Horizonte sanitario

ISSN (en línea): 2007-7459

Regional patterns and associated factors of self-medication in Peru: analysis of a national survey

Patrones regionales y factores asociados a la automedicación en Perú: análisis de una encuesta nacional

Research Original DOI: 10.19136/hs.a25.2.6202

Maria Pinedo Bardales [1]
Emiliana Rizo Patrón [2]
Maribel Riveros [3]
Brayan E. Gonzales [4]

Corresponding: Maria Pinedo Bardales. Mailing address: Universidad Peruana Cayetano Heredia. Av. Honorio Delgado 430. San Martín de Porres, Lima. Perú.
Email: maria.pinedo@upch.pe.

[1] *Master in Tropical Medicine. Master in Control of Infectious and Tropical Diseases. Instituto de Medicina Tropical Alexander von Humboldt. Universidad Peruana Cayetano Heredia. Lima. Perú.*
[2] *Medical doctor. Master in Clinical Epidemiology. Instituto de Medicina Tropical Alexander von Humboldt. Universidad Peruana Cayetano Heredia. Lima. Perú.*
[3] *Master in Molecular Biology. Instituto de Medicina Tropical Alexander von Humboldt. Universidad Peruana Cayetano Heredia. Lima. Perú.*
[4] *Master in Epidemiological Research. Master in Public Health. Instituto de Medicina Tropical Alexander von Humboldt. Universidad Peruana Cayetano Heredia. Lima, Perú.*

Abstract

Objective: To assess the factors associated with self-medication across Peru's macroregions using data from the National Health User Satisfaction Survey 2016 (ENSUSALUD 2016).

Materials and methods: To assess the factors associated with self-medication across Peru's macroregions using data from the National Health User Satisfaction Survey 2016 (ENSUSALUD 2016).

Results: Self-medication was most frequent in the Eastern macroregion (82.3%). In the Northern macroregion, lower prevalence was associated with having secondary (aPR: 0.83) or higher education (aPR: 0.80), affiliation with the Comprehensive Health Insurance (aPR: 0.85) or EsSalud (aPR: 0.86), purchasing antibiotics (aPR: 0.80) and knowledge of the duration of the treatment (aPR: 0.52-0.54). Higher prevalence of self-medication was associated with having private insurance (aPR: 1.21), being convalescent, retired or a domestic worker (aPR: 1.91), and knowledge of drug dosage (aPR: 4.50-4.78).

Conclusions: Regional variations were identified across the Central, Southern, Eastern and Lima Metropolitana macroregions, associated with sociodemographic and knowledge differences. These findings highlight the need to implement region-specific interventions to promote safe and rational medicine use.

Keywords: Self-medication; Associated factors; Prescription; Peru; Antibiotics

Resumen

Objetivo: Evaluar los factores asociados con la automedicación en las macrorregiones del Perú utilizando datos de la Encuesta Nacional de Satisfacción de Usuarios en Salud 2016 (ENSUSALUD 2016).

Materiales y métodos: SSe realizó un análisis secundario empleando regresión de Poisson modificada con varianzas linealizadas para estimar razones de prevalencia (RP) y ajustadas (RPa) con intervalos de confianza del 95%.

Resultados: La automedicación fue más frecuente en el Oriente (82.3%). En el Norte, menor prevalencia se asoció con educación secundaria (RPa: 0.83) y superior (RPa: 0.80), afiliación al seguro integral de salud (RPa: 0.85) o a EsSalud (RPa: 0.86), compra de antibióticos (RPa: 0.80) y conocimiento de la duración del tratamiento (RPa: 0.52-0.54). Mayor prevalencia se relacionó con seguro privado (RPa: 1.21), ser convaleciente, jubilado o trabajador del hogar (RPa: 1.91) y conocimiento de la dosis (RPa: 4.50-4.78).

Conclusiones: Se observaron variaciones regionales en las macrorregiones Centro, Sur, Oriente y Lima Metropolitana, relacionadas con diferencias de conocimiento y características sociodemográficas. Estos hallazgos resaltan la necesidad de implementar intervenciones adaptadas a cada región para promover el uso seguro y racional de medicamentos en el Perú.

Palabras Claves: Automedicación; Factores asociados; Perú; Antibacterianos

• Received date: February 20, 2026 • Accepted date: March 25, 2026
• Publication date: March 26, 2026

Introduction

Self-medication refers to the selection and use of medicines without professional medical supervision, either by individuals themselves or by their close relatives[1]. Its prevalence varies widely across countries, with reported rates ranging from 16.1% and 99%[2,3,4]. These differences are influenced by factors such as medication type[5] and geographic region[6]. People commonly purchase medicines without a prescription (PWP) to address minor ailments including headaches, colds or coughs[7], motivated by convenience and cost-saving, under the assumption that these conditions are mild and manageable[8]. However, self-medication carries several risks, including misdiagnosis, drug interactions, incorrect dosing and potential dependence[2]. Furthermore, the inappropriate use of antimicrobials contributes to antimicrobial resistance, a growing global health problem exacerbated in low- and middle-income countries such as Peru, especially after the COVID-19 pandemic[9,10].

Regionally, Brazil reported a prevalence of parental/guardians self-medication in children of 32.4%, predominating among male participants[11]. In Ecuador, it reached 30.3%, influenced by social networks and family advice[12]. In Saudi Arabia, factors such as age, sex, education and income were associated with self-medication[3]. In Portugal, 22.5% practiced self-medication, with associations to sex, age and education[13]. The presence of chronic diseases is commonly associated with self-medication[14,15].

In Peru, studies also indicate high self-medication prevalence. In Cajamarca in 2001, 36.2% of the population self-medicated[16], while in a district of Lima in 2013, it rose to 56.7%, being more common among men and individuals with primary or secondary education[17]. In 2014, 2015 and 2016, the National Health User Satisfaction Surveys (ENSUSALUD) included questionnaires for users of drugstores and pharmacies[18]. ENSUSALUD 2015 reported that 84.8% engaged in self-medication[6] and in 2016, self-medication was most frequent among adults aged 25-44, particularly in the Highlands and the Jungle regions[4]. During the COVID-19 pandemic, one study reported that 33.9% of hospitalized COVID-19 patients self-medicated with antibiotics and ivermectin prior to admission[19].

Although factors associated with self-medication have been identified in Peru, existing studies are limited by sample size and methodology, making generalizable conclusions and stratified analyses difficult[16,17,19]. Furthermore, ENSUSALUD data have not been analyzed in detail by macroregion, which would allow for tailored interventions to reduce self-medication. Therefore, this study aimed to determine the factors associated with PWP (self-medication) across Peru's macroregions using data from ENSUSALUD 2016.

Materials and methods

Cross-sectional study that analyzed data obtained from Questionnaire N°4 (C4) of ENSUSALUD 2016, conducted between May and July 2016, with the aim of describing the perceptions and behaviors of users who visited drugstores and pharmacies located near public and private healthcare facilities in Peru[20].

C4 was administered to people aged 15 years and older who purchased medications for themselves, their partner or their children in drugstores or pharmacies located within a two-block radius of the selected healthcare facilities. ENSUSALUD employed a probabilistic, two-stage, stratified and department-independent sampling design. Healthcare facilities at the first, second and third levels of care were selected with probability proportional to the number of patients served, including facilities from the Ministry of Health, the Social Health Insurance (EsSalud), the Armed Forces and Police Health Services, as well as the private sector.

