



RESEARCH ARTICLE

REVISED Factors associated with self-medication in users of drugstores and pharmacies in Peru: an analysis of the National Survey on User Satisfaction of Health Services, ENSUSALUD 2015 [version 2; peer review: 2 approved]

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Abstract

Background: Irresponsible self-medication is a problem for health systems in developing countries. We aimed to estimate the frequency of self-medication and associated factors in users of drugstores and pharmacies in Peru.

Methods: We performed a secondary data analysis of the 2015 National Survey on User Satisfaction of Health Services (ENSUSALUD), a two-stage probabilistic sample of all regions of Peru. Non self-medication (NSM), responsible self-medication (RSM) and irresponsible self-medication (ISM) were defined as the outcome categories. Demographic, social, cultural and health system variables were included as covariates. We calculated relative prevalence ratios (RPR) with their 95% confidence intervals (95%CI) using crude and adjusted multinomial logistic regression models for complex samples with NSM as the referent category.

Results: 2582 participants were included. The average age was 41.4 years and the frequencies of NSM, RSM and ISM were 25.2%, 23.8% and 51.0%, respectively. The factors associated with RSM were male gender (RPR: 1.35; 95%CI: 1.06-1.72), being between 40 and 59 years old (RPR: 0.53; 95%CI: 0.39-0.72), being 60 or older (RPR: 0.39; 95%CI: 0.25-0.59), not having health insurance (RPR: 1.89; 95%CI: 1.31-2.71) and living in the Highlands region (RPR: 2.27; 95%CI: 1.23-4.21). The factors associated with ISM were male gender (RPR: 1.41; 95%CI: 1.16-1.72), being between 40 and 59 years old (RPR: 0.68; 95%CI: 0.53-0.88), being 60 or older (RPR: 0.65; 95%CI: 0.48-0.88) and not having health insurance (RPR: 2.03; 95%CI: 1.46-2.83).

Conclusion: Around half of the population practiced ISM, which was associated with demographic and health system factors. These outcomes are the preliminary evidence that could contribute to the development of health policies in Peru.

Open Peer Review

Reviewer Status

	Invited Reviewers	
	1	2
version 2 (revision) 24 Jan 2020	 report	
	↑	
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Any reports and responses or comments on the article can be found at the end of the article.

Keywords

Adults, Pharmacies, Self-Medication, Universal Coverage, Insurance, Health Services Accessibility, Peru

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REVISED Amendments from Version 1

We have read the reviewers commentaries and want to clarify certain points in this new version:

1. We have removed Figure 2 and replaced it by a table (Table 2) for better visualization.
2. We have presented the bivariate analysis based on the 3 strata of the main variable and added the missing data in Table 3.
3. We have reviewed the literature and expanded the discussion section according to the reviewer's requirements.

Any further responses from the reviewers can be found at the end of the article

Introduction

Self-medication is a practice that represents a public health problem worldwide¹, mainly in developing countries, where it is an important issue for the health systems. The World Health Organization (WHO) defines self-medication as the selection and use of medicines by individuals to treat self-recognized illness or symptoms². In addition, the concept of responsible self-medication (RSM) is based on the treatment of diseases and conditions using medicines that do not require a prescription for their sale, due to their safety and effectiveness when correctly used². For that reason, there are over the counter (OTC) medicines, which would respond to the concept of RSM³. To study these behaviors is relevant in developing countries of Latin America.

The frequency of self-medication differs according to the country and context evaluated. Studies have reported self-medication prevalence ranging from 27% to 90.1%. In Asia, a study made in India reported a prevalence of 71%⁴, while in Iran it was 35.4%⁵. In Europe, research studies in Spain reported a prevalence between 14% and 90.1%⁶⁻⁸. In Latin America, Colombian studies presented prevalence ranges from 27.3% to 55.4%⁹⁻¹¹, whereas in Brazil, it oscillated from 31% to 86.4%^{12,13}. In Peru, a previous work found a self-medication prevalence of 56.7% in an urban area of Lima¹⁴. Then, we consider relevant to research the prevalence of self-medication since it has benefits and risks¹⁵.

Self-medication practice can entail suffering serious adverse effects. In addition, the concomitant use of several medicines may develop interactions that could increase those adverse effects^{1,16}. Even OTC medicines used inappropriately and irresponsibly can represent a risk for the consumer^{1,15,17}. Among the main benefits of the RSM, we can mention the increased access to pharmaceutical products, the reduction of unnecessary medical appointments, and of the expenses in healthcare services by the government¹⁵. For this reason it is important to evaluate the factors associated with the irresponsible self-medication practice (ISM)¹⁸.

Among the main conditions associated with self-medication practice are demographic, social, cultural, personal and health system factors. Age, sex, socio-economic status and educational level are frequently related to self-medication practice¹⁰. Among the personal factors associated with self-medication are having good results after self-medication, the belief of

having experienced manageable similar symptoms previously, the fear of being diagnosed with a serious disease and the need to alleviate symptoms prior using healthcare services^{16,19,20}. Regarding healthcare system, it has been described that self-medication is related to the easy access to medicines in drugstores and pharmacies and the lack of access to healthcare services, which in turn, is associated with the lack of a health insurance¹⁹. Thus, it is proved the multifactorial character of the self-medication practice.

