the total population
2000	45.05	10.07	0.65	0.49	0.19	1.31	57.75	57
2001	44.72	10.24	0.67	0.51	0.21	1.43	57.78	57
2002	45.35	10.31	0.68	0.54	0.21	1.37	58.46	57
2003	41.52	10.35	NA	NA	NA	NA	51.87	50
2004	43.01	10.46	0.69	0.68	0.21	1.47	56.52	53
2005	44.53	10.61	0.71	NA	0.20	1.44	57.49	54
2006	46.64	10.80	0.71	NA	0.20	1.54	59.88	55
2007	48.65	10.98	0.71	NA	0.20	1.42	61.97	56
2008	48.91	11.30	0.73	NA	0.22	NA	61.16	55
2009	49.13	11.59	0.74	0.87	0.23	0.95	63.51	56
2010	52.31	11.99	0.74	1.05	0.24	1.94	68.28	60
2011	54.91	12.21	0.75	0.81	0.26	1.95	70.89	61
2012	57.48	12.45	0.76	0.83	0.28	1.68	73.47	63
2013	59.51	12.63	0.76	0.83	0.29	1.55	75.58	64
2014	59.49	12.80	N/A	N/A	N/A	N/A	72.29	60
2015	61.87	12.97	N/A	N/A	N/A	N/A	74.84	62

Notes: The acronyms correspond to the names in Spanish of each social security institution: IMSS for the Mexican Institute of Social Security; ISSSTE for the Mexican State's Employees' Social Security; Sedena for the Ministry of National Defence; Semar for the Ministry of Navy; and Pemex for the state-owned oil company. The states that comprise the Mexican federation also have specific social security institutions. N/A = not available.

Source: data on beneficiaries come from the National Institute of Statistics and Geography (INEGI); total population figures are from the National Population Council (Conapo).

Social security services are funded through payroll taxes, employer contributions, and general revenues. The institutions that provide these services have their own facilities and budgets, and are centrally administered by the federal government. Apart from healthcare access, social

[1] There are 31 states in Mexico, plus a Federal District that will become the 32nd state in 2018 and will be formally named *Ciudad de México*, or Mexico City.

[2] Census data are publicly available on the website of the National Institute of Statistics and Geography (INEGI). According to the 2000 Census, there were 55.5 million uninsured individuals.

security benefits include temporary disability subsidies (for sickness, risks at work, and maternity), disability pensions for workers who suffer permanent disabilities, old-age pensions, and housing credits, among others.[3] Hence, social security provides protection from both effects of health shocks, income losses, and catastrophic health expenditures.

Before the reform that came into force in 2004, the uninsured population had access to health services provided by the Ministry of Health at a fee. The fees were based on self-reported income. By the end of the 1980s the decentralization of these services started in some states, but it was not until the mid-1990s that the Ministry of Health resumed the decentralization process (González-Pier et al. 2006).

Although the government was the provider of health services through both social security and Ministry of Health facilities, the latter were severely underfunded. While public per capita expenditure was MX$3,197.5 in 2000 for social security beneficiaries, the corresponding figure for the uninsured was less than half (MX$1,482.4) (Secretaría de Salud 2013).[4] This resulted in large differences in quality and large out-of-pocket payments. Between two and four million households suffered catastrophic and impoverishing healthcare spending in 2000; 86 per cent of these households were uninsured (Knaul et al. 2006). In fact, Mexico was ranked 144th out of 191 countries in fairness of healthcare by the World Health Organization (WHO) at the beginning of this century (WHO 2000). The 2004 reform that created the SP aimed at addressing this situation.

2.2 The 2004 reform: health access for all as citizens' entitlement

The SP was created to provide health insurance for those who were not covered by social security institutions, i.e. over 50 million individuals. Affiliation to the SP is voluntary, and the only eligibility criteria is not being a beneficiary of social security.

The rules of the SP indicate that the funding will come from the federal government (which contributes with an annual transfer known as *cuota social* equivalent to 3.92 per cent of the minimum wage per beneficiary plus an additional transfer of 1.5 times the *cuota social*),[5] the state government (which contributes with 0.5 times the *cuota social*), and progressive contributions from beneficiaries—the poorest being exempt. However, it has virtually operated as non-contributory health insurance since contributions from beneficiaries are negligible. According to the latest report of the National Commission for Social Protection in Health (*Comisión Nacional de Protección Social en Salud*, CNPSS), responsible for administration of the SP, beneficiaries' contributions have amounted to less than 1 per cent of the SP yearly budget between 2004 and

[3] To qualify for these benefits, the affiliates must fulfil certain requisites. For example, to qualify for a disability pension, the worker must have contributed for 150 to 250 weeks before the event that causes the permanent disability.

[4] Figures in constant pesos. Health expenditure data are publicly available on the Federal and State Health Accounts System (*Sistema de Cuentas en Salud a Nivel Federal y Estatal*, Sicuentas) administered by the Ministry of Health.

