EAI Endorsed Transactions
on Pervasive Health
Research Article EAI.EU

Out of pocket and catastrophic health spending in Mexico in the face of the COVID-19 pandemic

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Abstract

INTRODUCTION: The measurement of the financial coverage of a health system uses key indicators such as household out-of-pocket spending as well as catastrophic health spending. Said indicators depend on the financing structure of the health system as well as quality criteria and efficiency of the system in patient care. In the case of Mexico, in recent years there have been important changes in the structure of the health system in addition to suffering from the COVID-19 pandemic events that have significantly impacted the access to health of patients. Therefore, it is relevant to quantify the impact of these events on out-of-pocket spending and catastrophic spending on health in Mexico and have a robust diagnosis of the financial coverage of the system public health in Mexico.
OBJECTIVES: The main objective of this study is to quantify out-of-pocket spending and catastrophic spending on health in Mexican households for the year 2020. Comparing these estimates with previous years given the recent changes in the Mexican health system as well as the effect of the COVID-19 pandemic in these indicators.
METHODS: Based on the information available in the 2020 National Household Income and Expenditure Survey (ENIGH), out-of-pocket and catastrophic spending on health were estimated following the methodology proposed by the World Health Organization. A quantile regression was estimated to assess the effect of income distribution on out-of-pocket spending.
RESULTS: In Mexico in 2020, 67.7% (24.2 million) of households had an out-of-pocket health expenditure (OOHE) and 6% of these households had a catastrophic health expenditure (CHE), with respect to all households this percentage represents 4.04%. According to the classification stipulated by the World Health Organization, healthcare has six expenditure components: orthopedics, medicines, maternity, hospital, alternative medicines, and ambulatory expenses. The three main expenditure was attributable to drugs (39.9%), ambulatory (25.3%), and hospital costs (20.3%).
CONCLUSION: The effect of recent modifications to the public health system in Mexico in addition to the COVID-19 pandemic has been reflected in an increase in the percentage of households with out-of-pocket spending in Mexico, as well as the percentage of households with catastrophic spending in health. The main expense item is made in medicines, ambulatory care follow-up and hospitalization. It is a priority to establish efficient financial protection schemes that allow reversing this situation in terms of efficient access to health in Mexico.

Keywords: Financial coverage in health, out of pocket expense, catastrophic spending, quantile regression, COVID-19, Mexico

Received on 18 July 2023, accepted on 28 August 2023, published on 05 September 2023

doi: 10.4108/eetpht.9.3583

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1. Introduction

The reforms made to the Mexican Health System configured a fragmented system, which has led to differentiated financing and distribution through various sources, distinguishing between the population without and with social security. This system financing configuration maintains for both segments of the population a financing component funded through household out-of-pocket spending and in the worst case this spending implies catastrophic health spending defined as spending that compromises income available at home [1, 2]. In recent years there have been several modifications in the coverage for people without social security, who until 2018 were covered by Seguro Popular as part of the National Commission for Social Protection in Health (CNPSS by its acronym in Spanish), said institution formally disappeared in October 2019 and would be replaced by the National Institute of Health for Well-being (INSABI for its acronym in Spanish) which would take office as of January 1, 2020 [3]. However, on May 29, 2023, the decree was published by which INSABI disappears, and its functions are integrated into the so-called Health Services of the Mexican Institute of Social Security for Well-being (IMSS-Bienestar, by its acronym in Spanish) [4]. Which is transformed from a decentralized program of the Federal Ministry of Health in a decentralized public body with a creation date of August 31, 2022, initiating a process of federalization of health services through coordination agreements with the federal entities.

