



# Polypharmacy among older adults in Brazil: Association with sociodemographic factors and access to health services

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## ABSTRACT

**Background:** Polypharmacy is common among older adults and is of public health concern, since pharmacological therapy influences the quality of care for older individuals. Few studies have addressed its prevalence and correlates in low or middle-income countries. **Objective:** To evaluate the prevalence of polypharmacy in a representative sample of the Brazilian older population and its association with sociodemographic conditions and factors related to access to health services.

**Methods:** Cross-sectional study with data from the last National Health Survey, conducted in 2019. The dependent variable was polypharmacy (five or more medications) and independent variables were: sociodemographic characteristics, general health conditions and access to health services indicator.

**Results:** The prevalence of polypharmacy was 19.2%. Polypharmacy was higher among those aged 80 years and over compared to those aged 60–69 years (prevalence ratio (PR) 1.47; 95% CI: 1.30; 1.66); individuals with complete elementary education (PR 1.35; 95% CI: 1.13; 1.60) versus those who did not go to school; with 3+ chronic diseases (PR 11.14; 95% CI: 7.94; 15.63); those with limitations in basic activities of daily life (PR 1.49; 95% CI: 1.35; 1.63) and possession of private medical health insurance (PR 1.32; 95% CI 1.19; 1.46). Being in a marital relationship was inversely associated with polypharmacy (PR 0.88; 95% CI: 0.80; 0.96).

**Conclusion:** Polypharmacy affects a significant proportion of the Brazilian older population and is associated with sociodemographic factors and access to health services.

## 1. Introduction

Patient safety is a key component in healthcare [1]. In this sense, the World Health Organization launched, in 2017, the third Global Patient Safety Challenge seeking to reduce by 50% the level of serious and preventable harm related to medicines in five years [2]. These are important and necessary challenges to achieve universal health coverage, which is one of the goals of the Sustainable Development Goals (SDGs) [1].

In the context of the global challenge of patient safety, polypharmacy, which is understood as the consumption of five or more medications and thought in recent years in terms of the adequacy of the use of these multiple medications [1,3], is one of the priority categories of intervention [2]. In addition, it is a health issue of great relevance [1] in a context of population aging, with the increase in the prevalence of chronic diseases and coexistence of various morbidity conditions, which causes a therapeutic complexity with clinical, economic, and organizational implications [4,5].

Although its global distribution is still uncertain, with the main data reported in countries in Europe, North America, and the Western Pacific [1], polypharmacy has been increasing over time, especially among older

individuals living in the community [6,7]. This is a great challenge in the health field since pharmacological therapy influences the quality of care for older individuals [8]. Polypharmacy increases the risk of inappropriate prescriptions, drug interactions [8], adverse outcomes such as hospitalization [9], cognitive impairment [6], and increased risk of death [5], in addition to being able to lead to low adherence to pharmacotherapy [10] and increase in treatment costs [11]. However, harm-causing polypharmacy is one that includes inappropriate medications or that relates to harmful drug interactions [11].

International studies have indicated a prevalence of polypharmacy ranging from 4% to 96.5% [12]. In Brazil, the prevalence of polypharmacy found in population surveys of older adults living in the community also presented different results, ranging from 13.5% [13] to 36.0% [14].

Despite the hypothesis supported by some studies that polypharmacy is associated with sociodemographic factors such as age [15,16], gender [15,16], income [17], worse health conditions [18], and access to health services [19,20], this information is mostly from studies conducted in high-income countries and information for Latin America, including Brazil, is scarce [13]. The identification of polypharmacy determinants

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can contribute to the screening of vulnerable individuals in the early stages and reduce inappropriate polypharmacy [20], in addition to supporting the implementation of strategies to monitor the use of medications and prevent adverse events in the older population. Thus, this study aimed to identify the prevalence and determinants of polypharmacy in a representative sample of the Brazilian older adults.

## 2. Methods

A cross-sectional study was conducted with a representative sample of the Brazilian older population aged 60 years or older from the most recent National Health Survey (PNS in Portuguese), conducted in 2019.