[5] Before 2010 the financing unit was the family instead of the individual, and the *cuota social* was 15 per cent of the minimum wage per enrolled family. Also, the rules originally indicated that beneficiaries in the first two income deciles would be exempt from the fees, but in 2010 this was extended to those in the first four income deciles.

2014 (CNPSS 2015). Moreover, the average contribution per beneficiary has declined over the years, from MX$11.77 in 2004 to MX$0.52 in 2014 (Presidencia de la República 2015).[6]

The reform that became into force in 2004 made at least three fundamental changes to the Mexican health system. First, health access was legislated as citizens' entitlement; second, a comprehensive benefit package that covers most causes of morbidity and mortality—including 59 costly, specialized procedures—was offered to SP affiliates; and third, public health expenditure increased importantly (from 2.6 per cent of gross domestic product in 2000 to 3.1 per cent in 2011; Secretaría de Salud 2013).

The SP started as a pilot in 2002 in 341 municipalities across 20 states,[7] and was gradually expanded over the following years. According to administrative records of the programme, in 2007 all municipalities had at least one beneficiary and nearly 22 million individuals were affiliated; between 2011 and 2014, the number of affiliates increased from nearly 52 million to 57.3 million. In this study I exploit the variation in the SP coverage across municipalities to identify the protective effect of public health insurance, as explained below.

3 Methods

According to the Arrow–Debreu model, households are able to smooth consumption over states of nature in the presence of complete private insurance markets (Cochrane 1991; Townsend 1994). This implies that households' consumption growth should be independent of idiosyncratic shocks such as health shocks. But insurance markets can hardly be considered complete in practice, in particular in low- and middle-income countries; therefore, public insurance is essential to maintain households' welfare in the face of negative, unexpected events.

Formally, Chetty and Looney (2006) show that consumption changes caused by idiosyncratic (health) shocks are decreasing in risk aversion and increasing in the utility cost of consumption smoothing (see the Appendix). The welfare gain from public insurance depends on the extent to which it can effectively reduce this utility cost. In this study, I use the following model to analyse whether Mexican households are able to protect their consumption levels against health shocks, and especially examine the role of public health insurance:

$$\Delta \ln(C_{it}) = \alpha_s + \mu wave_t + \delta \Delta h_{it} + \beta insurance_{it} + \gamma \Delta h_{it} \times insurance_{it} + \rho X_{it} + \varepsilon_{it} \quad (1)$$

[6] In 2002 and 2003, the pilot years of the SP (i.e. before the law that formally created the SP was approved), the average contribution per beneficiary was the highest registered so far (MX$24.43 and MX$62.78, respectively). This is probably related to the low coverage of those years (1.1 million and 2.2 million individuals, respectively), which could have facilitated the collection of these contributions during the first years of operation of the programme. In 2004, however, the average contribution radically fell (to MX$11.77 on average per beneficiary), and although it slightly recovered in 2012 (MX$12.37 on average), it continued falling as the coverage expanded.

[7] States are divided into municipalities, which are the smallest autonomous political entities in Mexico. There are currently 2,457 municipalities. The three waves of the Mexican Family Life Survey (MxFLS), the survey employed in the analyses, cover 288 municipalities in 28 states, although the bulk of the sample is located in the 16 states where the first wave was collected.

where $\Delta\ln(C_{it})$ is the change in the logarithm of per capita non-medical consumption of household i between t and t – 1; a_s are state fixed effects to control for regional, time-invariant unobservable characteristics; Δh_{it} captures health shocks to household i that occurred between t and $t-1$; $insurance_{it}$ indicates whether the household has public insurance (either social security or SP) at time t; and X is a set of demographic variables at first interview. As I use information from three waves of the MxFLS (see details in Section 4), the $wave_t$ variable indicates whether the information is measured at wave 2 (reference category) or wave 3 to allow for changes over time in the outcome. $\delta \neq 0$ would provide evidence against the full insurance hypothesis, while γ would indicate the protective effect of formal insurance. In particular, $\delta + \gamma = 0$ would indicate that insured households are fully insured against health shock h.

The common problem of self-selection into insurance is a potential limitation of Equation 1, however (Giedion and Díaz 2010; Levy and Meltzer 2008). In particular, since social security is attached to formal employment as explained above, unobservable characteristics of social security beneficiaries are not only likely correlated with consumption levels, but also with short-term consumption growth. Likewise, households that gained public insurance through the SP may have unobservable characteristics that also affect consumption choices. Therefore, the following strategy based on the exogenous variation provided by the SP expansion is employed to identify the effect of public health insurance. First, I restrict the sample to households uninsured at baseline. Since no SP beneficiaries are reported at wave 1, this implies excluding social security beneficiaries, which results in a more homogeneous subsample. Second, the geographic variation in the roll-out of the SP is used as an instrument in a two-stage instrumental variable (IV) model. The specific instrumental variable is the yearly share of the population covered by the programme per municipality and indicates the SP availability to each household in the sample at time t. The idea is that municipality coverage entailed decisions at the state and federal level rather than at the household level (Sosa-Rubí et al. 2009). All models are estimated using robust standard errors.

