HEALTH-RELATED OUT-OF-POCKET EXPENSES IN OLDER PERUVIAN ADULTS: ANALYSIS OF THE NATIONAL HOUSEHOLD SURVEY ON LIVING CONDITIONS AND POVERTY 2017

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ABSTRACT

Objectives. To estimate out-of-pocket expense on health (OOP) and identify its associated factors in Peruvian older adults. ***Materials and Methods.*** An analytical cross-sectional study of the National Household Survey on Living Conditions and Poverty (ENAHO) 2017. Older adults were all individuals aged 60; over and OOP was considered the main study variable. Prevalence ratios (PR) and adjusted prevalence ratios (PRa) were estimated for each of the associated factors.. OOP means were estimated using a generalized linear model with gamma distribution and log binding function. All confidence intervals (95% CI) of the estimators were calculated by bootstrapping with the normal-based method. ***Results.*** A total of 18,386 older adults were included, of which 56.5% reported OOP. Mean and median OOP is S/ 140.8 (USD 43.2) and S/ 34.5 (USD 10.6), respectively. Factors such as urban origin, a higher level of education, history of chronic diseases and higher per capita expenses increase the probability of OOP by up to 1.6 times. In those affiliated with Integral Health Insurance (SIS), OOP is reduced by 63.0 soles (USD 19.3) compared to those without any health insurance. ***Conclusions.*** Six out of ten older Peruvian adults reported OOP to attend health needs. This generates an inequitable access in terms of health services, mainly for socially-vulnerable groups. We suggest researching the economic impact of health insurance and the preventive-promotional approach to chronic diseases, in order to reduce OOP and improve the efficiency in Peruvian health system.

Keywords: Medical economics; Health survey; Health Services; Older adult; Peru (source: MeSH NLM).

INTRODUCTION

Out-of-pocket expenses on health (OOP) are defined as any direct payment made by individuals who use health services and whose payments are not financed by the State or by health insurances [1]. OOP can be part of fees and co-payments to generate income, rationalize the use of health services, restrain costs, reflect gaps in the coverage of the health system, improve the efficiency of the health system and the quality of the service [1]. OOP can discourage utilization and become a barrier to access health services, as well as exposing the risk of impoverishment due to health care costs, especially in lower and middle income countries (LMIC). According to the World Health Organization (WHO), OOP have doubled in Latin America, from USD 55.2 million in 2000 to 122.5 million in 2015 [2]. Given the accelerated growth of older adult population, attention has been paid to the analysis of OOP due to the financial risk of this population given the increased use of health services and high prevalence of chronic noncommunicable diseases (NCDs) [3,4]. Thus, health systems face great challenges to achieve equity in financing and protection from the financial risk of the most vulnerable elderly population.

Some variables are associated with OOP, such as gender, age, area of residence, educational level, income, comorbidities of NCDs , and health insurance [5-12]. Older adults with lower incomes have a higher proportion of OOP in relation to their income, a lower educational level is associated with higher OOP, the lack of health insurance coverage and female elderly people

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have higher OOP due to their lower income and lower labor participation rate [13]. Similarly, the presence of 3 or more NCDs can increase the annual OOP by 10 times due to the purchase of medicines [3]. Unlike younger people, older adults face a reduction in their productive potential, multimorbidity, and polypharmacy, which could incur a higher OOP and subsequent impoverishment due to health expenses.

In Peru, the last two censuses show that population aged 60 and over increased from 9.1% in 2007 to 11.9% in 2017. Likewise, the number of dependent elderly people increased from 15.1 to 19.3 per-100 people of working age [14]. Given the limited information about OOP in elderly Peruvians and considering the context of demographic aging, the epidemiological transition, and possible difficulties in accessing health services, it is relevant to study the magnitude of OOP due to the negative impact on the economy of the older Peruvians.

In this sense, the present study aims to estimate the OOP and identify its associated factors in Peruvian older adults.

KEY MESSAGES

Motivation to carry out the study: Given the accelerated growth of the older adult population, health systems face great challenges to achieve equity in protecting against the financial risk of the most vulnerable.

