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Ex-Ante Moral Hazard? Overweight and Health Insurance Expansion in Mexico

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Abstract

Extending health insurance to previously uncovered populations can improve access to preventative health care alongside income effects resulting from lower need of out-of-pocket. However, theoretically, in the presence of ex-ante moral hazard, it can also give a disincentive to preventative efforts to lose weight among the already obese population. This paper draws on evidence from the introduction of the Mexican Seguro Popular (SP) in the 2000s to examine its effects on individuals' obesity and body mass index (BMI). We exploit the arbitrary timing of SP's rollout across Mexican municipalities, namely the exogenous variation resulting from the different speeds in the implementation of SP. We document no significant average effects of SP rollout on BMI and obesity. We document a reduction in the average BMI among those individuals who were already overweight at the time of the introduction of SP and a reduction in 2 pp in the probability of smoking. This evidence suggests no evidence of ex-ante moral hazard in Mexico.

JEL classification

I18, J5

Keywords

obesity, overweight, insurance expansion, Seguro Popular, ex-ante moral hazard, income effects, prevention, health behaviours

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1. Introduction

During the last decades we have witnessed the expansion of health insurance across the world to achieve the goal of universal health coverage. Consistently with theoretical predictions, health insurance expansions improve access to health care (Nyman, 1999), and especially preventative health care. Health insurance can reduce individuals' exposure to the financial consequences of ill health, especially catastrophic risks, and can reduce the need for precautionary savings to pay for health care out-of-pocket (World Health Organization, 2014). However, it has also been argued that it can give rise to unintended consequences, such as a depressing of preventative behaviour, which is referred as *ex-ante moral hazard*. That is, previously uninsured individuals might arguably reduce their preventive efforts and investment in long-term health after being covered by insurance, as they will not have to bear the (monetary) costs of future health treatments (Acharya *et al*. 2012). This entails an externality for the rest of individuals in the insurance pool, including a so-called *negative obesity externality associated with health insurance.*

Health insurance expansions may influence nutritional outcomes through several channels, such as an increase in disposable income, more frequent diagnosis and treatment of obesity through the health care system, as well as moral hazard. While earlier studies based on US data have found evidence that health insurance may increase both BMI and obesity (Bhattacharya et al. 2009), more recent evaluations based on the Affordable Care Act (ACA, commonly called "Obamacare") have not confirmed this finding (Simon et al. 2016, Rhubart 2018). Similarly, Rashad and Markowitz (2007) using an instrumental variable strategy based on company employment size document no evidence of insurance on body weight. However, Bhattacharya et al. (2009) exploiting evidence from the RAND health insurance expansion and an IV strategy —using company employment size and Medicaid coverage as an instrument for private and public insurance—, find that insurance does exert an influence on BMI, although there are different effect defending on the extensive and the intensive margins of insurance coverage, namely the coverage depth[3]. In contrast, the Oregon experiment documents no effect of public insurance on obesity (Sacarny et al. 2022). There is also evidence that the ACA improved preventative health behaviours (Sommers et al. 2017). Hence, we can conclude that there is no consensus in the literature. Moreover, most studies examining the effect of health insurance expansions on obesity and BMI focus on the US, warranting research in other settings to assess their external validity. However, such effects might well be different in Low- and Middle-Income Countries (LMIC) given the constraints for health production, and hence, insurance might reduce the risks of less healthy lifestyles.

Several LMICs which have also expanded health care to poor and vulnerable populations and/or informal sector workers, which offer an opportunity to analyse its effects on obesity.[4] A study from Colombia shows that health insurance expansion can incentivise the use of preventive health services, most notably preventive physician visits and child growth monitoring (Miller et al. 2013). Similarly, a study from Thailand also provides evidence of an increase in preventive visits after a health insurance expansion, while not detecting evidence of a change in risky behaviours (Ghislandi et al. 2015). Given the positive relationship between insurance and health prevention in other contexts, this paper assesses whether health insurance may also boost overweight and healthy nutrition more generally[5] or, alternatively,

[3] More specifically, private insurance increases BMI by 1.3 points and public insurance increases BMI by 2.1 points.

[4] Prominent examples in low-income countries include the *Ramed* programme in Morocco, Vietnam's *Health Care Fund for the Poor* and Mexico's *Seguro Popular*.

[5] Unhealthy nutrition is a major risk factor for several severe diseases including diabetes, heart disease and some forms of cancer (Field et al. 2001). It is therefore important to investigate whether health insurance is an adequate policy measure to improve health prevention by means of altering nutrition behaviours and outcomes.

give rise to moral hazard effects. Specifically, we evaluate the effects of the *Seguro Popular (SP)* health insurance programme implemented in Mexico during the 2000s on overweight, as well as expenditure on different food and non-food items. The implementation of SP was unique as all municipalities were potentially treated, however, the implementation of the program differed on political incentives unrelated to health outcomes and provides local level exogenous variation on insurance expansion. The main contribution of this paper lies in being the first paper that studies the effect of health insurance effects on overweight in a LMIC setting to examine the presence of ex-ante moral hazard.

Overweight and obesity are becoming a major concern in low- and middle-income countries (LMICs), as they are associated with the prevalence of several chronic diseases (Di Cesare et al. 2016; Field et al. 2001; Sturm 2002) and pose important challenges to the financial sustainability of public health systems[6]. This raises an important policy question, given that many LMICs have introduced, are introducing, or have already expanded equivalent free health insurance programmes for the poor and vulnerable (Wang et al. 2011). If health insurance gives rise to moral hazard effects on overweight, preventative programme interventions need to be introduced to counteract the externalities that it can engender. Similarly, it is important to understand whether such risk is driven by the entire population or by specific subgroups, such as already overweight individuals at baseline. Mexico has the second-highest obesity rate among OECD (Organisation for Economic Co-operation and Development) countries and ranks highest when considering both overweight and obesity; it is projected to have the highest obesity rate by 2030 (OECD 2023). While Seguro Popular was replaced by the *Instituto de Salud para el Bienestar* (INSABI) in 2019, and more

[6] Sturm (2002) estimates that health care costs for obese people are 36 percent higher, while medication costs are 77 percent higher than for people in a normal weight range.

recently by IMSS-Bienestar, this process has continued the expansion of health coverage to unprotected sectors in Mexico, making our research question remain policy-relevant.

The empirical strategy of identifying the effect of insurance on overweight draws on a difference-in-difference approach to compare treated to untreated municipalities which expanded health insurance expansion in Mexico. We exploit the arbitrary timing of Seguro Popular's rollout across Mexico's municipalities which provides quasi-experimental evidence which allows comparing two very similar groups of insured and uninsured individuals[7]. Although all states were treated the treatment intensity differed across state[8]. Furthemore, we run a robustness check using an alternative instrumental variable to measure the effects of insurance update based on the early pick up of the introduction of Seguro Popular.

Our main data source is the Mexican Family Life Survey (MxFLS), a longitudinal dataset available in three waves, containing not only anthropometric measures, but also comprehensive information on the socioeconomic situation and health of the respondents. The timing of the surveys matches the expansion of Seguro Popular, with one pre-treatment wave (2002) and two waves covering the expansion of the programme (2005 and 2009). Moreover, we match the MxFLS data to several administrative data sources on Seguro Popular coverage at the municipality level, as well as other municipality-level characteristics. The main objective is to analyse the effects of Seguro Popular on overweight and obesity, distinguishing the effects among the general population and those individuals who are overweight at baseline.

[7] The coverage of Seguro Popular was a measure for the availability of Seguro Popular in one's municipality but does not directly influence nutritional outcomes at the individual level.
[8] Hence the use of difference in differences for staggered treatments are not appropriate in this context.

Our findings suggest, consistently with previous studies, that health insurance expansion did neither increase obesity nor BMI suggesting *no evidence ex-ante moral hazard*, and instead we document some evidence of improvements in preventative behaviours. We find a reduction in BMI among those who were already overweight at baseline. We documen a 2-percentage point reduction in smoking which might exert an effect rising overweigh among SP beneficiaries but no significant changes in food consumption, exercise habits, healthcare utilization, or work absenteeism. However, we find important heterogeneities in the programme's impacts: the programme seems to protect the older individuals more effectively against obesity than younger individuals and, as expected, less educated individuals.

The rest of the paper is structured as follows. The second part describes the theoretical channels through which health insurance can influence nutritional outcomes and reviews the scarce empirical evidence that is available on health insurance and nutrition. Section 3 presents the policy context in Mexico, section 4 describes the data, and section 5 elaborates on our identification strategy. Sections 6 to 8 report our results, section 9 discusses the robustness checks that were conducted, and section 10 concludes.

2. Related Literature

Pathways of health insurance influence on nutritional outcomes.

Overweight and obesity arise when an individual's caloric intake exceeds caloric expenditure (Cutler et al. 2003; Lakdawalla and Philipson 2009); undernutrition occurs when individuals cannot meet their caloric needs (Black et al. 2013; Dasgupta and Ray 1986). However, undernutrition can also be caused by a lack of nutritional diversity and/or the shortage of certain micronutrients, such as vitamin A or iron (Banerjee and Duflo 2011; Black et al. 2013) or by infectious diseases (e.g. Bhutta et al. 2013). Health insurance can influence these outcomes through a number of pathways.

First, if health insurance is provided for free or at a subsidised price, as in the case of Seguro Popular, it *increases the disposable income* of the insured individuals (Heim et al, 2021). Health insurance, serves several welfare enhancing purposes including protection against catastrophic risks, allow consumption smoothing and reduces the needs of precautionary savings when credit market is far from perfect (Field et al, 2010), and produces income effects that can be employs for a number of potential investments that are welfare enhancing. This is because individuals no longer need to either fully or partially pay for their present-day medical expenses, nor hold precautionary savings for large health expenditures in the future (Cheung, and Padieu, 2015, Steinorth, 2011). Overall, one can hypothesise that a higher disposable income should increase food consumption that may, up to a certain point, lead to an increase in caloric intake and influence nutritional outcomes.

Second, after health insurance expansion beneficiary households might *adjust the composition of food expenditure* in response to the increase in disposable income and substitute inferior goods for superior goods and potentially also adjust expenditure shares on different normal goods, depending on their income elasticity of demand (de Groot et al, 2022). Individuals may switch from healthier to more unhealthy food or vice versa (e.g. from self-produced agriculture products to industrially processed food, or from a calorie-rich diet based on simple carbohydrates towards a diet based on animal-sourced protein). Again, this is an empirical question to test.