Due to the nature of out-of-pocket spending, it can lead a household to incur catastrophic expenses for health reasons, generating losses in social welfare. A household with catastrophic health expenses is defined as 30% or more of its disposable income or ability to pay for health care. Disposable income is defined as the remainder of total household spending after deducting its basic subsistence needs, measured through spending on food [5]. According to data from the OECD, Mexico in 2021 presented a significant lag in financial coverage indicators compared to the average of the OECD countries. Among the relevant indicators, per capita spending on health of 1138 USD PPP is mentioned (OECD average 3994 USD PPP) and out-of-pocket spending on health, which was 41% (OECD average 21%) [6].

In addition to the financial protection indicators, it is worth noting data related to the COVID-19 pandemic in Mexico, as of November 1, 2021, more than 3.8 million COVID-19 infections and nearly 290,000 deaths were registered. Low testing rates are considered to hide the full impact of the pandemic. About 8% of the detected cases of COVID-19 and 2% of all deaths occurred among health workers. Less than 47% of Mexicans had been vaccinated against COVID 19 compared to the OECD average of 65%, Mexico had the third-lowest vaccination rate against COVID-19 across 37 OECD countries. The pandemic caused health spending as a percentage of GDP to rise sharply, from 5.4% in 2019 to 6.2% in 2020 (compared to an average increase of 0.9 percentage points on average across the OECD). All-cause mortality in 2020 and the first six months of 2021 increased 54.8% compared to the 2015-2019 average. With COVID-19, Mexico experienced the highest excess mortality in the OECD and significant disruptions in other care (Fig. 1) [6].

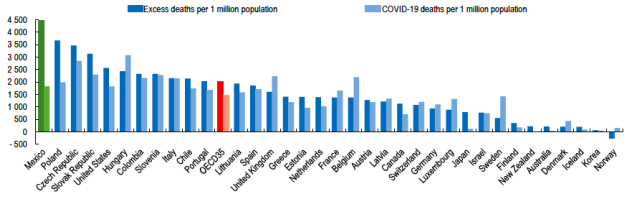

Figure 1. Cumulative excess mortality compared to reported COVID-19 deaths per million population, January 2020 to June 2021 [6].

In this context, this paper analyses the evolution of out-of-pocket spending and the percentage of households with catastrophic health spending in Mexico for the latest available data from the 2020 National Household Income and Expenditure Survey (ENIGH) in a context of constant change in the public Health System and in the face of a COVID-19 pandemic that has a significant impact throughout the world. The factors that influence household out-of-pocket spending are analysed by applying a regression by quantiles and it is identified whether differentiated effects by income level as determinants of out-of-pocket spending in households. The work is structured as follows. The following section briefly addresses the methodology used to calculate out-of-pocket and catastrophic spending using the ENIGH, and the quantile regression method is discussed. The third section presents the main results of the study, and the last section presents the conclusions and recommendations.

2. Literature Review

Catastrophic costs are primarily defined as a cost that is equal to or greater than 20% of a person's annual income [7]. The Covid-19 pandemic has been a relevant factor in increasing out-of-pocket spending and catastrophic costs in many developing countries. The socioeconomic impact of the pandemic in these countries has caused a substantial increase in poverty.

As a reference, the World Bank stated that approximately 97 million people have fallen into poverty as a result of the impacts of the pandemic [8].

In [9] it is mentioned that even people with social health insurance suffered out-of-pocket expenses for various items (transportation, work permits, purchase of items to prevent infections). For people with constant treatment and

who cannot go to health centers, out-of-pocket expenses during the pandemic also consider the inherent costs of their companions. Sometimes many people prefer to self-medicate to avoid facing such expenses [10].

In [11], the authors show that another expense factor has to do with the shortage of medicines and the saturation of primary diagnostic equipment for COVID-19. For developing countries, government spending on health is a very low percentage of Gross Domestic Product (GDP). These countries, such as Mexico, are characterized by low public spending on health and high out-of-pocket spending. For this reason, new strategies for the financial protection of the population should be promoted before these adversities [12]. For reference, in [13, 14] the authors clearly document the catastrophic cost increase due to the global pandemic.

