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Original Article

Creating a preference for prevention: the role of universal health care in the demand for preventive care among Mexico's vulnerable populations

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Abstract

The introduction of Seguro Popular (SP)— providing health insurance to over 50 million Mexicans since the early 2000s—represents a large shift in health care delivery to the Mexican population. And yet, its impact on Mexico's marginalized communities has been little studied, and its impact on health is unclear. Using a survey of poor urban Mexicans and Mexican Ministry of Health administrative data, this article investigates SP's effect on those at the most risk for health disparities by looking at the impact of the programme on demand for preventive care services, especially among women, children and the indigenous. Three outcomes important to Mexico's burden of disease are explored: general physical exams, diabetes screening, and cervical cancer screening. Ordinary least square regressions show that the introduction of SP is associated with an increase in demand for all three services, but these results are likely biased due to selection into the programme. I then use the staggered geographic roll out of SP between 2004 and 2007 to identify the causal impact of the programme on demand. I use length of exposure to SP as an instrumental variable to predict SP affiliation in 2009. Two stage least squares estimates of the causal impact of SP on demand for preventive care services finds that SP affiliation increases adult demand for physicals, but does not affect demand for diabetes screening. Additionally, I find that female and child SP affiliates are less likely to demand physicals, while affiliates who identify as indigenous are less likely to demand physicals but more likely to demand cervical cancer screenings.

Keywords: Mexico, prevention, health care reform, policy evaluation, indigenous populations

Key Messages

- The introduction of a universal health care system for the poor—Seguro Popular (SP)—was correlated with increased demand for three central preventive care interventions: general physical exams, diabetes screening and cervical cancer screening. However, much of this demand can be explained by self-selection into the programme.
- Controlling for self-selection, the causal impact of SP on demand for care is positive for physicals, but negative for diabetes screening. Additional interactions with an indicator for indigenous culture show that this group is less likely than the non-indigenous to demand physicals and diabetes testing when affiliated with SP.
- These results are consistent with ex ante moral hazard among some affiliates, and suggest that policy interventions aimed at indigenous health must go beyond targeting and consider the effect of affiliation on health-promoting behaviours such as the demand for preventive care.

Introduction

One of the most radical alterations in the history of Mexican health care occurred in 2003 with the introduction of 'Seguro Popular' (SP). SP is a government-funded programme that provides free health insurance with no user fees to over 50 million Mexicans. The programme is targeted to the ~50% of Mexicans that are not eligible for formal social security. These are workers (and their families) that are not salaried and therefore do not receive health insurance benefits funded through payroll taxes (Knaul *et al.*, 2006). This sector of the population is disproportionately made up of the poor, who are also disproportionately rural, indigenous, female, children and elderly. These have traditionally been the populations that are most vulnerable to disparities in health care access in Mexico, and part of SP's design explicitly targeted the programme to these groups (Paqueo and Gonzalez, 2003; King *et al.*, 2007; Leyva-Flores *et al.*, 2014).

SP has been successful in achieving near-universal coverage among previously uninsured Mexicans (Knaul *et al.*, 2012). However, while its affiliates have reduced their household out of pocket spending on health care (Galárraga *et al.*, 2010; Garcia-Diaz and Sosa-Rubi, 2011; Grogger *et al.*, 2015), researchers have found little evidence of increased health care utilization or improved health outcomes (King *et al.*, 2009). Two recent studies of long term outcomes show health improvements due to SP, mainly for women and children (Knox, 2016; Turrini *et al.*, 2016), although the mechanism through which these health improvements are created is unclear.

Ultimately, health care reform can still increase social welfare without improving public health, but evidence of health improvements due to such reforms would create a strong argument in their favour. This article specifically asks how the introduction of SP changed patterns of use of preventive care services, with an eye to understanding its impact on this dimension of population health. Preventive care can be a cost-effective way to increase health, especially in countries like Mexico that are undergoing an epidemiological transition, but it is often underutilized (Carrieri and Bilger, 2013). The literature on SP, moreover, displays a surprising absence of inquiry into this important question. Only one previous study of SP focusses on the demand for multiple forms of preventive care, but this study looks at a rural population and only in the period right after SP was introduced (Spenkuch, 2012). My study, instead, seeks to understand the impact of SP under the circumstances that are most likely to affect the greatest number of people: in the urban context (Grogger *et al.*, 2015), and several years after the introduction of the intervention.

Second, this analysis focusses specifically on SP's impact on the demand for preventive care from various population subgroups, specifically women, children and the indigenous. Much of the justification for SP came from the desire to reduce the health disparities suffered by these groups, and yet little work has been done to investigate its impact in these populations. A notable exception is Leyva-Flores *et al.* (2014), who find that indigenous SP affiliates are more likely to seek curative primary care than non-indigenous affiliates. This study seeks to discover whether SP has the same effect on promoting preventive care among its vulnerable affiliates, while also asking whether vulnerable groups are more or less likely than the rest of the population to affiliate with SP or to demand preventive care.