Main findings: Older adults in Peru pay out-of-pocket to take care of their health, mainly those with less education, lower per capita spending, or who suffer from chronic diseases.

Implications: It remains to investigate the economic impact of health insurance and the preventive-promotional approach to chronic diseases in order to reduce out-of-pocket health expenses and improve the efficiency of the Peruvian health system.

METHODS

DESIGN AND POPULATION

An analytical cross-sectional study was carried out using a subsample of the National Household Survey on Living Conditions and Poverty (ENAHO) 2017 collected by the National Institute of Statistics and Informatics of Peru (INEI). The subsample consisted of people aged 60 and over as defined by Law 30490, Law on the Elderly [15]. The ENAHO is an annual cross-sectional survey that uses a probabilistic sampling of areas, stratified, multistage and independent with representativeness at the national, departmental, natural and urban/rural levels. The survey collects information about the living conditions of the Peruvian population. The study population of the ENAHO is defined as the set of all private dwellings and their occupants residing in the urban and rural areas of the country. The databases of the ENAHO are freely available and can be obtained from the INEI web portal (http://iinei.inei.gob.pe/microdata).

VARIABLES AND OUTCOMES

The main study variable considered was OOP during 2017. The variable was constructed by adding the payments disbursed (in current soles) by the elderly or a member of their household, for the following health services, identified by their codes in the survey: medical consultation (p41601), medications (p41602), analyses (p41603), X-rays (p41604), other exams (p41605), dental and related services (p41606), ophthalmological service (p41607), purchase of lenses (p41608), vaccines (p41609), other expenses (p41612), and hospitalization (p41613). The reference period for disbursed payments was four weeks for medical consultation, medication, analysis, X-rays and exams; three months for ophthalmological service, lens purchase, dental and related services, vaccines and other expenses; and one year for hospitalization.

The following variables along with their codes in the survey were included as factors that predispose to the use of the health system and therefore, higher probabilities of incurring in OOP, according to the theoretical model of Andersen and Newman [16]: gender (p207), age (p208a), marital status (p209), area of residence, educational level (p301a), type of health insurance (p4191, p4192, p4194, p4195), geographic domain, suffering from a chronic disease (p401), suffering from some physical or psychological limitation (p401h1 to p401h6) and quintiles of monthly household spending per capita.

Ages were grouped in decades, and area of residence was considered rural if the sample stratum had less than 401 dwellings, or the house belonged to the rural census; otherwise, the area of urban residence was categorized. The variable affiliation to a type of health insurance included the categories “Without insurance”, “Health of the Armed Forces and National Police (FF.AA.)”, “Integral Health Insurance (SIS)”, “Social Security (EsSalud)” and “Private or Healthcare Providers (EPS)”. In Peru, the health services of the FF.AA. provides health coverage to the military, police and their families; the SIS belongs to the public sector and subsidizes health services to the uninsured population that lives in conditions of poverty and extreme poverty; In the other hand, EsSalud corresponds to social security and provides health services to affiliated workers and their beneficiaries; and, finally, the private or EPS is related to private provision of health services [17].

Suffering of chronic illness or some physical or psychological limitation were obtained by self-report (Yes/No). To evaluate

suffering of some physical or psychological limitation, a dichotomous variable was created considering "Yes" when the older adult reported at least one limitation, and "No" in case they did not report any. Quintiles of household expenditure per capita per month were obtained by dividing the total gross annual expenditure of the household by 12 and then dividing it by the number of household members surveyed. Quintile of household spending per capita monthly is an ordinal variable that was included as an approximation of the level of wealth of the elderly and families.

STATISTICAL ANALYSIS

Integration of databases, processing and statistical analysis were carried out using Stata® v14.2 (Stata Corporation, College Station, Texas, USA), specifying complex survey design that included expansion factors according to age groups (factor07a) of the ENAHO, for which the *svy* command was used. For all statistical tests, a p-value <0.05 was considered as statistically significant.

Sociodemographic characteristics were described using absolute frequencies and weighted proportions. OOP were presented as median and interquartile range, given the non-normal distribution of the variable, and weighted means of OOP were estimated and compared for those older adults who had an OOP greater than zero. Weighted mean differences were obtained by regression of quintiles and differences in weighted means were evaluated by the Student's t-test or ANOVA in the case of variables with more than two categories, considering the expansion factors of the ENAHO.