Third, health insurance lowers the costs of using *health care* and accessing health information,[9] so that overnutrition and undernutrition can be diagnosed and treated at a lower cost, and comprehensive information can be gathered. However, the prevalence of such health care effect will crucially depend on the extent to which the specific health insurance plan does indeed provide preventive care, especially obesity-related examinations and treatments, and the effectiveness of those treatments in improving outcomes. Increased health care usage may also decrease the costs of obtaining preventative actions and *nutrition-related information* and make it easier for individuals to learn about healthy eating. This information effect could potentially lead to a lower caloric intake and/or increased caloric expenditure through exercising for those at risk of overweight.

Fourth, health insurance may also affect the *time use* of the insured individuals. The increase in disposable income may induce individuals to reduce paid work and increase leisure, which may lead to a decrease in caloric expenditure for those engaged in non-sedentary work like farming or construction. On the other hand, increased leisure time may also incentivise individuals to prepare healthier meals or to exercise more.

Finally, some authors have assessed whether health insurance leads to *moral hazard* among insured individuals, as they are no longer pay the full costs of potential sickness in the future. In theory, this could increase caloric intake and lead to a higher willingness to accept overweight and obesity. On the other hand, there may also be *behavioural hazard*, as suggested by Baicker et al. (2013). Insured individuals may over-use preventive health care: instead of choosing the socially optimal consumption level, namely insured individuals might

[9] However, it is important to consider that increased health care usage may also entail costs, such as the cost of commuting to the hospital or clinic (Okunogbe et al. 2021).

use preventive care until their individual marginal benefit equals zero. Overall, this could lead to an earlier detection of underweight, overweight and obesity because some individuals might not be aware they are overweight or obese on the first place until they are weighed by a physician or a nurse.

The overall impact of health insurance on nutritional outcomes will depend on the magnitude of the different effects. One can also expect that impacts will differ depending on the implementation details of a specific health insurance scheme such as co-payments, coverage of obesity-related examinations and treatments, as well as the income and nutritional status of the programme's target population. Later in the paper we will discuss the extent to which our results may reflect any of these effects.

Evidence on the impact of health insurance on nutrition. The literature on the effects of health insurance on overweight and obesity is inconclusive. Two studies drawing on US data from the 1980s and 1990s found evidence that health insurance increases overweight and obesity (Bhattarchya et al. 2009, Rashad and Markovitz 2009). The authors of these studies interpreted their findings as a moral hazard effect, spurring additional interest in this hypothesis in subsequent studies.

Nonetheless, none of the more recent studies drawing on data from the 2000s or other contexts than the US were able to confirm these findings. Simon et al. (2016) evaluates the impact of the Medicaid expansion under the Affordable Care Act ("Obamacare") and do not find any impact of the reform on exercising, BMI or obesity, but do find a reduction in smoking among childless adults by 1.9 percentage points. In a similar study setting but without claiming causality, Rhubart (2018) finds that inhabitants of US states which did not expand Medicaid during the Affordable Care Act reforms are more likely to be overweight and obese, but less likely to drink heavily. Focusing on the elderly population in the US, Card et al. (2008) do not find any evidence that Medicare coverage affects the prevalence of obesity or exercising behaviour among the elderly. Courbage and Colon (2004) use UK data to assess the impacts of private insurance – purchased in addition to the universal NHS system – and do not find any effects on exercising, smoking or attending regular health check-ups.

We are not aware of any study investigating the effect of health insurance on overweight and obesity in a low- or middle-income country context. An evaluation of a free health insurance programme in Vietnam (Wagstaff and Pradhan 2005) found evidence of a decrease in undernutrition and an increase in BMI among the programme's target population. However, in their period of interest less than 1% of the Vietnamese population was classified as overweight or obese, so the increases in BMI were mainly interpreted as a success in reducing undernutrition. More generally, a study from Colombia showed that health insurance expansions can promote preventive health behaviours (Miller et al. 2013), but a study from Thailand found no evidence that healthy behaviours or preventative actions were influenced by the expansion of insurance coverage (Ghislandi et al. 2015).

Evidence on the impact of health insurance on other outcomes. There is vast evidence suggesting that free or subsidised health insurance increases disposable income of the insured and facilitates consumption smoothing over the life cycle (Baicker et al. 2013, Hu et al. 2016, Mazumder et al. 2016, King et al. 2009, Saenz de Miera 2017, Sommers et al. 2017, Wagstaff & Pradhan 2005). Using evidence form a randomised experiment King et al. (2009) found that SP led to a 23% reduction in catastrophic health expenditures. Galárraga et al. (2010)

confirmed this finding using an instrumental variable approach and nationally representative data.

Moreover, several studies document that health insurance increases the utilization of both inpatient and outpatient health care (Finkelstein et al. 2012, Baicker et al. 2013, Ghosh et al. 2017, Bleich et al. 2007, Sosa-Rubi et al. 2009, Sommers et al. 2017, Jowett et al. 2004, Wagstaff and Pradhan 2005, Wagstaff et al. 2009). While Rivera-Hernández et al. (2019) found no effects of SP on the use of preventive services such as screening for diabetes, hypertension, breast cancer and cervical cancer among individuals 50 to 75 years, using a specialised survey on aging Parker et al. (2019) found significant effects of the programme on utilization and diagnostic tests. In addition, Sosa-Rubi et al. (2009) documents evidence that SP increased access to obstetrical services, which might have exerted an impact on child health.

However, to date there the evidence of health insurance effect on health outcomes is more mixed. Several studies have shown that health insurance leads to improvements in self-reported health (Sommers et al. 2012, Cercone et al. 2010, Teruel et al. 2012), while others have not found any impact on self-assessed health (Field al 2010, King et al, 2009, Dow and Schmeer, 2003, Barros 2008). However, there seems to be quite some agreement that the extension of health insurance does seem to reduce infant mortality (Currie and Gruber 1996, Pfutze 2015, Saenz de Miera 2017, Conti and Ginja2023, Celhay et al. 2019), increase birthweight (Camacho and Conover 2013), improve mental health outcomes (Baicker et al. 2013), improve cancer prevention and treatment (Robbins et al. 2015, Loehrer et al. 2016), and improve preventive health care with regards to glucose and cholesterol testing (Sommers et al. 2017). However, studies analysing health insurance's impact on hypertension and high cholesterol have mostly not found any statistically significant impacts (Baicker et al. 2013, King et al. 2009, Brook et al. 1983, Barros 2008). Finally, Haushofer et al (2019) using evidence from a randomised experiment in Kenya, found that neither health insurance not cash transfers did increase self-reported health, utilisation and health outcomes. In contrast, health insurance exerted an effect on objective and subjective measures of stress, suggesting evidence of a 'piece of mind effect'. That is health insurance provides beneficial psychological effects by ameliorating the wellbeing effect of health shocks.

3. Institutional background

Obesity in Mexico. Mexico is one of the world countries with the highest prevalence of obesity (25.3 percent of the population at the end of our study period in 2009, as compared to 10.9 worldwide) and overweight (61.2 percent of the population in 2009 as compared to 35.2 percent worldwide), placing Mexico among the 25 countries most affected by obesity worldwide and the most affected country in Latin America. Importantly, Mexico experienced a quite substantial increase in obesity by 3.5 percentage points during the study period (as compared to 1.8 percentage points worldwide) allowing us to study the impact of health insurance in a context of rising obesity rates (World Health Organization 2017).

Health Insurance Expansion: the introduction of Seguro Popular. Before the introduction of Seguro Popular in the early 2000s, health insurance in Mexico was provided to formal sector employees alone through the country's social security systems which is based on payroll taxes. Only a very small share of the population (less than 3%) held private insurance. Informal workers, small-scale family farmers and the unemployed had to pay their health care expenditure out of pocket.[10] Seguro Popular precisely aimed at covering these hitherto uninsured parts of the Mexican population and established access to health care as a universal right. In this way Seguro Popular expanded health insurance to groups of the population that could not afford insurance before. Indeed, the only eligibility criterion for enrolling in Seguro Popular was not to be covered by a contributory / payroll-based health insurance or private insurance. While the design of Seguro Popular originally considered a tripartite financing structure, with contributions from the federal government, state governments, and progressive payments from beneficiaries (zero for the poorest), in practice, it operated as a non-contributory insurance program, as beneficiary contributions were negligible (Saenz-de-Miera 2017). Seguro Popular compares to other worldwide experiences in the US (e.g. the ACA and Medicaid expansions), China, Vietnam and Morocco, where health insurance has also recently been expanded to cover the poorest and most vulnerable groups of the population.

A pilot of Seguro Popular began in 2002 and the implementation of the actual programme began in 2004 but was only gradually rolled out through the country due to financial constraints. Individuals were only able to enrol in the programme once the programme was offered in their municipality. This in turn required that the state's government had signed an agreement with the central government on the programme's implementation. The central government established that more marginalised, rural and indigenous areas ought to be prioritised in the rollout, but no objective criteria and/or indicators had been established to guide the rollout. Previous studies found that municipalities with a higher population size tended to implement the programme earlier. Moreover, the sympathy of a municipality

[10] Before Seguro Popular, public hospitals provided medical attention for the population with no access to social security institutions, but fees applied (OECD 2005).

government with the central government may also have played a role, as Seguro Popular was seen as a prestige project of the central government. Besides these factors, previous studies investigating on the issue could not detect any other observable municipality-level factors that were correlated with the rollout (Azuara and Marinescu 2013, Bosch and Campos 2014, King et al. 2009, Pfutze 2015).

The rollout of Seguro Popular. Seguro Popular affiliates have access to a wide range of free health services as defined in Mexico's Universal Catalogue of Health Services (UCHS)[11], covering approximately 95% of Mexico's disease burden (King et al. 2007). The diagnosis and, to some extent also the treatment of obesity and obesity-related diseases are included in the UCHS. However, during the longest part of our study period, this is limited to children and adults over the age of 40:

- In the 2004 version of the UCHS, the diagnosis of obesity is included within the triannual check-ups for men and women over the age of 40. Dietary and exercise-related counselling is included as a treatment of diabetes II and hypertension.
- Since 2006, the UCHS also included the diagnosis of both undernutrition and obesity for children and adolescents, along with a comprehensive list of treatments for those who are diagnosed (e.g. 3-5 monthly nutrition counselling appointments with a GP)
- From 2008 onwards, preventive health services are included for adults aged 20-59. This includes measures to prevent and detect several chronic diseases, including obesity. However, unlike for children, no specific obesity-related treatments are listed. The UCHS only mentions educational measures to improve self-care for individual health.