In this context, despite its relevance, we have not found nationwide studies that had evaluate the frequency of self-medication in users of drugstores and pharmacies in Peru. The objective of this study was to estimate the frequency of RSM and ISM, and to identify the factors associated with such practice in a population-based sample.

Methods

Study design

We performed a secondary data analysis using the fourth questionnaire of the National Survey on User Satisfaction of Health Services (ENSUSALUD) of 2015. ENSUSALUD is an annual questionnaire, the first edition was carried out in 2014, and was applied to internal and external users of healthcare facilities. The survey has been executed by the National Institute of Statistics and Informatics (INEI, by its Spanish initials) in collaboration with the National Superintendency of Health (SUSALUD, by its Spanish initials)²¹.

ENSUSALUD is composed by six questionnaires, the fourth questionnaire evaluated the drugstores and pharmacies users who were within the perimeter of two blocks around the 181 healthcare facilities that provided health services for the Ministry of Health and Regional Government (MINSAGR, by its Spanish initials), Social Security System (EsSalud, by its Spanish initials), Health Service of the Armed Forces and Police (FF. AA.PP, by its Spanish initials) and Private Practice (CSP, by its Spanish initials) evaluated in the first and second questionnaires²¹. The study was carried out in 179 drugstores and pharmacies in the 25 regions of Peru.

Population, sample and sampling

The population was composed of clients of drugstores and pharmacies, who were surveyed after the purchase of a medicine. In total, the fourth questionnaire included 3863 participants. The sample size calculated of 3,863 participants represented an expanded population of 3,078,419 people; participants were not excluded due to lack of data or incomplete records (Figure 1). The calculation of the sample size used a design effect of 1.2 and a satisfaction possibility of 30% according to the results of the survey ENSUSALUD 2014; assuming a confidence level of 95%. Since our study was a secondary analysis, we calculate the statistical power and the result was 99%.

The sampling was probabilistic, stratified, for each one of the 25 regions of Peru, and two-staged. Drugstores and pharmacies were considered as primary sampling units, while users who went to such establishments were the secondary sampling units.

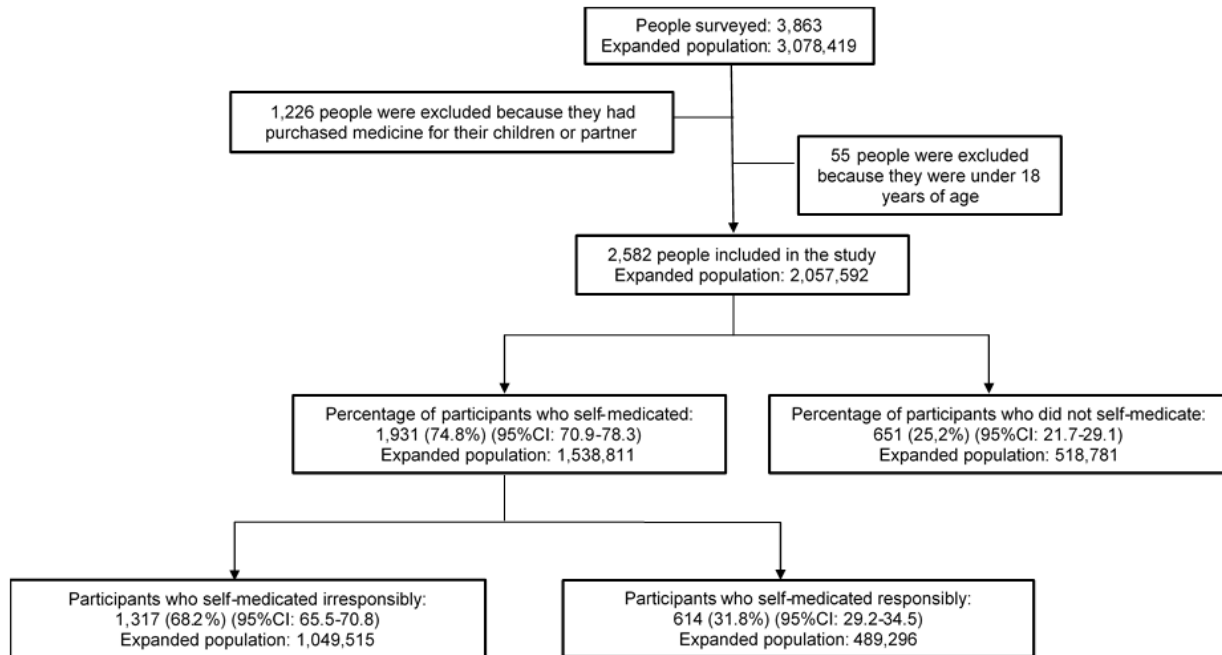


Figure 1. Flowchart of participants selection, ENSUSALUD 2015.

Eligibility criteria

The fourth questionnaire of ENSUSALUD included people who went and bought a medicine for themselves, their kid(s) or partner in a pharmacy or drugstore close to a health care establishment. For this study, we only included people who have bought medicine for themselves, and this was specified in the question (c4pa): Who did you buy medicine(s) for? Marking the alternative: “for myself”, so the self-medication definition of the WHO was met².