Of the 3 940 users of pharmacies and drugstores surveyed in ENSUSALUD 2016, with a refusal rate of 2.0%[20], those who completed the questionnaire in full were included in this secondary data analysis (N=3,858).

Considering 3 858 users and 5% loss rate, with an expected difference in the self-medication of 9% between two macroregions and a sample size ratio of 1:2[4], a statistical power of 80.4% and 95% Confidence Level. The C4 database was downloaded from the SUSALUD website[18], imported into Stata SE version 19.5 (Stata Corporation, College Station, Texas, US) and the inclusion criteria were verified.

The dependent variable "medication purchase" was recategorized using responses to question No. 12: "Did you buy this/these medication(s) with a prescription?", which included the following options: (1) Yes and shows prescription; (2) Yes but does not show prescription; (3) No. For this study, response options 2 and 3 were classified as self-medication or purchase of medications without a medical prescription (PWP), which corresponds to the widely accepted definition of self-medication as the acquisition and use of medications without prior medical evaluation or a valid prescription[1].

The main independent variable was recategorized the regions in which the health facilities (HF) were located, grouping them into five macroregions: 1) North: Tumbes, Piura, Lambayeque, Cajamarca, La Libertad; 2) Central: Lima (excluding the province of Lima), Áncash, Junín, Cerro de Pasco, Huánuco, Huancavelica, Ayacucho, Ica; 3) South: Arequipa, Moquegua, Tacna, Cusco, Madre de Dios, Apurímac, Puno; 4) Eastern: Loreto, Ucayali, Amazonas, San Martín; y 5) Lima Metropolitana: Constitucional province of Callao and province of Lima.

Absolute and relative frequencies were reported for categorical variables and means with standard deviations for numerical variables, both at the national level and by macroregion. In the bivariate analysis, factors associated with self-medication were explored using hypothesis tests (χ^2 and Student's t-test) and modified Poisson regression with linearized variances to estimate prevalence ratios (PR) and adjusted prevalence ratios (aPR). The variables reason for purchase and type of medication were analyzed in dichotomized form based on their most common categories. In the multivariable analysis, covariates identified as relevant in the literature were included and the type of medication variable was restricted to the category with the highest clinical relevance to avoid multicollinearity. Given the heterogeneity across Peruvian macroregions, stratified analysis by macroregion were conducted. To test whether the effect of co-variables on self-medication varied by macroregion, interaction terms

("##" operator) were included. A national and by macroregion models were generated, considering a 95% confidence interval and a p-value <0.05 as statistically significant. All analyses were performed using expansion factors according to the ENSUSALUD 2016 recommendations[20] and using complex survey package ("*svy*") in Stata/SE v.19.5 program (Stata Corporation, TX, USA).

Results

Among 3 858 participants of ENSUSALUD 2016, 73.2% (2,926) reported purchasing medicines without a medical prescription (self-medication), with the highest prevalence in the Eastern macroregion (82.3%), followed by the Southern (79.5%), Central (78.0%), Northern (68.7%) and Lima Metropolitana (66.3%). At the national level, significant associations were found between self-medication and factors such as sex, age, age group, macroregion, educational level, current occupation, type of health insurance, antibiotic purchase, NSAIDs purchase, level of medication knowledge and purchase for respiratory symptoms (p<0.05) (Table 1).

Table 1. Characteristics associated with the purchase medicines without a medical prescription among ENSUSALUD 2016 participants (N=3 858)[a]

Characteristics	Total N (%)	Purchase of medications		p
		With prescription N=932	Without prescription (self-medication) N=2 926	
		n (%)	n (%)	
Sex				0.007
Male	1 698 (43.9)	366 (39.6)	1 332 (45.5)	
Age (years) [b]	40.1 ± 14.8	42.2 ± 14.5	39.3 ± 14.9	<0.001
Age group (years)				0.001
≥15-<30	1 068 (27.6)	209 (21.5)	859 (29.8)	
≥30-<60	2 395 (60.8)	610 (65.2)	1 785 (59.2)	
≥60	395 (11.6)	113 (13.3)	282 (11.0)	
Macroregion of health facility location				<0.001
Central	1 016 (23.9)	227 (19.6)	789 (25.4)	
Southern	999 (17.4)	203 (13.3)	796 (18.9)	
Northern	832 (21.3)	245 (24.9)	587 (20.0)	
Lima Metropolitana	517 (29.5)	174 (37.0)	343 (26.7)	
Eastern	494 (7.9)	83 (5.3)	411 (9.0)	
Educational level				<0.001
Primary or less	494 (12.2)	140 (13.8)	354 (11.6)	
Secondary	1 508 (38.5)	388 (44.4)	1 120 (36.3)	

To be continued...

Technical studies	787 (19.9)	197 (19.7)	590 (20.0)	
Higher education	1 069 (29.5)	207 (22.1)	862 (32.2)	
Current occupation				<0.001
Unemployed	85 (1.9)	22 (2.2)	63 (1.8)	
Student	302 (7.8)	40 (4.0)	262 (9.2)	
Homemaker	820 (20.6)	250 (26.6)	570 (18.4)	
Employee	1 086 (28.6)	211 (22.8)	875 (30.7)	
Self-employed	1 502 (38.7)	400 (43.0)	1 102 (37.2)	
Other [c]	63 (2.4)	9 (1.4)	54 (2.7)	
Type of health insurance				<0.001
None	1 198 (33.1)	233 (25.7)	965 (35.9)	
Comprehensive Health Insurance	1 332 (32.6)	406 (44.0)	926 (28.4)	
EsSalud	1 137 (27.8)	254 (25.1)	883 (28.9)	
Private insurance	86 (3.0)	12 (1.7)	74 (3.5)	
Armed Forces or National Police	54 (1.7)	19 (2.3)	35 (1.5)	
More tan one insurance	51 (1.7)	8 (1.1)	43 (1.9)	
Purchased antibiotics				<0.001
Yes	973 (24.3)	284 (27.5)	689 (23.1)	
Purchased NSAIDs				<0.001
Yes	1 029 (25.4)	196 (19.0)	833 (27.7)	
Type of establishment				0.517
Drugstore	3 236 (84.4)	784 (85.1)	2 452 (84.1)	
Pharmacy	622 (15.6)	148 (14.9)	474 (15.9)	
Medication requires prescription				<0.001
Yes	2 939 (78.0)	823 (88.7)	2 116 (74.1)	
Knowledge of medication administration time				<0.001
None	143 (3.1)	61 (6.1)	82 (1.9)	
Minimal	1 058 (24.1)	222 (23.1)	836 (24.5)	
Moderate	2 140 (56.2)	504 (51.4)	1 636 (57.9)	
High	517 (16.7)	145 (19.5)	372 (15.6)	
Knowledge of medication dosage				<0.001
None	135 (3.0)	63 (6.3)	72 (1.8)	
Minimal	1 049 (24.0)	199 (20.7)	850 (25.2)	
Moderate	2 154 (56.7)	527 (53.8)	1 627 (57.7)	
High	520 (16.3)	143 (19.2)	377 (15.3)	
Purchased due to respiratory symptoms				<0.001
Yes	1 257 (31.4)	236 (24.6)	1 021 (33.9)	
Purchased due to gastrointestinal symptoms				0.034
Yes	557 (14.5)	124 (12.2)	433 (15.4)	

Note: [a] Some variables may add less than 3 858 due to missing data. [b] Mean ± standard deviation. [c] Convalescent, retired or domestic worker.
Source: Own elaboration.