[11] In Spanish *Catálogo Universal de Servicios de Salud (CAUSES).*

4. Data and sample

Dataset. Our main data source is the Mexican Family Life Survey (MxFLS), a longitudinal dataset with survey waves in 2002, 2005/06 and 2009-12 (Rubalcava and Teruel 2006, 2008, 2013). The MxFLS includes information on insurance status, anthropometric measures of children and adults (including height and weight) taken by specifically trained enumerators, consumption expenditure on different food items, as well as a wide range of socioeconomic characteristics. The timing of the survey waves matches the roll-out of Seguro Popular very well, as the first wave took place before the official start of the programme, the second wave at early stages of the rollout when approximately 20% of the target group were covered, and the third wave in 2009-12, when the programme already reached between 55% and 90% of the target population. The main outcome variables are BMI (weight in kilograms/height in meters^2), overweight (1 if BMI≥25, 0 otherwise), obesity (1 if BMI≥30, 0 otherwise), and undernutrition (1 if BMI<18.5, 0 otherwise), all based on interviewer-measured data. Additional outcomes used to evaluate whether Seguro Popular influenced other health-related behaviours include exercise (1=yes, 0=no; hours per week for those who exercise), smoking (1 if a current smoker, 0 otherwise; cigarettes per week for those who smoke), health care use (1 if received outpatient care in the prior 4 weeks or inpatient care in the prior 12 weeks, 0 otherwise), health-related absences from work (1=yes, 0=no), hours worked per week (for those employed), and self-reported health (1=very bad, 2=bad, 3=regular, 4=good, 5=very good). Food consumption, the only outcome measured at the household level, was assessed based on expenditure on various food items during the week prior to the interview. This information was typically provided by a woman, either the head of the household or her spouse, or a knowledgeable household member (Rubalcava and Teruel 2006, 2008, 2013).

The MxFLS data was matched to administrative records of Mexico's National Commission for Social Protection in Health (*Comisión Nacional de Protección Social en Salud, CNPSS*) with trimestral information on the number of Seguro Popular beneficiaries in each of the Mexican municipalities. Moreover, we draw on information from the National Statistics and Geography Institute (*Instituto Nacional de Estadística y Geografía, INEGI*) for municipality-level information on the overall population size, and on data from CONAPO (*Consejo Nacional de Poblacion*), CONEVAL (*Consejo Nacional de Evaluación de la Política Social*) and the Mexican Ministry of Health to measure the overall socioeconomic development of the municipality and the available health infrastructure. CNPSS data together with INEGI data also allowed us to compute the share of a municipality's population covered by *Seguro Popular* in a certain year. Hence, we were able to construct a rich set of control variables for our regressions, both at the individual level (female/male, age, years of schooling, civil status, employment status, BMI at baseline, chronic disease at baseline), household level (urban/rural, participation in the *Oportunidades* cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls), and municipality level (population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation). Summary statistics for all variables are presented in Table 1.

Sample. Our sample of analysis consists of all individuals who were surveyed in all three MxFLS waves, *who were uninsured and at least 18 years old*, not pregnant at the time of the survey, and for whom the full set of control variables as well as the anthropometric outcome variables are available. We identified 28,117 individuals for whom data is available in all three waves, corresponding to 84,351 observations, and 9,875 households in 275 municipalities. Out of them, only 23,443 individuals (or 59,361 observations) were at least 18 years of age and not pregnant. After excluding those insured at baseline and observations for whom we do not have the full set of anthropometric outcomes or control variables, we ended up with 5,909 individuals, corresponding to 12,362 observations (sample of analysis in table 1), in 3,396 households and 146 municipalities.

Restricting the sample to individuals who were uninsured at baseline decreases the sample size by about 75%. However, it should be noted that Seguro Popular was only intended to cover the previously uninsured parts of the population. Individuals who previously held contributory public insurance were not eligible for participating in Seguro Popular. Private insurance was infrequent and only accessible to high-income households who had no plausible incentives to forego the more comprehensive benefit package offered by private providers[12]. Consequently, we do not consider it reasonable to include previously insured households in the impact estimation, as their likelihood of being treated by Seguro Popular is nearly zero, making them unsuitable as a comparison group. This also implies that the estimated treatment effects refer to Seguro Popular's target population, not to the Mexican population at large.

Table 1 illustrates that our sample of analysis differs in important aspects from the overall MxFLS sample, which is representative for the Mexican population. As expected, the

[12] The 2010 INEGI Conteo indicates that only 3.3% of the Mexican population had private insurance. Those with private insurance could have switched to SP, but this is very unlikely since private insurance gives access to private hospitals and clinics that generally provide better health care.

individuals in our sample are poorer than the average population, have attained lower levels of schooling, and live more frequently in rural areas. However, the BMI and obesity estimates are similar in both groups, with average BMI of 27.5, overweight prevalence of 67%, and obesity prevalence of 28%. In this context, it is important to acknowledge again that the findings of this study only apply to the target population of Seguro Popular, e.g., uninsured low-income households, but not to the Mexican population on average.

[Insert Table 1 about here]

It is worth noting that while SP rollout is observed quarterly, outcomes are only measured at three survey waves (2002, 2005/06, and 2009-12), creating inconsistencies in exposure time. For example, two municipalities classified as "treated" in 2009 may have received SP in 2004 or 2008, leading to significantly different treatment durations. However, this is not particularly problematic for BMI or overweight outcomes, which tend to evolve slowly and hence it is unlikely that a more frequent measurement would have made large difference. However, the interpretation of the effects is that of observed BMI increase among overweight individuals may reflect longer SP exposure rather than true treatIV

ment effects. Furthermore, another limitation of the dataset lies in the fact that MXFLS covers a sample of Mexico's states, and despite the arbitrary nature of SP rollout, hence our estimates can be affected by the restricted sample.

5. Identification strategy

Differences in differences design. To assess the impact of Seguro Popular on nutritional outcomes we are interested in estimating the following specification:

$$Y_{it} = \alpha + \beta \, SP_{it} + \gamma \, X_{it} + \mu \, wave_t + \varepsilon_{it} \qquad (1)$$

where Y_{it} is a nutritional outcome (e.g. BMI) of individual i at time t; SP_{it} is the individual's affiliation to Seguro Popular at time t; X is a vector of individual, household-level, and municipality-level control variables; $Wave_t$ is a linear time trend; and ε_{it} the individual-specific error term. Our goals are to identify the effect of the access to the of SP which depended on the speed at which SOP was rolled out across municipalities which differed on political (e.g., SP was the program of a newly elected PAN party) and other grounds unrelated to health outcomes an was a federal program, hence unaffected by differences in spending at the local level. That is, differences in the local rollout of SO provide for local level exogenous variation on insurance availability.

The main challenge in this specification, however, is that the treatment status SP_{it} may be correlated with the error term ε_{it}, even after controlling for X, potentially leading to a biased estimate of β. In our case, selection bias may occur both at the individual and the municipality level. First, individuals who are obese, or at a higher risk of obesity, might have a higher (or lower) propensity to enrol in Seguro Popular than the average population. Moreover, some other unobservable individual characteristics may be correlated with treatment status (e.g. intelligence, having a genetical predisposition for overweight/obesity, being health-conscious, etc.). Secondly, municipalities with a high (or low) obesity prevalence may have been prioritised in the rollout of Seguro Popular, leading to selection bias at the municipality level.

Empirical strategies. We adopt two strategies to address these abovementioned threats. First, we use a difference-in-difference (DiD) approach to compare *treated to untreated municipalities*, e.g., we use municipality coverage measured with a binary variable that indicates whether municipality m is covered by SP at time t-1 ("SP coverage") rather than individual SP enrolment at time t. This approach is theoretically relevant given that the political nature of the program, and hence states that were aligned with the federal government at the time would have an incentive of a paster rollout. By using an IV strategy we can reduce the risk of selection bias. That is, the extent to which overweight individuals might have been more likely to enroll in SP due to expected healthcare needs. It is important to note that municipality coverage is lagged by one period with respect to our treatment variable to prevent this measure from being jointly determined with the treatment, ensuring it precedes the treatment decisions. This implies that all municipalities are considered untreated in the first wave of the MxFLS since it was collected between March and June 2002, before SP implementation (including the pilot, which was implemented in the last quarter of 2002 according to administrative records).

Second, we report the estimates including both municipality-level fixed effects and a wide range of time-varying municipality-level control variables. While the municipality-level fixed effects control for any time-invariant characteristics, the municipality-level controls allow us to account for a wide range of time-varying observable characteristics. This strategy aims at eliminating any selection bias at the municipality level. With fixed effects and municipality level controls, the structural model becomes:

$$Y_{it} = \alpha + \beta\, SP_{it} + \gamma\, X_{it} + \mu\, wave_t + W_{mt} + \eta_m + \varepsilon_{it} \qquad (2)$$

where W_{mt} is a vector of municipality-level control variables and η_m are municipality-level fixed effects. Standard errors for all regressions are clustered at the municipality level to account for the clustered treatment assignment. We also estimate a dynamic DiD specification (event study) to assess pre-treatment trends (the parallel trends assumption) and to capture variation in exposure to the treatment over time. This involves including lags and leads of SP implementation.

Alternative specifications. Alternatively, we use an instrumental variable (IV) approach as a robustness check, with the share of individuals in municipality m covered by SP at time t-1 as the instrument. In particular, the instrument z is calculated as:

$$z_{im,t-1} = \frac{SP\ affiliates_{m,t-1}}{Population_{m,t-1}}$$

This is equivalent to estimating equations (1) and (2) above with two-stages least square regressions. Using coverage as an instrument allows to measure varying degrees of availability of Seguro Popular in a municipality, and to exploit the variation in exposure to Seguro both within and between municipalities. A similar IV approach has also been taken by Saenz-de-Miera (2017) and Pfutze (2015) in previous impact assessments of Seguro Popular, and by Liu and Zhao (2014) in a study on China's Urban Resident Basic Medical Insurance. To assess whether the instrument is both relevant (it has a statistically significant impact on the probability of being treated) and valid (it has no direct impact on obesity, and only affects obesity through the treatment), we use a standard underidentification test after first stage estimates.