According to [15], in the Mexican case, the government programmed spending on Health for 2020 equivalent to 2.95% of its Gross Domestic Product. Expenditure in the sector for 2021 was equivalent to 2.66%; for 2022 it was 2.93% and in 2023 it reached 2.80%.

Due to the aforementioned, many countries have the need to generate information on out-of-pocket expenditure and catastrophic health expenditures (CHE) due to COVID-19. In this context, we carried out this study to estimate the costs for Mexico. Information collected in official databases was analyzed, which allowed trends to be projected.

3. Materials and methods

3.1. Estimating out-of-pocket and catastrophic spending on health

Out-of-pocket spending and catastrophic health spending were estimated based on ENIGH 2020 data [16]. Household out-of-pocket spending was considered according to the WHO definition, where out-of-pocket spending is those outlays made by the home for care: a) maternity, b) outpatient, c) hospital and d) medicines. To determine the percentage of HGCS, the methodology defined by the Ministry of Health based on criteria defined by the World Health Organization (WHO) in 2005 [17, 18] is used. In addition to the ENIGH, among the inputs for the estimation of the indicator are the definition of total current income and expenditure of the National Institute of Geography and Statistics, and the food poverty line defined by the National Council for the Evaluation of Social Policy in the respective years [19]. The ENIGH contains information on houses and households, their income and expenses, socio-demographic characteristics, and labour aspects.

Households with catastrophic health expenses. (hgc_i): A household is considered to incur catastrophic expenses for health reasons when the household's health expenses represent 30% or more of its ability to pay. Households with catastrophic spending are identified according to the income quintile defined according to the level of total net income, see equation 1.

$$hgc_{Qi} = \{0,\ cfh_i < 30\%\ 1,\ cfh_i \geq 30\% \qquad (1)$$

Where:

hgc_{Qi}: Households with catastrophic spending by income quintile

cfh_i: Financial capacity of households

3.1. Quantile regression

Quantile regressions have wide application in models where we work with a large amount of cross-sectional data, with the presence of outliers and data that frequently do not meet the homoscedasticity assumption, as well as changes identified in the sample structure. Quantile regression was developed by [20]. One way to express quantiles in the context of quantile regression estimation is through the equation 2.

$$y_i = X_i\beta_\theta + u_{\theta i} \qquad (2)$$

Where y_i is the dependent variable, X_i represents the matrix of the independent variables, β_θ is the parameter corresponding to the θ quartile, and $u_{\theta i}$ is the random disturbance corresponding to the θ quantile. As many regression lines are estimated as quantiles are considered. In the presence of extreme values or high variability, quantile regression is a more robust alternative, since it allows the creation of different regression lines for different quantiles of the dependent variable.

A set of variables related to out-of-pocket spending were selected for the estimation of the quantile regression. Table 1 presents the selected variables and their description.

Table 1. Variables considered in quantile regression

Variable	Description
Out-of-pocket health expenditure (Oop)	Amount of out-of-pocket
Total net income (Nti)	Monetary and non-monetary income
Affiliation (Afl)	Households that have health coverage
Chronic disease (Chr)	A household with spent health care for diabetes or high blood pressure
Rural (Rur)	Rural conditions
Female head of household (Fhh)	Female head of household
Upper secondary School (Ued)	Upper secondary school by the head of the household
Age of the head of the household (Ahh)	Age of the head of the household
Total members in the household (Tom)	Total members in the household

The specification of the model was as follows:

$$log\ (Oop_i) = \beta_0 + log\ (Nti_i)\beta_{1,\theta} + Afl_i\beta_{2,\theta} + Chr_i\beta_{3,\theta} + Rur_i\beta_{4,\theta} + Fhh_i\beta_{5,\theta} + Ued_i\beta_{6,\theta} + log\ (Ahh_i)\beta_{7,\theta} + log\ (Tom_i)\beta_{8,\theta} + u_{i,\theta} \quad (3)$$

$$\forall i \in \{1, \dots, n\}\ and\ \theta\epsilon(0,1)$$

4. Results

4.1. Out-of-pocket health spending estimates

Household out-of-pocket spending was broken down into expenditures made by the household for medical care in the following categories:

(i) maternity
(ii) ambulatory
(iii) hospital
(iv) medications
(v) orthopedics
(vi) alternative medicines

In Mexico in 2020, 24.2 million households had a household out-of-pocket health expenditure. The OOHE had an average of 395.8 Mexican pesos per family and the total amount expended was 169,739 million pesos. The out-of-pocket spending of Mexican households in 2020 represented a real increase of 46% compared to the data observed in 2018. Figure 1 presents the percentage of the total amount expended in 2018 and 2020 by component. Medicines represent the highest percentage of expenditure followed by ambulatory and hospital spending. However, the percentage expended in 2020 on the component of the medicine was bigger in comparison with 2018, and the rest were smaller.

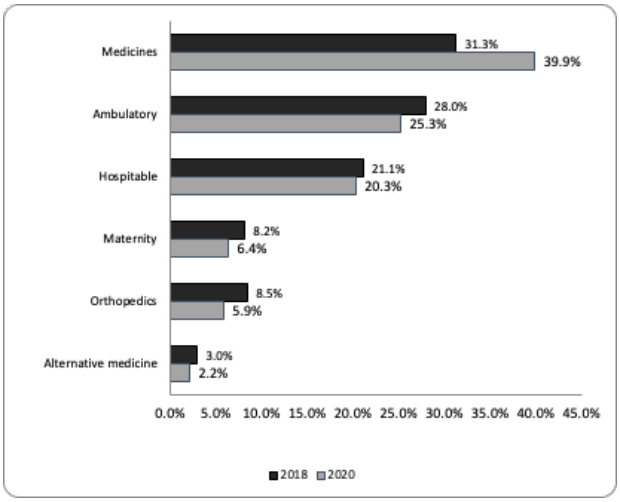

Figure 2. Distribution of out-of-pocket expenditure by component, 2018-2020.

Table 2 shows the distribution of out-of-pocket spending on health by household income quintile. The number of households in each quintile is shown, as well as the average value of out-of-pocket spending plus the standard deviation, which, when dealing with spending items, presents a high variability, especially in the highest income quintiles. For example, in quintile 5, a household can spend up to 162,000 pesos on health care.

Table 2. Out-of-pocket health expenditure per quintile

Quantile	Observations	Mean	Range
Q1	4,737,476	22.18	41.85
Q2	4,856,837	74.51	71.51
Q3	4,888,749	170.55	131.20
Q4	4,889,961	388.55	354.53
Q5	4,842,994	2260.75	162876.90

4.2. Quantile regression

A regression by quantiles was estimated to analyse the effect on household out-of-pocket spending on health in Mexico of a set of selected variables. Table 3 shows the descriptive statistics of the variables selected as factors related to the amount of household out-of-pocket spending. The only variables that increase by quantile are the presence of chronic diseases and the education of the head

of the household. The rest of the variables remain similar between quantiles. In the case of income, its standard deviation was greater than the average, and the reason was because contributions in donations were subtracted from monetary income.

Table 3. Description of variables included in quantile regression

Variable	Q1	Q2	Q3	Q4	Q5
Nti (mean)	9449	11876	13241	16034	20991
Afl (Yes,%)	68.3	71.4	71	71	74
Chr (Yes,ı%)	1.2	3.64	6.1	8.4	13
Rural (Yes,%)	26.32	20.27	20.32	20.57	19
Fhh (Yes,%)	30	31	30.2	30	30
Ued (Yes, %)	28.2	32.5	34.2	38.3	42.2
Ahh(mean)	50	50.3	50.6	51.7	54.2
Tom (mean)	3.4	3.6	3.7	3.8	3.8

The effect of the income and the set of variables on the household out of pocket was estimated by quantile regression. Figure 2 presents the coefficients' results considering a 95% of confidence interval.