I find that SP affiliation is associated with an increase in demand for preventive care. However, increased use of only one form of preventive care (general physical exams) can be causally attributed to SP and in that case only for adults. Additionally, I find that the effect of SP on vulnerable groups is variable. In spite of the history of health disparities suffered by Mexico's indigenous population, SP was neither successfully targeted to the indigenous in my sample, nor was it effective in boosting utilization among those indigenous individuals who did choose to affiliate. In fact, in many cases, indigenous affiliates use less care than others.

SP was more effectively targeted at women and children in my sample, but my findings show that these groups are already more likely to receive preventive care and SP affiliation does not increase their utilization. The answers found here suggest that Mexican policy makers have much room for improvement in encouraging preventive care among SP affiliates, especially among the members of society most at risk for health disparities.

The scale of 'SP'—over 50 million people moved from uninsured to complete coverage over the course of 10 years—provides a unique opportunity to understand the social and economic heterogeneity in demand for health care by vulnerable populations more broadly. This article investigates these questions in Mexico, but the results can be used to evaluate and understand the effects of alterations in the prices of health care resources on both spending decisions and health outcomes in a broad variety of countries and contexts.

Background on the demand for preventive care

Preventive care is commonly believed by policy makers to be beneficial for reducing overall health expenditure and improving population-level health outcomes. Because of this belief, many public and private health programmes subsidize preventive care, with some even offering incentives for its use (Paris *et al.*, 2016). By making preventive care free, the reasoning goes, patients have increased incentives to choose screenings and disease prevention services over the potential for more costly treatments of disease down the line (Tian, 2016).

However, these incentives will not be effective if consumers are not very sensitive to the price of preventive care (Manning *et al.*, 1987). Additionally, SP makes all forms of health care free, not just preventive care, reducing the attractiveness of preventive care over other forms of free care. It is easy to imagine that affiliates may still find it optimal to forgo preventive care in favour of seeking curative care later, if and when they perceive a need for it. This will be even more likely to be true if there are any non-pecuniary costs associated with preventive care, such as wait times or discomfort (Aron-Dine *et al.*, 2013; Simon *et al.*, 2017).

This form of *ex ante* moral hazard was previously observed among SP affiliates by Spenkuch (2012), who found that SP affiliation reduced the demand for an index of preventive care measures. There is little additional evidence of *ex ante* moral hazard in other studies of SP and similar programmes, though. For example, among older Mexicans, testing for and monitoring of diabetes is not increased by SP affiliation, but neither is it reduced (Rivera-Hernandez *et al.*, 2016). And under a similar fully subsidized health insurance system in Colombia, adults were no more and no less likely to seek preventive diabetes care than the uninsured (Trujillo *et al.*, 2010). This paper is capable of contributing to the debate surrounding *ex ante* moral hazard specifically under fully subsidized health insurance, especially among the population sub-groups that are at risk of health disparities, which can be exacerbated by a lack of preventive care.

Health insurance also affects the supply of health care providers; the present study is intended to examine how different sets of people react to these changes in their health care resource sets. In particular, we should note that the SP reform not only lowered out of pocket costs, it increased access and quality of services relative to services

available for the poor before the reform (Garcia-Diaz and Sosa-Rubi, 2011). We might expect these reforms to increase demand; there was, however, also a significant increase in wait times for care (Scott 2006). Since waiting for care effectively increases the cost to the user, queuing tends to lead to decreased demand—especially for preventive care, for which a perceived lack of urgency makes waiting seem onerous (Carrieri and Bilger 2013). To investigate the role of health care supply more fully, I include two variables representing supply in my analysis.

The questions asked in this study are increasing in importance. The top causes of premature death and disability in Mexico are now diseases against which preventive care can be effective: diabetes, heart disease, and kidney disease (Global Burden of Disease Study, 2016). If Mexico's health policies are failing to give the Mexican people reason to use preventive care, then those policies are in need of revision.

Background on Mexico's health system and reform

The SP programme was created in 2003, to serve that half of Mexico's population without access to employment-based health insurance. That sector—~50 million people—faced high user fees and inconsistent service from the Mexican Ministry of Health (Frenk *et al.*, 2006; Knaul *et al.*, 2006). It was also disproportionately composed of the rural, the poor, and the indigenous, and SP was designed to be targeted to those populations (King *et al.*, 2007; Leyva-Flores *et al.*, 2014). Affiliates can receive primary or specialist care at a SP clinic or hospital free of charge. These facilities were either built new or were refurbished former Ministry of Health facilities. This investment in health care facilities was done over time, between 2002 and 2009, as part of the health reform that created SP.