To evaluate variables associated with the outcome, OOP was recoded into a dichotomous variable that takes values of one when older adults reported OOP and zero otherwise. Prevalence ratios (PR) were estimated using a bivariate analysis for each of the variables included in the study. Likewise, adjusted prevalence ratios (APR) were estimated for those factors that showed a p-value <0.20 in the bivariate analysis. All estimates were performed using a generalized linear model with *Poisson* distribution and log link function for complex samples [18].

To describe OOP expense levels, a generalized linear model with *gamma* distribution and log link function were estimated. This distribution was chosen because expense values are positively skewed by the presence of data close to zero [19]. The dependent variable OOP is numerical, measured in current soles. The estimations were made in a bivariate way with all those variables that were associated with the OOP. The resulting β coefficients were later analyzed by marginal predictors, in order to obtain interpretable results in current soles. To make international comparisons, current soles (S/) were converted into US dollars (USD). The average exchange rate (S/ per USD) used for the 2017 period was 3.26 [20].

All confidence intervals (IC 95%) of the estimators were calculated by *bootstrapping* with the normal-based method, including the weights and the complex survey design, to correct for residues potentially distributed in a different way from what the model assumed. *Bootstrapping* was carried out with 1000 replications, as recommended in health economics [21].

ETHICAL CONSIDERATIONS

This study did not require the approval of an ethics committee because it is an analysis of secondary data that are in the public domain, and do not identify the individuals surveyed.

RESULTS

A total of 18,386 older adults (expanded population 3´355,037) were included, after excluding observations for not meeting selection criteria or having missing data (Figure 1). The majority of respondents were female (52.5%), between ages 60 and 69 (54.8%), married or living with someone (60.0%), four out of five lived in the urban area (79.4%) and close to had primary education (42.7%). Approximately one fifth lack health insurance (18.3%), while 41.6% indicated being affiliated with the SIS and 36.8% with EsSalud insurance. The majority of older adults reported suffering from a chronic disease (75.8%) and 14.5% from some physical or psychological limitation (Table 1).

Overall, 9842 (56.5%) reported OOP. The highest proportion of older adults who reported OOP ocurred in those affiliated with private insurance or health providers (EPS) (71.0%) and those located in the richest quintile of expenditure per capita (68.0%) (Table 1).

Mean and median OOP were 140.8 (USD 43.2) and 34.5 soles (USD 10.6) respectively. Differences in the level of OOP according to variables that predispose to OOP were found, with the exception of gender and suffering from some physical or psychological limitation. The highest level of OOP was reported by older adults in the richest quintile per capita expenditure (293.3 soles equivalent to USD 90.0), who were affiliated with private insurance or EPS (249.9 soles; USD 76.6), and those with higher education (247.9 soles; USD 76.0). It was also reported that the highest levels of OOP occur in Metropolitan Lima (183.5 soles; USD 56.3) followed by the rest of the coast (131.5 soles; USD 40.3). On the other hand, those who report a lower level of OOP were older adults in the first and second quintiles of expenditure per capita (35.7