6. Results

Impact of Seguro Popular on nutritional outcomes. Table 2 reports our baseline estimates of the effect of Seguro Popular on BMI, obesity, overweight and underweight. We report both DiD estimates with state-level fixed effects (columns 1-3) and municipality-level fixed effects (columns 4-6). Overall, the regression results do not yield evidence for any impact of Seguro Popular on obesity, overweight, underweight or BMI among adults. The coefficients on all outcomes are very close to zero and not statistically significant. This finding is robust to the inclusion of different controls, and irrespective of the use of state-level or municipality-level fixed effects.

[Insert Table 2 about here]

Heterogeneous treatment effects. The average effects might mask important heterogeneous effects. Table 3 analyses the extent to which the impacts of Seguro Popular on obesity differs between sub-groups of the population. First, access to insurance might not exert the same effect across individuals' age. Older individuals might be more likely to take advantage of better health care access and standard check-ups on obesity-related conditions such as diabetes or heart disease may only be routinely carried out for individuals over a certain age threshold. Consistently, we find evidence of a negative and significant interaction term of Seguro Popular and age, e.g., Seguro Popular is more effective in protecting older individuals against overweight and obesity. This is also in line with the Seguro Popular programme guidelines on eligibility for different treatments. In our period of interest, regular check-ups on an individual's health and chronic diseases were only foreseen for individuals over the age of 40.

We also interact Seguro Popular coverage with gender, years of schooling, and rural vs. urban residence. The interactions with gender and area of residence are not significant, but we find a significant and positive interaction effect of Seguro Popular affiliation and years of schooling, for both obesity and BMI. This implies that more educated individuals may be subject to a higher risk of becoming obese in response to Seguro Popular than less educated individuals. Such a pattern would not be in line with a health information effect of Seguro Popular as more educated individuals tend to communicate more effectively with doctors (Willems et al. 2005). Possible explanations for this counter-intuitive finding include a moral hazard effect, where more educated individuals are less overweight before Seguro Popular and have less to gain from further health insurance. Alternatively, there might well be some selection into treatment by more educated individuals of more overweight individuals.

More importantly, Table 3 suggests that individuals who are covered by Seguro Popular and were already overweight at baseline exhinit a reduction in their BMI – and no change in their overweight - after health insurance is expanded. The effect survives the formal linear testing of the interaction term effect. The effect is precisely estimated and suggest 0.46 BMI score reduction which is about 1.6% reduction(see column 5 of panel B of table 3). The effects led to no change among those who are overweight at baseline.

[Insert Table 3 about here]

Mechanisms: changes in food consumption, lifestyle and health care use. Finally, we discuss several potential mediating factors influencing individuals' obesity and overweight. We also assess whether Seguro Popular has affected any nutrition-related behaviours, including food consumption patterns, exercising behaviours and health care usage. Table 4 presents regression results on the impact of Seguro Popular on the composition of a household's food expenditure, measured by the share of different food groups in household's total food expenditure. After including municipality-level fixed effects, we find no effect on any food consumption effect except for an imprecisely estimates increase in meet consumption.

[Insert Table 4 about here]

Lastly, we examine whether Seguro Popular might have changed people's lifestyles across any relevant dimension including smoking cessation consistently with evidence form Medicaid expansions (Yip et al, 2020), and the large evidence that smoking cessation can increase obesity (Courtemanche, et al 2018). Estimates are presented in Table 5 and include state-level fixed effects in some specifications. Our estimates suggest statistically significant evidence of a reduction in smoking in 2 perceptual points but no significant effect in any other healthy lifestyle behaviour examines such as exercise, health care use and employment absenteeism. The latter can be explained by evidence that SP increased informal employment instead (Bosch et al, 2014). However, evidence of no effect on health care use is explained instead by the comparatively short recall periods in the MxFLS survey, with only 4 weeks for outpatient and 12 months for inpatient care.

[Insert Table 5 about here]

7. Robustness checks

A number of robustness checks have been carried out in order to detect any possible threads in our identification strategy that might biased our previous results.

Event study. First, we estimate a dynamic DiD specification. MxFLS interviews were conducted between the first semester of 2002 and the second semester of 2013, while treatment timing is observed for all calendar semesters. Therefore, time is defined in calendar semesters to correctly measure treatment exposure and event time. Joint F tests of the coefficients on all pre-treatment leads indicate no evidence of differential pre-treatment trends prior to SP implementation ($p>0.05$; Figure A1). Overall, the results consistently show no evidence of an effect of SP on obesity, overweight, underweight, or BMI among adults. We also tested pre-treatment trends for the subsample of individuals who were overweight at baseline, obtaining similar results ($p>0.05$; Figure A2).

Sample definition. We also check the sensitivity of the results with regards to the definition of the sample of analysis. As described above, in the main regressions presented in section 6 we are using a balanced sample, so that coefficients across specifications with different control variables are comparable. Table A1 also reports the estimates using three different samples: an unbalanced sample, a balanced sub-sample of individuals who were overweight at baseline, and a balanced sub-sample of individuals over the age of 40. These results also confirm the main findings presented in Table 2 and suggest overall that there is no significant average effect of Seguro Popular on nutritional outcomes. Although we show significant interactions between Seguro Popular and age, as well as Seguro Popular and overweight at baseline, one might have expected significant results in the respective sub-samples. However, one explanation for the lack of significance lies in the lower statistical power in the sub-samples, which have only 50-60% of the original observations.

Allowing for insurance substitution. Our estimates do significantly change when we consider individuals that had other forms of insurance at baseline. This is important as Seguro Popular did increase informal employment, namely individuals who had a formal employment before Seguro Popular for insurance reasons, now have an incentive to go informal and switch to having Seguro Popular as reported (Bosch and Campos-Vazquez, 2014). Hence, we also relaxed the exclusion criteria related to insurance status at baseline and estimated the models for a larger sample that includes individuals with social security (or other health insurance) at baseline (see Table A2). Table A2 show that when we allow for individuals insurance substitution, we find that Seguro Popular reduced obesity in 2.5pp and BMI in 0.24, which results from relatively healthy individuals who select into having Seguro Popular. Next, in Table A3 we consider the heterogeneous effects of the estimates presented in Table A2 by age, years of schooling and urbanicity and results are consistent with those of Table 3. However, when in this sample, we find evidence of moral hazard effects among individuals who were overweight at baseline, namely we find that BMI increases by 1.6 units and 9 percentual points after the introduction of Seguro Popular.

Supply side controls. Then, we have check whether our results are affected by the expansion of health infrastructure and run additional regressions where we control for the number of doctors per 1000 inhabitants and clinics per 1000 inhabitants (both measured at the municipality level). The corresponding results are presented in Table A4. However, even after controlling for a municipality's health infrastructure, we do not find any evidence that Seguro Popular has impacted nutritional outcomes.

Multiple hypothesis testing. Next, we investigate whether our significant results on household food expenditure (decrease in carbohydrate expenditure, increase in meat expenditure) can be explained by multiple hypothesis testing. Indeed, we ran regressions on 10 different food consumption outcomes, using different regression specifications. This makes our estimates vulnerable to “false positives”. After correcting for multiple hypothesis testing including effects on overweight, none of the previously significant findings on carbohydrates, meat or plant-based protein, is significant at the 5% or 10% significance level. Therefore, we cannot rule out the possibility that our findings on food consumption are purely to be explained by multiple hypothesis testing. The findings should thus be interpreted with caution.

Instrumental variable estimates

Lastly, we use an instrumental variable approach as an additional robustness check where we use the previous term penetration of the SP as discussed earlier, which was mainly driven by the political affiliation and agenda of state governors and its orthogonal to an individual’s overweight. The first stage estimates presented in Table A5 (only shown for obesity, but with similar results for other outcomes) illustrate that the instrument is indeed relevant (i.e. $Cov(z_{mt}, SP_{imt}) \neq 0$), as confirmed by the underidentification test. Moreover, the first stage remains relevant even after the inclusion of municipality-level fixed effects. Consistently with our previous results, the reduced form estimates do not suggest any statistically significant impact of the instrument on any of our outcome variables (see table A5), which is consistent with previous results.

8. Conclusion

This paper has assessed the impact of a free health insurance expansion on obesity and Body Mass Index (BMI) by drawing on the extension of Seguro Popular (SP) in Mexico in the

2000s and examining whether the differential exposure to SP driven by the progressive and continuous rollout of the program across municipalities exerted an effect on obesity. The evidence allows for testing the presence of ex-ante moral hazard in a relevant behavioural outcome, namely obesity and overweight that influences the prevalence of chronic conditions.

Our results suggest that the expansion of health insurance to low-income households in Mexico *did not* exert an average across- the board effect on obesity and BMI, In fact, we find that Seguro Popular reduced BMI in 1.6% among individuals that were already overweight at baseline. Furthemore, our estimates also provide suggestive evidence that households covered by Seguro Popular did not experience major dietary changes after the insurance expansion but were 2 percentual points more likely to quit smoking. Our findings suggest that health insurance expansions targeting lower income individuals that were uninsured at baseline do not increase overweight and obesity, among the entire population, suggesting the *absence of ex-ante moral harzard effects*. On the country, our estimates results suggest that health insurance expansions induce subsequent uptake of preventative health behaviours among specially vulnerable groups.

References

Acharya, A., Vellakkal, S., Taylor, F., Masset, E., Satija, A., Burke, M., & Ebrahim, S. (2012). Impact of national health insurance for the poor and the informal sector in low- and middle-income countries. *London: The EPPI-Centre.*

Azuara, O. and Marinescu, I., 2013. Informality and the expansion of social protection programs: Evidence from Mexico. *Journal of health economics*, *32*(5), pp.938-950.

Baicker, K., Mullainathan, S., & Schwartzstein, J. (2013). Behavioral hazard in health insurance. *National Bureau of Economic Research bulletin on aging and health*, (1), 2.

Banerjee, Abhijit, and Esther Duflo. 2011. *Poor Economics - A Radical Rethinking of the Way to Fight Global Poverty*. Public Affairs.

Barros, R. (2008). Wealthier but not much healthier: effects of a health insurance program for the poor in Mexico. *Department of Economics Working Paper*, 09-002. Stanford, CA: Stanford University.