Nationwide factors associated with self-medication

Among those who practiced self-medication, 54.5% were women, with the highest prevalence in the Southern macroregion (57.1%) and the lowest in the Eastern macroregion (45.9%). 59.2% were aged between 30 and 59 years and 36.3% had completed secondary education, with the lowest educational level in the Northern macroregion (17.9%). Independent workers represented 37.2% of those who practiced self-medication and were the predominant group across all macroregions, except in Lima Metropolitana, where employed workers were more prevalent (41.7%). Additionally, 35.9% of this population lacked health insurance, particularly in the Northern macroregion (40.5%). The majority (84.1%) obtained medications from drugstores and approximately 57% reported having moderate knowledge regarding the timing and dosage of medication administration. The primary reasons for self-medication were respiratory symptoms (33.9%) and gastrointestinal symptoms (15.4%), both nationally and across macroregions (Table 2). The most purchased medications without a prescription were nonsteroidal anti-inflammatory drugs (NSAIDs) (22.6%) and antibiotics (19.3%) (Table 3). Among the antibiotics, amoxicillin was purchased most frequently (31.9%).

Table 2. Characteristics of drugstore and pharmacy users who purchased medications without a medical prescription (self-medication) (N=2 926)[a]

Characteristics	Total N (%)	Macroregion of health facility location				
		Northern N=587	Central N=789	Southern N=796	Eastern N=411	Lima Metropolitana N=343
		n (%)	n (%)	n (%)	n (%)	n (%)
Sex						
Male	1 332 (45.5)	275 (46.9)	329 (45.0)	356 (42.9)	221 (54.1)	151 (44.0)
Age (years) [b]	39.3 ± 14.9	39.8 ± 14.7	39.0 ± 14.8	37.5 ± 13.7	39.4 ± 14.2	40.6 ± 16.1
Age group (years)						
≥15-<30	859 (29.8)	164 (27.6)	232 (29.8)	241 (32.7)	120 (29.0)	102 (29.7)
≥30-<60	1 785 (59.2)	366 (61.3)	490 (58.6)	480 (58.8)	250 (60.8)	199 (58.0)
≥60	282 (11.0)	57 (11.1)	67 (11.6)	75 (8.5)	41 (10.3)	42 (12.2)
Educational level						
Primary or less	354 (11.6)	88 (17.9)	100 (13.9)	90 (9.9)	59 (14.0)	17 (5.0)
Secondary	1 120 (36.3)	241 (39.8)	305 (38.8)	275 (30.6)	193 (49.3)	106 (30.9)
Technical studies	590 (20.0)	142 (23.5)	141 (15.3)	164 (22.4)	71 (17.1)	72 (21.0)
Higher education	862 (32.2)	116 (18.7)	243 (32.1)	267 (37.1)	88 (19.7)	148 (43.2)
Current occupation						
Unemployed	63 (1.8)	14 (2.0)	16 (1.4)	16 (2.1)	12 (3.1)	5 (1.5)
Student	262 (9.2)	51 (8.6)	89 (11.1)	65 (8.8)	25 (6.0)	32 (9.3)
Homemaker	570 (18.4)	139 (24.8)	207 (22.2)	106 (13.2)	70 (17.3)	48 (14.0)
Employee	875 (30.7)	138 (22.9)	206 (23.8)	257 (32.4)	131 (31.6)	143 (41.7)

To be continued...

Self-employed	1 102 (37.2)	236 (40.0)	255 (37.6)	339 (42.1)	170 (41.4)	102 (29.7)
Other [c]	54 (2.7)	9 (1.8)	16 (3.9)	13 (1.5)	3 (0.7)	13 (3.8)
Type of health insurance						
None	965 (35.9)	237 (40.5)	268 (38.1)	251 (35.3)	88 (22.4)	121 (35.3)
Comprehensive health insurance	926 (28.4)	181 (31.8)	256 (32.2)	241 (26.9)	190 (47.2)	58 (16.9)
EsSalud	883 (28.9)	143 (23.9)	248 (27.8)	263 (32.0)	119 (26.9)	110 (32.1)
Private insurance	74 (3.5)	17 (2.3)	11 (1.4)	12 (1.8)	6 (1.6)	28 (8.2)
Armed Forces or National Police	35 (1.5)	5 (1.1)	3 (0.4)	14 (2.0)	4 (0.9)	9 (2.6)
More tan one insurance	43 (1.9)	4 (0.5)	3 (0.2)	15 (2.0)	4 (1.0)	17 (5.0)
Type of establishment						
Drugstore	2 452 (84.1)	436 (72.2)	713 (90.1)	658 (87.1)	352 (83.7)	293 (85.4)
Pharmacy	474 (15.9)	151 (27.8)	76 (9.9)	138 (12.9)	59 (16.3)	50 (14.6)
Knowledge of medication administration time						
None	82 (1.9)	11 (1.7)	35 (2.7)	25 (2.5)	7 (1.4)	4 (1.2)
Minimal	836 (24.5)	142 (24.1)	210 (23.9)	271 (31.3)	158 (38.1)	55 (16.0)
Moderate	1 636 (57.9)	368 (62.5)	466 (61.9)	385 (49.3)	216 (52.8)	201 (58.6)
High	372 (15.6)	66 (11.7)	78 (11.5)	115 (16.9)	30 (7.7)	83 (24.2)
Knowledge of medication dosage						
None	72 (1.8)	8 (1.3)	28 (2.0)	24 (2.5)	6 (1.3)	6 (1.8)
Minimal	850 (25.2)	140 (23.5)	225 (27.3)	270 (31.7)	163 (39.2)	52 (15.2)
Moderate	1 627 (57.7)	373 (63.5)	457 (60.4)	384 (49.0)	210 (51.5)	203 (59.2)
High	377 (15.3)	66 (11.7)	79 (10.3)	118 (16.9)	32 (8.0)	82 (23.9)
Reason for purchasing medication						
Respiratory symptoms	1 021 (33.9)	192 (33.5)	267 (32.9)	319 (37.5)	132 (33.5)	111 (32.8)
Gastrointestinal symptoms	433 (15.4)	78 (13.4)	134 (15.0)	103 (15.0)	56 (13.2)	62 (18.3)
Bone pain	299 (10.4)	67 (11.9)	85 (11.7)	67 (8.6)	51 (12.2)	29 (8.6)
Fever/headache	363 (11.7)	60 (10.8)	99 (13.1)	106 (12.9)	68 (15.6)	30 (8.9)
Genitourinary disease	221 (8.3)	55 (8.6)	65 (8.1)	39 (7.0)	30 (7.0)	32 (9.5)
Endocrine, nutritional or metabolic disease	143 (5.1)	38 (5.4)	34 (5.1)	37 (4.4)	15 (4.1)	19 (5.6)
Cardiovascular disease	96 (3.4)	20 (3.8)	29 (4.0)	20 (2.0)	15 (3.6)	12 (3.6)
Other [d]	328 (11.8)	73 (12.7)	71 (10.0)	98 (12.6)	43 (10.9)	43 (12.7)

Note: [a] Some variables may add less than 3 858 due to missing data. [b] Mean ± standard deviation. [c] Convalescent, retired or domestic worker.
[d] Dental problems, infectious diseases, and mental and behavioral disorders.
Source: Own elaboration.