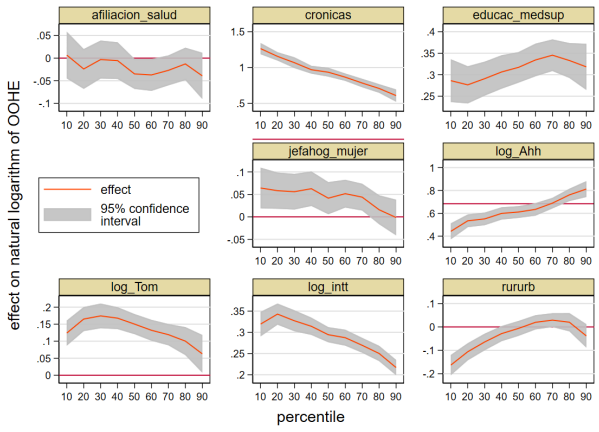

Figure 3. Coefficients and 95% confidence intervals of quantile regression. (See Appendix A).

The logarithm of the income, the presence of chronic diseases in the household members, the upper secondary school of the head of the household, the logarithm of the total number of members in the household, and the logarithm of the age of the head of the household were significant in all quantiles. In the first two and the fourth variables, the magnitude decreased as the quantile increased. It is observed an inverse effect in the third and fifth variables. The rural conditions of the household and the female head of household had a positive impact on out-of-pocket spending on health in the first quantiles; affiliation status had no impact across quantiles.

For those variables where the confidence intervals may overlap, we perform hypothesis tests between the 80% and 20% quantile of the parameters. Table 4 shows that differences persist in rural conditions, female head of household, and upper secondary education by head of household.

Table 4. Comparison of quantile parameters 20 and 80

Variable	Coefficient (95% IC)
Affiliation	0.01 [-0.04:0.06]
Rural conditions in the household	0.13*** [0.08:0.17]
Female head of household	-0.04* [-0.9:0]
Upper secondary school by the head of the household	0.06** [0.01:0.1]
Total members in the household	-0.06 [-0.11:-0.02]

***p<0.01; **p<0.05; *p<0.1

4.3. Catastrophic health spending

Estimates of the indicator of catastrophic health spending show an incidence of 4.04% of all households in 2020, an increase of 85% compared to 2018, which represents an increase of 684,060 more households that incurred catastrophic spending. The historical behaviour of catastrophic spending showed a stable trend until 2018 when the trend was reversed (Fig. 3).

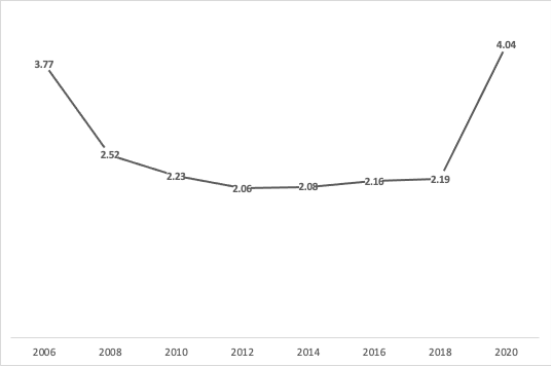

Figure 4. Percentage of households with catastrophic health spending, 2006-2020.

Considering the percentage of households that presented out-of-pocket expenses and of these how many incurred in catastrophic expenses, the proportion is 6.07%. When analysing this indicator by state, it is observed that states such as Hidalgo and Chiapas presented percentages of 9.0% and 9.6%, respectively. And the states with the lowest percentage are Baja California Sur and Quintana Roo with 3.4% each.