Bhattacharya, J., Bundorf, K., Pace, N., & Sood, N. (2009). *Does health insurance make you*

fat? (No. w15163). National Bureau of Economic Research.
Black, R. E., Cousens, S., Johnson, H. L., Lawn, J. E., Rudan, I., Bassani, D. G., ... & Eisele, T. (2010). Global, regional, and national causes of child mortality in 2008: a systematic analysis. *The Lancet*, *375*(9730), 1969-1987.
———. 2013. "Maternal and Child Undernutrition and Overweight in Low-Income and Middle-Income Countries." *The Lancet* 382(9890): 427–51.
Bleich, Sara N., Bradley J. Herring, Desmond D. Flagg, and Tiffany L. Gary-Webb. 2012. "Reduction in Purchases of Sugar-Sweetened Beverages among Low-Income Black Adolescents after Exposure to Caloric Information." *American Journal of Public Health* 102(2): 329–35.
Bosch, M. and Campos-Vazquez, R.M., 2014. The Trade-Offs of Welfare Policies in Labor Markets with Informal Jobs: The Case of the" Seguro Popular" Program in Mexico. *American Economic Journal: Economic Policy*, *6*(4), pp.71-99.
Brook, R.H., Ware Jr, J.E., Rogers, W.H., Keeler, E.B., Davies, A.R., Donald, C.A., Goldberg, G.A., Lohr, K.N., Masthay, P.C. and Newhouse, J.P., 1983. Does free care improve adults' health? Results from a randomized controlled trial. *New England Journal of Medicine*, *309*(23), pp.1426-1434.
Case, Anne, and Christina Paxson. 2008. "Stature and Status: Height, Ability, and Labor Market Outcomes." *Journal of Political Economy* 116(3): 499–532.
Cawley, J. (2004). The impact of obesity on wages. *Journal of Human resources*, *39*(2), 451-474.
Celhay, P., Martinez, S., Muñoz, M., Perez, M., Perez-Cuevas, R. (2019). Long-term effects of public health insurance on the health of children in Mexico: a retrospective study. *Lancet Glob Health*, published online Aug 9.
Cercone, J., Pinder, E., Jimenez, J. P., & Briceno, R. (2010). Impact of health insurance on access, use, and health status in Costa Rica. Washington D.C. Brookings Institution Press.
Chan, L., Hart, L. G., & Goodman, D. C. (2006). Geographic access to health care for rural Medicare beneficiaries. *The Journal of Rural Health*, *22*(2), 140-146.
Cheung, D., & Padieu, Y. (2015). Heterogeneity of the effects of health insurance on household savings: Evidence from rural China. *World Development*, *66*, 84-103.
Conti, G., & Ginja, R. (2023). Who benefits from free health insurance?: Evidence from mexico. *Journal of Human Resources*, *58*(1), 146-182.
Courtemanche, C., Tchernis, R., & Ukert, B. (2018). The effect of smoking on obesity: Evidence from a randomized trial. *Journal of health economics*, *57*, 31-44.
Currie, J. and Gruber, J., 1996. Health insurance eligibility, utilization of medical care, and child health. *The Quarterly Journal of Economics*, *111*(2), pp.431-466.
Cutler, David M, Edward L Glaeser, and Jesse M Shapiro. 2003. "American Economic Association Why Have Americans Become More Obese?" *Source: The Journal of Economic Perspectives* 17(3): 93–118. http://www.jstor.org/stable/3216824%5Cnhttp://www.jstor.org/page/.
Dasgupta, P., & Ray, D. (1986). Inequality as a determinant of malnutrition and unemployment: Theory. *The Economic Journal*, *96*(384), 1011-1034.
de Groot, R., Yablonski, J., Valli, E., & Ghana LEAP1000 Evaluation Team. (2022). The impact of cash and health insurance on child nutrition during the first 1000 days: Evidence from Ghana. *Food Policy*, *107*, 102217.
Di Cesare, Mariachiara et al. 2016. "Trends in Adult Body-Mass Index in 200 Countries from 1975 to 2014: A Pooled Analysis of 1698 Population-Based Measurement Studies with 19.2 Million Participants." *The Lancet* 387(10026): 1377–96.
De Allegri, M., Ridde, V., Louis, V.R., Sarker, M., Tiendrebéogo, J., Yé, M., Müller, O. and

Jahn, A., 2012. The impact of targeted subsidies for facility-based delivery on access to care and equity–Evidence from a population-based study in rural Burkina Faso. *Journal of Public Health Policy*, *33*(4), pp.439-453.
Dong, Y., & Lewbel, A. (2015). A simple estimator for binary choice models with endogenous regressors. *Econometric Reviews*, *34*(1-2), 82-105.
Dow, W H and K K Scheer (2003). Health Insurance and Child Mortality in Costa Rica, Social Science and Meicine, 57(6): 975-86.
Dzakpasu, S., Powell-Jackson, T. and Campbell, O.M., 2013. Impact of user fees on maternal health service utilization and related health outcomes: a systematic review. *Health policy and planning*, *29*(2), pp.137-150.
FAO, IFAD, and WFP. 2015. FAO, IFAD and WFP *The State of Food Insecurity in the World: Meeting the 2015 International Hunger Targets: Taking Stock of Uneven Progress*. http://www.fao.org/3/a4ef2d16-70a7-460a-a9ac-2a65a533269a/i4646e.pdf.
Field, A E et al. (2001). "Impact of Overweight on the Risk of Developing Common Chronic Diseases during a 10-Year Period." *Archives of Internal Medicine* 161(13): 1581–86.
Field, E, Thorton, R, Hyatt, L, Murssaleena, I and F Solis (2010). Social Security Health Insurance for the Informal Sector in Nicaragua: A randomised Evaluation. *Health Economics*.
Finkelstein, A., Taubman, S., Wright, B., Bernstein, M., Gruber, J., Newhouse, J. P., ... & Oregon Health Study Group. (2012). The Oregon health insurance experiment: evidence from the first year. *The Quarterly journal of economics*, *127*(3), 1057-1106.
Frenk, J., González-Pier, E., Gómez-Dantés, O., Lezana, M. A., & Knaul, F. M. (2006). Comprehensive reform to improve health system performance in Mexico. *The Lancet*, *368*(9546), 1524-1534.
Galárraga, O., Sosa-Rubí, S.G., & Sesma-Vázquez S. (2010). Health insurance for the poor: impact on catastrophic and out-of-pocket health expenditures in Mexico. *Eur J Health Econ*, 11:437–447.
Ghosh, A., Simon, K., & Sommers, B. D. (2017). *The effect of state Medicaid expansions on prescription drug use: evidence from the Affordable Care Act* (No. w23044). National Bureau of Economic Research.
Ghislandi S, Manachotphong W, Perego VME (2015). The impact of Universal Health Coverage on health care consumption and risky behaviours: evidence from Thailand. *Heal Econ Policy Law*,10: 251–266.
Haushofer, J., Chemin, M., Jang, C., & Abraham, J. (2020). Economic and psychological effects of health insurance and cash transfers: Evidence from a randomized experiment in Kenya. *Journal of Development Economics*, *144*, 102416.
Heim, B. T., Hunter, G., Isen, A., Lurie, I. Z., & Ramnath, S. P. (2021). Income responses to the affordable care act: Evidence from a premium tax credit notch. *Journal of Health Economics*, *76*, 102396.
Hu, L., Kaestner, R., Mazumder, B., Miller, S., & Wong, A. (2016). *The effect of the patient protection and affordable care act medicaid expansions on financial wellbeing* (No. w22170). National Bureau of economic research.
Johansson, E., Böckerman, P., Kiiskinen, U., & Heliövaara, M. (2009). Obesity and labour market success in Finland: The difference between having a high BMI and being fat. *Economics & Human Biology*, *7*(1), 36-45.
Jowett, M., Deolalikar, A. and Martinsson, P., 2004. Health insurance and treatment seeking behaviour: evidence from a low-income country. *Health economics*, *13*(9), pp.845-857.
King, Gary et al. (2007). "A 'politically Robust' experimental Design for Public Policy Evaluation, with Application to the Mexican Universal Health Insurance Program." *Journal of Policy Analysis and Management* 26(3): 479–506.
King, G., Gakidou, E., Imai, K., Lakin, J., Moore, R. T., Nall, C., ... & Llamas, H. H. (2009).

Public policy for the poor? A randomised assessment of the Mexican universal health insurance programme. *The lancet*, *373*(9673), 1447-1454.
King, G., Gakidou, E., Imai, K., Lakin, J., Moore, R.T., Nall, C., Ravishankar, N., Vargas, M., Téllez-Rojo, M.M., Ávila, J.E.H. and Ávila, M.H., 2009. Public policy for the poor? A randomised assessment of the Mexican universal health insurance programme. *The lancet*, *373*(9673), pp.1447-1454.
Lakdawalla, Darius, and Tomas Philipson. 2009. "The Growth of Obesity and Technological Change." *Economics and Human Biology* 7(3): 283–93.
Lewbel, A. (2000). Semiparametric qualitative response model estimation with unknown heteroscedasticity or instrumental variables. *Journal of Econometrics*, *97*(1), 145-177.
Loehrer, A.P., Chang, D.C., Hutter, M.M., Song, Z., Lillemoe, K.D., Warshaw, A.L. and Ferrone, C.R., 2015. Health insurance expansion and treatment of pancreatic cancer: does increased access lead to improved care?. *Journal of the American College of Surgeons*, *221*(6), pp.1015-1022.
Mazumder, B., & Miller, S. (2016). The effects of the Massachusetts health reform on household financial distress. *American Economic Journal: Economic Policy*, *8*(3), 284-313.
Melorose, J., R. Perroy, and S. Careas. 2015. "World Population Prospects." *United Nations* 1(6042): 587–92. http://www.ncbi.nlm.nih.gov/pubmed/21798940.
Miguel, Edward, and Michael Kremer. 2004. "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities." *Econometrica* 72(1): 159–217.
Miller G, Pinto D, Vera-Hernandez M. Risk Protection, Service Use, and Health Outcomes under Colombia's Health Insurance Program for the Poor. *Am Econ J Appl Econ*. 2013;5: 61–91.
Nyman, J. A. (1999). The value of health insurance: the access motive. *Journal of health economics*, *18*(2), 141-1.
OECD (2005). OECD Reviews of Health Systems. Mexico. OECD Publishing, Paris.
OECD (2023). Health at a Glance 2023: OECD Indicators, OECD Publishing, Paris, https://doi.org/10.1787/7a7afb35-en.
Okunogbe, A., Nugent, R., Spencer, G., Ralston, J.and Wilding, J. (2021). Economic impacts of overweight and obesity: current and future estimates for eight countries. *BMJ Global Health*, 6:e006351.
Parker, S.W., Saenz, J. & Wong, R. (2018). Health Insurance and the Aging: Evidence From the Seguro Popular Program in Mexico. *Demography*, 55(1):361-386.
Pfutze, T. (2015). Does access to health insurance reduce the risk of miscarriages? Evidence from Mexico's Seguro popular. *Latin American Economic Review*, *24*(1), 8.
Pfutze, T. (2014). The effects of Mexico's Seguro Popular health insurance on infant mortality: An estimation with selection on the outcome variable. *World Development*, *59*, 475-486.
Rashad, I., & Markowitz, S. (2007). Incentives in Obesity and Health Insurance No. 13113; NBER Working Paper.
Rhubart, D. C. (2018). Disparities in individual health behaviors between medicaid expanding and non-expanding states in the US. *SSM-population health*, *6*, 36-43.
Rivera-Hernádez, M., Rahman, M., & Galárraga, O. (2019). Preventive healthcare-seeking behavior among poor older adults in Mexico: the impact of Seguro Popular, 2000-2012. *Salud Publica Mex*, 61:46-53.
Robbins, A.S., Han, X., Ward, E.M., Simard, E.P., Zheng, Z. and Jemal, A., 2015. Association between the Affordable Care Act dependent coverage expansion and cervical cancer stage and treatment in young women. *Jama*, *314*(20), pp.2189-2191.
Rubalcava, Luis and Teruel, Graciela (2006). "Mexican Family Life Survey, First Wave",