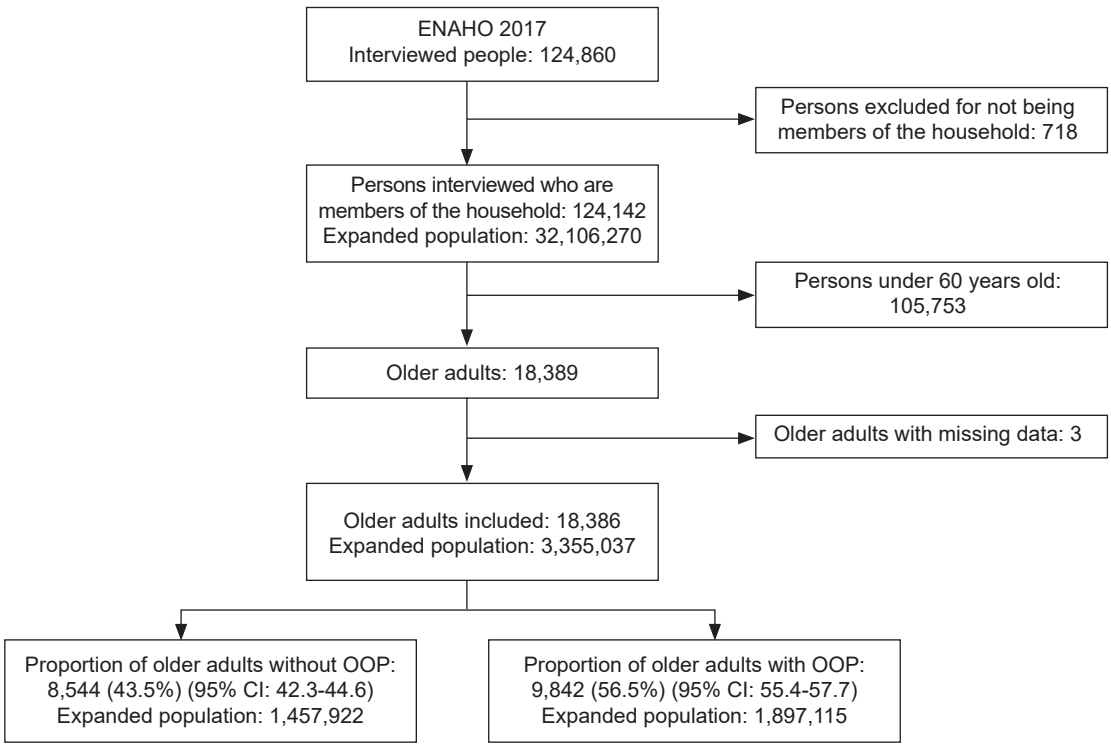

Figure 1. Flowchart of participants' selection.

ENAHO: National Household Survey on Living Conditions and Poverty
OOP: out-of-pocket expenditure on health

and 59.0 soles respectively or USD 11.0 and USD 18.1, respectively), who had initial or no level of education (68.0 soles; USD 20.9) and those living in rural areas (70.5 soles; USD 21.6) (Table 2).

Table 3 reports variables associated with OOP and the estimates of the OOP average levels. In the model bivariate, all the variables were statistically significant, except for the factor suffering a physical or psychological limitation (p = 0.641). In the multivariate model, it was found that those with higher education (APR 1.09, 95% CI: 1.00-1.18) or those who suffer from a chronic disease (APR 1.44, 95% CI: 1.37-1, 52) were more likely to have OOP compared to those with less education or without a chronic disease. In addition, older adults in the highest quintile of expenditure per capita were approximately 1.63 times more likely to have OOP compared to of the lowest quintile per capita expenditure.

Regarding the average levels of OOP, it was found that older adults with higher education had an average OOP of 180.0 soles (USD 55.2) higher than those who have primary levels of education or who have not had any at all (Table 3). Older adults suffering from chronic diseases spend approximately 33.0 soles more (USD 10.1) compared with those who do not suffer from chronic diseases. On the other hand, being affiliated with SIS reduces 63.0 soles (USD 19.3) compared to those without health insurance. Likewise, it was found that older adults of the highest quintile of expenditure per capita spend 257.6 soles (USD 79.0) had more in OOP than those in the lowest quintile (Table 3).

DISCUSSION

Our study on OOP shows that the proportion of Peruvian older adults who incur OOP in 2017 was 56.5% and that the average expense was 140.8 soles (USD 43.2). This average represents approximately 15.1% of the minimum wage [22], a third of the minimum pension in Peru [23] and 20.0% of the extreme poverty line [24]. Those who have greater proportions are those who are affiliated with a private insurance or EPS and those who are in the highest quintile of expenditure. Significant differences in the level of OOP between the domains were reported. It was also found that being of urban area, having a higher level of education, suffering from a chronic disease and being in the highest quintile of per capita expenditure increase the OOP.