Since families were not eligible for SP affiliation until their district had an accredited SP health care facility, there was geographic variation in SP eligibility over this time period. Otherwise, any family not eligible for formal social security through Mexican Social Security Institute (IMSS) or similar organizations was eligible to affiliate with SP. By design, no premiums were to be charged to those in the bottom two income quintiles. In practice, no premiums were charged in the early years of the programme (Knaul *et al.*, 2012).

Given SP's background and goals of decreasing health inequities, we can ask how those targeted by SP altered their health care consumption patterns in response to this intervention. It is to this task that I now turn.

Methods

Data

The data are drawn from the Urban Evaluation Survey (Encelurb), a repeated sampling of over 17 000 poor, urban Mexican households over 7 years. The survey was originally conducted to evaluate the urban implementation of Mexico's conditional cash transfer programme, called 'Oportunidades' at the time of the survey (and now called 'Prospera'). Poor, urban households (households near the cut-off for 'Oportunidades' programme eligibility) were surveyed yearly in 2002–04, and a follow-up survey of the same households was added in 2009 (Behrman *et al.*, 2012). Most of the outcomes and explanatory variables used in this study are drawn from the 2009 follow-up, but 2004 variables are included, especially for explaining selection into the programme.

For this study, a subsample of 23 599 individuals were selected based on their eligibility for 'SP'. Selected individuals were not covered by formal insurance systems in 2002, and were living in regions that were included in SP eligibility in 2003 or later. The households in this subsample represent 58 districts ('municipios') (out of over 2400) in 16 Mexican states (out of 32). The districts were chosen for their similarities in demographic and socioeconomic characteristics, as well as in the availability of health care (Behrman *et al.*, 2012).

Due to its focus on urban households, the ENCELURB survey is not nationally representative. However, this urban sample may be considered as a group who has access to the highest quality SP facilities and the fewest barriers to programme uptake for a few reasons. Despite targeting of the programme to rural communities, the majority of affiliates in the programme's early years were urban (Scott, 2006). There are also many reports of heterogeneous quality and financial protection in SP's rural facilities (Grogger *et al.*, 2015). In many ways, then, the urban sample gives a more consistent and 'best possible' set of outcomes for the programme. Finally, all respondents in this survey have incomes near or below the eligibility cut-offs for the conditional cash transfer programme, 'Oportunidades', which was targeted to the poorest of the poor. Since 'SP' was targeted those in the bottom two income deciles, the respondents here should be similar to the typical 'SP' affiliate, even if they were not yet eligible for administrative reasons.

Data on health care human resources by district were also added to this data set to represent health care supply or access beyond affiliation with SP. These data are available through the Mexican Ministry of Health Infrastructure database (SINERHIAS). Only values from 2009 were used, in order to give the best representation of health care access at the time SP affiliation and health care demand were observed.

Analysis using ordinary least squares

To test the relationship between SP affiliation, demographic characteristics, and preventive care demand, I first estimate a linear probability model using ordinary least squares (OLSs). There are three main outcomes of interest (all dummy variables): a general preventive care consultation (a 'physical') for all ages, screening for diabetes via a blood sugar measurement for adults over 18, and cervical cancer screening ('Pap' testing) for women between 25 and 49. These latter two tests can be seen, in light of their efficacy as means for increasing population health, as a proxy for overall quality of available preventive care (Cohen *et al.*, 2008; Villarivera *et al.*, 2012; Rivera-Hernandez *et al.*, 2016).

My main explanatory variable is a dummy for SP affiliation in 2009. I also include three demographic control variables: sex, age and whether the individual speaks an indigenous language. This last variable is consistent with the definition of 'indigenous' used in other studies and yields a similar measure of proportions of indigenous in the population (about 10%) (Leyva-Flores *et al.*, 2014). Finally, I include interactions between SP affiliation and these measures of vulnerability in order to detect whether there are differential effects of SP for these sub-groups.

Other determinants of demand for preventive care considered are age, education, and the individual's affiliation with the 'Oportunidades' conditional cash transfer programme, since this programme was targeted to children and their mothers. Cash incentives were given for receiving some very basic forms of preventive care, including physical exams, so we should expect that membership in the programme would increase demand for at least some of these outcomes (Behrman *et al.*, 2012). I find that Oportunidades is strongly correlated with preventive care use, but does not uniquely determine it. Since 80% of the sample studied is in some way affiliated with Oportunidades by 2009, we could view this study as an investigation of the impact of SP on Oportunidades affiliates. This view is consistent with the main purpose of the study: to measure