We excluded from the analysis the adults that bought medicines for their kid(s) or partner, who has not been able to go to the pharmacy and drugstore, since it was not possible to obtain the sociodemographic data and variables of interest of those people. A total of 1,226 (31.7%) people were excluded since they did not buy medicines for themselves (for their kid or partner). In addition, 55 participants were excluded for being under 18 years old. Finally, a total of 2,582 people were included in the study and they represented an expanded population of 2,057,592 people (Figure 1). Despite the exclusion of 1,281 (33.2%) participants, the number of participants in the strata of the variables studied did not generate statistical differences.

Variables and measurements

Response variable. We used the question (c4p12): “These medicines, did you buy them with prescription?” to define the response variable. The answers were divided into three options: yes, and showed prescription=1; yes, and did not show prescription =2; no=3. Based on these categories, we created a dichotomous variable called self-medication (yes=1 and no=0), the self-medication category included those participants who bought medicines without doctor’s prescription and those who did not show the prescription when they were surveyed. Additionally, we categorized those participants who had

self-medicated in two strata according to the type of medicine they bought (c4p11_1e): RSM (with OTC medicines) and ISM (without using OTC medicines). On the other hand, the non self-medication (NSM) category was composed of participants who bought medicines and showed doctor’s prescription when they were surveyed. Consequently, three final categories were generated (NSM=0; RSM=1; ISM=2).

Exposure variables.

Demographic, social and cultural factors

We included the following variables: sex (c4p3), age (c4p1), language (c4p5), education level (c4p4), current occupation (c4p6), guidance or help for self-medication (c4p21) and geographic region of residency (dominiog).

Factors associated with the Health System

We included the following variables: health insurance affiliation (c4p7), type of health insurance (c4p8) and the request of prescription by the pharmacist when buying the medicine (c4p19).

Ethical considerations

ENSUSALUD 2015 is publicly accessible: <http://portal.susalud.gob.pe/blog/base-de-datos-2015/>. We downloaded the database without identifiers; thus, the confidentiality of the information given by the participants was guaranteed. Data collection was carried out after the verbal consent of the participants, it did not involve the biological sampling and was conducted for the management of health services nationwide.

Statistical analysis

The database was downloaded from SUSALUD’s website in compatible format with the statistical package STATA @ v14.0 (Stata Corporation, College Station, Texas, USA). The database

was programmed for a complex sample analysis, the regions of Peru were considered as strata; and drugstores, pharmacies and their users were considered as sampling units. The STATA module “complex survey data” (svy) was used.

The categorical variables were shown as absolute frequencies and as weighted proportions by the complex sampling, with their respective 95% confidence intervals (95%CI). Weighted proportions were calculated which allowed a comparison between the variable’s categories included in the analysis. In this way, we evaluated the association between variables, RSM and ISM practice through Pearson’s chi-squared test corrected for design purposes.

To evaluate the factors associated with RSM and ISM, multinomial logistic regression models were conducted (crude and adjusted) and the complex sampling of the study was considered (svy)²². NSM was considered as the reference category.

The variables that showed statistically significant association ($p < 0.05$) in the bivariate analysis, were included in the multinomial regression model. Possible collinearity relationships among variables was evaluated to obtain an adequate statistical consistency in the adjusted model. We developed a variable based on health insurance affiliation in participants (c4p7) and the type of health insurance (c4p8). This variable was evaluated in the multinomial regression models (crude and adjusted). The

measure of association reported was the relative prevalence ratio (RPR), with their respective 95%CI. Moreover, we elaborated a second multivariate model that included variables whose association with self-medication has been described in the literature. However, this was similar to the first model prepared.

Results

General description of the population

We found that 57.4% participants were women, the average age was 41.4, 96.7% of the respondents spoke Spanish and only 25.3% of the participants had university education. Likewise, 69.4% of the respondents were affiliated to a health insurance, of which more than half were covered by the Comprehensive Health Insurance (SIS, by its Spanish initials) (52.8%) and EsSalud (40.0%).

The prevalence of NSM, RSM, and ISM was 25.2%, 23.8%, and 51.0% respectively. Only 27.7% of the participants were asked for their prescription by the pharmacist when buying the medicine. Furthermore, 54.6% of the participants received guidance or help by the drugstore or pharmacy personnel to self-medicate, and 13.1% of the participants resided in Lima (Table 1).

Description of drugs purchased by participants

When analyzing the total number of self-medicated users, it was found that the most commonly purchased medicine were non-steroidal anti-inflammatory drugs (NSAIDs) (24.4%), followed

Table 1. General characteristics of drugstores and pharmacies users, ENSUSALUD 2015 (N=2,057,592; n=2,582).

