# Association between changes in out-of-pocket expenditures during 2020 with the Covid-19 pandemic in Mexico

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## Abstract

**Objective.** To disentangle the contribution of the Covid-19 pandemic and the abolition of the *Seguro Popular* (SP) health protection system to changes in out-of-pocket health expenditures (OPE) in Mexico during 2020. **Materials and methods.** We used national representative surveys between 2014 and 2020. We described OPE in absolute and relative terms and per disposable income. Changes in OPE were estimated using adjusted two-part models. Results were reported nationally, by health insurance and income quintile. **Results.** OPE increased for all in 2020 with the largest increases for the high- and very high-income households and those with social security (30.4, 23.4 and 22.2 USD, respectively). Households with no health insurance and those with *Seguro Popular/Instituto de Salud para el Bienestar* had the lowest increase in OPE. However, for the lowest income households and those with no social security, OPE represented the highest proportion per disposable income as their income decreased during the Covid-19. **Conclusions.** Social safety nets, including access to health care services for the uninsured and lower income households, are crucial.

Keywords: Covid-19; health insurance; out-of-pocket expenditures; Mexico

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## Resumen

**Objetivo.** Aislar la contribución de la pandemia de Covid-19 y de la eliminación del Seguro Popular (SP) en cambios en gasto de bolsillo (GDB) en México en 2020. **Material y métodos.** Se utilizó información de encuestas nacionales (2014-2020). Se describió el GDB en términos absolutos y relativos, y por ingreso disponible. Se estimaron cambios en GDB con modelos en dos partes. Los resultados se presentan por tipo de afiliación y por quintil de ingresos. **Resultados.** El GDB se incrementó para todos en 2020 con aumentos mayores en hogares de ingresos altos, muy altos y en aquellos con afiliación (30.4, 23.4 y 22.2 USD). Los hogares sin afiliación y los de Seguro Popular/Instituto de Salud para el Bienestar presentaron los menores incrementos en GDB. Sin embargo, para los hogares de menores ingresos y aquellos sin seguridad social, el GDB representó la mayor proporción por ingreso disponible porque su ingreso se redujo durante la pandemia. **Conclusiones.** Es crucial contar con redes de protección social y acceso a servicios de salud, especialmente para hogares sin afiliación y aquellos de menores ingresos.

Palabras clave: Covid-19; servicios de salud; gasto de bolsillo en salud; México

The Covid-19 pandemic affected health systems and household economies globally.[1] Lockdown measures may have prevented the spread of Covid-19 but altered the economy. Temporary preventive measures were associated with reductions or closing of companies causing job losses and income reductions, as well as reductions in sales from informal businesses that affected more the population working in the informal sector.[2] The

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high rates of mortality and morbidity placed Mexico as the fourth country with the highest fatality rate[3] and exceeded the health system capacity.[4]

There is evidence that the Covid-19 was associated with increases in health expenditures in several countries. In Thailand, medical supplies increased approximately 24% from 2019 to 2021; similarly, vitamins and supplements increased by 27% in the same period. This study also showed that out-of-pocket health expenditures (OPE) was 10 times higher for the population in the highest-income decile compared with those in the lowest-income decile.[5] In India, 26% of households suffered catastrophic health expenditures during the Covid-19 pandemic, but the most affected were households in the lowest income quintile and those located in rural areas.[6] Results from a survey in Indonesia showed that 7.3% of total household income was spent on preventive supplies such as masks and hand sanitizer and that 18.6% of the households experienced catastrophic health expenditures due to Covid-19.[7] Studies in Mexico also show increases in both the proportion of households that had OPE and the amount of OPE during the Covid-19. Rodriguez-Aguilar and colleagues showed that between 2018 and 2020, OPE increased of 46% and that the proportion of households with catastrophic health spending went from 2.2 to 4%.[8] Haakenstad and colleagues showed a 42% increase in OPE, greater among insured households (46%).[9] Another study showed that between 2018 and 2020 the proportion of households with OPE went from 62.7 to 73.4%, but that OPE in monetary terms only increased for those without health insurance.[10]

In parallel to the Covid-19, the federal administration –elected for the 2018-2024 period of governance–, abolished the System of Social Protection in Health implemented in 2004. That reform introduced a funding mechanism called *Seguro Popular* (SP) to reduce catastrophic health expenditures for the uninsured by increasing free access to a set of interventions and public services.[11] The 2018-2024 administration introduced the *Instituto de Salud para el Bienestar* (Insabi for its acronym in Spanish) to provide free health services to the population without health insurance.[12] Although by 2012 the SP enrolled 75% of the uninsured population,[13] only about half percent of those affiliated to the SP used public health services.[14] Still, the removal of the SP may have been associated with increases in OPE in 2020. It is unclear to what extent increases in OPE in Mexico were associated with these two events.