Table 1. Characteristics of study sample

	Full sample $n = 23\,967$	2009 affiliates $n = 8766$	2009 non-affiliates $n = 15\,201$	*P*-value
	2002 Characteristics			
Age (in years)	29.33 [17.86]	28.47 [18.09]	29.83 [17.71]	0.00
Proportion female	0.52 [0.50]	0.56 [0.50]	0.49 [0.50]	0.00
Education (in years)	5.29 [4.27]	6.19 [3.72]	4.77 [4.47]	0.00
Proportion speaks indigenous language	0.08 [0.27]	0.08 [0.27]	0.07 [0.26]	0.22
Days of illness (in last 30 days)	0.58 [2.59]	0.60 [2.61]	0.57 [2.58]	0.43
Household medical spending (in last 30 days, Pesos)	10.91 [123.72]	10.89 [143.41]	10.92 [110.80]	0.99
	2009 characteristics			
Proportion has Oportunidades 2009	0.80 [0.40]	0.89 [0.31]	0.75 [0.43]	0.00
Has Primary Care Facility in Neighbourhood, 2009	0.89 [0.31]	0.88 [0.32]	0.90 [0.30]	0.00
Number of primary care facilities in neighbourhood, 2009	3.25 [2.52]	3.37 [2.60]	3.18 [2.47]	0.00
Number of obstetricians in district, 2009	18.95 [20.6]	18.26 [20.3]	19.35 [20.7]	0.00
Duration of SP affiliation, 2009	1.29 [1.89]	3.56 [1.33]	0.00 [0.00]	0.00
	2009 Outcomes			
Proportion receiving physical in last year	0.20 [0.40]	0.32 [0.47]	0.13 [0.34]	0.00
Proportion screened for diabetes in last year ($n = 16\,017$)	0.25 [0.43]	0.36 [0.48]	0.19 [0.40]	0.00
Proportion screened for cervical cancer in last year ($n = 5149$)	0.35 [0.48]	0.47 [0.50]	0.26 [0.44]	0.00

Note: Means and SDs reported. *P* values shown for *t*-test of difference in means between SP affiliates and non-affiliates.

the impact of SP on vulnerable populations. Oportunidades is a programme for families with young children and low socioeconomic status, a group typically considered vulnerable to health disparities.

From the ENCELURB dataset and Ministry of Health data, I include the number of primary care facilities in the respondent's neighbourhood (zona or colonia) and the number of obstetricians in the respondent's district (municipio). These variables represent access to health care and are measured in 2009 only.

Summary statistics for this population are given in Table 1. Column 1 shows means and standard deviations for the full sample, while Columns 2 and 3 show the same statistics for those affiliated with SP in 2009 ($n = 8766$) and those not affiliated by 2009 ($n = 15\,201$), respectively. Of those who were affiliated by 2009, 2374 were eligible in 2003, 3473 in 2004, 1341 in 2005, 822 in 2006 and 756 in 2007. The median year of eligibility was 2004, and the average length of affiliation in the sample was slightly >3.5 years.

The fourth column tests whether the means of each variable are the same for affiliates and non-affiliates. This hypothesis is rejected for almost every explanatory variable. Those that were affiliated with SP by 2009 are younger, more likely to be female, and more educated than the non-affiliates. They are also more likely to have Oportunidades, and are less likely to live in a neighbourhood with a primary care facility, although this is balanced by having more health facilities on average. These differences between affiliates and non-affiliates are a potential source of bias in the coefficients estimated using OLS, a concern that is addressed in the sections that follow.

Table 1 also shows the average outcomes for affiliates and non-affiliates. As expected, the affiliated group reports significantly higher utilization for all three outcomes. Since the survey contains some utilization data from earlier years, I also test the means for both groups in 2002. In unreported results, I find that there is no significant difference in utilization of diabetes testing for adults or for preventive care for children under 6 in 2002, the only two variables included in the survey at that time.

Selection into health insurance

Literature on the impact of health insurance on health is often concerned with unobservable differences in health-related behaviour between those who voluntarily choose to enrol in health insurance and those who do not (Manning *et al.*, 1987). Selection into health insurance can lead to overestimates or underestimates of programme impacts, especially if entry is based on unobservable characteristics. For this reason, I investigate the factors that determine selection into the SP programme. These findings are important both for gaining a deeper understanding of whether SP was implemented in a way consistent with its targeting goals, and for developing a set of instrumental variables that can be used to correct for selection bias later in the analysis.

I estimate a linear probability model of selection that uses affiliation with SP in 2009 as the binary outcome variable. I anticipate that observable demographic factors such as age, sex, and indigenous status play important roles in explaining affiliation to SP, especially since the programme was specifically targeted to women, children and the indigenous (King *et al.*, 2007). I also include socioeconomic factors such as household size and home ownership, previous medical spending and health status (as a proxy for need). The rules regarding SP eligibility automatically grant affiliation to Oportunidades beneficiaries who apply (Scott, 2006). This suggests that Oportunidades status may be an important predictor of SP affiliation, especially in this population, and in fact, there is a strong correlation between the two.