4 Data

The data are from the three-wave MxFLS, a nationally representative longitudinal survey.[8] The first wave, conducted in 2002, included more than 35,000 individuals from 8,439 households, of which nearly 90 per cent were followed up in 2005–06 and 85 per cent in 2009–10.[9]

[8] Datasets, questionnaires, and supplementary information are available at www.ennvih-mxfls.org. Rubalcava and Teruel (2006, 2008, 2013), also available at www.ennvih-mxfls.org, describe the planning and design of the MxFLS, as well as the content and structure of the files included on the MxFLS's website.

[9] According to the control database that contains information for all households (cover section), 7,572 (89.7 per cent) and 7,912 (93.8 per cent) of the original sampled households were re-interviewed in the second and third round of the MxFLS, respectively. Additionally, the second and third round included 865 and 1,492 new participants. Of the new households added in the second round, 718 (83 per cent) were re-interviewed in the third round. A few households were interviewed for the second and third round in 2007 and 2011–13, respectively.

4.1 Measures

The dependent variable, monthly non-medical consumption, is measured as the sum of household expenditures and the value of in-kind payments, gifts, and home-produced items. The section of the MxFLS questionnaire on food consumption is the most detailed, including 37 items plus a special segment on 10 highly consumed products such as corn tortillas and soft drinks. The section on non-food consumption covers clothing, home services, and electronic appliances, among other durables and services. Consumption figures were adjusted for inflation using the National Consumer Price Index from INEGI and are reported in Mexican pesos of December 2013 (MX$Dec13).

The main independent variable is the change in health status, i.e., the health shock indicator. Two health shock measures are used. The first is an index that captures physical performance. According to previous studies (Gertler and Gruber 2002; Gertler et al. 2009), this type of measure is more reliable than subjective measures such as self-reported symptoms. Also, this index better captures severe, exogenous health problems that households find more difficult to cope with, either using formal or informal mechanisms.

The MxFLS registers abilities to perform eight activities of daily living (ADLs) among respondents 50 years and older: (1) carry a heavy bucket for 20 metres; (2) walk five kilometres; (3) bend, sit on your knees or squat; (4) climb up stairs without help; (5) dress without help; (6) stand up from a chair without help; (7) go to the bathroom without help; and (8) rise from the floor and get on your feet without help. The last four ADLs can be further classified as basic ADLs. For each ADL, participants can respond 'easily' (coded as 2), 'with difficulty' (coded as 1), or 'could not do it' (coded as 0). The index is simply the standardized sum of the responses for the eight ADLs:

$$\text{ADL index}_i = \frac{\sum_{j=1}^{8} ADL_{j,i} - \text{Minimum}[\sum_{j=1}^{8} ADL_j]}{\text{Rank}\,[\sum_{j=1}^{8} ADL_j]} \qquad (2)$$

Therefore, those respondents who cannot perform any ADL have an ADL index equal to 0, while those respondents who can easily perform all the ADLs have an ADL index equal to 1. Likewise, increases in the ADL index indicate improvement in physical capacity, while declines indicate deterioration.

The ADL index constructed using the MxFLS has an important limitation, however, as the information on ability to perform ADLs is only available for respondents 50 years and older. Older respondents are more likely to present disabilities and are also more likely to have lower contributions to household income (Gertler et al. 2009). I focus, though, on the physical performance of household heads, which is expected to have a more evident effect on consumption. I also analyse a second health shock measure that can be calculated for all the households in the sample. The MxFLS asks all adult household members if they have suffered severe accidents, and if so, their age and the date when the accident occurred. With this information, I am able to construct a variable that indicates whether household heads or any other adult household member had a severe accident between waves.

As previously explained, Mexican households can be broadly classified according to their insurance status: (1) beneficiaries of social security; (2) beneficiaries of SP (once available

throughout the country); and (3) uninsured. Only a few households reported having private insurance and are excluded from the sample.[10] In particular, households are defined as publicly insured if at least one member of the household reported having either social security (IMSS, ISSSTE, PEMEX/SEDENA/SEMAR, or a state government insurance) or the SP.

Supplementary data on SP coverage across municipalities comes from administrative records; household interview dates and municipality of residence reported in the MxFLS were used to link these data. The SP coverage records are not publicly available, but were requested through the Federal Institute of Access to Public Information (*Instituto Federal de Acceso a la Informacion*, IFAI). Municipality population, used to calculate the ratio of programme beneficiaries to total population, was obtained from the INEGI 2000 and 2010 Censuses and the 2005 Conteo.[11] Linear interpolation was used to calculate the values for the years for which data were not available. Population data for 2011–13 are publicly available on Conapo's website.