We aimed to disentangle the contribution of these two events by estimating changes in the probability of having OPE and OPE in monetary terms in 2020 compared to 2018, nationally and by health insurance. Evidence of lower increases in OPE among the population with no health insurance in 2020 –that had SP before– compared to those with social security would reduce the probability of attributing these changes to the removal of the SP. We estimated changes in OPE using a representative sample of Mexican households at the national level, by health insurance and income quintile. Analyzing OPE is a key metric to understand the overall health care system of a country, household welfare and constitutes an important indicator of the United Nations Sustainable Development Goals.[15] Understanding Mexico's experience can provide lessons for other middle-income countries facing similar challenges.

# Materials and methods

## Data source

We used data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) in its 2014, 2016, 2018 and 2020 rounds. ENIGH is a cross-sectional survey with a probabilistic design stratified in two stages, representative at the national level and by place of residence (urban/rural).[16] The ENIGH collects household income and expenditures (amount, source and distribution) and sociodemographic information. The survey includes information on quarterly health expenditures for: drugs, outpatient care, hospitalizations, alternative medicine, weight control, orthopedics, health insurance, health care during pregnancy and childbirth and healing material. Households with OPE values above the 99th percentile were considered atypical and excluded from the analysis ($n$= 3 505). The analytical sample includes 249 938 households of which 8% were from the 2014 round, 28% from the 2016 round, 30% from the 2018 round and 35% from the 2020 round.[17]

The study is a secondary analysis of publicly available data from the ENIGH Surveys with no identifiers at the individual of household level.

## Empirical estimation

The two main outcomes of the study were the probability of having OPE and quarterly OPE in USD. A two-part model regression was used to estimate changes in OPE (absolute values) in 2020 compared to 2018. We chose a two-part model as the dependent variable is censored by the presence of zeros (46.7 and 32.7% of households had no health expenditures in 2018 and 2020, respectively).[18] The first part of the model uses a probit regression to estimate the probability of spending on health, while the second part uses a generalized linear model to estimate changes in OPE in USD. Post-estimations of marginal

effects combine both parts of the model (probit and generalized linear model) and allow predicting OPE among households with expenditures greater than zero.

For the probability of having OPE we created a dummy variable with a value of 1 if the household had any health spending, 0 otherwise. We compared the probability of having OPE as well as OPE in monetary values, in 2020 with 2018 and adjusted for prior rounds (2014 and 2016). We also adjusted the two-part model for variables that can be associated with OPE. We created four mutually exclusive categories of health insurance at the household level following Serván-Mori and colleagues:[10] 1) *no health insurance*; 2) *SP/Insabi* for those that reported being affiliated to SP (before 2020) or Insabi (after 2020); 3) *social security* for the population working in the private sector affiliated to the Mexican Social Security Institute (IMSS), government workers affiliated to the Institute of Security and Social Services of State Workers (ISSSTE) and other public providers for oil, marine and military personnel, and 4) *other health insurance* for households with members with social security and SP / Insabi in the same household. We also included age and sex of the head of the household, household size, binary variables for household composition to distinguish 1) households without children under five or adults over 65 years old, 2) households with children under 5 years old, 3) households with adults over 65 years old and 4) households with children under five and adults over 65 years old since they are more likely to use health services; education of the head of the household in five categories (no education, primary completed, secondary school completed, high school completed, university or higher); household income in quintiles and place of residence (urban or rural).