Correction for selection bias using instrumental variables

Given that I find that affiliation with SP is only partially determined by observable characteristics, it is likely that unobservable characteristics, especially those related to demand for health care, will also influence affiliation. These unobservables may include a potential affiliate's health endowment, or underlying beliefs about health. If those who favour healthy behaviours are also those who are more likely to affiliate with SP, e.g. there will be advantageous selection into the programme, and the OLS coefficient will be an overestimate of the impact of the programme on demand for preventive care. On the other hand, it is possible that health insurance attracts those who engage in the least healthy behaviours, leading to an underestimate of the impact of SP in an OLS estimate.

To reduce the bias from selection into SP, I employ instrumental variables to estimate the impact of SP affiliation on demand for care. The excluded instruments chosen should be able to predict and explain an individual's choice to affiliate with SP without being correlated with the unobservable characteristics that also determine demand. Because SP eligibility was tied to district of residence in the early years of its introduction, I am able to use this staggered geographic roll-out as an instrument for programme uptake. The individuals in my sample received district-level access to SP between 2003 and 2007, with the median individual receiving access in 2004,[1] and I use duration of exposure to SP as my main excluded instrument in the analysis that follows.[2]

My identification strategy relies on the timing of programme roll-out being uncorrelated with health or demand for health services in the affected population. This relationship has been investigated by several previous authors, who have found district-level SP accreditation to be linked to political factors, health infrastructure and population size, but not individual demand for services (Barros, 2008; Conti and Ginja, 2016; Rivera-Hernandez *et al.*, 2016). The other instruments used for my main IV results are a dummy for home ownership in 2004 and the number of household residents in 2004. I take both as an indicator of poverty.

I also must consider the question of whether the interaction between SP and demographic variables should be treated as endogenous. Bun and Harrison (2014) suggest several methods for dealing with interactions between an endogenous and exogenous variable, such as the interactions between affiliation and demographic characteristics used here. One suggestion is to treat these interaction terms as exogenous. This is the approach taken in my main results presented below. Other suggested methods for including endogenous interactions are explored in the Supplementary Appendix.

Results

Estimation of determinants of demand using OLS

Table 2 shows the results of the OLSs regression of the binary outcome variables for preventive care utilization on SP affiliation, membership in the 'Oportunidades' programme, demographic characteristics, health status, and access to health care. Variables for the interaction between SP affiliation and the three demographic characteristics of interest—speaking an indigenous language, being female, and being under 18—are also included. Column 1 reports the results for a general physical in the past year for all individuals, Column 2 reports results for diabetes screening for adults over 18, and Column 3 reports results for Pap testing for cervical cancer detection for women aged 25–49. Robust standard errors are clustered at the municipio level, and are reported in Table 2 and all tables that follow.

The results show that access to both 'SP' and 'Oportunidades' are associated with an increase in the likelihood of using all three forms of preventive care. The mean effect of SP on demand for a general visit is 16 percentage points (pp), a 123% increase over demand for non-affiliates in the same period. SP affiliates are also 13 pp (68%) more likely to receive blood sugar testing and 15 pp (58%) more likely to receive a Pap test than non-affiliates. Affiliation with 'Oportunidades' is also associated with large increases in all three types of care (69% for general preventive, 42% for blood sugar testing, and 50% for Pap testing). It is not surprising that the largest impacts of Oportunidades can be seen among children and women in their child-bearing years, given that 'Oportunidades' was targeted to children and their mothers and would be expected to have much less effect on the older adults most likely to be screened for diabetes. As stated earlier, due to the strong influence of Oportunidades in this population, it is important to view the effect of SP as an effect in conjunction with the Oportunidades programme.

Table 2. Determinants of demand for preventive care—OLS regression

	1	2	3
	Physical	Diabetes screen	Pap test
SP Affiliation	0.16* [0.02]	0.13* [0.02]	0.15* [0.02]
SP*Indigenous	–0.04 [0.03]	–0.02 [0.03]	0.07*** [0.04]
SP*Female	0.02** [0.01]	0.05* [0.01]	
SP*Under 18	–0.02 [0.01]		
Female	0.05* [0.01]	0.07* [0.01]	
Indigenous	0.01 [0.03]	0.01 [0.03]	–0.02 [0.02]
Oportunidades	0.09* [0.01]	0.08* [0.01]	0.13* [0.02]
Age	0.00* [0.00]	0.01* [0.00]	0.06* [0.02]
Age Squared	–0.00** [0.00]	–0.00* [0.00]	–0.00* [0.00]
Under 18	0.08* [0.01, 0.00]		
Years Education	0.01* [0.00]	0.01* [0.00]	0.02* [0.00]
Days of Illness	0.01* [0.00]	0.01* [0.00]	0.01** [0.00]
Number primary facilities	0.01 [0.02]	0.01 [0.02]	–0.04 [0.03]
Number obstetricians			0.00*** [0.00]
Observations	23 599	15 753	5073
R-squared	0.11	0.13	0.14

Note: Linear regressions with binary dependent variables and state fixed effects. Robust standard errors are in brackets. Robust standard errors clustered at the district level.