Household head characteristics measured at first interview as well as changes in household composition are included in the models to account for preferences and changes in preferences. In particular, age, sex, marital status (whether married or not), participation in the labour market (whether employed in the 12 months before the first interview), and education (none, primary, secondary, high school, or more) of the household head; and changes in the logarithm of household size and in the proportion of members 0–5 years, 6–12 years, 13–15 years, 16–64 years and 65 and more years are used as controls. Rural/urban area of residence (less than 2,500 residents/2,500 residents or more) is included too.

4.2 Analytic samples

The analytic samples for this study include households with non-missing information for the relevant variables for at least two consecutive waves, whose head at first interview was part of the household in subsequent waves. This implies that households whose head according to first interview died or moved to another household are excluded from the analysis. In total, 12,614 and 4,344 household-wave observations are used to analyse the health shock measures described above, namely severe accidents and changes in physical capacity, respectively.[12] If these samples are restricted to uninsured households at baseline, we end up with 3,338 and 1,168 household-

[10] Only 73 households reported having private insurance exclusively (either at wave 2 or wave 3), which is less than 1 per cent of the total initial sample. After eliminating records with incomplete information in the variables of interest, these household-wave observations also account for less than 1 per cent of the sample (see below).

[11] Conteos are shorter versions of the Census and are collected between Census periods. All the information at the municipality level is available on INEGI's website.

[12] The initial sample comprises households with consistent (not duplicated) head information: 8,439 households at wave 1 plus 824 new households at wave 2. The steps followed to obtain the final analytic sample were: (1) baseline households with no follow-up at wave 2 (969) and new wave 2 households with no follow-up at wave 3 (107) were removed; (2) households whose head had died or moved to another household by the time the subsequent wave was collected were excluded (391 baseline households and 146 households added at wave 2); (3) 73 households that reported having private insurance exclusively were eliminated (see note 10); and (4) households with incomplete information were excluded (328). This resulted in 12,614 household-wave observations that correspond to 5,365 households with complete information in all waves, 1,139 households with complete information in waves 1 and 2, and 745 households with complete information in waves 2 and 3. Since changes in physical capacity are only measured for heads 50 years and older, the analytic sample in this case is smaller.

wave observations in each case.[13] Households uninsured at baseline are residents in 122 to 131 municipalities across 16 states.

Table 2 presents the characteristics of the households included in the analyses. The first and second columns include all publicly insured households (i.e. those with social security or SP once it became available) together with those uninsured, while the third and fourth columns include only uninsured households in 2002 that gained public insurance through the SP in subsequent years. The second and fourth columns focus on households whose head is 50 years and older, as these are the only household heads for which the ability to perform ADLs is measured. Overall, most household heads are married, male, with no formal education or primary education only. Although labour-market participation is lower among older heads, as expected, over two-thirds of the heads 50 years and more worked in the reference period; this share reaches 75 per cent among the subsample of uninsured at baseline. Around 55 per cent of the households in the complete sample were insured at first interview. The main difference between the households in the complete sample and those in the subsamples that exclude social security beneficiaries is that the latter are less educated.

[13] Uninsured households at baseline that gained access to social security are also excluded ($n = 950$) so we can compare households that gained insurance through the SP to those that remained uninsured during the whole study period.

Table 2: Sample characteristics at first interview—means and standard deviations

	Complete sample		Uninsured at wave 1	
	All households	Households with heads 50+ years	All households	Households with heads 50+ years
Household head characteristics				
Age	45.969	60.440	47.163	61.421
	(15.816)	(9.837)	(15.948)	(10.329)
Male	0.802	0.737	0.774	0.729
	(0.398)	(0.440)	(0.418)	(0.445)
No formal education	0.152	0.287	0.256	0.452
	(0.359)	(0.453)	(0.437)	(0.498)
Last level of education primary	0.479	0.567	0.547	0512
	(0.500)	(0.496)	(0.498)	(0.500)
Last level of education secondary	0.202	0.070	0.134	0.017
	(0.401)	(0.256)	(0.341)	(0.128)
Last level of education high school or more	0.168	0.076	0.062	0.019
	(0.374)	(0.264)	(0.242)	(0.138)
Worked in the 12 months before	0.815	0.674	0.824	0.745
	(0.388)	(0.469)	(0.381)	(0.436)
Married	0.653	0.608	0.617	0.544
	(0.476)	(0.488)	(0.486)	(0.498)
Head's ADL index		0.842		0.841
		(0.209)		(0.208)
Household composition variables				
Household size	4.239	3.948	4.175	3.508
	(2.032)	(2.326)	(2.201)	(2.326)
Proportion of members 0–5 years	0.112	0.042	0.116	0.035
	(0.158)	(0.092)	(0.164)	(0.089)
Proportion of members 6–12 years	0.133	0.072	0.153	0.077
	(0.173)	(0.132)	(0.183)	(0.142)

Proportion of members 13–15 years	0.057	0.047	0.058	0.047
	(0.108)	(0.101)	(0.111)	(0.107)
Proportion of members 16–64 years	0.604	0.636	0.552	0.576
	(0.267)	(0.322)	(0.285)	(0.354)
Proportion of members 65 years or older	0.092	0.201	0.118	0.261
	(0.235)	(0.326)	(0.276)	(0.374)
Household insurance status				
Has public insurance	0.553	0.582	0	0
	(0.497)	(0.493)		
Per capita monthly non-medical consumption (MX$Dec2013)	2,322.268	2,376.645	1,849.212	2,061.523
	(6,386.361)	(6,841.944)	(5,526.188)	(7,375.838)
Number of observations (households)	7249	2725	1827	719

Notes: Standard deviations are in parenthesis. ADL = activities of daily living. The ADL index takes values 0 to 1; increases indicate improvements in physical capacity.