In addition to estimating the probability and monetary value of OPE, we also analyzed OPE as a share of disposable income, defined as OPE divided by total household income minus household food expenditures. However, as this indicator relies on income and expenditures and there is evidence of reductions in both during the Covid-19 pandemic,[19] we simulated how OPE per disposable income would differ with no changes in household income in 2020 except by previous trends. The rationale is as follows: as the poorest and those with no health insurance may have been more affected by decreases in income, the simulation would isolate these trends associated with the Covid-19 to see how much changes in OPE only, would affect OPE per disposable income. For this simulation, we first calculated the compound growth rate (CGR)[20] as follows:

$$CGR = \left(\frac{\text{2018 disposable income}}{\text{2014 disposable income}}\right)^{\frac{1}{n}} - 1$$

where *n* equals 3 for the three rounds between 2014 and 2018. To get the 2020 simulated disposable income, we applied to the 2018 disposable income the calculated compound growth rate.

For unadjusted analyses, all outcomes and variables included in the models were summarized using means or proportions for all ENIGH rounds between 2014 and 2020.

We stratified the two-part model and the observed and simulated OPE per disposable income by health insurance affiliation and income quintile. All monetary values were deflated using the National Consumer Price Index[21] and converted to constant 2022 US dollars. Statistical significance was defined as *p* values less than 0.05. All analyses were performed with the Stata program version 15.0 (Stata Press, College Station, TX, USA).[22] We used the *svy* command for complex surveys and weighting factors to reflect the survey design

# Results

Table I shows the sociodemographic characteristics of the analytical sample. Households with OPE greater than 0 went from 53.3% in 2018 to 67.3% in 2020. The average value of OPE increased from 44.7 to 61.3 USD between 2018 and 2020 with the largest increases observed among households with other health insurance (46.9%), SP / Insabi (36.5%), those under social security (31.6%) and much smaller for those with no health insurance (5.6%). Between 2014 and 2020, the average age of the household head increased from 48.8 to 51.3 years. Households with a male head of the household went from 74.3% in 2014 to 70.1% in 2020. In the 2014-2018 rounds, the percentage distribution of the type of affiliation remained similar. However, between 2018 and 2020 the proportion with *no health insurance* increased from 8.4 to 16%; *SP/Insabi* decreased from 30.1 to 21.2%; the proportion in *social security* increased from 41 to 48.3%; and *other health insurance* went from 20.4 to 14.7%. Quarterly income decreased between 2018 and 2020, for the very-low quintile it went from 763.3 to 758.6 USD and for the very-high quintile from 7 344.7 to 6 758.8 USD. In the entire period about 29% of the households had a head of the household who had completed secondary school and 53% had no children under five years or over 65 years, household size was in average 3.6 inhabitants and 22% of households live in rural areas. Disposable income and food expenditures increased in 2016 and 2018 and decreased in 2020.

Figure 1 shows that OPE per disposable income increased overall, by health insurance and income quintile between 2018 and 2020. The proportion of OPE increased 1.2% at the national level with the largest in-

**Table I**

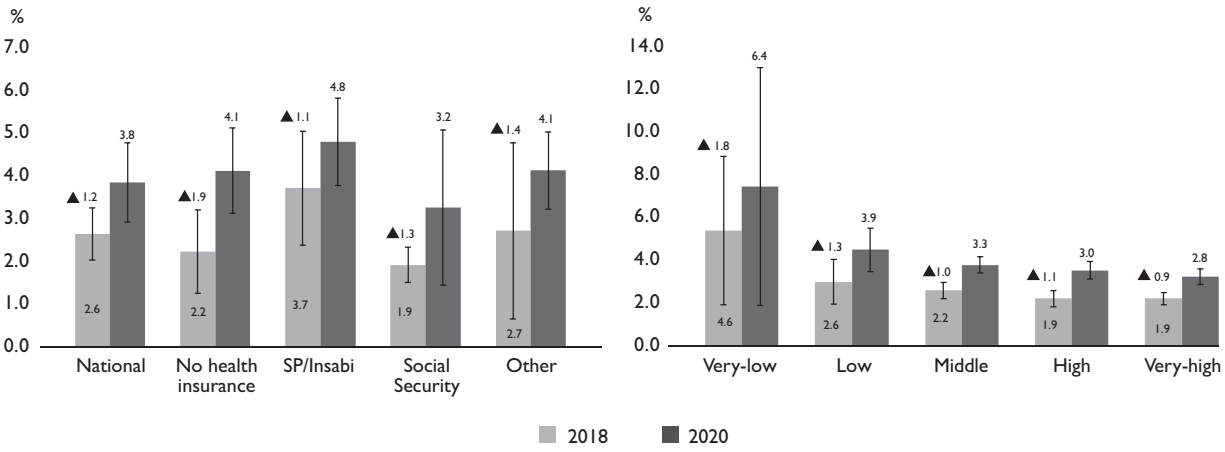
**Descriptive characteristics of households by survey round. México, ENIGH 2018-2020**