Characteristics	Absolute frequency of users surveyed	Weighted proportion of each category*	
	N	%	(95%CI)
Gender			
Female	1,481	57.4	(55.2-59.5)
Male	1,101	42.6	(40.5-44.8)
Age			
Average (95%CI)	41.4 (40.3-42.4)		
18 to 39	1,350	52.3	(49.2-55.4)
40 to 59	808	31.3	(29.1-33.6)
60 and older	424	16.4	(14.4-18.7)
Language			
Spanish	2,498	96.7	(94.7-98.0)
Quechua/Other	84	3.3	(2.0-5.3)
Education level			
University education [§]	653	25.3	(22.2-28.7)
Non-university higher education [§]	534	20.7	(18.6-22.9)
High school [§]	974	37.8	(34.8-40.8)
Complete elementary education or below	419	16.2	(14.0-18.8)
Current occupation			
Dependent employee	659	25.5	(23.1-28.1)
Independent worker	958	37.1	(34.4-40.0)
Student	206	8.0	(6.8-9.4)

Characteristics	Absolute frequency of users surveyed	Weighted proportion of each category*	
	N	%	(95%CI)
Housewife	591	22.9	(20.6-25.3)
Unemployed	109	4.2	(3.0-5.9)
Other	59	2.3	(1.6-3.4)
Health insurance			
Yes	1,792	69.4	(66.1-72.5)
No	790	30.6	(27.5-33.9)
Type of health insurance[‡]			
Comprehensive Health Insurance (SIS)	947	52.8	(47.2-58.5)
Social Security System (EsSalud)	717	40.0	(35.0-45.3)
Health Promoting Entities (EPS)	25	1.4	(0.8-2.3)
Health Insurance from Private Companies	30	1.7	(1.1-2.5)
Health Insurance from Private Clinics	13	0.7	(0.2-2.2)
College student health insurance	12	0.7	(0.3-1.4)
FF.AA.PP. Insurance	47	2.6	(1.8-3.8)
Other	1	0.1	(0.01-0.4)
Self-medication			
No	651	25.2	(21.7-29.1)
Responsible	614	23.8	(21.5-26.2)
Irresponsible	1,317	51.0	(47.8-54.2)
Request of prescription by the pharmacist when medicine was sold			
Yes	714	27.7	(23.9-31.7)
No	1,868	72.3	(68.3-76.1)
Guidance or help for self-medication			
Not applicable/not needed/other	370	14.3	(11.6-17.5)
Pharmacists	1,410	54.6	(49.6-59.5)
Radio/Newspapers or Magazines/Television	610	23.6	(19.8-27.9)
Internet	192	7.4	(5.9-9.4)
Geographic region of residency			
Metropolitan Lima	338	13.1	(8.5-19.6)
Other areas of Coast region	727	28.2	(21.2-36.3)
Highlands	1,070	41.4	(33.1-50.2)
Jungle	447	17.3	(11.9-24.5)

* Weight proportions and design effect of complex survey sampling were included.

[‡] Refers to complete or incomplete university, non-university higher education, or high school education.

[§] Refers only to users who had health insurance.

by antibiotics (16.5%) and analgesics/antipyretics/corticoids (16.4%). Also, the types of drugs most commonly purchased by participants who irresponsibly self-medicated were: NSAIDs (24.0%), antibiotics (22.6%) and gastrointestinal drugs (15.3%) (Table 2).

After evaluating the 651 participants who did not self-medicate, it was found that the main drugs purchased by this group were

antibiotics (26.1%), NSAIDs (16.7%) and gastrointestinal drugs (9.5%) (Table 2).

Bivariate analysis

The absolute number of users per category of the variables studied was shown, in addition to the RSM and ISM percentages per each category. The corresponding weighting was considered.

Table 2. Types of medicine purchased by users who self-medicated (N=1,538,811; n=1,931), self-medicated irresponsibly (N=1,049,515; n=1317) and did not self-medicate (N=518,781; n=651).

Type of medicine purchased by participants	Self-medication N (%) [*]	Irresponsible self-medication N (%)	Non self-medication N (%)
Antibiotics	319 (16.5)	298 (22.6)	170 (26.1)
NSAIDs	471 (24.4)	316 (24.0)	109 (16.7)
Gastrointestinal	241 (12.5)	201 (15.3)	62 (9.5)
Analgesics/Antipyretics/Corticoids	317 (16.4)	144 (11.0)	58 (8.9)
Antihistamines/Respiratory pathologies	231 (12.0)	99 (7.5)	42 (6.5)
Nutritional supplement	104 (5.4)	53 (4.0)	46 (7.1)
Cardiac pathologies	89 (4.6)	57 (4.3)	51 (7.8)
Antiparasitic/Antiviral/Antimycotic	64 (3.3)	55 (4.2)	21 (3.2)
Metabolic disorders	41 (2.1)	41 (3.1)	37 (5.7)
Neurological pathologies	29 (1.5)	28 (2.1)	33 (5.1)
Other	25 (1.3)	25 (1.9)	22 (3.4)

^{*} Includes irresponsible and responsible self-medication.

No significant association was found between the practice of self-medication and language. However, there was statistically significant association with sex, age, education level, current occupation, having a health insurance, health insurance type, the request for prescription by the pharmacist when buying the medicine, guidance or help for self-medication, and region of residence (Table 3).

Multinomial logistic regression analysis

In the crude analysis, there was a greater RSM and ISM frequency in relation to male gender, current occupation (being a student) and not having a health insurance. Living in the Highlands region was associated with a higher frequency of RSM. Likewise, there was less frequency of RSM and ISM in relation to age (40 to 59 years and 60 to older), education level (complete elementary education or below) and current occupation (housewife) (Table 4).