Table 3. Medications purchased without a medical prescription (self-medication) (N=3 775) [a]

Type of medication purchased	Total N (%)	Macroregion of health facility location				
		Northern N=774	Central N=1 079	Southern N=991	Eastern N=529	Lima Metropolitana N=402
		n (%)	n (%)	n (%)	n (%)	n (%)
Antibiotics	723 (19.2)	149 (19.3)	247 (22.9)	170 (17.2)	89 (16.8)	68 (16.9)
Nonsteroidal anti-inflammatory drugs (NSAIDs)	853 (22.6)	171 (22.1)	249 (23.1)	229 (23.1)	131 (24.8)	73 (18.2)
Analgesics, antipyretics, steroidal anti-inflammatories and corticosteroids	640 (17.0)	116 (15.0)	165 (15.3)	205 (20.7)	104 (19.7)	50 (12.4)
For respiratory symptoms	521 (13.8)	114 (14.7)	142 (13.2)	138 (13.9)	69 (13.0)	58 (14.4)
For gastrointestinal symptoms and antiemetics	415 (11.0)	90 (11.6)	116 (10.8)	112 (11.3)	39 (7.4)	58 (14.4)
Cardiovascular agents	105 (2.8)	24 (3.1)	33 (3.1)	22 (2.2)	13 (2.5)	13 (3.2)
Antifungals, antiparasitics, antivirals	139 (3.7)	23 (3.0)	37 (3.4)	37 (3.7)	25 (4.7)	17 (4.2)
Vitamins and supplements	83 (2.2)	16 (2.1)	19 (1.8)	10 (1.0)	21 (4.0)	17 (4.2)
Other [b]	296 (7.8)	71 (9.2)	71 (6.6)	68 (6.9)	38 (7.2)	48 (11.9)

[a] Participants may have purchased more than one medication. [b] Nervous system agents, anxiolytics and anticonvulsants; antigout agents; hemostatic agents; dermatological agents; blood-forming and blood-modifying agents; hormones and other hormonal agents, among others.
Source: Own elaboration.

The multivariate model at national level showed that being aged 30 to 60 years (aPR: 0.94; 95%CI: 0.89-0.99), having Comprehensive Health Insurance (aPR: 0.82; 95%CI: 0.77-0.87), having EsSalud (aPR: 0.92; 95%CI: 0.87-0.98), having insurance through the Armed Forces or National Police (aPR: 0.79; 95%CI: 0.63-0.99) and purchase antibiotics (aPR: 0.91; 95%CI: 0.86-0.96) were statistically associated with lower frequency of self-medication. In contrast, Central (aPR: 1.20; 95%CI: 1.12-1.29), Southern (aPR: 1.21; 95%CI: 1.13-1.30) and Eastern macroregion (aPR: 1.29; 95%CI: 1.19-1.39) macroregions were statistically associated with higher frequency of self-medication (Table 4).

Table 4. Factors associated with the purchase of medications without a medical prescription (self-medication) at the national level

Characteristics	Bivariate analysis			Multivariate analysis [a]		
	PR	95% CI	p	aPR	95% CI	p
Sex						
Female	Ref.			Ref.		
Male	1.07	1.02 - 1.12	0.006	1.03	0.98 - 1.08	0.305
Age (years) [b]	1.00	0.99 - 1.00	<0.001	-	-	-

To be continued...

Age group (years)						
≥15-<30	Ref.			Ref.		
≥30-<60	0.90	0.86 - 0.95	<0.001	0.94	0.89 - 0.99	0.023
≥60	0.87	0.80 - 0.95	0.002	0.91	0.82 - 1.01	0.065
Educational level						
Primary or less	Ref.			Ref.		
Secondary	0.99	0.92 - 1.08	0.873	0.94	0.86 - 1.02	0.124
Technical studies	1.06	0.97 - 1.15	0.216	0.95	0.86 - 1.04	0.227
Higher education	1.15	1.06 - 1.24	<0.001	1.00	0.91 - 1.09	0.939
Current occupation						
Unemployed	Ref.			Ref.		
Student	1.24	1.04 - 1.50	0.020	1.14	0.95 - 1.36	0.158
Homemaker	0.94	0.78 - 1.13	0.531	1.02	0.85 - 1.21	0.838
Employee	1.13	0.95 - 1.36	0.172	1.12	0.94 - 1.33	0.196
Self-employed	1.01	0.85 - 1.21	0.892	1.02	0.86 - 1.21	0.790
Other [c]	1.21	0.97 - 1.50	0.086	1.29	1.04 - 1.59	0.019
Type of health insurance						
None	Ref.			Ref.		
Comprehensive health insurance	0.80	0.76 - 0.86	<0.001	0.82	0.77 - 0.87	<0.001
EsSalud	0.96	0.91 - 1.01	0.108	0.92	0.87 - 0.98	0.012
Private insurance	1.07	0.96 - 1.19	0.235	1.11	0.99 - 1.25	0.084
Armed Forces or National Police	0.80	0.63 - 1.01	0.058	0.79	0.63 - 0.99	0.036
More tan one insurance	1.04	0.89 - 1.21	0.643	1.06	0.90 - 1.25	0.492
Type of establishment						
Drugstore	Ref.			-		
Pharmacy	1.02	0.96 - 1.08	0.509	-	-	-
Purchased antibiotics						
No	Ref.			Ref.		
Yes	0.94	0.89 - 0.99	0.021	0.91	0.86 - 0.96	0.001
Purchased NSAIDs						
No	Ref.			-		
Yes	1.13	1.08 - 1.18	<0.001	-	-	-
Medication requires prescription						
No	Ref.			-		
Yes	0.81	0.77 - 0.84	<0.001	-	-	-
Knowledge of medication administration time						
None	Ref.			Ref.		
Minimal	1.59	1.28 - 1.99	<0.001	1.17	0.82 - 1.65	0.382
Moderate	1.62	1.30 - 2.02	<0.001	1.26	0.88 - 1.80	0.200
High	1.47	1.17 - 1.85	0.001	1.18	0.82 - 1.71	0.370

To be continued...

Horizonte sanitario
vol. 25, no. 2, mayo - agosto 2026
ISSN (en línea): 2007-7459
https://revistahorizonte.ujat.mx/

Knowledge of medication dosage						
None	Ref.			Ref.		
Minimal	1.75	1.38 - 2.22	<0.001	1.44	1.00 - 2.08	0.052
Moderate	1.69	1.34 - 2.15	<0.001	1.31	0.90 - 1.90	0.160
High	1.56	1.22 - 1.99	<0.001	1.27	0.86 - 1.86	0.230
Purchased due to respiratory symptoms						
No	Ref.			Ref.		
Yes	1.12	1.07 - 1.17	<0.001	1.11	1.06 - 1.16	<0.001
Purchased due to gastrointestinal symptoms						
No	Ref.			-		
Yes	1.07	1.01 - 1.14	0.023	-	-	-
Macroregion of health facility location						
Lima Metropolitana	Ref.			Ref.		
Northern	1.04	0.96 - 1.12	0.386	1.07	0.99 - 1.16	0.098
Central	1.18	1.09 - 1.26	<0.001	1.20	1.12 - 1.29	<0.001
Southern	1.20	1.11 - 1.29	<0.001	1.21	1.13 - 1.30	<0.001
Eastern	1.24	1.15 - 1.34	<0.001	1.29	1.19 - 1.39	<0.001

Note: [a] Adjusted for sex, age group, educational level, current occupation, type of health insurance, type of establishment, antibiotic purchase, knowledge of medication administration time, knowledge of medication dosage and purchase due to respiratory symptoms. [b] Mean ± standard deviation. [c] Convalescent, retired or domestic worker.
PR: Prevalence Ratio, aPR: Adjusted Prevalence Ratio, 95% CI: 95% Confidence Interval.
Source: Own elaboration.