*$P < 0.10$,

**$P < 0.05$,

***$P < 0.01$.

Turning to the impact of demographics on demand, I find that women are more likely than men to demand both general preventive care and diabetes screening. Being under 18 also increases demand for general preventive care relative to those who are over 18. Both of these results suggest that these populations—women and children—are being reached by the health care system and are less likely to be facing significant barriers to care. Surprisingly, although the indigenous population's health outcomes are uniformly worse than those of the non-indigenous (Barraza-Lloréns *et al.*, 2002; Leyva-Flores *et al.*, 2014), there seems to be no impact of indigenous status on demand for any of the preventive care outcomes.

Interaction terms were also included in this regression to directly measure the impact of SP on members of the three demographic groups of interest in this article. Any significant coefficient on an interaction term indicates that SP increased (or decreased) demand by that group over and above the effect of SP on the average affiliate. Female SP affiliates are more likely than female non-affiliates or male affiliates to demand both physical exams and diabetes screening, but there is no additional impact of SP on children's preventive care utilization. There is no differential demand for physicals or diabetes screening for indigenous affiliates, although they are 7 percentage points more likely than the non-indigenous to receive cervical cancer screening.

Estimation of selection in SP

Determinants of affiliation with SP in 2009 are shown in Table 3. Column 1 shows results of a regression testing the effect of many socio-economic, demographic, and health-related factors on the decision to enrol in SP. As expected, I find that years of eligibility for

Table 3. Determinants of selection into SP

	1	2
	Selection into SP	First Stage Variables
Yrs Eligible for SP	0.03*** [0.01]	0.04*** [0.02]
HH Residents in 2004	–0.01*** [0.00]	–0.01*** [0.00]
Own Home 2004	–0.02 [0.02]	–0.05*** [0.02]
Female	0.06*** [0.01]	
Indigenous	–0.01 [0.04]	
Oportunidades	0.23*** [0.02]	
Age	0.01*** [0.00]	
Age squared	–0.00*** [0.00]	
Under 18	0.31*** [0.02]	
Years of education	0.02*** [0.00]	
Days of Illness	0.00*** [0.00]	
Number primary facilities	–0.00 [0.00]	
Number obstetricians	0.01*** [0.00]	
Observations	23 599	23 599
R-squared	0.14	0.06

Note: Linear regressions with binary dependent variable. First stage regression for SP affiliation used in IV regressions in Table 4. Exogenous variables are: years exposed to SP, any primary facility, number of primary facility and number of nurses. Robust standard errors (clustered at district level) are in brackets.

$^{***}P < 0.01$.

Table 4. Determinants of demand for preventive care—IV regression

	1	2	3
	Physical	Diabetes screen	Pap test
SP affiliation	1.08* [0.49]	0.25 [0.24]	0.16** [0.02]
SP*Indigenous	–0.50* [0.24]	–0.08 [0.10]	0.11** [0.03]
SP*Female	–0.62*** [0.33]	–0.12 [0.22]	
SP*Under 18	–0.58*** [0.30]		
Female	0.25* [0.10]	0.11* [0.05]	
Indigenous	0.17* [0.09]	0.02 [0.04]	–0.05* [0.02]
Oportunidades	0.02 [0.04]	0.02 [0.02]	0.12** [0.02]
Age	–0.00 [0.00]	0.02** [0.00]	0.04** [0.02]
Age squared	0.00 [0.00]	–0.00** [0.00]	–0.00** [0.00]
Under 18	0.14** [0.04]		
Years education	0.00 [0.00]	0.01** [0.00]	0.02** [0.00]
Days of illness	0.01** [0.00]	0.01** [0.00]	0.00* [0.00]
Number primary facilities	0.05*** [0.03]	0.04*** [0.02]	–0.05 [0.03]
Number obstetricians			0.00*** [0.00]
Observations	23 599	15 753	5073
Kleibergen-Paap *P*-value	0.00	0.04	N/A
Hansen's J *P*-value	0.48	0.67	N/A

Note: Generalized Method of Moments (GMM) instrumental variables linear regressions with binary dependent variables and state fixed effects. Instruments are: Years of exposure to eligibility for SP in 2009, home ownership in 2004, and number of household residents in 2004. Kleibergen-Paap underidentification test used to test instrument relevance. Rejection of the null hypothesis implies instruments are not weak. Hansen's J statistic used to test overidentifying restrictions. Failure to reject null hypothesis implies excluded instruments are correctly excluded, assuming that at least one instrument is exogenous. Robust standard errors (clustered at the district level) are in brackets.