The factors associated with RSM in the adjusted analysis were male gender (RPR: 1.35; 95%CI: 1.06-1.72), not having health insurance (RPR: 1.89; 95%CI: 1.31-2.71) and living in the Highlands region (RPR: 2.27; 95%CI: 1.23-4.21). On the other hand, the only factors that remained associated with a lower frequency of RSM were being between 40 and 59 years old (RPR: 0.53; 95%IC: 0.39-0.72) and being 60 or older (RPR: 0.39; 95%IC: 0.25-0.59) (Table 4).

The factors associated with a higher frequency of ISM in the adjusted analysis were male gender (RPR: 1.41; 95%CI: 1.16-1.72) and not having health insurance (RPR: 2.03; 95%CI: 1.46-2.83). Furthermore, the factors that remained associated with a lower frequency of ISM were being between 40 and 59 years old (RPR: 0.68; 95%IC: 0.53-0.88) and being 60 or older (RPR: 0.65; 95%IC: 0.48-0.88) (Table 4).

Discussion

This study found that three-quarters of the participants self-medicated and one out of two of the total population practiced ISM. Also, two out of three participants who irresponsibly self-medicated were not asked for the corresponding prescription when purchasing the medicine they wanted. The factors associated with increased RSM and ISM practice were male gender and not having health insurance. In addition, living in the Highlands was associated with RSM. On the other hand, being 40 to 59 years old or 60 to older were associated with a lower frequency of RSM and ISM.

Our study showed that the prevalence of self-medication was 74.8%, which was higher than that reported by Faria-Domingues *et al.*²³ in a systematic review that aimed to assess the prevalence of self-medication in adult population from Brazil. This review found that one-third of the population self-medicates. Likewise, the prevalence in our study was higher than that found by Jerez-Roig *et al.*²⁴ in a systematic review that included 28 studies predominantly from Brazil and the United States. Such review showed that the prevalence of self-medication in individuals aged 60 or older was on average 38%, and ranged from 4 to 87%. In our study, the participants were over 18 years old, this may explain the above-average prevalence mentioned in the systematic review of Faria-Domingues *et al.*²³.

Evidence from previous studies shows that self-medication frequency is higher in low and middle-income countries than in developed countries²⁰. Variable prevalence rates have been reported in Latin America, Africa and Asia (27%-86.4%)^{4,5,9-13,25}. However, percentages ranging from 8% to 14%¹ are reported in developed countries (United Kingdom, Italy, Switzerland, Belgium, Germany, France, United States of America and the United Kingdom). This is due to the fact that in these countries

Table 3. Percentage of responsible and irresponsible self-medication among users of drugstores and pharmacies of ENSUSALUD 2015 (N=2,057,592; n=2,582).

Characteristics	Absolute frequency of users per category	Weighted proportion of non self-medication according to each category*	Weighted proportion of responsible self-medication according to each category*	Weighted proportion of irresponsible self-medication according to each category*	
	N	%	%	%	p-value†
Gender					
Female	1,481	28.0	23.4	48.6	0.001
Male	1,101	21.5	24.3	54.2	
Age					
18 to 39	1,350	20.1	28.1	51.8	<0.001
40 to 59	808	29.5	20.4	50.1	
60 and older	424	33.5	16.3	50.2	
Language					
Spanish	2,498	25.2	23.7	51.1	0.754
Quechua/Other	84	25.0	27.4	47.6	
Education level					
University education§	653	23.0	26.5	50.5	0.044
Non-university higher education§	534	22.4	24.0	53.6	
High school§	974	25.1	22.9	52.0	
Complete elementary education or below	419	32.3	21.2	46.5	
Current occupation					
Dependent employee	659	23.6	25.3	51.1	<0.001
Independent worker	958	25.0	23.6	51.4	
Student	206	14.1	36.4	49.5	
Housewife	591	30.8	19.6	49.6	
Unemployed	109	28.4	20.2	51.4	
Other	59	23.7	13.6	62.7	
Type of medical insurance					
No	790	17.3	25.7	57.0	<0.001
Comprehensive Health Insurance (SIS)	947	30.4	22.9	46.7	
Social Security (EsSalud and EPS)	742	26.6	22.9	50.5	
Other**	103	28.2	23.3	48.5	
Request of prescription by the pharmacist when medicine was sold					
Yes	714	70.6	6.0	23.4	<0.001
No	1,868	7.8	30.6	61.6	
Guidance or help for self-medication					
Not applicable/not needed/other	370	38.1	18.4	43.5	<0.001
Pharmacists	1,410	25.5	20.7	53.8	

Characteristics	Absolute frequency of users per category	Weighted proportion of non self-medication according to each category*	Weighted proportion of responsible self-medication according to each category*	Weighted proportion of irresponsible self-medication according to each category*	
	N	%	%	%	p-value†
Radio/Newspapers or Magazines/Television	610	18.7	34.6	46.7	
Internet	192	18.7	22.4	58.9	
Geographic region of residency					
Metropolitan Lima	338	29.3	19.8	50.9	0.012
Other areas of Coast region	727	28.3	18.3	53.4	
Highlands	1,070	19.9	30.6	49.5	
Jungle	447	29.7	19.5	50.8	

* Weight proportions and design effect of complex survey sampling were included.

** It included the following categories: Health Insurance from Private Companies, Health Insurance from Private Clinics, College student health insurance, FF.AA.PP. Insurance.

§ Refers to complete or incomplete university, non-university higher education, or high school education.