| *Covariables* | | *2014* | *2016* | *2018* | *2020* |
|---|---|---|---|---|---|
| Households | | 19 231 | 69 560 | 73 804 | 87 343 |
| Households with out-of-pocket expenditure >0 (%) | | 52.0 | 54.5 | 53.3 | 67.3 |
| Mean out-of-pocket expenditure (USD) ($) | National | 41.8 | 45.7 | 44.7 | 61.3 |
| By health insurance ($) | No health insurance | 36.3 | 55.9 | 41.1 | 43.7 |
| | *Seguro popular*/Insabi | 27.6 | 27.0 | 29.8 | 40.7 |
| | Social security | 57.5 | 60.9 | 57.5 | 75.7 |
| | Other health insurance | 35.9 | 41.4 | 42.6 | 62.6 |
| By income quintile ($) | Very low | 11.5 | 12.8 | 13.3 | 17.9 |
| | Low | 18.2 | 21.7 | 21.4 | 30.1 |
| | Medium | 22.7 | 30.7 | 30.3 | 43.9 |
| | High | 35.2 | 42.4 | 44.0 | 66.0 |
| | Very high | 119.9 | 119.6 | 113.2 | 145.3 |
| Health insurance affiliation (%) | No health insurance | 9.7% | 8.2% | 8.4% | 16.0% |
| | *Seguro Popular*/Insabi | 31.8% | 30.3% | 30.1% | 21.1% |
| | Social security | 39.4% | 38.7% | 41.0% | 48.3% |
| | Other health insurance | 19.1% | 22.8% | 20.4% | 14.7% |
| Household quarterly income by quintiles (USD) ($) | National | 2 813.5 | 3 137.5 | 2 988.6 | 2 824.4 |
| By income quintile ($) | Very low | 673.2 | 757.1 | 763.5 | 758.6 |
| | Low | 1 269.3 | 1 419.3 | 1 437.9 | 1 382.4 |
| | Medium | 1 893.9 | 2 126.8 | 2 129.0 | 2 037.6 |
| | High | 2 867.4 | 3 202.3 | 3 171.5 | 3 030.0 |
| | Very high | 7 255.9 | 8 073.1 | 7 344.7 | 6 758.8 |
| Household head characteristicss | Age (years) | 48.8 | 49.2 | 49.8 | 51.3 |
| | Male sex (%) | 74.3 | 72.2 | 71.3 | 70.1 |
| Household head education (%) | No formal education | 24.9 | 22.7 | 21.2 | 20.6 |
| | Primary completed | 20.6 | 20.4 | 19.7 | 19.3 |
| | Secondary school completed | 27.6 | 29.0 | 29.3 | 29.6 |
| | High school completed | 13.9 | 14.7 | 15.7 | 16.3 |
| | University or higher | 12.9 | 13.2 | 14.0 | 14.2 |
| Household composition (%) | Without children under 5 or adults over 65 years old | 52.0 | 52.4 | 53.1 | 53.8 |
| | With children under 5 year old | 26.7 | 25.7 | 23.9 | 20.8 |
| | With adults over 65 years old | 18.3 | 19.2 | 20.3 | 22.7 |
| | With children under 5 and adults over 65 years old | 3.0 | 2.7 | 2.7 | 2.7 |
| Household size ($) | | 3.80 | 3.70 | 3.60 | 3.50 |
| | Disposable income (USD) | 2 180.8 | 2 477.1 | 2 317.4 | 2 195.7 |
| | Food expenditures (USD) | 632.6 | 660.4 | 671.2 | 628.7 |
| Place of residence (%) | Rural | 22.0 | 21.6 | 23.0 | 21.6 |

Own estimations using data from *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) 2014-2020.
The complex sample design was considered. Monetary values were expressed in constant 2022 US dollars.
All monetary variables represent quarterly household amounts expressed in constant 2022 USD.

creases among those with *no health insurance* (1.9%) and households with *other health insurance* (1.4%).