In general, greater proportions of OOP are grouped into older adults with less social disadvantage. This segment of older adults has a higher risk of incurring in debt due to the higher proportions of OOP [25]. Instead, those who present lower proportions of OOP are socially vulnerable (older

Table 1. Characteristics of Peruvian elderly and reported of out-of-pocket expenses in health, ENAHO 2017.

Characteristics	Older adults surveyed (N=18,386)		OOP**	
	Absolute frequency	Weighted proportion*	n	Weighted proportion*
Gender				
Men	8.808	47.5	4.480	53.4
Women	9.578	52.5	5.362	59.4
Age group (years)				
60-69	9.371	54.8	5.022	56.8
70-79	5.771	28.5	3.142	57.9
80-89	2.720	14.0	1.394	52.9
≥90	524	2.7	284	55.8
Marital status				
Married	11.313	60.0	5.860	54.3
Single	887	5.9	448	55.6
Widowed, divorced or separated	6.186	34.1	3.534	60.7
Area of residence				
Urban	11.445	79.4	6.741	59.4
Rural	6.941	20.6	3.101	45.6
Education level				
No level or initial	3.698	15.8	1.668	48.4
Primary	8.449	42.7	4.446	56.0
Secondary	3.683	24.3	2.178	59.8
Tertiary	2.556	17.2	1.550	60.9
Type of health insurance				
No health insurance	3.098	18.3	1.745	58.8
FF.AA.	331	2.2	222	67.5
SIS	8.972	41.6	4.435	53.7
EsSalud	5.857	36.8	3.369	57.6
Private o EPS	128	1.1	71	71.0
Geographic domain				
Metropolitan Lima	2.456	36.0	1.493	60.8
Rest of the coast	5.740	24.2	3.314	58.4
Highlands	7.354	30.5	3.574	51.0
Jungle	2.836	9.3	1.461	53.2
Chronic disease				
Yes	14.021	75.8	8.127	61.3
No	4.365	24.2	1.715	41.5
Physical or psychological limitation				
Yes	2.997	14.5	8,255	56.6
No	15.389	85.5	1,587	56.0
Quintiles of monthly household spending per capita				
Quintil 1 (less)	5.069	20.0	1.953	41.0
Quintil 2	4.023	20.0	2.126	53.5
Quintil 3	3.317	20.0	1.929	59.6
Quintil 4	3.109	20.0	1.886	60.7
Quintil 5 (higher)	2.868	20.0	1.948	68.0

*Estimates included the expansion factor and sampling specifications of the ENAHO 2017
** Number and proportion weighted by each category of the included characteristics
ENAHO: National Household Survey on Living Conditions and Poverty
OOP: Out-of-pocket expenses on health
FF.AA.: Health Insurance of Armed Forces and National Police
SIS: Integral Health Insurance
EsSalud: Social Security
EPS: Health Service Providers

Table 2. Out-of-pocket expense on health in Peruvians elderly (current soles), ENAHO 2017.