$^{*}P < 0.10$,
$^{**}P < 0.05$,
$^{***}P < 0.01$.

the programme are a significant determinant of enrolment in 2009. Individuals in eligible districts are 3 percentage points more likely to enrol in SP per additional year of exposure. 'Oportunidades' membership also increases uptake, as do socio-economic status, age, and education. There is no effect of medical spending, and the impact of access to care is mixed, with affiliation increasing in the number of obstetricians, but not the number of primary facilities in the respondent's neighbourhood. Days of illness in the last month, a proxy for perceived need, does have a significant and positive, albeit small, impact on affiliation.

Table 3 shows that women are more likely to affiliate than men and children under 18 are more likely to affiliate than adults. This reinforces the finding above that these groups are not facing significant barriers to accessing the Mexican health care system. Individuals identified as indigenous, however, are not any more (or any less) likely to enrol in SP than the non-indigenous. These results show that indigenous status does not negatively impact an individual's access to the Mexican health care system overall, at least for this urban population.

Part of the goal of this exercise is to find suitable predictors of SP affiliation for use in an instrumental variables analysis in the next section. Many of the characteristics in Column 1 may also be correlated with demand for health care, however, and would not satisfy the exclusion restriction. Column 2 of Table 3 shows the effect of an abbreviated set of characteristics from 2004: years of eligibility for SP, number of household members, and home ownership, on affiliation in 2009. Column 2 demonstrates that these characteristics are important predictors of affiliation even in the absence of the other variables, and so this model is used as the first stage of the two stage least squares regression performed in the next section.

Instrumental variables estimation

Table 4 shows the results of the second stage of the instrumental variables regression that estimates the impact of SP on demand for preventive care. As discussed previously, I treat the interactions between SP and demographic characteristics as exogenous, following Bun and Harrison (2014). Given that all instruments available to me are weak predictors of the interaction terms (this is explored in Supplementary Appendix Table A1), I conclude that the strategy of treating the interactions as exogenous is appropriate for this context.

In order for instruments to be valid, they must be strong predictors of the endogenous variable and must not be correlated with the error term. To test the validity of the instruments used, Table 4 displays *P*-values for standardly used tests for weak and endogenous instruments. The first *P*-value is for the Kleinbergen-Paap test statistic. The rejection of the null here shows that the instruments are a strong predictor of the endogenous variable (Baum *et al.*, 2007). The second *P*-value is for Hansen's J statistic, used as a test of overidentifying restrictions. Failure to reject the null hypothesis here implies that the set of instruments is suitably specified. Additioanlly, although it is impossible to directly test whether the excluded instruments are uncorrelated with the error, the test of overidentifying restrictions can show that when there are more instruments than endogenous variables, the additional instruments are not correlated with the error term (Wooldridge, 2010). Together, the *P*-values shown in Table 4 suggest that the instruments used are relevant and that the overidentifying restrictions are valid. An additional Hausman test shows that SP affiliation should not be treated as

endogenous in the sample of reproductive-aged females who are candidates for Pap tests.

In Table 4, I find that once self-selection bias is removed, SP affiliation is a statistically significant predictor of receiving a physical and cervical cancer screening, but not diabetes testing. Since the effect of SP on demand for physicals is larger in this model than in the uncorrected model, the results imply that there is adverse selection into SP, at least for this outcome. In other words, those who choose to affiliate with SP are, in the absence of affiliation, less likely to receive this sort of preventive care than non-affiliates. For diabetes screening, the conclusions are less clear. The point estimate of the impact of SP on demand is larger, but so are the standard errors, and so we cannot draw any firm conclusions about the direction of the effect.

Column 1 of Table 4 also shows that among SP affiliates, women, children and the indigenous are less likely to demand preventive care in the form of physicals, even though all three of those groups have higher demand outside of the SP system. On the other hand, Column 2 shows that there is no differential demand for diabetes screening by demographic group among SP affiliates, although women are more likely to use this type of care in general. I check the robustness of these results to alternative data constraints in Supplementary Appendix Table A2.