Working Paper, www.ennvih-mxfls.org
Rubalcava, Luis and Teruel, Graciela (2008). "Mexican Family Life Survey, Second Wave", Working Paper, www.ennvih-mxfls.org
Rubalcava, Luis and Teruel, Graciela (2013). "Mexican Family Life Survey, Third Wave", Working Paper, www.ennvih-mxfls.org
Sacarny, A., Baicker, K., & Finkelstein, A. (2022). Out of the woodwork: enrollment spillovers in the Oregon health insurance experiment. *American Economic Journal: Economic Policy*, *14*(3), 273-295.
Sáenz de Miera Juárez, B. (2017). *The expansion of public health insurance in Mexico: health, financial and distributional effects* (Doctoral dissertation, The London School of Economics and Political Science (LSE)).
Simon, K., Soni, A., & Cawley, J. (2017). The impact of health insurance on preventive care and health behaviors: evidence from the first two years of the ACA Medicaid expansions. *Journal of Policy Analysis and Management*, *36*(2), 390-417
Sommers, B.D., Baicker, K. and Epstein, A.M., 2012. Mortality and access to care among adults after state Medicaid expansions. *New England Journal of Medicine*, *367*(11), pp.1025-1034.
Sommers B.D., Maylone B., Blendon R., Orav E., Epstein A(2017). Three-year impacts of the Affordable Care Act: Improved medical care and health among low-income adults. Health Affairs. 2017;36(6):1119–1128.
Sosa-Rubí, Sandra G., Omar Galárraga, and Jeffrey E. Harris. 2009. "Heterogeneous Impact of the 'Seguro Popular' Program on the Utilization of Obstetrical Services in Mexico, 2001–2006: A Multinomial Probit Model with a Discrete Endogenous Variable." *Journal of Health Economics* 28(1): 20–34.
Steinorth, P. (2011). Impact of health savings accounts on precautionary savings, demand for health insurance and prevention effort. *Journal of Health Economics*, *30*(2), 458-465.
Stock, J. H., & Yogo, M. (2005). Testing for weak instruments in linear IV regression, in DWK Andrews and JH Stock, eds., Identification and Inference for Econometric Models: Essays in Honor of Thomas J. Rothenberg. Cambridge: Cambridge University Press.
Sturm, Roland. 2002. "The Effects of Obesity, Smoking, and Drinking on Medical Problems and Costs." *Health Affairs* 21(2): 245–53.
Teruel Belismelis, G., Castro, M. and Guadarrama, R. 2012. Estudio sobre los efectos del Seguro Popular en la utilización de servicios médicos y en la salud de los afiliados. *CIDE working paper*. Mexico City: Centro de Investigación y Docencia Económicas (CIDE).
Wagstaff, A., & Pradhan, M. (2005). Health insurance impacts on health and nonmedical consumption in a developing country. *World Bank Policy Research Paper*, Vol. 3563.
Wagstaff, A., Yip, W., Lindelow, M. and Hsiao, W.C., 2009. China's health system and its reform: a review of recent studies. *Health economics*, *18*(S2), pp.S7-S23.
Wang H, Switlick K, Ortiz C, Zurita B, Connor C. Health Insurance Handbook. The World Bank; 2011. 10.1596/978-0-8213-8982-9.
Willems, S., De Maesschalck, S., Deveugele, M., Derese, A., & De Maeseneer, J. (2005). Socio-economic status of the patient and doctor–patient communication: does it make a difference?. *Patient education and counseling*, *56*(2), 139-146.
World Health Organization. Research for universal health coverage: World health report 2013. WHO. Geneva: World Health Organization; 2014.
World Health Organization. 2017. "Global Health Observatory Data - Overweight and Obesity.
Yip, D., Gubner, N., Le, T., Williams, D., Delucchi, K., & Guydish, J. (2020). Association of Medicaid expansion and health insurance with receipt of smoking cessation services and

smoking behaviors in substance use disorder treatment. *The journal of behavioral health services & research*, *47*, 264-274.

Table 1. Summary statistics

	MXFLS sample			Sample of analysis			t-test
Outcome variables	Mean	SD	N	Mean	SD	N	p-value
BMI	27.48	5.32	42,536	27.57	5.17	12,362	0.0328
Overweight	0.66	0.47	42,536	0.67	0.47	12,362	0.0001
Obesity	0.28	0.45	42,536	0.28	0.45	12,362	0.2330
Underweight	0.02	0.14	42,536	0.02	0.13	12,362	0.0001
Exercise (binary)	0.16	0.36	46,575	0.12	0.33	12,327	<0.001
Smoking (binary)	0.11	0.32	46,564	0.11	0.31	12,326	0.0560
Smoking (cigarettes per week)	4.36	21.19	46,413	4.93	24.11	12,321	0.0005
Hours worked (week)	43.22	18.83	24,769	43.22	20.26	6,713	0.9992
Control variables, individual level							
Female	0.54	0.50	57,357	0.56	0.50	12,362	<0.001
Married	0.45	0.50	59,361	0.59	0.49	12,362	<0.001
Age	41.52	17.06	44,796	43.69	15.44	12,362	<0.001
Years of schooling	7.08	4.62	46,750	5.58	4.10	12,362	<0.001
Chronic disease at baseline (binary)	0.17	0.37	42,359	0.16	0.37	12,362	0.0064
Employed	0.39	0.49	59,361	0.51	0.50	12,362	<0.001
Control variables, household level							
Urban	0.78	0.41	59,361	0.69	0.46	12,362	<0.001
Oportunidades	0.14	0.35	52,332	0.23	0.42	12,362	<0.001
Consumption expenditure at baseline	5,488.42	23,134.46	49,999	4,469.21	12,045.13	12,362	<0.001
HH size at baseline	4.81	2.19	59,361	4.86	2.26	12,362	0.0035
Years of schooling HH head	5.99	4.59	46,300	4.85	3.96	12,362	<0.001
Female HH head	0.21	0.41	45,502	0.19	0.39	12,362	<0.001
Married HH head	0.70	0.46	47,088	0.69	0.46	12,362	0.1779
Age HH head	51.05	14.79	41,040	50.63	14.40	12,362	0.0002
Employed HH head	0.69	0.46	47,088	0.73	0.44	12,362	<0.001
Control variables, municipality level							
Population size	310,245.51	401,584.57	57,040	201,539.93	338,359.11	12,362	<0.001
Proportion of women	0.51	0.01	57,040	0.51	0.01	12,362	<0.001
Percentage of illiterate	8.62	7.45	57,040	11.01	8.10	12,362	<0.001
Percentage low-income	46.66	18.46	57,040	53.70	17.95	12,362	<0.001
Percentage poor	20.59	14.94	57,040	25.90	16.30	12,362	<0.001
Proportion with electricity	0.02	0.03	57,040	0.03	0.03	12,362	<0.001
Proportion with piped water	0.10	0.10	57,040	0.12	0.12	12,362	<0.001
Proportion with sanitation	0.17	0.19	57,040	0.22	0.21	12,362	<0.001

Note: The last column provides the p-values associated to t-tests testing for the equality of the means in both samples (H0: means are equal).