Variables	Median (Q1-Q3)	p-value	Mean (95% CI)¶	p-value
Overall	34.5 (9.5-128.0)		140.8 (130.4-151.2)	
Gender				
Men	31.0 (9.0-120.0)	0.212	132.1 (118.6-145.5)	0.108*
Women	35.0 (10.0-145.0)		147.9 (133.2-162.5)	
Age group (years)				
60-69	30.0 (8.0-120.0)	<0.001	129.0 (116.9-141.0)	<0.001**
70-79	35.5 (10.0-132.0)		155.7 (134.8-176.6)	
80-89	50.0 (10.0-180.0)		147.5 (127.9-167.2)	
≥90	48.0 (12.0-108.0)		188.3 (75.2-301.5)	
Marital status				
Married	35.0 (9.0-130.0)	0.026	151.3 (136.7-165.9)	0.002**
Single	38.0 (8.5-140.0)		124.9 (90.0-159.8)	
Widowed, divorced or separated	30.0 (10.0-122.5)		126.7 (113.9-139.4)	
Area of residence				
Urban	40.0 (10.0-150.0)	<0.001	154.8 (142.8-166.8)	<0.001*
Rural	13.0 (5.0-50.0)		70.5 (60.4-80.7)	
Education level				
No level or initial	18.0 (5.0-70.0)	<0.001	68.0 (57.7-78.4)	<0.001**
Primary	25.0 (7.0-100.0)		108.5 (97.6-119.3)	
Secondary	42.0 (12.0-156.0)		155.0 (134.5-175.5)	
Tertiary	78.0 (20.0-242.0)		247.9 (210.5-285.3)	
Type of health insurance				
No health insurance	30.0 (9.0-130.0)	<0.001	143.6 (118.2-168.9)	<0.001**
FF.AA.	120.0 (30.0-225.0)		213.1 (158.3-267.9)	
SIS	20.0 (6.0-70.0)		80.8 (72.0-89.6)	
EsSalud	60.0 (15.0-200.0)		193.2 (172.5-213.9)	
Private o EPS	85.0 (30.0-300.0)		249.9 (140.4-359.5)	
Geographic domain				
Metropolitan Lima	60.0 (15.0-191.0)	<0.001	182.7 (159.8-205.7)	<0.001**
Rest of the coast	32.0 (10.0-121.5)		131.9 (117.5-146.2)	
Highlands	18.0 (6.0-78.0)		99.8 (87.5-112.0)	
Jungle	24.5 (6.0-80.0)		109.7 (87.6-131.8)	
Chronic disease				
Yes	40.0 (10.0-150.0)	<0.001	146.7 (135.7-157.7)	0.015*
No	19.3 (5.5-75.0)		113.3 (88.3-138.4)	
Physical or psychological limitation				
Yes	33.0 (9.0-125.0)	0.142	139.1 (127.7-150.5)	0.367*
No	40.0 (10.0-150.0)		150.7 (128.6-172.7)	
Quintiles of monthly household spending per capita				
Quintil 1 (less)	10.0 (4.2-30.0)	<0.001	35.7 (29.8-41.5)	<0.001**
Quintil 2	17.0 (5.5-55.0)		59.0 (52.2-65.7)	
Quintil 3	30.0 (10.0-100.0)		86.9 (77.5-96.3)	
Quintil 4	50.0 (15.0-180.0)		166.0 (142.9-189.0)	
Quintil 5 (higher)	120.0 (35.0-304.0)		293.3 (260.8-325.8)	

Estimates included the expansion factor and sampling specifications of the ENAHO 2017.
* Statistical significance obtained through the Student's t test
** Statistical significance obtained through the ANOVA test
¶ 95% CI calculated by bootstrapping with the normal-based method with 1000 replications
Q1-Q3: percentil 25 - percentil 75
ENAHO: National Household Survey on Living Conditions and Poverty
FF.AA.: Health Insurance of Armed Forces and National Police
SIS: Integral Health Insurance
EsSalud: Social Security
EPS: Health Service Providers
Exchange rate (S / per USD): 3.26

Table 3. Two-stage model for associated factors and levels of out-of-pocket expense on health in Peruvians elderly. ENAHO 2017.