The PNS was approved by the National Research Ethics Commission (CONEP), of the National Health Council (CNS in Portuguese), in August 2019 (protocol n° 3,529,376) [21]. The PNS sample was collected by clusters in three stages. The first stage corresponded to the selection of the Primary Sampling Unit consisting of census sectors or set of these sectors. The second stage was the selection of households and the third stage corresponded to a random selection of individuals aged 15 years or more living in the households. The selection was based on the list of household residents obtained at the time of the household interview [21]. The PNS sample is representative of the Brazilian population living in permanent private households (i.e. built for the exclusive purpose of habitation) and makes it possible to estimate the data for urban and rural areas, by major national regions, Units of the Federation, capitals, and metropolitan regions [21]. The PNS's questionnaire had three parts, covering: (i) the household; (ii) all residents of the household, focusing on collection of socioeconomic and health information; and (iii) the selected resident (15 years old or more) for whom lifestyles, chronic diseases, violence, among other topics were investigated. A detailed description of the research has been previously published by Stopa et al. (2020) [22].

In this study, we used data from individuals aged 60 years or more, who answered the third part of the questionnaire, which comprised a representative sample of older adults. A total of 22,728 individuals were interviewed and from this sample 47 individuals were excluded due to missing data in any of the variables of interest, leaving a final sample of 22,681 participants.

The dependent variable was polypharmacy, defined as the use five or more medications [3]. PNS assessed the self-report number of medications in continuous use by means of the following questions: *Do you make use of any medicine, which has been prescribed by a doctor, for regular or continuous (daily) use? How many different medications of regular or continuous use, prescribed by your doctor, have you used in the last two weeks?*

Independent variables were: sociodemographic characteristics [sex (female/male), age group (60–69/70–79/80+), marital status (no marital relationship/with marital relationship), schooling (no schooling/incomplete elementary/complete elementary/complete high school/complete higher education), and income [(up to 1 minimum wage (i.e. 998 Brazilians Reals, in 2019, about 194,05 current US dollars)/>1 up to 2 minimum wages/>2 up to 3 minimum wages/>3 up to 5 minimum wages/>5 minimum wages)]; health conditions [number of chronic diseases (0, 1, 2, 3+), limitations to perform Basic Activities of Daily Living (BADL) (no/yes), self-rated health (good/regular/poor)], and access to health services [possession of private medical health insurance (no/yes)].

The BADL variable was constructed through the report of difficulty in performing one or more of the following basic activities of daily living [23,24]: eating, bathing, going to the bathroom, dressing, walking from one room to another, lying down or getting out of bed alone, sitting down or getting up from a chair alone.

The number of chronic diseases was obtained based on the self-reported morbidities available in the PNS, namely: arterial hypertension, diabetes, high cholesterol, asthma (or asthmatic bronchitis), heart disease, cerebrovascular accident (CVA) or stroke, chronic back problem, arthritis or rheumatism, work-related musculoskeletal disorders (WMSD), depression, chronic kidney failure, cancer, other mental illness, and chronic lung disease. The questions used to assess the presence of morbidities were:

*“Has any doctor ever diagnosed you as having (disease)?”; “Do you have any chronic back problems, such as chronic back or neck pain, low back pain, sciatic pain, vertebrae or disc problems?” “Has any doctor or mental health professional (such as a psychiatrist or psychologist) ever given you the diagnosis of depression”, and “Has any doctor or health professional (such as a psychiatrist or psychologist) ever given you the diagnosis of another mental illness such as anxiety disorder, panic syndrome, schizophrenia, bipolar disorder, psychosis, or OCD (Obsessive Compulsive Disorder), etc.?” “Has any doctor ever given you the diagnosis of any other chronic lung disease, such as pulmonary emphysema, chronic bronchitis, or COPD (Chronic Obstructive Pulmonary Disease)?”*

Descriptive analyses were performed for all variables, calculating the prevalence and respective 95% confidence intervals (95% CI). Based on the questions about the number of medications, polypharmacy was also described as the use of 5–9 medications and hyperpolypharmacy was the use of ten medications or more. Pearson's chi-square test with Rao-Scott correction was used for the bivariate analyses as it takes into consideration the complex sample design [25]. The Poisson regression was used to test the associations between polypharmacy and independent variables, estimating the crude and adjusted prevalence ratios (PR) and their respective 95% confidence intervals (95% CI). This regression is recommended for cross-sectional studies assessing binary non-rare events and provides direct estimates for the Prevalence Ratios [26,27]. Data analysis was conducted using the *Stata* 15.0 statistical software. All analyses considered the effect of the study design and the sample weights using the *survey* command.