† It refers to the statistical significance obtained from the comparison of proportions between categories of the variable considering the complex survey sampling.

there is an adequate supervision when supplying OTC drugs. Therefore, most of these prevalence’s correspond to the purchase of OTC medicines. It has also been reported that certain types of drugs such as antibiotics and NSAIDs are available as OTC drugs, causing adverse reactions due to misuse^{1,16,19,20}.

The most requested drugs by the participants were NSAIDs, antibiotics and analgesics/antipyretics/corticoids. A previous study in Peru found that NSAIDs were also the most acquired drugs (30%)¹⁴. On the other hand, in a study carried out in Colombia, the most commonly used drugs were analgesics/antipyretics (44.3%), NSAIDs (36.4%) and antihistamines (8.5%), which goes according to our findings¹⁰. These findings are similar because analgesics/antipyretics/corticoids, NSAIDs, antihistamines, and antibiotics are the most frequently used drugs described in other studies^{7,9,26-31} and are used to treat common symptoms that people do not consider sufficient reason to see a doctor; therefore, they tend to self-medicate.

Our study showed that the male gender reported a higher self-medication frequency. However, studies such as those of Jerez-Roig *et al.*²⁴ and Lukovic *et al.*³² reported that the female gender is associated with a higher prevalence of self-medication practice. Our findings are further supported by the study of Quédraogo *et al.*³³, who described that the self-medication practice was found to be associated mostly with the male gender in rheumatic diseases. However, this study was only carried out in an urban area; therefore, the results could vary or not be extrapolated at rural or national level, as is the case of our research.

In Peru, a study conducted in a district of Metropolitan Lima by Hermoza-Moquillaza *et al.*¹⁴ described that self-medication percentage was higher in the male gender. However, this study did not carry out regression models with multiple variables, which would give our study an innovative character because it

is a population-based study and includes a multivariate analysis. On the other hand, findings in Peru regarding a lower self-medication prevalence in females can probably be explained by the sexist nature of its society³⁴. We consider that, in sexist societies, the family structure implies that women are relegated to housekeeping and taking care of children, which, together with the repression from their partner, would reduce their probability to self-medicate and even access to health services. This association could also be explained because men would spend most of their time at work and would not have enough time to go to a health center, having less access to health services^{35,36}, so they would resort to the practice of self-medication. Besides, the high prevalence of NSM in women and older adults could be explained due to their poor health status, which would predispose them to use frequently health services and receive a medical prescription. Furthermore, older adults need to acquire several drugs for the best management of their comorbidities³⁷.

A higher self-medication prevalence was found in participants without health insurance compared to those with SIS. Not having health insurance prevents patient from accessing health services, with the option of self-medicate in drugstores and pharmacies. In this context, some studies have associated the difficulty in obtaining a medical appointment with the self-medication practice, as well as an adverse financial situation³⁸⁻⁴¹. However, in some health systems, having a health insurance does not guarantee a lower self-medication prevalence. Thus, no statistically significant differences were found between people who have SIS or EsSalud and the practice of RSM or ISM. This situation could be explained by the fact that those with SIS can easily make an appointment as an outpatient, but they would not have an adequate access to medicines²¹. In contrast, the situation with social security is the opposite, people with this insurance can benefit from the adequate supply of medicines under this contributory system. However, making an appointment as an

Table 4. Factors associated with responsible and irresponsible self-medication among users of drugstores and pharmacies, ENSUSALUD 2015 (N=2,057,592; n=2,582).

Characteristics	Responsible self-medication				Irresponsible self-medication							
	Crude Model*	(95%CI)	p-value	RPR	Adjusted Model*	(95%CI)	p-value	RPR	Adjusted Model*	(95%CI)	p-value	
Gender												
Female	Reference			Reference				Reference				
Male	1.34	(1.06-1.70)	0.015	1.35	(1.06-1.72)	0.016	1.45	(1.19-1.76)	<0.001	1.41	(1.16-1.72)	0.001
Age												
18 to 39	Reference			Reference			Reference					
40 to 59	0.49	(0.37-0.66)	<0.001	0.53	(0.39-0.72)	<0.001	0.66	(0.51-0.85)	0.001	0.68	(0.53-0.88)	0.003
60 and older	0.35	(0.24-0.50)	<0.001	0.39	(0.25-0.59)	<0.001	0.58	(0.43-0.79)	0.001	0.65	(0.48-0.88)	0.005
Education level												
University education [§]	Reference			Reference			Reference			Reference		
Non-university higher education [§]	0.92	(0.66-1.30)	0.654	1.01	(0.70-1.44)	0.968	1.08	(0.79-1.49)	0.625	1.16	(0.84-1.60)	0.377
High school [§]	0.79	(0.54-1.15)	0.213	1.04	(0.72-1.51)	0.836	0.94	(0.70-1.25)	0.668	1.12	(0.84-1.49)	0.444
Complete elementary education or below	0.57	(0.37-0.89)	0.014	0.94	(0.60-1.47)	0.770	0.66	(0.45-0.96)	0.028	0.92	(0.64-1.34)	0.674
Type of Medical Insurance												
Comprehensive Health Insurance (SIS)	Reference			Reference			Reference			Reference		
No	1.97	(1.35-2.87)	0.001	1.89	(1.31-2.71)	0.001	2.14	(1.52-3.01)	<0.001	2.03	(1.46-2.83)	<0.001
Social Security (EsSalud and EPS)	1.15	(0.75-1.74)	0.524	1.34	(0.90-2.00)	0.150	1.24	(0.85-1.81)	0.266	1.29	(0.88-1.88)	0.186
Other**	1.10	(0.58-2.08)	0.772	1.13	(0.60-2.14)	0.701	1.12	(0.66-1.92)	0.670	1.05	(0.61-1.81)	0.858