	Factors associated with OOPs (Model 1)						Levels of OOPs (Model 2)					
Variables	**Unadjusted Model**			**Adjusted Model***			**Unadjusted Model**			**Marginal prediction of the unadjusted model**		
	PR	**(95% CI)¶**	**p-value**	**APR**	**(95% CI)¶**	**p-value**	**Beta**	**(95% CI)¶**	**p-value**	**Margin predictor¥**	**(95% CI)¶**	**p-value**
Gender												
Men	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Women	1.11	(1.07-1.15)	<0.001	1.07	(1.03-1.11)	0.001	0.11	(-0.03-0.25)	0.110	15.78	(-3.70-35.25)	0.112
Age group (years)												
60-69	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
70-79	1.02	(0.97-1.06)	0.369	1.00	(0.97-1.04)	0.821	0.19	(0.03-0.34)	0.017	26.77	(-3.69-49.85)	0.023
80-89	0.93	(0.88-0.98)	0.012	0.90	(0.85-0.95)	<0.001	0.13	(-0.03-0.30)	0.104	18.57	(-4.41-41.56)	0.113
≥90	0.98	(0.88-1.10)	0.748	0.94	(0.84-1.05)	0.262	0.38	(-0.22-0.97)	0.212	59.38	(-51.83-170.59)	0.295
Marital status												
Married	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Single	1.02	(0.94-1.12)	0.611	0.96	(0.88-1.05)	0.358	-0.19	(-0.47-0.09)	0.181	-26.44	(-62.50-9.61)	0.151
Widowed, divorced or separated	1.12	(1.08-1.16)	<0.001	1.05	(1.01-1.08)	0.015	-0.18	(-0.32- -0.04)	0.011	-24.65	(-43.98- -5.33)	0.012
Area of residence												
Urban	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Rural	0.77	(0.74-0.80)	<0.001	0.92	(0.88-0.98)	0.005	-0.79	(-0.95- -0.62)	<0.001	-84.28	(-100.63- -67.93)	<0.001
Education level												
No level or initial	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Primary	1.16	(1.10-1.22)	<0.001	1.09	(1.03-1.15)	0.003	0.47	(0.29-0.64)	<0.001	40.41	(26.11-54.70)	<0.001
Secondary	1.23	(1.16-1.31)	<0.001	1.09	(1.01-1.17)	0.031	0.82	(0.63-1.02)	<0.001	86.94	(63.56-110.32)	<0.001
Tertiary	1.26	(1.18-1.34)	<0.001	1.09	(1.00-1.18)	0.048	1.29	(1.08-1.50)	<0.001	179.88	(141.13-218.62)	<0.001
Type of health insurance												
No health insurance	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
FF.AA.	1.15	(1.02-1.30)	0.027	0.99	(0.87-1.12)	0.846	0.39	(0.09-0.69)	0.011	69.53	(10.25-128.81)	0.022
SIS	0.91	(0.87-0.96)	<0.001	0.99	(0.94-1.04)	0.593	-0.58	(-0.77- -0.38)	<0.001	-62.78	(-88.10- -37.46)	<0.001
EsSalud	0.98	(0.93-1.03)	0.433	0.86	(0.81-0.90)	<0.001	0.30	(0.10-0.50)	0.003	49.65	(17.87-81.43)	0.002
Private o EPS	1.21	(1.03-1.42)	0.023	1.01	(0.86-1.18)	0.901	0.55	(0.04-1.07)	0.034	106.33	(-17.14-229.81)	0.091
Geographic domain												
Metropolitan Lima	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Rest of the coast	0.96	(0.92-1.01)	0.119	1.03	(0.98-1.08)	0.239	-0.33	(-0.50- -0.15)	<0.001	-50.83	(-78.63- -23.03)	<0.001
Highlands	0.84	(0.80-0.89)	<0.001	1.02	(0.96-1.08)	0.525	-0.60	(-0.78- -0.43)	<0.001	-82.93	(-109.54- -56.32)	<0.001
Jungle	0.88	(0.82-0.93)	<0.001	1.01	(0.94-1.07)	0.875	-0.51	(-0.75- -0.27)	<0.001	-73.02	(-104.70- -41.35)	<0.001
Chronic disease												
Yes	1.48	(1.40-1.56)	<0.001	1.44	(1.37-1.52)	<0.001	0.26	(0.03-0.49)	0.029	33.35	(6.35-60.34)	0.015
No	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Physical or psychological limitation												
Yes	0.99	(0.94-1.04)	0.641	-	-	-	-	-	-	-	-	-
No	Ref.	-	-	-	-	-	-	-	-	-	-	-
Quintiles of monthly household spending per capita												
Quintil 1 (less)	Ref.	-	-	Ref.	-	-	Ref.	-	-	Ref.	-	-
Quintil 2	1.31	(1.22-1.40)	<0.001	1.26	(1.18-1.35)	<0.001	0.50	(0.30-0.70)	<0.001	23.27	(14.23-32.32)	<0.001
Quintil 3	1.46	(1.37-1.55)	<0.001	1.41	(1.31-1.51)	<0.001	0.89	(0.69-1.09)	<0.001	51.26	(39.70-62.83)	<0.001
Quintil 4	1.48	(1.39-1.58)	<0.001	1.44	(1.34-1.55)	<0.001	1.54	(1.33-1.75)	<0.001	130.29	(106.88-153.70)	<0.001
Quintil 5 (higher)	1.66	(1.57-1.76)	<0.001	1.63	(1.51-1.76)	<0.001	2.11	(1.91-2.30)	<0.001	257.63	(223.30-291.96)	<0.001