## 3. Results

Data from 22,681 individuals, 56.7% female, were analyzed. More than half of the individuals (56.3%) were between 60 and 69 years of age and 13.6% had 80 years or over. The largest proportion of respondents reported schooling corresponding to incomplete elementary education (46.5%) and income up to one minimum wage (41.7%). Most reported having a diagnosis of multimorbidity (56.5%) and 29.3% reported having private medical health insurance. The prevalence of polypharmacy was 19.2% (95% CI: 18.3; 20.0) (Table 1). It was found that 16.3% used 5–9 medications and 2.9% used ten or more (hyperpolypharmacy).

The use of polypharmacy was more frequent in older females, those with 80 years or more, and those with poor self-rated health. The prevalence of polypharmacy was 15.7% among individuals with 2 chronic diseases, 36.2% among those with BADL limitations, and 23.6% among the older individuals who had private medical health insurance (Table 2).

Table 3 shows the results of the crude and adjusted analysis for the factors associated with polypharmacy. The findings related to the adjusted analysis show that polypharmacy was directly associated with age and socioeconomic conditions. The prevalence of polypharmacy was higher in the age groups of 70–79 years (PR = 1.29; 95% CI: 1.18; 1.41) and 80+ (PR = 1.47; 95% CI: 1.30; 1.66) when compared to that of the older individuals aged 60–69 years. Individuals with incomplete elementary education (PR = 1.21; 95% CI: 1.07; 1.36) and complete elementary education (PR = 1.35; 95% CI: 1.13; 1.60) presented a higher prevalence of polypharmacy than those who did not go to school. Individuals with income >2 to 3 minimum wages (PR = 1.25; 95% CI: 1.09; 1.45) and income >3 to 5 minimum wages (PR = 1.19; 95% CI: 1.02; 1.39) in relation to those with income up to 1 minimum wage. Regarding health conditions, there was an increase in the prevalence of polypharmacy with the increase in the number of chronic diseases (1 disease: PR = 2.98; 95% CI: 2.10; 4.23; 2 diseases: PR = 5.32; 95% CI: 3.79; 7.47; 3+ diseases: PR = 11.14; 95% CI: 7.94; 15.63). The prevalence was higher among those with regular self-rated health (PR = 1.58; 95% CI: 1.41; 1.77) and poor/very poor self-rated health (PR = 1.86; 95% CI: 1.61; 2.14) compared to those with good/very good self-rated health; and among those with BADL limitation (PR = 1.49; 95% CI: 1.35; 1.63), and who had private medical health insurance (PR = 1.32; 95% CI = 1.19; 1.46). The prevalence of polypharmacy was lower among those with a marital relationship (PR = 0.88; 95% CI: 0.80; 0.96).