Table II shows OPE per disposable income including the lineal simulation of income in 2020 based on previous rounds. In the simulated scenario, OPE per disposable income has the smallest proportions among the *no health insurance* (2.0%) compared to all other groups (ranging between 2.4 and 3.4%). The largest difference between the observed and simulated OPE per disposable income was 2.1% for the *no health insurance* population and the lowest 0.9% for the *social security* group. Results by income quintile show that very low-income households had the largest OPE per disposable income in 2020 (6.4%) and the largest difference between the observed and the simulated OPE per disposable income of 2.4%.




* Own estimations using data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH) 2018-2020. The complex sample design was considered.
OPE: out-of-pocket health expenditures; SP/Insabi: *Seguro Popular/Instituto de Salud para el Bienestar*

**FIGURE 1. OPE PER DISPOSABLE INCOME. NATIONALLY, BY HEALTH INSURANCE, AND BY HOUSEHOLD INCOME QUINTILE. MEXICO, ENIGH 2018-2020***

**Table II**

**OBSERVED AND SIMULATED OPE PER DISPOSABLE INCOME, NATIONALLY, BY HEALTH INSURANCE AND BY INCOME QUINTILE. MEXICO, ENIGH 2014-2020**

| *OPE per disposable income* | *2014* % | *2016* % | *2018* % | *2020* % | *2020 simulation* % | *Difference** % |
|---|---|---|---|---|---|---|
| National | 2.4 | 2.5 | 2.6 | 3.8 | 2.6 | 1.2 |
| By health insurance | | | | | | |
| No-HI | 3.1 | 3.3 | 2.2 | 4.1 | 2.0 | 2.1 |
| SP/Insabi | 3.3 | 3.3 | 3.7 | 4.8 | 3.4 | 1.4 |
| Social security | 1.8 | 2.0 | 1.9 | 3.2 | 2.4 | 0.9 |
| Other HI | 2.0 | 2.1 | 2.7 | 4.1 | 2.6 | 1.5 |
| By income quintile | | | | | | |
| Very-low | 3.7 | 4.3 | 4.6 | 6.4 | 4.0 | 2.4 |
| Low | 2.8 | 2.5 | 2.6 | 3.9 | 3.0 | 0.8 |
| Middle | 2.0 | 2.3 | 2.2 | 3.3 | 2.8 | 0.5 |
| High | 1.7 | 1.8 | 1.9 | 3.0 | 2.6 | 0.4 |
| Very-high | 2.1 | 1.9 | 1.9 | 2.8 | 2.3 | 0.4 |

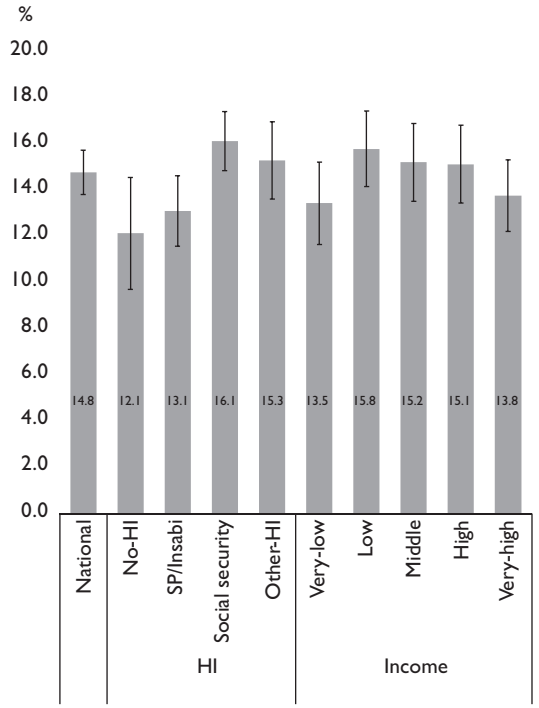
Own estimations using data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), 2014-2020.
OPE: out-of-pocket health expenditures; SP/Insabi: *Seguro Popular/Instituto de Salud para el Bienestar*; HI: health insurance.
* Difference between current and simulated 2020 scenarios.