Source: author's calculations based on the Mexican Family Life Survey (MxFLS).

The average health status of household heads 50 years and over, measured using the ADL index (0.84; Table 2), is good but declining. Nearly 45 per cent report drops in the capacity to perform ADLs between waves, whereas only 28 per cent report improvements (Table 3, panel A). Declines in the capacity to perform basic ADLs are also more prevalent than improvements (29 per cent vs 17 per cent; Table 3). No salient differences are observed between insured and uninsured households; in particular, current insurance status is not associated with larger declines in health. In fact, decreases in the household head's ADL index are more marked for the uninsured, especially in the subsample of uninsured at baseline, i.e. those that remain uninsured during the whole study period (–0.076 vs –0.047; Table 3).

Although the second health shock indicator, severe accidents, is measured among all household heads, only nearly 3 per cent experienced a health shock so defined (Table 3; panel B). Therefore, we also consider accidents among other adult members of the household, for which the percentage almost doubles. Unlike changes in physical capacity, insured households report more accidents than the uninsured for both the head (3.1 per cent vs 2.3 per cent) and other adults (6.1 per cent vs. 3.4 per cent; Table 3).

Table 3: Average changes in health by current insurance status

	Complete sample			Uninsured at wave 1		
	Insured	Uninsured	Total	Insured	Uninsured	Total
Panel A. Households with heads 50+ years						
Change in head's ADL index	−0.049	−0.059	−0.052	−0.047	−0.076	–0.067
	(0.231)	(0.239)	(0.233)	(0.245)	(0.246)	(0.246)
Proportion reporting decline in ADL index	0.432	0.451	0.438	0.425	0.469	0.455
Proportion reporting increase in ADL index	0.277	0.272	0.275	0.304	0.257	0.271
Change in head's basic ADL index	−0.039	−0.051	−0.043	−0.023	−0.063	−0.051
	(0.224)	(0.230)	(0.226)	(0.226)	(0.235)	(0.233)
Proportion reporting decline in basic ADL index	0.288	0.309	0.294	0.276	0.341	0.321
Proportion reporting increase in basic ADL index	0.171	0.169	0.170	0.214	0.167	0.182
Number of observations (household-waves)	3,048	1,296	4,344	355	813	1,168
Panel B. All households						
Proportion reporting accident of head	0.031	0.023	0.028	0.036	0.022	0.026
Proportion reporting accident of other adults	0.061	0.034	0.053	0.070	0.031	0.043
Number of observations (household-waves)	8,553	4,061	12,614	1,003	2,335	3,338

Notes: Standard deviations are in parenthesis. ADL = activities of daily living. The ADL index takes values 0 to 1; increases indicate improvements in physical capacity. Changes in health (measured with changes in the ADL index or accidents) refer to changes occurring between wave 1 and wave 2 or wave 2 and wave 3 of the MxFLS.

Source: author's calculations based on the MxFLS.

5 Results

5.1 The effect of health shocks on consumption and the role of public insurance (social security and the SP)

The results obtained using Equation 1 indicate uninsured Mexican households are unable to protect their consumption levels from severe health shocks to household heads (Table 4). Passing from being able to perform all ADLs to being able to perform none reduces consumption by nearly 20 per cent among uninsured households ($\delta = 0.193$; $p < 0.10$; panel A, first column). If the shock affects male heads, whose contribution to household income is likely larger, the negative effect on consumption is over 30 per cent. Columns 3 and 4 further restrict the attention to potentially more important income earners, namely male working heads and male working heads between 50 and 70 years old;[14] as expected, the effect of health shocks to these household heads is larger.

Public insurance in the form of social security seems to have a protective effect, but the SP does not. While the coefficients of the interaction between ADL index changes and both types of insurance offset the main effect of the health shock (see the tests in the last row of panel A; $p > 0.10$), the results that involve the SP are not statistically significant.

Panel B of Table 4 shows similar results for basic ADLs. A change in the head's ability to perform four basic ADLs (from being able to perform all to being able to perform none) reduces the consumption of uninsured households by 31 per cent ($\delta = 0.312$; $p < 0.01$). Again, the negative effect of the health shock is larger when relatively more important income earners are affected (columns 2–4). Beneficiaries of social security also seem to be insured against this health shock (see the tests in the last row of panel B; $p > 0.10$). In this case, the effect of the SP is significant for some groups of heads.