**Table 1**  
Distribution of the sample according to sociodemographic and health variables, Brazil, PNS 2019.

	%	95% CI <sup>#</sup>
Sex		
Female	56.7	55.6–57.7
Male	43.3	42.3–44.4
Age		
60–69	56.3	55.2–57.4
70–79	30.2	29.2–31.2
80+	13.6	12.8–14.3
Schooling		
No schooling	16.8	16.0–17.6
Incomplete elementary	46.5	45.3–47.6
Complete elementary	9.5	8.9–10.2
Complete high school	15.9	15.0–16.8
Complete higher education	11.3	10.5–12.2
Income		
Up to 1 minimum wage	41.7	40.5–42.9
>1 up to 2 minimum wages	31.9	30.8–33.0
>2 up to 3 minimum wages	10.8	10.1–11.5
>3 up to 5 minimum wages	8.2	7.6–8.9
> 5 minimum wages	7.4	6.7–8.1
Number of chronic diseases (%)		
0	17.8	17.1–18.7
1	25.7	24.8–26.6
2	22.3	21.4–23.2
3+	34.2	33.1–35.3
Self-rated health		
Good/very good	47.0	45.9–48.2
Regular	41.8	40.6–42.9
Poor/very poor	11.2	10.5–11.9
Limitations to perform BADL		
Yes	20.6	19.7–21.5
No	79.4	78.5–80.3
Polypharmacy		
No	80.8	80.0–81.7
Yes	19.2	18.3–20.0
Private medical health insurance		
No	70.7	69.5–71.9
Yes	29.3	28.1–30.5

BADL = Basic Activities of Daily Living. <sup>#</sup> 95% CI = 95% confidence interval.

#### 4. Discussion

This study showed that polypharmacy affects approximately one-fifth of the older population in Brazil, and approximately 3% have hyperpolypharmacy. Sociodemographic factors, in addition to health conditions and access to health services, were significantly associated with this outcome.

Overall, the results found regarding the prevalence of polypharmacy vary greatly. Among the possible causes for the heterogeneity of the findings is the difference between the age groups evaluated [28] and the definition of polypharmacy used [12]. Some studies consider only the numerical count of medications and others have defined polypharmacy according to categories, ranging from two or more medications to 11 or more medications [3]. The geographical location of the study [12] and the research environment (i.e., long-stay institution, hospital, community) and its representativeness also affect the prevalence of polypharmacy, given the different patterns of supply and consumption of medications observed, which makes it difficult to compare studies [6,12,28,29].

Some international studies reveal a higher prevalence than that found in the present study [18,30]. A study conducted in 17 European countries and Israel, all of them of middle and upper income, found that the prevalence of polypharmacy among individuals aged 65 years or older ranged from 26.3% in Switzerland to 39.9% in the Czech Republic [18]. An estimated

**Table 2**  
Prevalence of polypharmacy in older Brazilians, according to independent variables. PNS, Brazil, 2019.

	%	95% CI <sup>#</sup>	p-value
Sex			<0.001
Female	21.6	20.4–22.8	
Male	16.0	14.8–17.2	
Age			<0.001
60–69	15.1	14.1–16.1	
70–79	22.8	21.1–24.5	
80+	28.1	25.5–31.0	
Schooling			0.0031
No schooling	17.0	15.1–19.0	
Incomplete elementary	20.8	19.5–22.1	
Complete elementary	20.2	17.4–23.3	
Complete high school	18.0	16.0–20.2	
Complete higher education	16.5	14.3–19.0	
Renda			0.1607
Up to 1 minimum wage	18.2	16.9–19.5	
>1 up to 2 minimum wages	19.1	17.6–20.7	
>2 up to 3 minimum wages	21.5	18.8–24.3	
>3 up to 5 minimum wages	20.6	17.9–23.5	
> 5 minimum wages	20.0	17.0–23.3	
Number of chronic diseases			<0.001
0	2.4	1.8–3.4	
1	8.0	7.0–9.3	
2	15.7	14.2–17.4	
3+	38.5	36.6–40.4	
Self-rated health			<0.001
Good/very good	11.0	10.0–12.0	
Regular	23.6	22.2–25.1	
Poor/very poor	36.9	34.0–40.0	
Functional limitation			<0.001
Limitations to perform BADL	36.2	33.9–38.7	
Private medical health insurance			<0.001
Yes	23.6	21.9–25.4	

RF = Reference Category; BADL = Basic Activities of Daily Living. <sup>#</sup> 95% CI = 95% confidence interval.

prevalence of polypharmacy of 86.4% was found in a sample of the Korean population of 319,185 people aged 65 years or older. This finding was explained by the probable culture in force in Asian countries of valuing the use of medicines and health supplements, which configures a public health problem in those countries [30]. Results from developing countries are scarce [31]. A systematic review and meta-analysis of studies conducted with the population aged 65 years and over in Ethiopia estimated the combined prevalence of polypharmacy of 33% in older individuals, higher than that pointed out in this study and many developed countries, despite insufficient financial resources and the well-known paradox of over-treatment with unnecessary medications and under-treatment with necessary medications [31].