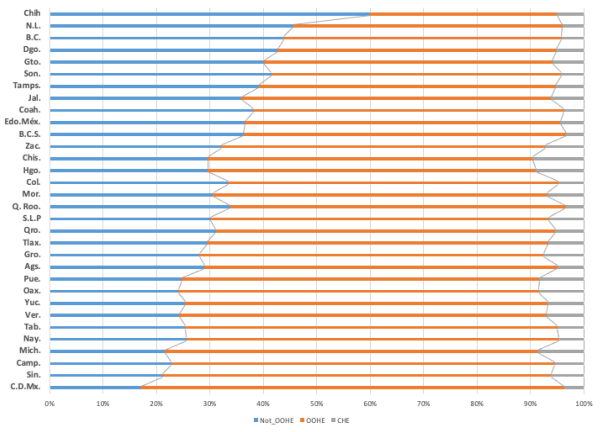

Figure 5. Distribution of percentage of households with out-of-pocket and catastrophic health expenses in Mexico by state, 2020. (See Appendix B).

It is observed that the state of Chihuahua has the highest proportion of households with out-of-pocket spending on health in Mexico and Mexico City is the state with the lowest percentage (See Appendix B).

5. Conclusions

The structure of the Mexican public health system is made up of a differentiated financing scheme according to the individual's affiliation. Both financing and service schemes are differentiated by institution. The main public health institutions in Mexico are ISSSTE (state workers), IMSS (private sector workers) and currently IMSS-Bienestar (population without social security).

The different reforms of the Mexican health system have sought to grant financial protection to the Mexican population, seeking to reduce out-of-pocket spending and catastrophic spending on health. As a result of the implementation of Seguro Popular in 2008, a downward trend is observed in household out-of-pocket spending and catastrophic spending. However, in 2020 it is observed that both indicators have increased significantly, which is attributable to the effect of the COVID-19 pandemic in addition to structural changes in the public health system.

The results of the ENIGH 2020 show that 67.7% of households had out-of-pocket spending on health, representing a total amount in Mexico of 169,703.9 million pesos, which represents a real increase of 46% compared to 2018. The most representative expenditures are medicines, ambulatory care, and hospital care. The factors related to out-of-pocket spending analysed using quantile regression show that there are significant differences in out-of-pocket health spending between quintiles. The main differences are attributed to the net income of the household, the presence of household members with chronic diseases, the rural environment of the household, the age of the head of the household and the total number of household members.

Catastrophic spending, for its part, shows an increase compared to the last measurement, presenting an incidence of 4.04% of households with catastrophic spending of all households (1,444,363 households). If we consider the percentage of households with catastrophic expenses out of the total number of households that presented out-of-pocket expenses, this proportion increases to 6% of households. The states most affected by the incidence of catastrophic spending were Chiapas with 6.8% and Hidalgo with 6.3% of households.

Considering the evidence shown regarding the differentials in both indicators between quantiles, it is necessary to propose programs and strategies focused on the most unprotected segment of the population. Because the incidence of out-of-pocket and catastrophic spending in each quantile is attributed to differentiated factors. It is necessary to rethink the financial structure of the Mexican health system considering criteria of equity and sustainability. Achieve universal coverage is a long-term objective that will depend to on the solid foundations of a consistent and sustainable financing scheme.

Appendix A. Estimations of quantile regression

	log_Oop	Coef.	Bootstrap Std. Err.	t	P>t	[95% Conf.	Interval]
q20	log_intt	0.34295	0.013302	25.78	0.000	0.316878	0.369022
	afiliacion_salud	-0.023978	0.0207644	-1.15	0.248	-0.064676	0.01672
	cronicas	1.156222	0.0339761	34.03	0.000	1.089629	1.222815
	rururb	-0.106055	0.0225605	-4.7	0.000	-0.150273	-0.061836
	jefahog_mujer	0.058262	0.0212898	2.74	0.006	0.016533	0.09999
	educac_medsup	0.276484	0.023237	11.9	0.000	0.230939	0.322029
	log_Ahh	0.534007	0.0288481	18.51	0.000	0.477465	0.590549
	log_Tom	0.165039	0.0184941	8.92	0.000	0.12879	0.201287
	_cons	-1.6751	0.177851	-9.42	0.000	-2.02368	-1.32651
q40	log_intt	0.314212	0.0110267	28.5	0.000	0.2926	0.335824
	afiliacion_salud	-0.00551	0.0204899	-0.27	0.788	-0.04567	0.034649
	cronicas	0.969842	0.0282771	34.3	0.000	0.914419	1.025265
	rururb	-0.02841	0.0199285	-1.43	0.154	-0.06747	0.010646
	jefahog_mujer	0.062626	0.0191967	3.26	0.001	0.025	0.100252