Estimates included the complex survey design of the ENAHO 2017.
Model 1: linear generalized model with Poisson distribution and log link function family
Model 2: generalized linear model with gamma distribution family and log link function for each of the variables with p value <0.2 in the unadjusted model of factors associated with OOPs *
Adjusted model for all the variables that resulted with a value of p <0.2 in the bivariate analysis
¶ 95% CI calculated by bootstrapping with the normal-based method with 1000 replications
¥ dy / dx for OOPs levels given the discrete change of the independent variable (marginal predictors expressed in current soles).
ENAHO: National Household Survey on Living Conditions and Poverty
OOPs: Out-of-pocket expenses on health
FF.AA.: Health Insurance of Armed Forces and National Police
SIS: Integral Health Insurance
EsSalud: Social Security
EPS: Health Service Providers
PR: Prevalence ratio
Exchange rate (S / per USD): 3.26

adults without education level, from rural area or from the lowest quintile of per capita expenditure), which reflects the obstacles to accessing the health service, given the financial consequences and impoverishing that the OOP represents. Efforts to reduce inequalities and guarantee the universality of health services should give priority to this last group of older adults.

It was also found that residents of urban area, having a higher level of education, suffering from a chronic disease, as well as having higher per capita expenses increase the possibilities and levels of OOP. These findings are consistent with the results of Bock et al. [6], Gong et al. [7], Turi et al. [10] and Corrieri et al. [13]. The strong association reported between the OOP level and the quintiles of per capita expenditure suggests that the OOP/per capita expenditure ratio is unfavorable for the socially disadvantaged, as Proaño and Bernabe point out in their study [26]. Longitudinal investigations are required to thoroughly evaluate the effects of OOP on the financial risk of older adults.

Older adults suffering from chronic diseases spend approximately 33 more soles (USD 10.1) in OOP. Due to the fact that in Peru the prevalence of chronic diseases is growing [27] and that its treatment requires costly and prolonged medications over time, the possibility of incurring financial risks in patients with chronic diseases is high. The health system can design programs focused on chronic patients to strengthen the surveillance system and the early detection of such diseases, in order to protect the financial situation of the elderly.

The highest levels of OOP in older adults who have insurance from the Armed Forces or EsSalud can be explained by the dissatisfaction of the health service provided, as well as long waiting times [28]. As a consequence, patients do not usually use this service, encouraging them to pay for private services [29]. Other studies agree that some insurances do not adequately protect the insured population [8,30]. Another study agrees that in Peru, the use of health services differs according to the type of insurance someone has [29]. The results presented indicate that the SIS reduces the level of OOP. One possible explanation for this is that SIS members are socially disadvantaged people who frequently use health services and receive what is established in the Essential Plan for Health Insurance (PEAS) and extra benefits for cancer (*Plan Esperanza*). In turn, through the *Fondo Intangible Solidario de Salud* (FISSAL) they receive financing for other high-cost diseases [31].

A limitation of our study is that, given the cross-sectional nature of the survey, causality can not be established between the variables of interest and there are inherent measurement errors that the survey could have. Similarly, it should be considered that the payments disbursed for health services may present individual, family or a combination of both levels. Another limitation is that questions about payments disbursed by health services did not have the same time reference which increases the risk of incurring in recall bias. However, the ENAHO is designed to quantify consumer expenditure and characterize the living conditions of the Peruvian population by providing information at a population level that can not be obtained from other sources. Therefore, it is the best source of information currently available in Peru to perform OOP analysis.

In conclusion, older adults in Peru pay OOP to take care of their health, which generates inequity in access to health services, mainly for the most vulnerable, such as the population with the lowest educational level, lowest per capita expenditure, or who suffer from chronic diseases. The SIS offers greater financial protection to older adults. Based on the results obtained, it is suggested to investigate the economic impact of health insurance and the preventive-promotional approach of chronic diseases in order to reduce OOP and improve the efficiency of the Peruvian health system.

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