The estimates using the second health shock measure, severe accidents, also suggest uninsured households are not able to maintain their consumption levels (second column of Table 5; $\delta = 0.152$; $p < 0.05$), although the effect is not statistically significant for accidents of the household head. This result, however, is likely related to the low prevalence of accidents among household heads; as mentioned above (Table 3), less than 3 per cent experienced accidents. The protective effect of social security is also observed (last row of Table 5), but the effect of the SP is not statistically significant.

[14] Mexico is the second OECD country with the highest effective retirement age, 70 in average (OECD 2015).

Table 4: Effect of changes in household head's ADL index on non-medical consumption and the role of public insurance, OLS estimates (heads 50 years and older)

	All	Male	Male, working	Male, working, <70
	1	2	3	4
Panel A. General ADL index				
Change in head's ADL index	0.193*	0.313**	0.395**	0.461**
	(0.111)	(0.142)	(0.158)	(0.185)
SP × change in head's ADL index	−0.049	−0.278	−0.263	−0.330
	(0.182)	(0.200)	(0.210)	(0.241)
SS × change in head's ADL index	−0.176	−0.399**	−0.429**	−0.412*
	(0.133)	(0.165)	(0.191)	(0.219)
Household has SP	0.052	0.020	0.034	0.012
	(0.049)	(0.053)	(0.054)	(0.059)
Household has SS	0.049	0.032	0.035	0.036
	(0.035)	(0.041)	(0.042)	(0.045)
State of residence fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R^2	0.07	0.08	0.10	0.09
N	4,344	3,171	2,451	2,170
Ho: $\delta + \gamma 1 = 0$; p > F	0.321	0.801	0.337	0.392
Ho: $\delta + \gamma 2 = 0$; p > F	0.821	0.315	0.752	0.678
Panel B. Basic ADL index				
Change in head's ADL index	0.312***	0.400***	0.459***	0.526**
	(0.116)	(0.149)	(0.171)	(0.209)
SP × change in head's basic ADL index	−0.164	−0.465**	−0.384	−0.500*
	(0.205)	(0.224)	(0.239)	(0.278)
SS × change in head's basic ADL index	−0.276**	−0.426**	−0.411**	−0.401*
	(0.137)	(0.171)	(0.206)	(0.243)
Household has SP	0.045	0.015	0.032	0.011
	(0.048)	(0.053)	(0.054)	(0.058)
Household has SS	0.046	0.034	0.040	0.040
	(0.034)	(0.040)	(0.042)	(0.045)
State of residence fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R^2	0.07	0.08	0.10	0.09
N	4,344	3,171	2,451	2,170
Ho: $\delta + \gamma 1 = 0$; p > F	0.385	0.700	0.654	0.884
Ho: $\delta + \gamma 2 = 0$; p > F	0.625	0.760	0.679	0.314

Notes: the dependent variable is the change in the logarithm of per capita non-medical consumption. The controls include characteristics of the household head (age, sex, education, marital status, and working status) and household composition variables (changes in household size and the share of members under 5 years, 6–12, 13–15, 16–64, and 65 and over). Robust standard errors are in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. ADL = activities of daily living, SP = Seguro Popular, SS = social security.

Source: author's calculations based on the MxFLS.

Table 5: Effect of severe accidents on non-medical consumption and the role of public insurance, OLS estimates

	All heads	Other adults
Accident	0.076	−0.152**
	(0.086)	(0.074)
SP × accident	0.086	0.054
	(0.156)	(0.102)
SS × accident	−0.121	0.158*
	(0.104)	(0.085)
Household has SP	0.031	0.037
	(0.025)	(0.025)
Household has SS	0.054***	0.045**
	(0.018)	(0.018)
State fixed effects	Yes	Yes
Controls	Yes	Yes
R^2	0.07	0.07
N	12,614	12,614
Ho: $\delta + \gamma 1 = 0$; p > F	0.209	0.163
Ho: $\delta + \gamma 2 = 0$; p > F	0.446	0.888

Notes: The dependent variable is the logarithm of per capita non-medical consumption. Health shocks are measured with a binary variable that indicates whether the household head or any other adult in the household had a severe accident between waves. The controls include characteristics of the household head (age, sex, education, marital status, and working status) and household composition variables (changes in household size and the share of members under 5 years, 6–12, 13–15, 16–64, and 65 and over). Robust standard errors are in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. SP = Seguro Popular, SS = social security.

Source: author's calculations based on the MxFLS.

5.2 The effect of health shocks on consumption and the expansion of public insurance through the SP

The results presented so far indicate that health shocks can have sizeable effects on households' consumption, except for that of social security beneficiaries, who seem to be fully insured against these idiosyncratic shocks. No consistent evidence of a protective effect of the SP was observed. These estimates are potentially biased, however, as unobservable characteristics of publicly insured households can be correlated with consumption choices. Therefore, in this section I focus on the subsample of uninsured households at baseline that gained insurance through the SP and use the geographical variation in SP coverage to instrument affiliation.