	educac_medsup	0.306452	0.0201941	15.18	0.000	0.266871	0.346032
	log_Ahh	0.59906	0.0234428	25.55	0.000	0.553112	0.645009
	log_Tom	0.167685	0.0169332	9.9	0.000	0.134496	0.200874
	_cons	-0.79821	0.1359174	-5.87	0.000	-1.06461	-0.53181
q60	log_intt	0.287352	0.0098178	29.27	0.000	0.268109	0.306595
	afiliacion_salud	-0.03715	0.0185535	-2	0.045	-0.07351	-0.00078
	cronicas	0.866056	0.0278942	31.05	0.000	0.811383	0.920729
	rururb	0.019765	0.017126	1.15	0.248	-0.0138	0.053332
	jefahog_mujer	0.051584	0.0162594	3.17	0.002	0.019715	0.083453
	educac_medsup	0.334354	0.0185624	18.01	0.000	0.297972	0.370737
	log_Ahh	0.634288	0.0240744	26.35	0.000	0.587102	0.681474
	log_Tom	0.132046	0.0153356	8.61	0.000	0.101988	0.162104
	_cons	0.100404	0.1313638	0.76	0.445	-0.15707	0.357878
q80	log_intt	0.250121	0.0099723	25.08	0.000	0.230575	0.269666
	afiliacion_salud	-0.012799	0.0178413	-0.72	0.473	-0.047768	0.02217
	cronicas	0.708626	0.0295567	23.98	0.000	0.650695	0.766558
	rururb	0.020251	0.0168895	1.2	0.231	-0.01285	0.053355
	jefahog_mujer	0.01584	0.0173257	0.91	0.361	-0.018119	0.049798
	educac_medsup	0.333072	0.0205007	16.25	0.000	0.292891	0.373254
	log_Ahh	0.761239	0.0269074	28.29	0.000	0.7085	0.813977
	log_Tom	0.100293	0.017212	5.83	0.000	0.066558	0.134029
	_cons	0.830271	0.1384237	6	0.000	0.55896	1.101582

Appendix B. Out-of-pocket and catastrophic spending by state, Mexico 2020

Federal entity	% Households with out-of-pocket expenses	% Households with catastrophic spending
C.D.Mx.	83%	3.1%
Sin.	79%	4.9%
Camp.	77%	4.3%
Mich.	78%	6.8%
Nay.	74%	3.5%
Tab.	75%	3.7%
Ver.	76%	5.4%
Yuc.	75%	5.1%
Oax.	76%	6.4%
Pue.	75%	6.3%
Ags.	71%	3.5%
Gro.	72%	5.5%
Tlax.	70%	4.8%
Qro.	69%	3.7%
S.L.P	70%	4.6%
Q. Roo.	66%	2.3%
Mor.	69%	4.8%
Col.	67%	3.2%
Hgo.	70%	6.3%
Chis.	70%	6.8%
Zac.	68%	5.0%
B.C.S.	64%	2.1%
Edo.Méx.	63%	2.8%
Coah.	62%	2.3%
Jal.	64%	3.9%
Tamps.	61%	3.2%
Son.	59%	2.5%
Gto.	60%	3.6%
Dgo.	57%	3.0%
B.C.	56%	2.4%
N.L.	54%	2.2%
Chih	40%	2.0%

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