In Brazil, other population surveys found different results for the prevalence of polypharmacy by older adults, identified by the simultaneous use of five or more medications [13,14,32]. Similar to this study, data from the National Survey on Access, Use, and Promotion of the Rational Use of Medicines (PNAUM in Portuguese), conducted between September 2013 and February 2014, showed that 18.0% of Brazilian individuals aged 60 years or older reported polypharmacy [33]. Higher prevalence rates were found in a study conducted with the population aged 60 years or older residing in the city of Sao Paulo, in 2006 (36%) [14] and in a study conducted in 2009 and 2010, with community-dwelling older adults in the urban area of the municipality of Florianopolis (32%) [32]. The higher prevalence of polypharmacy in these studies was possibly due to the methodology used, which considered, in addition to chronic use medications, those of eventual use, including those without a medical prescription [14,32], and did not include nationally representative samples [14,32], which could result in a different pattern of medication use given the geographical differences in access [13]. Additionally, in the case of the first study, there was a higher proportion of individuals aged 75 years or older (83.6%) [14] who were more prone to the accumulation of chronic diseases, which favors the use of medications [4,34]. Seixas et al.(2021) [13] estimated the prevalence of

**Table 3**  
Factors associated with polypharmacy among older Brazilians: unadjusted and adjusted models, Brazil, 2019.

Variables	Polypharmacy	
	Unadjusted	Adjusted
	PR <sup>+</sup> (95% CI <sup>#</sup> )	PR <sup>+</sup> (95% CI <sup>#</sup> )
<b>Sociodemographic</b>		
Sex (ref. male)		
Female	1.35 (1.23–1.48) ***	0.93 (0.85–1.02)
Age (ref. 60–69)		
70–79	1.51 (1.37–1.67) ***	1.29 (1.18–1.41) ***
80+	1.87 (1.65–2.11) ***	1.47 (1.30–1.66) ***
<b>Schooling (ref. no schooling)</b>		
Incomplete elementary	1.22 (1.07–1.39) **	1.21 (1.07–1.36) **
Complete elementary	1.19 (0.98–1.44)	1.35 (1.13–1.60) **
Complete high school	1.06 (0.90–1.25)	1.18 (1.00–1.38) *
Higher education	0.97 (0.81–1.17)	1.17 (0.97–1.43)
<b>Income (ref. up to 1 minimum wage)</b>		
>1 up to 2 minimum wages	1.05 (0.95–1.17)	1.03 (0.93–1.13)
>2 up to 3 minimum wages	1.18 (1.02–1.37) *	1.25 (1.09–1.45) **
>3 up to 5 minimum wages	1.13 (0.97–1.32)	1.19 (1.02–1.39) *
> 5 minimum wages	1.10 (0.92–1.31)	1.19 (0.99–1.42)
<b>Marital status (ref. no marital relationship)</b>		
With marital relationship	0.76 (0.69–0.83) ***	0.88 (0.80–0.96) **
<b>Health conditions</b>		
Number of chronic diseases (ref. 0)		
1	3.29 (2.31–4.68) ***	2.98 (2.10–4.23) ***
2	6.44 (4.59–9.03) ***	5.32 (3.79–7.47) ***
3+	15.74 (11.29–21.93) ***	11.14 (7.94–15.63) ***
Self-rated health (ref. good/very good)		
Regular	2.16 (1.93–2.41) ***	1.58 (1.41–1.77) ***
Poor/very poor	3.37 (2.98–3.82) ***	1.86 (1.61–2.14) ***
<b>Functional limitation</b>		
Limitations to perform BADL (ref. no)		
Yes	2.46 (2.25–2.69) ***	1.49 (1.35–1.63) ***
<b>Access to health services</b>		
Private medical health insurance (ref. no)		
Yes	1.37 (1.24–1.50) ***	1.32 (1.19–1.46) ***

Ref. = reference category. <sup>+</sup> PR = prevalence ratio. <sup>#</sup> 95% CI = 95% confidence interval.