Characteristics	Responsible self-medication				Irresponsible self-medication			
	Crude Model*	(95%CI)	p-value	Adjusted Model*	Crude Model*	(95%CI)	p-value	Adjusted Model*
	RPR			RPR			RPR	
Geographic region of residency								
Metropolitan Lima	Reference			Reference			Reference	
Other areas of Coast region	0.95	(0.51-1.78)	0.882	1.02	(0.56-1.86)	0.937	1.08	(0.63-2.04)
Highlands	2.27	(1.22-4.23)	0.010	2.27	(1.23-4.21)	0.009	1.43	(0.82-2.70)
Jungle	0.97	(0.44-2.11)	0.932	0.98	(0.45-2.12)	0.962	0.98	(0.52-2.09)
Current Occupation								
Dependent employee	Reference			Not included ^{§§}			Not included ^{§§}	
Independent worker	0.87	(0.62-1.24)	0.448				0.94	(0.68-1.31)
Student	2.40	(1.42-4.07)	0.001				1.62	(1.00-2.61)
Housewife	0.59	(0.42-0.83)	0.002				0.74	(0.56-0.98)
Unemployed	0.66	(0.35-1.25)	0.200				0.83	(0.49-1.41)
Other	0.53	(0.20-1.41)	0.201				1.22	(0.60-2.48)

* A multinomial logistic regression model was performed considering the weighted proportions and design effect of the complex survey sampling.
 ** It included the following categories: Health Insurance from Private Companies, Health Insurance from Private Clinics, College student health insurance, FF,AA,PP, Insurance.
 § Refers to complete or incomplete university, non-university higher education, or high school education.
 §§ Not included in the adjusted model due to collinearity with gender and type of medical insurance.

outpatient would represent a more problematic situation compared to people with SIS⁴². Both situations would eventually lead to RSM or ISM. A similar case occurs in China, where long waiting times (more than half a day), and an expensive medical care, would lead to a high self-medication prevalence of antibiotics in college students⁴³. Similarly, in Saudi Arabia, there was a positive association between the difficult access to health services and the self-medication practice of patients in primary care centers⁴⁴.

Peru has a fragmented health system, which is divided into two sectors: public and private^{45,46}. The public sector is also divided into subsidized or indirect contributory system and direct contributory or social security system. In the public sector, the government provides medical services (SIS) to the population living in poverty through the MINSAs-GR establishments. The social security system is intended for citizens with formal employment. It has two subsystems: EsSalud and the private health care providers. Furthermore, the FF.AA.PP have their own health subsystem. Finally, the private sector is divided into the for-profit system (private insurance companies, private clinics) and non-profit system (NGOs)^{45,46}. The process of universal health insurance in Peru has begun since 2009 and seeks to ensure that more Peruvians have medical insurance based on an essential plan. However, this process is still being implemented and many citizens do not have health insurance yet⁴⁷. This leads to a lack of access to medical services and a high prevalence of ISM in Peru^{48,49}.

We found an association between the lack of request for prescription by the pharmacist when purchasing the medicine and self-medication in the bivariate analysis. This situation is evidenced by the inadequate distribution of prescription medicines, as is the case with the OTC sale of antibiotics in Peru, despite the current regulations^{14,50}. This situation also occurs in other Latin-American countries such as Chile and Colombia, where there are regulations to prevent the free distribution of antibiotics; however, the results are not evidenced over the years^{26,51}. We also observed a small percentage of participants (6%) who were asked for a prescription despite purchasing an OTC

medicine. This would reflect a professional malpractice by pharmacists in Peru.

This study has limitations: 1) since it is a secondary analysis of a survey designed to assess user's satisfaction of health services, it was not necessarily conducted to answer our research question; however, the questionnaire has been designed and validated by the INEI staff; 2) the cross-sectional design of this study does not allow us to establish a causal relationship among the factors associated with self-medication. However, it allows us to find the association and identify the markers that could be used by healthcare managers to carry out future public health interventions⁵².

In conclusion, there is a high self-medication frequency in Peru, mostly with medicines that are not authorized for OTC sale. It is important to carry out public health interventions in order to reduce the ISM frequency in Peru. There is also a need for educational reforms aimed at raising awareness of the consequences of this irresponsible practice. Similarly, respective measures should be taken to improve the coverage of universal health insurance, thus preventing people from resorting to ISM due to lack of access to medical services. Finally, efforts should be made to integrate druggists and pharmacists into regulatory entities in order to control OTC and uncontrolled sales of prescription drugs. Self-medication could represent a quick and economical solution for users, but it must be practiced within a responsible context.