Figure 2 shows the results of the probit model used to estimate changes in the probability of presenting OPE between 2018 and 2020. At the national level, there was a 14.8% increase in the probability of OPE. By health insurance, we see an increase of 12.1% for those with *no health insurance*, 13.1% for *SP/Insabi*, 16.1% for those with *social security* and 15.3% for *other health insurance*. By income level, results show significant increases of 13.5, 15.8, 15.2, 15.1 and 13.8% between 2018 and 2020 for the very-low, to very-high income households, respectively.

Figure 3 shows results from the adjusted two-part model. Overall OPE increased 16.2 USD (equivalent to a 36.2% increase). For those with *no health insurance* there was an increase of 12.8 USD (31.2%), 9.5 USD for *SP/Insabi* (31.8%), for those with *social security* OPE increased 22.2 USD (38.6%) and for *other health insurance* the increase was 19.3 USD (45.3%). For very low-income households, OPE increased by 5.1 USD (equivalent to a 38.2% increase), 9.2 USD (43.2%) for the low-income, 13.9 USD (45.9%) for the middle-income, 23.4 USD (53.1%) for high-income and 30.4 USD (26.8%) for very-high income.

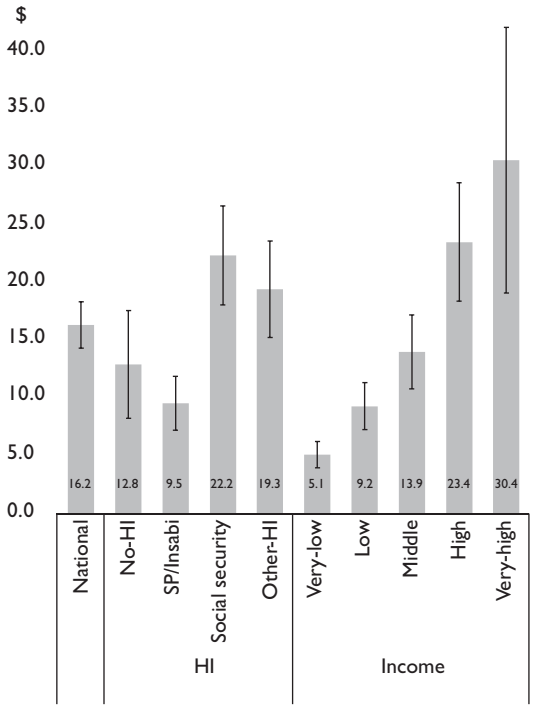
## Discussion

Our study estimated changes in the probability of having OPE and changes in OPE in USD in 2020 compared to 2018 using a representative sample of Mexican households adjusting for previous survey rounds, individual and household characteristics. Our results show significant increases in the probability of having OPE and in OPE in absolute values in 2020 compared to 2018. Households with *social security* and low-income quintiles had the greatest increases in the probability of having OPE (16.1 and 15.8%, respectively). In absolute terms, the largest OPE increases were observed in households with




* Own estimations using data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), 2018-2020.
Marginal effects of a probit model, adjusted for household head sex, age, health insurance affiliation (for nationally and income quintile estimations) household size, household composition, education of the head of household, quintiles of household income (for nationally and health insurance estimations) and place of residence.
SP/Insabi: *Seguro Popular/Instituto de Salud para el Bienestar*; HI: health insurance

**Figure 2. Changes in the probability of having out-of-pocket expenditures in 2020 compared to 2018 nationally, by health insurance and income quintile. Mexico, ENIGH 2018-2020***




* Own estimations using data from the *Encuesta Nacional de Ingresos y Gastos de los Hogares* (ENIGH), 2018-2020.
Marginal effects of a two-part model, adjusted for household head sex, age, health insurance affiliation (for nationally and income quintile estimations) household size, household composition, education of the head of household, quintiles of household income (for nationally and health insurance estimations) and place of residence.
SP/Insabi: *Seguro Popular/Instituto de Salud para el Bienestar*; HI: health insurance

**Figure 3. Changes in out-of-pocket expenditures in 2020 compared to 2018 at the national and by health insurance affiliation and income quintile. Mexico, ENIGH 2018-2020***

social security and in the high– and very high-income households with values of 22.2, 23.4 and 30.4 USD, respectively. In relative terms, the largest changes were observed in the high (53.1%) and middle-income (45.9%) households and in the *other health insurance* group (45.3%). Households with *no health insurance* and *SP/Insabi* had the lowest increases in OPE (in absolute and relative terms).