Factors associated by macroregion

Effect modification by macroregion was evaluated for variables related to medication knowledge. Statistically significant interactions were found between the Northern macroregion and knowledge level. These findings indicate heterogeneity in the effect of medication knowledge on self-medication across macroregions, demonstrating effect modification.

Stratified regression models were conducted for each macroregion. In the Northern macroregion, having secondary (aPR: 0.83; 95%CI: 0.72-0.96) or higher education (aPR: 0.80; 95%CI: 0.66-0.95), having Comprehensive Health Insurance (aPR: 0.85; 95%CI: 0.76-0.96) or EsSalud (aPR: 0.86; 95%CI: 0.74-0.99), purchase antibiotics (aPR: 0.80; 95%CI: 0.70-0.91) and having minimal (aPR: 0.54; 95%CI: 0.38-0.75) or moderate (aPR: 0.52; 95%CI: 0.38-0.73) knowledge regarding medication administration time were statistically associated with lower frequency of self-medication. In contrast, having private insurance (aPR: 1.21; 95%CI: 1.07-1.37) and reporting minimal (aPR: 4.78; 95%CI: 2.50-9.11), moderate (aPR: 4.50; 95%CI: 2.35-8.62) or high (aPR: 4.78; 95%CI: 2.40-9.55) knowledge about medication dosage were statistically associated with higher frequency of self-medication (Table 5).

In the Central macroregion, having Comprehensive Health Insurance (aPR: 0.86; 95%CI: 0.78-0.95) and multiple health insurance (aPR: 1.25; 95%CI: 1.12-1.40) were associated with a statistical decrease and increase in the frequency of self-medication, respectively. In the Southern macroregion, people aged 30 to 60 years (aPR: 0.90; 95%CI: 0.83-0.97) and those with insurance from the Armed Forces or National Police (aPR: 0.68; 95%CI: 0.46-0.98) had a statistical lower frequency of self-medication, whereas those who purchased medications for respiratory symptoms (aPR: 1.18; 95%CI: 1.10-1.26) had a statistical higher prevalence of self-medication. In the Eastern macroregion, only those who purchased antibiotics (aPR: 0.87; 95%CI: 0.77-0.98) showed a statistical higher frequency of self-medication. Finally, in Lima Metropolitana, having Comprehensive Health Insurance (aPR: 0.65; 95%CI: 0.52-0.81) and purchasing medications for respiratory symptoms (aPR: 1.16; 95%CI: 1.02-1.31) were statistically associated with a lower and higher frequency of self-medication, respectively (Table 5).

Table 5. Factors associated with the purchase of medications without a medical prescription (self-medication), stratified by macroregion [a]

Characteristics	Multivariate analysis [b]			Multivariate analysis [c]			Multivariate analysis [d]			Multivariate analysis [e]			Multivariate analysis [f]		
	aPR	95% CI	p	aPR	95% CI	p	aPR	95% CI	p	aPR	95% CI	p	aPR	95% CI	p
Sex															
Female	Ref.			Ref.			Ref.			Ref.			Ref.		
Male	1.04	0.93 - 1.17	0.477	0.98	0.90 - 1.07	0.719	1.04	0.95 - 1.12	0.396	1.04	0.95 - 1.15	0.388	1.01	0.90 - 1.14	0.836
Age group (years)															
≥15 - <30	Ref.			Ref.			Ref.			Ref.			Ref.		
≥30 - <60	0.96	0.85 - 1.09	0.561	0.99	0.89 - 1.09	0.809	0.90	0.83 - 0.97	0.010	0.94	0.86 - 1.04	0.252	0.94	0.81 - 1.09	0.387
≥60	0.96	0.79 - 1.18	0.725	0.96	0.79 - 1.17	0.685	0.90	0.77 - 1.05	0.190	0.92	0.75 - 1.12	0.402	0.92	0.70 - 1.22	0.570
Educational level															
Primary or less	Ref.			Ref.			Ref.			Ref.			Ref.		
Secondary	0.83	0.72 - 0.96	0.012	1.09	0.93 - 1.27	0.277	0.98	0.84 - 1.14	0.767	1.10	0.95 - 1.28	0.204	0.88	0.65 - 1.19	0.405
Technical studies	0.86	0.73 - 1.01	0.071	1.09	0.92 - 1.28	0.314	0.92	0.78 - 1.10	0.364	0.93	0.76 - 1.13	0.443	0.97	0.71 - 1.34	0.865
Higher education	0.80	0.66 - 0.95	0.014	1.14	0.97 - 1.33	0.109	1.00	0.85 - 1.18	0.967	1.04	0.87 - 1.25	0.637	1.02	0.75 - 1.39	0.885
Current occupation															
Unemployed	Ref.			Ref.			Ref.			Ref.			Ref.		
Student	1.40	0.93 - 2.12	0.109	0.97	0.77 - 1.23	0.810	1.01	0.79 - 1.28	0.955	0.96	0.68 - 1.37	0.832	1.42	0.85 - 2.38	0.178
Homemaker	1.15	0.77 - 1.72	0.508	0.86	0.69 - 1.08	0.198	0.99	0.78 - 1.26	0.957	0.95	0.70 - 1.31	0.775	1.24	0.74 - 2.08	0.417
Employee	1.33	0.89 - 1.99	0.161	0.92	0.74 - 1.14	0.436	1.05	0.83 - 1.33	0.684	0.97	0.71 - 1.33	0.848	1.33	0.81 - 2.19	0.255
Self-employed	1.21	0.82 - 1.79	0.345	0.94	0.76 - 1.17	0.585	0.95	0.76 - 1.19	0.683	0.94	0.69 - 1.29	0.718	1.11	0.67 - 1.82	0.690
Other [c]	1.91	1.25 - 2.91	0.003	1.19	0.93 - 1.52	0.168	0.93	0.59 - 1.48	0.769	1.25	0.87 - 1.78	0.228	1.42	0.81 - 2.48	0.215

To be continued...