Data availability

Underlying data

Data associated with this study is available at National Superintendency of Health (*Superintendencia Nacional de Salud, SUSALUD*) website: <http://portal.susalud.gob.pe/blog/base-de-datos-2015/>

Extended data

Questionnaire analyzed is available online: <http://portal.susalud.gob.pe/wp-content/uploads/archivo/encuesta-sat-nac/2015/Cuestionario-4-DIRIGIDA-A-USUARIOS-DE-FARMACIAS-BOTICAS.pdf>

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Marcus Tolentino Silva 

University of Sorocaba, Sorocaba, Brazil

I have no further comments to make.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: epidemiology, health technology assessment, pharmacy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 28 May 2019

<https://doi.org/10.5256/f1000research.19222.r42721>

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Cristian Díaz-Vélez 

Oficina de Inteligencia Sanitaria, Hospital Nacional Almanzor Aguinaga Asenjo EsSalud, Chiclayo, Peru

1. The sample calculation mentions the use of 30% satisfaction, but it is not a used variable.
2. The first paragraph of the discussion should go into the results section.
3. It shows results of types of drugs most used in self-medication, but in the discussion this is not mentioned. See existing studies published in Peru (Lima and Lambayeque).

4. Another limitation of the study not mentioned, is the effect of the pharmacies in the dispensing of medicines, when changing or indicating drugs. See Study: Alterations in drug dispensation by private sector pharmacies in the district of Chiclayo¹.

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Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Médico Epidemiólogo, Oficina de Inteligencia Sanitaria del Hospital Nacional Almanzor Aguinaga Asenjo

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 15 Jan 2020

Diego Urrunaga-Pastor, Universidad San Ignacio de Loyola, Lima, Peru

We have read the reviewers commentaries and want to clarify certain points in this new version:

Dear Dr. Cristian Díaz-Vélez:

1. The sample calculation mentions the use of 30% satisfaction, but it is not a used variable.

Answer: Thank you for the observation, ENSUSALUD was developed to evaluate health user satisfaction, therefore the INEI did not perform a sample size calculation based on self-medication prevalence.

2. The first paragraph of the discussion should go into the results section.

Answer: Thank you for the suggestion, however, we consider keeping the paragraph as a summary of our main findings.

3. It shows results of types of drugs most used in self-medication, but in the discussion, this is not mentioned. See existing studies published in Peru (Lima and Lambayeque).

Answer: Thank you for the commentary, in the 4th paragraph of the discussion section we have cited international and national studies to mention these results.

4. Another limitation of the study not mentioned is the effect of the pharmacies in the dispensing of medicines when changing or indicating drugs. See Study: Alterations in drug dispensation by private sector pharmacies in the district of Chiclayo1.

Answer: Thank you for the suggestion, however, it is not part of the objectives of our study and we did not have an instrument to measure this variable.

Competing Interests: No competing interests were disclosed.

Reviewer Report 23 January 2019

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Marcus Tolentino Silva

University of Sorocaba, Sorocaba, Brazil

This is a national survey in Peru performed in drugstores and pharmacies in 2015. The authors stratified their respondents in: (i) non self-medication (NSM, purchased based a prescription); (ii) responsible self-medication (RSM, paid an OTC); or (iii) irresponsible self-medication (IRM, acquire a prescription drug without prescription). The results reveal that RSM and IRM are more frequent in males and without health insurance, and more uncommon in >39 years old.

Some suggestions for improvement:

1. In Table 1, please stratify the characteristics of participants by the three response variables (NSM, RSM, IRM) and exclude the Table 2 (male data are missing). Change the Figure 2 to table for better visualization.
2. I believe that the results are influenced by the NSM group. This population had a prescription, which is, visited more health services and probably had poor health status. Such characteristics

are attributable to women and elders. The poor health status of the NSM group induced their best behavior. Sexism is important, but I think that it is not sufficient to explain worse male health behavior. Please review these aspects in the discussion.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: epidemiology, health technology assessment, pharmacy

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 15 Jan 2020

Diego Urrunaga-Pastor, Universidad San Ignacio de Loyola, Lima, Peru

We have read the reviewers commentaries and want to clarify certain points in this new version:

Dear Dr. Marcus Tolentino-Silva:

1. In Table 1, please stratify the characteristics of participants by the three response variables (NSM, RSM, IRM)

Answer: Thank you very much for the commentary, however, we consider important to keep table 1 with the descriptive analysis and to present the 3 strata of our main variable (NSM, RSM, ISM) in table 2.

2. Exclude the Table 2 (male data are missing)

Answer: Thank you for the observation, we have added the missing data in table 3. In addition, we have presented the bivariate analysis based on the 3 strata of the main variable.

3. Change the Figure 2 to table for better visualization.

Answer: We appreciate the comment. We have removed figure 2 and replaced it by a table (table 2) for better visualization.

4. I believe that the results are influenced by the NSM group. This population had a prescription, which is, visited more health services and probably had poor health status. Such characteristics are attributable to women and elders. The poor health status of the NSM group induced their best behavior

Answer: Thank you for the commentary, we have reviewed the literature, expanding this discussion section with this information.

5. Sexism is important, but I think that it is not sufficient to explain worse male health behavior. Please review these aspects in the discussion.

Answer: Thank you for the commentary, we did a review of the literature regarding this topic, expanding the information presented in the discussion.

Competing Interests: No competing interests were disclosed.

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