Overall, the results for the subsample also indicate that uninsured households are not able to protect their consumption levels from health shocks to the household head (Table 6). The effect is clearer for shocks to relatively more important income earners and for basic ADLs (panel B, columns 2–4). Additionally, the magnitude of the main effect of changes in the heads' basic ADL index is similar to the one observed with the full sample: passing from being able to perform all basic ADLs to being able to perform none reduces consumption by 32–52 per cent.

In line with the results from the previous section, the interaction of self-reported affiliation to the SP with the health shock offsets the main effect of the latter but is not statistically significant

(columns 1–4). Columns 5–8 present the results using the SP municipality coverage to instrument the programme's affiliation. The last two rows of both panels, A for the general ADL index and B for the basic ADL index, indicate that the instrument is valid ($p < 0.01$) and that self-reported affiliation to the programme can be considered exogenous ($p > 0.10$), so OLS estimates are preferred.

Finally, Table 7 presents the results for the subsample of uninsured at baseline using severe accidents as the health shock measure. Since an even smaller share of the household heads in the subsample experienced accidents (2.6 per cent, Table 3), only accidents to all adults in the household (including heads) and adult members other than the head are analysed. The chi-square test in the last row of Table 7 indicates that the SP self-reported indicator should be considered endogenous and thus the IV estimates (columns 3 and 4) are preferred in this case ($p < 0.10$). In contrast to the results obtained for disability shocks, we observe that households that gained access to health insurance through the SP can mitigate the adverse effect of severe accidents ($\gamma = 0.398$, $p < 0.05$ in column 3; $\gamma = 0.386$, $p < 0.05$ in column 4). Uninsured households that experienced severe accidents, on the other hand, do suffer consumption drops that range between 16 per cent and 27 per cent ($\delta = 0.271$, $p < 0.05$ in column 3; $\delta = -0.160$, $p < 0.10$ in column 4).

Taken together, the results of this section suggest that the SP effectively provided consumption insurance for unexpected health events such as accidents, but not for those that resulted in limited physical functioning.

Table 6: Effect of changes in head's ADL index on non-medical consumption and the role of the SP; OLS and IV estimates (heads 50 years and older)

	Subsample of uninsured at baseline, OLS				Subsample of uninsured at baseline, IV			
	All	Male	Male, working	Male, working, <70	All	Male	Male, working	Male, working, <70
	1	2	3	4	5	6	7	8
Panel A. General ADL index								
Δ head's ADL index	0.129	0.274	0.346*	0.442**	0.165	0.282	0.410**	0.503**
	(0.133)	(0.167)	(0.185)	(0.209)	(0.147)	(0.178)	(0.195)	(0.210)
SP × Δ head's index	0.046	−0.229	−0.217	−0.202	−0.058	−0.246	−0.355	−0.331
	(0.222)	(0.253)	(0.261)	(0.302)	(0.282)	(0.308)	(0.309)	(0.325)
Household has SP	0.065	0.021	0.071	0.044	−0.087	−0.009	−0.189	−0.274
	(0.067)	(0.077)	(0.080)	(0.088)	(0.284)	(0.303)	(0.331)	(0.368)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.07	0.08	0.10	0.10	0.06	0.08	0.09	0.08
N	1,168	844	722	605	1,167	843	721	604
Ho: instrument weak					$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
Ho: SP exogenous					$p > 0.10$	$p > 0.10$	$p > 0.10$	$p > 0.10$
Panel B. Basic ADL index								
Δ head's ADL index	0.231	0.321*	0.439**	0.521**	0.266*	0.332*	0.511**	0.588**
	(0.145)	(0.184)	(0.200)	(0.245)	(0.156)	(0.198)	(0.213)	(0.248)
SP × Δ head's index	−0.148	−0.418	−0.385	−0.392	−0.233	−0.441	−0.514	−0.479
	(0.270)	(0.314)	(0.311)	(0.370)	(0.299)	(0.342)	(0.334)	(0.366)
Household has SP	0.054	0.014	0.063	0.038	−0.104	−0.029	−0.215	−0.300
	(0.067)	(0.076)	(0.080)	(0.088)	(0.275)	(0.298)	(0.327)	(0.360)
State fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.07	0.08	0.11	0.10	0.06	0.08	0.09	0.08
N	1,168	844	722	605	1,167	843	721	604
Ho: instrument weak					$p < 0.01$	$p < 0.01$	$p < 0.01$	$p < 0.01$
Ho: SP exogenous					$p > 0.10$	$p > 0.10$	$p > 0.10$	$p > 0.10$

Notes: the dependent variable is the logarithm of per capita non-medical consumption. * p < 0.10; ** p < 0.05; *** p < 0.01. Δ denotes changes, ADL = activities of daily living, SP = Seguro Popular.

Source: author's calculations based on the MxFLS.