OPE per disposable income showed increases for all health insurance and income groups but higher among the population with no health insurance and very low-income households. Removing the potential effect of Covid-19 on income, we showed that the *no health insurance* group would had the lowest OPE per disposable income, as expected, because their income decreased significantly more (-32.1%) than their OPE in monetary values (+5.9%) between 2018 and 2020. Very low-income households had already higher OPE per disposable income before 2020.

Our results are consistent with previous studies showing that Covid-19 was associated with increases in OPE. A recent study that evaluated OPE by type of social security in a representative sample of older Mexican adults show that, in 2021, older adults with a formal affiliation to a health institution reported the highest OPE compared to those without affiliation.[23] Their findings are similar to our results showing that households in the social security group reported the largest increase in OPE in absolute terms. A study published by Haakenstad and colleagues shows that between 2018 and 2020 OPE had a relative increase of 42% in Mexican households, in the population with health insurance the increase was 46.9%, while among those without health insurance there was an increase of 21%.[9] The study published by Rodriguez-Aguilar and colleagues shows that 67.7% of Mexican households had OPE in 2020 (similar to what we reported at 67.3%). This study also showed that between 2018 and 2020 the proportion of households with catastrophic health expenditures increased from 2.2 to 4.0%. We estimated that catastrophic spending rose from 2.2 to 3.7% during the same period (data not shown).[8] Similar to our study, research in Peru revealed that the OPE increased during the Covid-19 contingency and that the effect was not different by type of health insurance.[24]

In contrast, a study from Mexico by Serván-Mori and colleagues[10] shows very different findings compared to our study and those described above for Mexico. Their study shows that for households with OPE greater than zero, there was a reduction in OPE overall and by health insurance, except for an increase of 2.7% for the population without social security. In our study, if we considered only households with OPE >0 (data not shown), we observe the opposite, increases in OPE overall and by affiliation, except for a -14.8% reduction among households without health insurance. Their results are also inconsistent with official data showing an increase in OPE between 2018 and 2020.[25] In addition, this study found increases in catastrophic health expenditures, impoverishing health expenditures and excessive health expenditures only among households without health insurance and attributes these findings to the removal of the SP. The limitation of their study is, not only the opposite findings in unadjusted figures for OPE, but that all outcomes have income or expenditures as denominators. As shown in our study, income and expenditures decreased in 2020 at the national level by health insurance and income groups but the largest reductions were for the non-health insurance group.

Our results suggest that changes in OPE in 2020 were associated with Covid-19 and not with the elimination of the SP. Our findings revealed that the highest increases in OPE (in relative and absolute changes) were seen in households with *social security* and that, in contrast, the lowest OPE increases were observed among households with no insurance (those with no insurance in 2020 could include households that had SP before) and *SP/Insabi* (those with SP that reported having Insabi in 2020).

Our study has some limitations. First, given the cross-sectional design of the ENIGH, we cannot claim causality. In addition, the 2020 ENIGH round was the only one exposed to the effect of Covid-19 so we could not adapt a study design such as interrupted time series analyses that would allow us to estimate and compare OPE trends before and after. However, descriptive analyses show that OPE in 2020 was significantly higher than in previous rounds. We also acknowledge that OPE per disposable income is biased as income decreased in 2020, mostly associated with Covid-19.[19]

## Conclusion

Despite the limitations, our study shows that in 2020 there was an overall increase in absolute and relative OPE for all health insurance and income categories, but higher among households with *social security*, *other health insurance* and high-income households. Although households with *no health insurance* had lowest OPE increases in 2020, OPE represented the highest proportion per disposable income because they experienced the largest reduction in household income in 2020. The lowest income households had also the smallest increases in OPE but the highest increases per disposable income, similar to the no health insurance group. However, the lowest income households had already the highest proportion of OPE per disposable income before 2020. Social safety

nets, including access to health care services, for the uninsured and lower income households are crucial.

*Declaration of conflict of interests*. The authors declare that they have no conflict of interests.

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