Type of health insurance															
None	Ref.			Ref.			Ref.			Ref.			Ref.		
Comprehensive health insurance	0.85	0.76 - 0.96	0.009	0.86	0.78 - 0.95	0.002	0.91	0.82 - 1.00	0.059	0.93	0.84 - 1.04	0.194	0.65	0.52 - 0.81	
EsSalud	0.86	0.74 - 0.99	0.046	0.95	0.87 - 1.05	0.329	0.93	0.84 - 1.04	0.207	1.06	0.94 - 1.20	0.314	0.93	0.80 - 1.09	0.387
Private insurance	1.21	1.07 - 1.37	0.002	0.93	0.71 - 1.21	0.583	1.04	0.91 - 1.19	0.596	1.00	0.69 - 1.44	0.999	1.14	0.92 - 1.42	0.233
Armed Forces or National Police	0.60	0.34 - 1.07	0.085	1.14	0.95 - 1.35	0.151	0.68	0.46 - 0.98	0.041	0.86	0.53 - 1.42	0.562	0.88	0.61 - 1.27	0.498
More tan one insurance	0.92	0.46 - 1.83	0.814	1.25	1.12 - 1.40	<0.001	1.02	0.83 - 1.25	0.842	1.11	0.75 - 1.64	0.601	1.06	0.84 - 1.35	0.622
Purchased antibiotics															
No	Ref.			Ref.			Ref.			Ref.			Ref.		
Yes	0.80	0.70 - 0.91	0.001	0.94	0.87 - 1.03	0.175	0.91	0.83 - 1.00	0.059	0.87	0.77 - 0.98	0.025	1.01	0.86 - 1.18	0.939
Knowledge of medication administration time															
None	Ref.			Ref.			Ref.			Ref.			Ref.		
Minimal	0.54	0.38 - 0.75	<0.001	1.09	0.59 - 2.03	0.782	0.97	0.63 - 1.49	0.882	1.33	0.50 - 3.53	0.573	1.41	0.62 - 3.18	0.412
Moderate	0.52	0.38 - 0.73	<0.001	1.30	0.69 - 2.44	0.411	0.98	0.62 - 1.54	0.925	1.45	0.54 - 3.90	0.464	1.61	0.70 - 3.66	0.260
High	0.54	0.36 - 0.81	0.003	1.25	0.66 - 2.36	0.491	0.93	0.58 - 1.49	0.762	1.35	0.48 - 3.76	0.565	1.40	0.60 - 3.24	0.435
Knowledge of medication dosage															
None	Ref.			Ref.			Ref.			Ref.			Ref.		
Minimal	4.78	2.50 - 9.11	<0.001	1.50	0.74 - 3.05	0.259	1.37	0.88 - 2.13	0.163	0.97	0.32 - 2.96	0.956	1.12	0.61 - 2.08	0.711
Moderate	4.50	2.35 - 8.62	<0.001	1.36	0.66 - 2.78	0.403	1.20	0.75 - 1.91	0.443	0.85	0.27 - 2.62	0.773	1.01	0.54 - 1.89	0.980
High	4.78	2.40 - 9.55	<0.001	1.40	0.68 - 2.88	0.363	1.24	0.77 - 2.00	0.376	0.77	0.24 - 2.46	0.665	0.90	0.47 - 1.74	0.751
Purchased due to respiratory symptoms															
No	Ref.			Ref.			Ref.			Ref.			Ref.		
Yes	1.09	0.99 - 1.20	0.079	1.04	0.97 - 1.13	0.274	1.18	1.10 - 1.26	<0.001	1.04	0.95 - 1.14	0.397	1.16	1.02 - 1.31	0.025

Note: [a] Adjusted for sex, age group, educational level, current occupation, type of health insurance, type of establishment, antibiotic purchase, knowledge of medication administration time, knowledge of medication dosage and purchase due to respiratory symptoms. [b] Model adjusted and stratified by Northern macroregion. [c] Model adjusted and stratified by Central macroregion. d Model adjusted and stratified by Southern macroregion. [e] Model adjusted and stratified by Eastern macroregion. [f] Model adjusted and stratified by macroregion of Lima Metropolitana. [g] Convalescent, retired or domestic worker. PR: Prevalence Ratio, aPR: Adjusted Prevalence Ratio, 95% CI: 95% Confidence Interval.
Source: Own elaboration.

Discussion

This study reports that in 2016, 73.2% of the Peruvian population engaged in self-medication, with the highest prevalence in the Eastern macroregion (82.3%) and the lowest in Lima Metropolitana (66.3%). Nationally, self-medication was less common among people aged 30-60 years, without health insurance or with the Armed Forces or National Police insurance and among those who purchased antibiotics. These associations at national level varied when analyses were stratified by macroregion, suggesting that region-specific factors influence the national estimates. This finding supports the use of stratified analyses, as they reveal key differences across macroregions. In the Northern macroregion, self-medication was less frequent among people with secondary education, Comprehensive Health Insurance or moderate medication knowledge, but more frequent among those with private insurance and higher medication knowledge. In the Central macroregion, self-medication was associated with Comprehensive Health Insurance and having multiple insurances. In the Southern macroregion, self-medication was lower among people with Armed Forces or National Police insurance and higher among those purchasing medications for respiratory symptoms. In the Eastern macroregion, self-medication decreased among antibiotic purchasers. Finally, in Lima Metropolitana, self-medication was associated with Comprehensive Health Insurance and the purchase of medications for respiratory symptoms.

The frequencies of self-medication observed in the Southern (79.5%) and Central (78.0%) macroregions are comparable to those reported in El Salvador during COVID-19 pandemic (79%)[21]. However, these rates are substantially lower than those reported in China (99%)[22]. Both the national and macroregional frequencies in our study exceed previous reports from Cajamarca, Peru (36.1% in 2001)[16], as well as estimates from Greece (20.2%), Romania (19.1%), Italy (19.0%) (12.3%) and Spain (14.9%)[23]. These disparities likely reflect variations in national regulations on medication sales and differences in access to healthcare services across countries.

At the national level, men were associated with a higher prevalence of self-medication, which aligns with findings from previous studies conducted in Peru[17]. However, this pattern differs from reports in Saudi Arabia and Portugal, where self-medication was more prevalent among women or where being male was associated with a lower risk of self-medication[3,13]. These contrasting results underscore how the influence of gender on self-medication can vary across populations. On the other hand, in the Southern macroregion, being 30-60 years old was associated with a lower prevalence of self-medication compared to those aged 15-29. This finding is consistent with studies from Lima and Europe showing that self-medication tends to decrease with age[17,23]. However, evidence from Ethiopia[8] indicates higher self-medication rates among adults aged 50-59, possibly due to factors such as chronic diseases and more frequent medication use.

In the Northern macroregion, having secondary or higher education was associated with a lower self-medication prevalence compared with having only primary education or less. A similar pattern was observed in Saudi Arabia, where lower education increased the risk of self-medication[3].

In contrast, in the European population, higher education was associated with a greater prevalence of self-medication[23]. These contrasting findings suggest that educational level may interact with additional factors (e.g., trust in pharmacy staff, prior experiences with medications or the sources from which individuals receive recommendations), indicating that these variables should be incorporated into future data collection and analysis.

Regarding occupational status, individuals who were convalescent, retired, or a domestic workers showed a higher prevalence of self-medication in the Northern macroregion. Although this group represents a small proportion (2.7%), it should be considered in strategies aimed at reducing self-medication. This contrasts with findings from Portugal, where no association between occupation and self-medication was observed[13]. In Saudi Arabia, however, not being a healthcare worker was associated with a higher risk of self-medication[3]. Since ENSUSALUD did not differentiate between healthcare and non-healthcare workers, including this information in future surveys would allow for a more accurate assessment of its potential influence.

Affiliation with the Comprehensive Health Insurance was associated with a lower prevalence of self-medication in the Northern (aPR: 0.85), Central (aPR: 0.86) and Lima Metropolitana (aPR: 0.65) macroregions, while EsSalud (aPR: 0.86) and Armed Forces or National Police insurance (aPR: 0.68) reduced self-medication in the Northern macroregion. These results align with findings from Jordan, linking lack of health insurance to increased antibiotic purchase without prescription, likely due to efforts to avoid medical costs and long waiting times 24. In contrast, in the Central macroregion, having more than one type of insurance (RPa: 1.19) was associated with increased self-medication. This highlights that the relationship between insurance coverage and self-medication can vary according to factors such as the extent of coverage and the performance of local health systems.