Discussion

In Mexico, health disparities have often been suffered by children, women, the elderly, and the indigenous (Barraza-Lloréns *et al.*, 2002; Paqueo and Gonzalez, 2003). This outcome is likely to be due, at least in part, to Mexico's two-tiered health care system and the lack of health insurance access for the lower income tier prior to 2002. The introduction of the SP health insurance programme in 2003; then, created the opportunity for Mexico to bridge these pre-existing gaps in access to quality health care, and to potentially reduce disparities in health outcomes. This article explores whether SP has been successful in reducing disparities in health care use and access by measuring whether affiliation with SP increases the use of preventive health care among a group of over 23 000 poor, urban Mexicans. This group could be considered at risk of health disparities based on poverty alone; however, I am also able to explore whether there are additional impacts of SP on specific populations of interest—the indigenous, women, and children.

First, I find that SP is associated with an increase in demand for three services: physical exams, diabetes screening, and cervical cancer screening, but that demand for the first two services are lower for female affiliates and affiliates under 18, even though these groups demand more of both services in general. Second, I find a more complex relationship between indigeneity, SP, and demand for preventive care. In my data, indigenous SP affiliates appear to demand less care in the form of physical exams or diabetes screenings, although the indigenous demand more of those services in general. In contrast, I find the opposite impact of indigeneity on demand for cervical cancer screening. In general, the indigenous demand this type of care less than others, but indigenous SP affiliates demand it more.

These findings do not support the conclusion that SP affiliates engage in moral hazard in general, although my findings are somewhat more mixed among women and the indigenous. One explanation for why female affiliates demand fewer physicals than male affiliates is that in the absence of SP, women demand more preventive care services than men. SP affiliation could then be creating convergence between male and female demand for this service. Similar reasoning applies to the finding of negative interaction between youth and SP affiliation, even though the young consume more of these services overall. Among the indigenous, this explanation could also apply for physical exams, although it has less appeal due to the fact that we do not observe a greater demand for preventive care by that group in the OLS results. For cervical cancer screening, my results imply movement in the opposite direction—that SP is bringing demand by the indigenous up to levels experienced by the non-indigenous.

An alternative explanation for why some sub-groups of SP affiliates may avoid preventive care is the possibility that visiting the doctor carries greater non-pecuniary costs for those populations than for others. Previous research also finds that effective access to SP is low due to long wait times and insufficient knowledge of patients' rights under the SP system (Leyva-Flores *et al.*, 2014). This explanation could be especially salient for understanding the reduction in demand for physical exams by the indigenous, traditionally a less-educated and -empowered population. Clearly, simply lowering the price of care is not sufficient to increase demand if the care is not truly accessible.

This explanation is consistent with findings by Paqueo and Gonzalez (2003), who recommend that Mexico tailor its health care services to the needs and priorities of indigenous cultures in order to reduce health disparities. It also follows López-Cevallos and Chi (2010) who suggest that healthcare expansions should incorporate culturally appropriate practices such as 'traditional' healing.

Limitations

Without random assignment, it is difficult to measure the causal impact of health insurance. Studying SP presents an opportunity to study a programme that was rolled out in a quasi-random manner, across over 50 million people, however. In this study, I use the length of exposure to SP as an instrument for affiliation into the programme. Although I present evidence that the instruments are valid, this is not the same as true random assignment into the programme. Thus, there is always the chance that the estimates presented here are biased. Given that the experimental evaluation of SP ended after ten months, this study is consistent with the methods used in most other examinations of SP's impact.

Another limitation of this study is that the survey data used do not include a large enough sample of the elderly to study the impacts of SP for this group. Given Mexico's changing burden of disease and aging population, this is unfortunate. The question of SP's effect on diabetes and hypertension treatment is investigated for the elderly by Rivera-Hernandez *et al.* (2016), although they do not focus on vulnerable groups beyond looking at those without access to social security. Future research is needed to fully explore the interactions between age, gender, and ethnicity in the provision of health care in Mexico.

Conclusions

This study shows that age, sex and ethnicity can partially explain affiliation with the SP programme. Specifically, I find that SP was effectively targeted to women and children, but not to the indigenous. Additionally, I find that SP is effective in promoting some forms of preventive care, but its impact is heterogeneous by sex, age and ethnicity. I also find that there is no evidence to show that SP affiliation increases demand for diabetes screening, an increasingly important test, given rising rates of diabetes in Mexico. There is clearly room for SP to grow in its delivery of preventive care services to Mexico's most vulnerable, however it does not appear to be associated with a decline in demand for these services in the general population as would be the case if ex ante moral hazard were present.

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Supplementary Data

Supplementary data are available at *Health Policy and Planning* online

Conflict of interest statement. None declared.

Notes

1. Of the 58 districts, 18 gained accreditation by SP in 2003, 16 in 2004, 11 in 2005, 4 in 2006 and 9 in 2007.
2. In unreported results, I use exposure to SP before 2006 as an alternative instrument. The direction and significance of the results are unchanged, although the first stage is weaker.

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