Table 2. Impact of Seguro Popular on nutritional outcomes among adults

	Difference-in-difference estimates					
	(1)	(2)	(3)	(4)	(5)	(6)
Obesity	-0.0098	-0.0109	-0.0115	-0.0037	-0.0040	-0.0046
	(0.0140)	(0.0139)	(0.0144)	(0.0134)	(0.0134)	(0.0134)
Overweight	-0.0058	-0.0054	-0.0090	-0.0200	-0.0199	-0.0222
	(0.0152)	(0.0150)	(0.0144)	(0.0139)	(0.0139)	(0.0139)
Underweight	0.0023	0.0021	0.0017	0.0013	0.0011	0.0021
	(0.0053)	(0.0052)	(0.0053)	(0.0046)	(0.0046)	(0.0044)
BMI	-0.1803	-0.1741	-0.1782	-0.1987	-0.1945	-0.2019
	(0.1503)	(0.1491)	(0.1518)	(0.1287)	(0.1294)	(0.1283)
Individual-level controls	x	x	x	x	x	x
Household-level controls		x	x		x	x
Municipality-level controls			x			x
State-level fixed effects	x	x	x			
Municipality-level fixed effects				x	x	x
Observations	12,362	12,362	12,362	12,362	12,362	12,362

Note: Summary of the regression coefficients on Seguro Popular treatment for the four nutritional outcomes of interest (obesity, overweight, underweight, BMI). All regressions include a linear time trend. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, age square, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline. Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Table 3. Heterogeneous treatment effects of Seguro Popular

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Outcome variable = obesity						
Seguro Popular	-0.0046	-0.0167	0.1049***	-0.0410**	-0.0252*	0.0079
	(0.0134)	(0.0144)	(0.0227)	(0.0160)	(0.0140)	(0.0171)
Seguro Popular * Female		0.0214				
		(0.0135)				
Seguro Popular * Age			-0.0025***			
			(0.0004)			
Seguro Popular * Years of schooling				0.0063***		
				(0.0015)		
Seguro Popular * Overweight at baseline					0.0337**	
					(0.0144)	
Seguro Popular * Urban						-0.0177
						(0.0171)
Linear combination of coefficients		0.0048	-0.0045	-0.0058	0.0085	-0.0097
(main effect of SP + interaction term)		(0.0154)	(0.0134)	(0.0133)	(0.0161)	0.0144
Observations	12,362	12,362	12,362	12,362	12,362	12,362
R-squared	0.4918	0.4920	0.4933	0.4925	0.2400	0.4919
Panel B. Outcome variable = BMI						
Seguro Popular	-0.2019	-0.2654*	1.5699***	-0.7525***	-0.3742**	-0.1523
	(0.1283)	(0.1378)	(0.2271)	(0.1460)	(0.1686)	(0.1424)
Seguro Popular * Female		0.1123				
		(0.1051)				
Seguro Popular * Age			-0.0405***			
			(0.0039)			

Seguro Popular * Years of schooling				0.0952***		
				(0.0117)		
Seguro Popular * Overweight at baseline					-0.841***	
					(0.1697)	
Seguro Popular * Urban						-0.0701
						(0.1293)
Linear combination of coefficients		-0.1530	-0.2016	-0.2212*	-0.467***	-0.2224
(main effect of SP + interaction term)		(0.1388)	(0.1299)	(0.1262)	(0.1454)	(0.1412)
Observations	12,362	12,362	12,362	12,362	12,362	12,362
R-squared	0.7995	0.7996	0.8025	0.8007	0.4663	0.7995

Note: Summary of the regression coefficients on Seguro Popular treatment for two nutritional outcomes of interest (obesity in Panel A and BMI in Panel B). Difference-in-Difference estimates, standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. All regressions include the full set of control variables which are also included in column 6 of table 2 (individual-level, household-level and municipality-level controls, as well as municipality-level fixed effects), a linear time trend, and the main effects corresponding to the interaction terms presented in each column.

Table 4. Impact of Seguro Popular on the composition of household food expenditure (shares of food group in total food expenditure)

	Difference-in-difference estimates	
	Seguro Popular	Seguro Popular * Overweight at baseline
Carbohydrates	0.0001	0.0023
	(0.0080)	(0.0054)
Meat	0.0029	0.009*
	(0.0090)	(0.005)
Dairy	0.0005	-0.0041
	(0.0050)	(0.0038)
Plant-based protein	0.0006	-0.0012
	(0.0039)	(0.0023)
Fruit	-0.0053	-0.0006
	(0.0045)	(0.0026)
Vegetables	-0.0026	-0.0002
	(0.0056)	(0.0033)
Sugary products	0.0021	-0.0010
	(0.0025)	(0.0013)
Fat	-0.0030	0.0012
	(0.0022)	(0.0018)
Meals out	-0.0027	-0.0023
	(0.0067)	(0.0044)
Processed food	-0.0002	-0.0002
	(0.0005)	(0.0003)
Observations	7,352	

Note: Summary of the regression coefficients on Seguro Popular treatment for the outcomes in the rows. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. All regressions include the full set of household-level and municipality-level control variables which are also included in column 3 of table 2, as well as state-level fixed effects and a linear time trend.

Table 5. Impact of Seguro Popular on lifestyle and time use

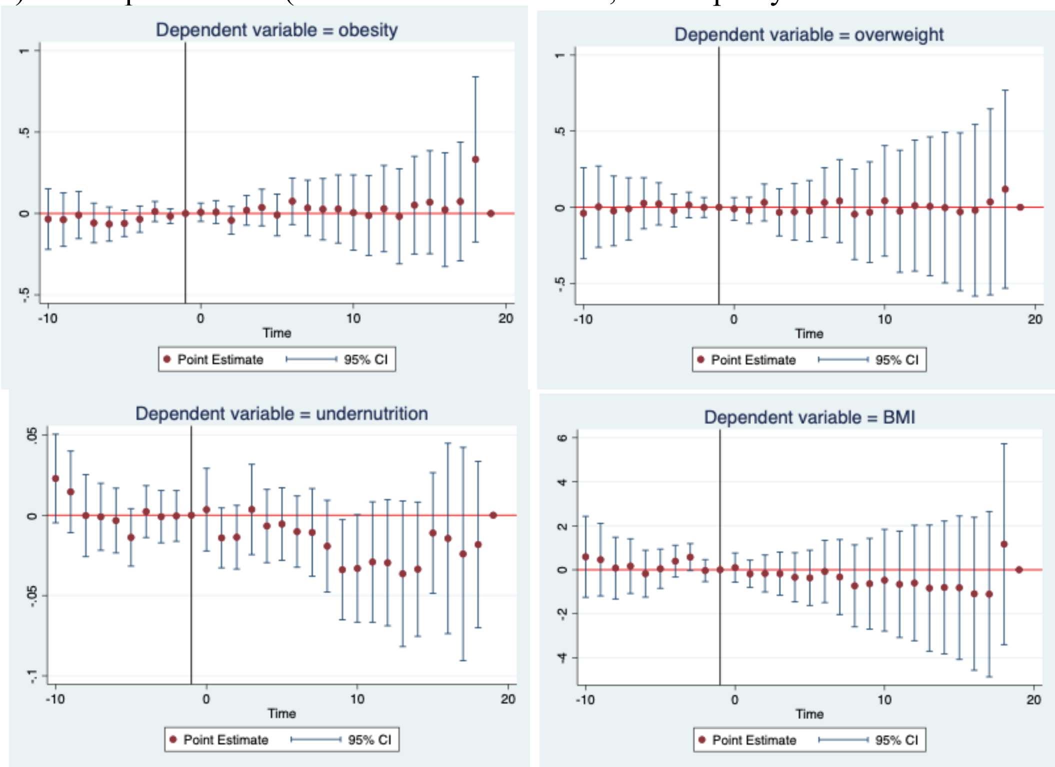
	Difference-in-difference estimates			
	Seguro Popular	Seguro Popular * Overweight at baseline	Linear combination of coefficients	Observations
	(1)	(2)	(1+2)	
Excercise	-0.0219	0.0292***	0.0073	12,327
	(0.0155)	(0.0110)	(0.0147)	
Excercise hours	1.4909	1.064	-0.0018	118
	(4.8506)	(3.4622)	(0.0425)	
Smoking (binary)	0.0020	-0.0234**	-0.0214**	12,326
	(0.0134)	(0.0112)	(0.0279)	
Number of cigarettes (per week)	2.0579	-7.0904	-5.0325	1,322
	(6.6441)	(4.3118)	(5.7831)	
Self-assessed health	0.0686*	-0.0520**	0.0166	12,325
	(0.0359)	(0.0229)	(0.0359)	
Health-related absence from work	0.0362**	-0.0221**	0.0141	12,325
	(0.0159)	(0.0098)	(0.0142)	
Health care use (binary) in last 4 weeks	-0.0243	0.0171	-0.0072	12,310
	(0.0166)	(0.0114)	(0.0153)	
Hours worked (per week)	-0.2249	0.3683	0.0141	6,713
	(1.3282)	(1.0620)	(1.2740)	

Note: Summary of the regression coefficients on Seguro Popular treatment for the outcomes in the rows. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. All regressions include the full set of control variables which are also included in column 3 of table 2 (individual-level, household-level and municipality-level controls, as well as state-level fixed effects), a linear time trend.

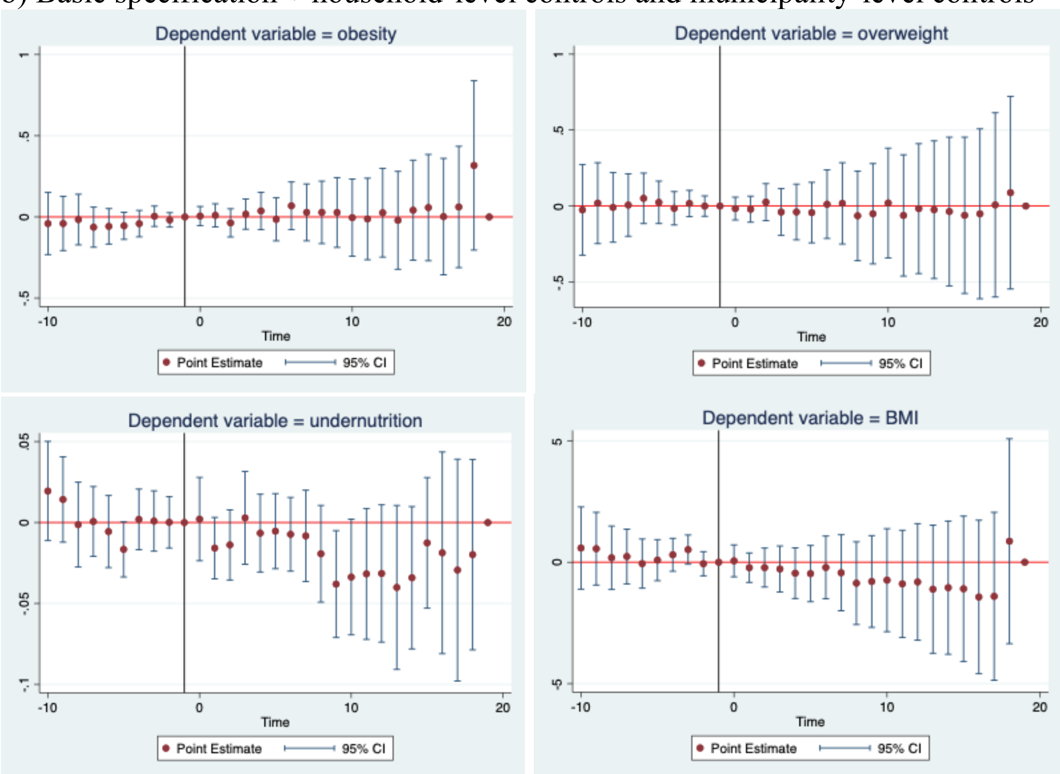
Appendix

Figure A1. Event study estimates: Impact of Seguro Popular on nutritional outcomes among adults

a) Basic specification (individual-level controls, municipality-level and time fixed effects)