Antibiotic purchase was associated with a 20% reduction in self-medication in the Northern macroregion and a 13% reduction in the Eastern macroregion. Globally, the prevalence of non-prescription antibiotic use varies widely[5,7,25], often influenced by lax regulatory enforcement and limited consultation time with healthcare providers[5,26]. Although Peru has implemented partial regulation of antibiotic sales, these findings suggest that physicians remain the primary source of antibiotic guidance. Further studies on user behavior are needed to support rational antibiotic use and combat antimicrobial resistance.

In the Northern macroregion, knowledge about the medication administration timing was associated with a 46% to 48% reduction in self-medication. However, knowledge of the medication dosage, whether minimal (aPR: 4.78), moderate (aPR: 4.50) or high (aPR: 4.78) was linked to self-medication. While few studies assess these knowledge aspects separately, some have reported an overall association between medication knowledge and reduced self-medication. For instance, a study in Africa found that inadequate antibiotic knowledge increased the risk of self-medication[27], Similarly, in Colombia and Ecuador, it has been suggested that higher levels of education may reduce the self-medication[28,29,30]. These findings may reflect differences in the reliability of the knowledge asses-

sed. Information about medication timing tends to be straightforward and more easily retained, as it usually involves simple, routine instructions. In contrast, dosage-related knowledge, such as specific milligram amounts or tablet quantities, is more complex and therefore more susceptible to recall inaccuracies. Consequently, individuals with prior self-medication use may report a higher level of familiarity with dosage not because they possess accurate pharmacological knowledge, but because of self-perceived expertise derived from past experiences. This could explain the positive association between reported dosage knowledge and self-medication. Future research, particularly qualitative studies, would be valuable to better understand how individuals acquire, interpret and apply medication-related knowledge and to distinguish true pharmacological understanding from experience-based perceptions.

In Lima Metropolitana and the Southern macroregion, purchasing medication for respiratory symptoms was associated with a 16% (aPR: 1.16; 95% CI: 1.02-1.31) and 18% (aPR: 1.21; 95% CI: 1.10-1.26) increase in self-medication, respectively. During 2013 in Lima, a study identified respiratory conditions as the second leading cause of self-medication (23,7%)[17]. Likewise, respiratory symptoms are the main cause of self-medication[7,31], with antibiotics commonly used based on false assumptions regarding about their effectiveness against viral infections. These findings highlight the importance of targeting self-medication related to respiratory illnesses in future public health interventions.

In addition to these findings, future research should explore behavioral and structural determinants of self-medication in greater depth, particularly those related to pharmacy practices, health-seeking behavior and trust in the healthcare system. Qualitative studies could also help clarify why some macroregions exhibit patterns that contrast with national trends, offering insight into cultural, economic and geographic influences. Furthermore, the evidence presented here can support the development of region-specific public health strategies in Peru, such as strengthening pharmaceutical counseling, improving regulation of non-prescription sales and designing educational campaigns to local needs. Integrating these results into policies aimed at optimizing access to healthcare and promoting the rational use of medicines may contribute to reducing self-medication at the national level.

This study has limitations. Data collection was conducted exclusively between May and July, which may affect representativeness due to geographic and climatic variations that can influence clinical indications for medication purchases. Moreover, because the survey was administered near health facilities, the prevalence of self-medication may be underestimated, as users likely had greater access to healthcare services. These findings may also not be generalized to rural or remote settings.

Conclusions

This study is the first to evaluate factors associated with self-medication stratified by macroregion, after assessing effect modification. Overall, our findings provide evidence that can inform region-specific public health strategies. In addition, the use of probabilistic sampling with expansion factors

strengthens the precision and representativeness at the national level. Our results also show that ENSUSALUD is a useful tool for identifying factors linked to self-medication, supporting the need to reinstate the survey in future years, especially given the impact of the COVID-19 pandemic on health services. It is also recommended that future surveys include users of drugstores and pharmacies in rural and remote areas, considering whether they are healthcare workers, trust in pharmacy staff, prior experiences with medications and the sources from which they receive medication recommendations, as these characteristics may influence the prevalence of self-medication.

Conflict of interest

The authors declare that they have no commercial or financial relationships that could be viewed as a potential conflict of interest.

Ethical considerations

The Peruvian ENSUSALUD survey is an anonymized, open-access dataset (http://portal.susalud.gob.pe) and contains no personally identifiable information. Therefore, the Institutional Research Ethics Committee of the Universidad Peruana Cayetano Heredia classified this study as exempt from ethical review (SIDISI: 207293).

Use of artificial intelligence

The authors declare that they have not used any applications, software, or generative artificial intelligence websites in the writing of the manuscript, in the design of tables and figures, or in the analysis and interpretation of the data.

Authors' contributions

Conceptualization: M.P.B., M.R., E.R.P., B.E.G.; Data curation: M.P.B., B.E.G.; Formal analysis: M.P.B., B.E.G.; Funding acquisition: M.R.; Investigation: M.P.B., B.E.G.; Methodology: M.P.B., M.R., E.R.P., B.E.G.; Project administration: M.R.; Resources: M.R.; Software: M.P.B.; Supervision: M.R.; Validation: M.P.B., B.E.G.; Visualization: M.P.B., B.E.G.; Writing – original draft: M.P.B., B.E.G.; Writing – review and editing: M.P.B., M.R., E.R.P., B.E.G.

Funding

This research project did not receive external funding

Acknowledgments

MPB and BGJ are currently affiliated with the Laboratory of Applied Microbiology and Biotechnology, University of Antwerp, Antwerp, Belgium.

Referencias

1. Baracaldo-Santamaría D, Trujillo-Moreno MJ, Pérez-Acosta AM, Feliciano-Alfonso JE, Calderon-Ospina CA, Soler F. Definition of self-medication: A scoping review. Ther Adv Drug Saf 2022;13:20420986221127501. Doi: https://doi.org/10.1177/20420986221127501

2. Ray I, Bardhan M, Hasan MM, Sahito AM, Khan E, Patel S, et al. Over the counter drugs and self-medication: A worldwide paranoia and a troublesome situation in India during the COVID-19 pandemic. Ann Med Surg (Lond) 2022;78:103797. Doi: https://doi.org/10.1016/j.amsu.2022.103797

3. Ansari M, Alanazi A, Moin A. Consumers' awareness, attitude and associated factors towards self-medication in Hail, Saudi Arabia. PLoS One 2020;15(4):e0232322. Doi: https://doi.org/10.1371/journal.pone.0232322

4. Hernández-Vásquez A, Alarcon-Ruiz CA, Díaz-Seijas D, Magallanes-Quevedo L, Ros-selli D. Purchase of medications without prescription in Peru: a cross-sectional population-based study. F1000Res 2018;7:1392. Doi: https://doi.org/10.12688/f1000research.15886.2

5. Sachdev C, Anjankar A, Agrawal J. Self-medication with antibiotics: An element in-creasing resistance. Cureus 2022;14(10):e30844. Doi: https://doi.org/10.7759/cureus.30844

6. Urrunaga-Pastor D, Benites-Zapata VA, Mezones-Holguín E. Factors associated with self-medication in users of drugstores and pharmacies in Peru: an analysis of the National Sur-vey on User Satisfaction of Health Services, ENSUSALUD 2015. F1000Res 2019;8:23. Doi: https://doi.org/10.12688/f1000research.17578.2

7. Brian B, Goruntla N, Bommireddy BR, Mopuri BM, Easwaran V, Mantargi MJS, et al. Knowledge, attitude, and practice towards responsible self-medication among pharmacy stu-dents: A web-based cross-sectional survey in Uganda. Drug Healthc Patient Saf 2025;17:7–23. Doi: https://doi.org/10.2147/DHPS.S496924