Table 7: Effect of severe accidents on non-medical consumption and the role of the SP; OLS and IV estimates

	Subsample of uninsured at baseline			
	OLS		IV	
	Non-head	Any adult	Non-head	Any adult
	1	2	3	4
Severe accident	−0.192*	−0.076	−0.271**	−0.160*
	(0.107)	(0.077)	(0.118)	(0.093)
SP × severe accident	0.163	0.123	0.398**	0.386**
	(0.142)	(0.115)	(0.193)	(0.185)
Household has SP	0.032	0.028	−0.283	−0.315*
	(0.036)	(0.036)	(0.179)	(0.189)
State fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
R^2	0.07	0.07	0.05	0.05
N	3,338	3,338	3,336	3,336
Ho: instrument weak			$p < 0.01$	$p < 0.01$
Ho: SP exogenous			$p < 0.10$	$p < 0.10$

Notes: The dependent variable is the logarithm of per capita non-medical consumption. Health shocks are measured with a binary variable that indicates whether any adult had a severe accident between waves. The controls include characteristics of the household head (age, sex, education, marital status, and working status) and household composition variables (household size, share of members under 5 years, 6–12, 13–15, 16–64, and 65 and over). Robust standard errors are in parentheses. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. SP = Seguro Popular.

Source: author's calculations based on the MxFLS.

6 Conclusions

The contribution of this study is twofold. First, I provide evidence on the welfare consequences of incomplete private insurance markets in a middle-income country with a fragmented health system; and second, I analyse the protective effect of public health insurance. The results indicate that uninsured Mexican families are not able to cope with the consequences of health shocks, which is consistent with previous analyses for Indonesia (Gertler and Gruber 2002) and Viet Nam (Wagstaff 2007). Severe accidents are associated with declines in non-medical consumption that range between 16 per cent and 27 per cent. Likewise, changes in the health status of household heads, especially those who are relatively more important income earners, are associated with declines in non-medical consumption that can reach 50 per cent.

While the results concerning social security should be interpreted cautiously, it seems that this type of public insurance plays an important protective role against both types of shocks, however. Having social security fully offsets the main negative effect of physical capacity declines and accidents on non-medical consumption. On the other hand, the endogeneity-corrected estimates about the role of the SP differed depending on which health shock measure was taken into consideration. For the case of unexpected events such as severe accidents, the results indicate that the SP effectively provides consumption insurance to beneficiaries, but not so for the case of disability shocks measured by changes in the ability to perform ADLs. This conclusion is not surprising, though, if we consider that income losses associated to disability shocks are likely larger than medical care expenditures (Gertler and Gruber 2002). Unlike social security that provides both healthcare at no cost at the point of service and disability pensions, the SP only provides the former. Hence, if disability shocks affect relatively more the income-earning capacity of the household, the protective effect of the SP will be limited.

The results of this analysis add to the literature that had found reductions in medical care expenditures among beneficiaries of the SP (King et al. 2009; Knaul et al. 2012). But the study on consumption fluctuations provides an alternative measure of the welfare gains that can be obtained through the expansion of public insurance and, more importantly, highlights the sizeable economic costs that households face in the event of major illness when public insurance is not available. In this regard, it seems pertinent to consider whether other social security benefits such as disability insurance should be extended to non-beneficiaries. Certainly, large welfare gains could be obtained from insuring the income loss from severe disabilities, but further research is required to weight both the potential gains and the associated costs.

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A1 Appendix: theoretical framework—the consumption-smoothing properties of public health insurance

The framework originally developed by Baily (1978) and later expanded by Chetty and Looney (2006) is based on the following assumptions:

1 there are two states of nature, good and bad (in this case, one with good health and one with bad health);
2 the utility cost of obtaining consumption level c is θ_b in the bad state and θ_g in the good state, with $\theta_b > \theta_g$, i.e. θ is an increasing function of health shocks; and
3 utility is state independent.

If agents have a constant relative risk aversion (CCRA) utility function:

$$u(c) = \frac{c^{1-\gamma}}{1-\gamma} \tag{A1.1}$$

the consumption drop from the good to the bad state is:

$$\frac{\Delta c}{c} = \frac{c_g - c_b}{c_g} = 1 - \left(\frac{1}{\theta_b}\right)^{1/\gamma} \tag{A1.2}$$

where γ is the coefficient of risk aversion, and c_g and c_b represent optimal consumption in the good and bad state, respectively. Therefore, consumption changes are decreasing in γ and increasing in θ_b. If private insurance markets were complete, $C_b = C_g$, i.e. consumption would be the same in both states, but if private insurance markets are incomplete as expected, θ_b will be likely high unless public insurance is provided. The expansion of public health insurance in Mexico can help distinguish whether the provision of public insurance can effectively reduce the cost of smoothing consumption.

Note that zero or small consumption drops could also be observed if agents are very risk averse, i.e. if γ is high. While this requires further study, we observed that the health shocks analysed generally resulted in consumption drops for those who remained uninsured during the study period.