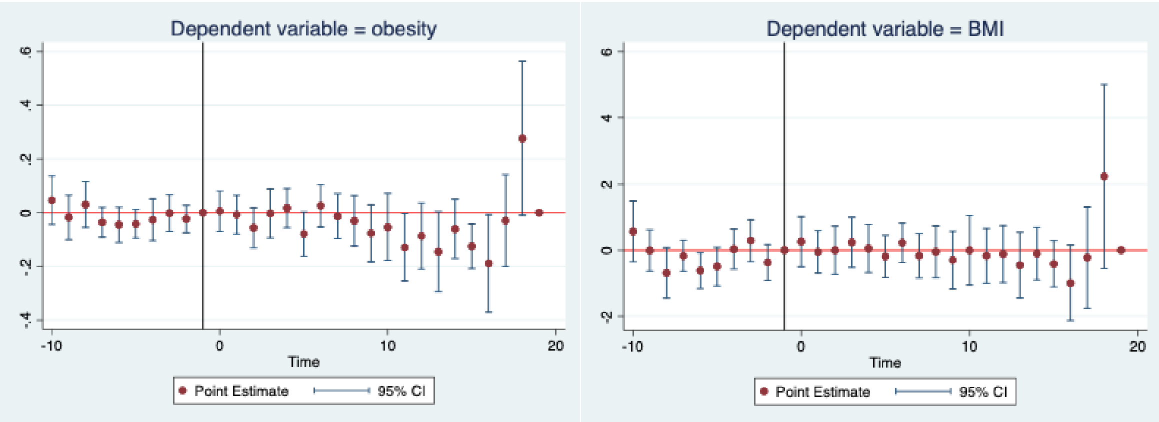


b) Basic specification + household-level controls and municipality-level controls



Note: n= 12,326. Time corresponds to calendar semesters. All regressions include time and municipality fixed effects. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Figure A2. Event study estimates: subsample of individuals who were overweight at baseline



Note: n= 7,986. Time corresponds to calendar semesters. All regressions include time and municipality fixed effects. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Table A1. Impact of Seguro Popular on nutritional outcomes among adults. Alternativae samples

a) Unbalanced sample

	Difference-in-difference estimates		
	(1)	(2)	(3)
Obesity	-0.0116	-0.0131	-0.0141
	(0.0140)	(0.0139)	(0.0144)
Overweight	-0.0073	-0.0065	-0.0098
	(0.0152)	(0.0152)	(0.0145)
Underweight	0.0021	0.0018	0.0013
	(0.0053)	(0.0052)	(0.0053)
BMI	-0.1885	-0.1849	-0.1910
	(0.1496)	(0.1486)	(0.1509)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Observations	13,189	13,189	13,189

b) Subsample of individuals overweight at baseline

	Difference-in-difference estimates		
	(1)	(2)	(3)
Obesity	-0.0111	-0.0126	-0.0135
	(0.0193)	(0.0192)	(0.0196)
Overweight	-0.0174	-0.0174	-0.0147
	(0.0187)	(0.0185)	(0.0177)
Underweight	0.0008	0.0008	0.0009
	(0.0024)	(0.0025)	(0.0024)
BMI	-0.1905	-0.1902	-0.1899
	(0.1872)	(0.1828)	(0.1845)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Observations	7,986	7,986	7,986

c) Subsample of over 40 years

	Difference-in-difference estimates		
	(1)	(2)	(3)
Obesity	-0.0158	-0.0165	-0.0144
	(0.0177)	(0.0175)	(0.0180)
Overweight	0.0123	0.0098	0.0052
	(0.0202)	(0.0199)	(0.0196)
Underweight	0.0036	0.0041	0.0042
	(0.0068)	(0.0067)	(0.0067)
BMI	-0.1088	-0.1128	-0.1198
	(0.1853)	(0.1843)	(0.1879)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Observations	6,875	6,875	6,875

Note: Summary of the regression coefficients on Seguro Popular treatment for the four nutritional outcomes of interest (obesity, overweight, underweight, BMI). All regressions include a linear time trend. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Table A2. Impact of Seguro Popular on nutritional outcomes among adults. Extended sample that includes insured under other schemes at baseline

	Difference-in-difference estimates		
	(1)	(2)	(3)
Obesity	-0.0247**	-0.0251**	-0.0258**
	(0.0108)	(0.0107)	(0.0112)
Overweight	-0.0104	-0.0097	-0.0136
	(0.0113)	(0.0112)	(0.0108)
Underweight	0.0013	0.0011	0.0007
	(0.0033)	(0.0033)	(0.0034)
BMI	-0.2406**	-0.2333**	-0.2463**
	(0.1167)	(0.1167)	(0.1173)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Observations	22,123	22,123	22,123

Note: Summary of the regression coefficients on Seguro Popular treatment for the four nutritional outcomes of interest (obesity, overweight, underweight, BMI). All regressions include a linear time trend. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Table A3 Heterogeneous effects

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Outcome variable = Obesity						
Seguro Popular	-0.025**	-0.033***	0.087***	-0.059***	-0.265***	-0.010
	(0.0112)	(0.0118)	(0.0188)	(0.0126)	(0.0129)	(0.0138)
Seguro Popular * Female		0.0145				
		(0.0093)				
Seguro Popular * Age			-0.0025***			
			(0.0003)			
Seguro Popular * Years of schooling				0.0053***		
				(0.0010)		
Seguro Popular * Overweight at baseline					0.3652***	
					(0.0103)	
Seguro Popular * Urban						-0.0203*

	(1)	(2)	(3)	(4)	(5)	(6)
						(0.0121)
Linear combination of coefficients		-0.0194	-0.0253**	-0.0259**	0.0997***	-0.0303**
(main effect of SP + interaction term)		(0.0124)	(0.0116)	(0.0112)	(0.0128)	(0.0119)
Observations	22,123	22,123	22,123	22,123	22,123	22,123
R-squared	0.4873	0.4873	0.4889	0.4879	0.1318	0.4874
Panel B. Outcome variable = BMI						
Seguro Popular	-0.2463**	-0.2755**	1.4586***	-0.7293***	-3.8912***	-0.2473**
	(0.1173)	(0.1157)	(0.1946)	(0.1319)	(0.1701)	(0.1249)
Seguro Popular * Female		0.0524				
		(0.0744)				
Seguro Popular * Age			-0.0380***			
			(0.0029)			
Seguro Popular * Years of schooling				0.0746***		
				(0.0085)		
Seguro Popular * Overweight at baseline					5.5375***	
					(0.1317)	
Seguro Popular * Urban						0.0014
						(0.1022)
Linear combination of coefficients		-0.2231*	-0.2396*	-0.2476**	1.6464***	-0.2460*
(main effect of SP + interaction term)		(0.1283)	(0.1232)	(0.1167)	(0.1434)	(0.1247)
Observations	22,123	22,123	22,123	22,123	22,123	22,123
R-squared	0.7970	0.7970	0.7999	0.7980	0.2227	0.797

Note: Summary of the regression coefficients on Seguro Popular treatment for two nutritional outcomes of interest (obesity in Panel A and BMI in Panel B). Difference-in-Difference estimates, standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. All regressions include the full set of control variables which are also included in column 3 of table 2 (individual-level, household-level and municipality-level controls, as well as state-level fixed effects), a linear time trend, as well as the main effects corresponding to the interaction terms presented in each column.

Table A4. Impact of Seguro Popular on nutritional outcomes among adults. Estimates with supply side controls

	Difference-in-difference estimates	R-squared
Obesity	-0.0097	0.4830
	(0.0147)	
Overweight	-0.0162	0.4176
	(0.0146)	
Underweight	-0.0001	0.0601
	(0.0053)	
BMI	-0.1884	0.7930
	(0.1545)	

Individual-level controls	x
Household-level controls	x
Municipality-level controls	x
Supply side controls	x
State-level fixed effects	x
Observations	11,767

Note: Summary of the regression coefficients on Seguro Popular treatment for the four nutritional outcomes of interest (obesity, overweight, underweight, BMI). All regressions include a linear time trend. Standard errors are clustered at the municipality-level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.

Table A5. Two-stage least squares (2SLS)

Panel A. First stage (outcome = obesity)			
	(1)	(2)	(3)
SP coverage (municipality-level)	0.8836***	0.8928***	0.8936***
	(0.0000)	(0.0000)	(0.0000)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Underidentification test (F)	88.99	96.09	91.31
P-value	<0.0001	<0.0001	<0.0001
Observations	10,941	10,941	10,941

Panel B. Second stage			
	(1)	(2)	(3)
Obesity	0.0385	0.0317	0.0699
	(0.0459)	(0.0452)	(0.0452)
Overweight	0.0124	0.0235	0.0203
	(0.0466)	(0.0464)	(0.0499)
Underweight	0.0026	0.0005	0.0014
	(0.0138)	(0.0140)	(0.0147)
BMI	0.1500	0.0876	0.2736
	(0.4363)	(0.4277)	(0.4427)
Individual-level controls	x	x	x
Household-level controls		x	x
Municipality-level controls			x
State-level fixed effects	x	x	x
Observations	10,941	10,941	10,941

Note: Summary of the regression coefficients on Seguro Popular treatment for the four nutritional outcomes of interest (obesity, overweight, underweight, BMI). All regressions include a linear time trend. Standard errors are clustered at the municipality-level. *** p<0.01, ** p<0.05, * p<0.1. Individual-level controls include sex, age, years of schooling, civil status, employment status, BMI at baseline, and chronic disease at baseline Household-level controls include urban vs. rural, participation in the Oportunidades cash transfer programme, consumption expenditure at baseline, household size and demographic composition of the household at baseline, as well as information on the household head analogous to the individual-level controls. Municipality-level controls include population size, poverty rate, illiteracy rate, percentage of the population earning less than two minimum wages, percentage of women, and the proportion of households without access to piped water, without electricity connection and without access to sanitation.