8. Teketel EW. Socioeconomic determinants of health contributing to the consumption of nonprescribed medicines in Ethiopia. Patient Prefer Adherence 2021;15:213–26. Doi: https://doi.org/10.2147/PPA.S278659

9. Alied M. Antimicrobial resistance, COVID-19 and self-medication in Syria: A potential boost for an already escalating problem. JAC Antimicrob Resist 2021;3(3):dlab100. Doi: https://doi.org/10.1093/jacamr/dlab100

10. Zhang A, Hobman EV, De Barro P, Young A, Carter DJ, Byrne M. Self-medication with antibiotics for protection against COVID-19: The role of psychological distress, knowledge of, and Experiences with antibiotics. Antibiotics (Basel) 2021;10(3):232. Doi: https://doi.org/10.3390/antibiotics10030232

11. Carvalho MOC, Perazzo MF, Pereira TS, Paiva SM, Coutinho DCO, Martins-Júnior PA. Perception of parents/guardians about self-medication for oral problems in their children: A cross-sectional study in Brazilian parents/guardians. Eur Arch Paediatr Dent 2026; Doi: https://doi.org/10.1007/s40368-025-01160-0

12. Arias F, Izquierdo-Condoy JS, Naranjo-Lara P, Alarcón V, Bonilla P, Erazo E, et al. A cross-Sectional analysis of self-medication patterns during the COVID-19 pandemic in Ecua-dor. Medicina (Kaunas) 2022;58(11):1678. Doi: https://doi.org/10.3390/medicina58111678

13. Tavares AI, Ferreira PL, Cavadas V. Factors contributing to self-medication and con-sumption of non-prescribed drugs in Portugal. Int J Public Health 2022;67:1604852. Doi: https://doi.org/10.3389/ijph.2022.1604852

14. Srisaknok T, Ploylearmsang C, Wongkongdech A, Chanthamath S, Wongkongdech R. Health literacy and self-medication among older adults in rural Thailand: understanding inequi-ties in a digital era. Glob Health Action 2025;18(1):2572008. Doi: https://doi.org/10.1080/16549716.2025.2572008

15. AlKhalidi DK, Abbas MO, Hamad AS, Dawood KA, Al Jazar AM, Ahmed NS, et al. Self-medication practices in the UAE: prevalence, determinants, public awareness, and the im-pact of an educational intervention on safe medication use. J Pharm Policy Pract 2026;19(1):2600782. Doi: https://doi.org/10.1080/20523211.2025.2600782

16. Llanos LF, Contreras CE, Velásquez JE, Mayca JA, Lecca L, Reyes R, et al. [Self-medication in five provinces of Cajamarca]. Revista Medica Herediana 2001;12(4):127–33. Doi: https://doi.org/10.20453/rmh.v12i4.680

17. Hermoza-Moquillaza R, Loza-Munarriz C, Rodríguez-Hurtado D, Arellano-Sacramento C, Hermoza-Moquillaza V. [Self-medication in a district of Lima Metropolitana, Peru]. Revista Medica Herediana 2016;27(1):15–21. Doi: https://doi.org/10.20453/rmh.v27i1.2779

18. Superintendencia Nacional de Salud (SUSALUD). [Database of the 2016 National sur-vey of user satisfaction in health (ENSUSALUD 2016)] [Internet]. SUSALUD2018 [cited 2025 Apr 21];Available from: http://portal.susalud.gob.pe/blog/base-de-datos-2016/

19. Barros-Sevillano JS, Sandoval CP, Alcarraz-Mundial LS, Barboza JJ. Self-medication in times of COVID-19. A perspective from Peru. Gac Med Mex 2021;157(1):116. Doi: https://doi.org/10.24875/GMM.M21000526

20. Encuestas de satisfacción a nivel nacional (ENSUSALUD 2016) [Internet]. SU-SALUD2018 [cited 2025 May 10];Available from: http://portal.susalud.gob.pe/blog/encuestas-de-satisfaccion-a-nivel-nacional-ensusalud-2016/

21. Mejia CR, Ruiz-Aquino M, Garcia-Arteta G, Ramos G, Astete-Pérez I, Pineda-Cáceres M, et al. Factors associated with the use of medicines and self-medication during the COVID-19 pandemic in 12 Latin American countries. Heliyon 2023;10(1):e22299. Doi: https://doi.org/10.1016/j.heliyon.2023.e22299

22. Ge P, Li Q, Dong M, Niu Y, Han X, Xiong P, et al. Self-medication in Chinese residents and the related factors of whether or not they would take suggestions from medical staff as an important consideration during self-medication. Front Public Health 2022;10:1074559. Doi: https://doi.org/10.3389/fpubh.2022.1074559

23. Yeamans S, Gil-de-Miguel Á, Hernández-Barrera V, Carrasco-Garrido P. Self-medication among general population in the European Union: Prevalence and associated fac-tors. Eur J Epidemiol 2024;39(9):977–90. Doi: https://doi.org/10.1007/s10654-024-01153-1

24. Al-Tarawneh A, Ali T, Al-Taani GM. Public patterns and determinants of antibiotic self-medication and antibiotic knowledge in Southern Jordan. Antibiotics (Basel) 2024;13(1):98. Doi: https://doi.org/10.3390/antibiotics13010098

25. Rojas-Adrianzén C, Pereyra-Elías R, Mayta-Tristán P. [Prevalence and factors associat-ed with over-the-counter antimicrobial purchases, Peru 2016]. Rev Peru Med Exp Salud Publica 2018;35(3):400–8. Doi: https://doi.org/10.17843/rpmesp.2018.353.3458.
26. Tadesse YB, Kassaw AT, Belachew EA. Evaluating self-medication practices in Ethio-pia. J of Pharm Policy and Pract 2023;16(1):47. Doi: https://doi.org/10.1186/s40545-023-00553-0

27. Jimah T, Ogunseitan O. Socio-demographic characteristics of the association between knowledge of antibiotic therapy and prudent use in Ghana. J Glob Health Rep 2020;4:e2020034. Doi: https://doi.org/10.29392/001c.12838

28. Zambrano KRVDLB, Fernández CA de. Knowledge of self-medication with antibiotics in adults. Salud, Ciencia y Tecnología 2023;3:378–378. Doi: https://doi.org/10.56294/saludcyt2023378

29. Cruz JC, Perez CZ, Cabrera MCS, Lopez ER, Hoyos PV, Rojas Rojas D, et al. Factors associated with self-medication of antibiotics by caregivers in pediatric patients attending the emergency department: a case-control study. BMC Pediatr 2022;22(1):520. Doi: https://doi.org/10.1186/s12887-022-03572-z

30. Aljalamdeh R, Barakat M, Mosleh R, H Abdel-Qader D. Knowledge, attitude, and prac-tices of self-medication with antibiotics among senior undergraduate pharmacy students: A cross-sectional study in Jordan. SAGE Open Med 2025;13:20503121251404848. Doi: https://doi.org/10.1177/20503121251404848

31. Mushemeza R, Mwebaza H, Amutuhaire P, Nakwanyi D, Twinomujuni SS, Ojuka S. Resolution of signs and symptoms of illnesses among self-medicating undergraduate students of Mbarara University of Science and Technology: a cross-sectional study. J Pharm Health Ca-re Sci 2025;11:62. Doi: https://doi.org/10.1186/s40780-025-00469-8