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

polypharmacy at 13.5% using data from the baseline of the Brazilian Longitudinal Study of Aging conducted in 2015 [13], lower than that observed in the present study, which could be explained by the inclusion of younger individuals, from 50 years of age, with lower prevalence of multimorbidity [35] and therefore less dependent on medications when compared to older individuals [4].

Regarding the influence of sociodemographic factors on polypharmacy, in agreement with the results of other studies [14–16,32], there was a higher prevalence of polypharmacy among older individuals when compared to those aged 60–69 years. Although the increase in multimorbidity that occurs with aging is an explanation for the increase in polypharmacy [12], the use of multiple medications remained positively associated with age even after adjusting for the number of diseases.

The findings are heterogeneous regarding the association with sex. Some studies suggest higher prevalence in females [14,32,36] or lack of association [15,37], as in this study. According to the literature, drug therapies are prescribed differently for men and women in the older population [38], and women value symptoms more than men [39], and use health services earlier and more often than men [40], thus they would be more susceptible to receiving medication prescriptions [4,41], which would lead to polypharmacy [18]. On the other hand, the sex can influence the ability to pay for medication. Older women are less likely than older men to have pensions or medication benefit plans because they are less involved in the formal workforce [38].

As observed in this study, the lower prevalence of polypharmacy among older adults of lower socioeconomic status has been described in different studies [13,14,42], although the absence of association [43] or inverse relationship are also described [5,15]. Among the possible explanations for the higher prevalence of polypharmacy among those with higher income and education, it is suggested that these individuals tend to have private medical health insurance and access health services more, including the use of medications [42]. In addition, higher-income individuals are more likely to use over-the-counter medications, such as aging modifiers and food supplements [20].

Income is directly associated with ownership of private medical health insurance [44], which contribute to the increase of polypharmacy, corroborating previous studies [13,14,19,45,46]. The possession of private health plans can favor access to health services and, consequently, to doctors and specialists [47]. The overlap of medications resulting from the exchange of health service providers is reported as a serious public health problem that can result in polypharmacy [1]. In the context of fragmented care by specialties, medication might be mistakenly added to the patient's pharmacotherapy to treat clinical problems caused by adverse reactions to other medications, which can worsen the health status of the older individual, setting up an iatrogenic cascade [45,48]. The difficulty in deciding treatment in a shared form among health professionals and the difficulty in providing patient-centered care can contribute to polypharmacy [49]. Therefore, the evaluation of polypharmacy should be considered whenever the patient begins a new treatment and when he/she goes through different health care environments [1].

Being in a marital relationship was inversely associated with polypharmacy in this study. A similar result was reported in a longitudinal study of older individuals from Denmark in which being married was associated with a reduced risk of polypharmacy compared to being divorced or widowed [5]. The interaction and union between an older individual and a family member or neighbors is suggested as an important aspect of managing depression, pain, and multimorbidity, which potentially reduces the risk of polypharmacy [50]. This may indicate that social relationships and connections affect the health behaviors and the use of health care, which might, consequently, impact the use of medications [5].

The positive association between worse health conditions (i.e., functional limitation, poor health self-assessment, and increased number of chronic diseases) and polypharmacy has been consistently reported [18,32,33,45,49,51]. The need for continuous assistance for the control of chronic diseases can lead to greater use of medications by older individuals [4]. It is known that pharmacological intervention is still the most used for the care of this population, and prescription is among the major contributing factors to polypharmacy [52]. Other factors may also contribute to the frequent use of medications in multimorbid older individuals, such as their fragmented care [53], health protocols targeted at a single disease [52], and the difficulty in deciding on treatment in a shared manner among health professionals [54]. As well as multimorbidity, poor self-rated health has been related to polypharmacy [12,49,55]. This relationship is expected since older individuals who perceive themselves as sick are more likely to seek health services and receive a medical prescription or even to self-medicate [32,56].

Among the limitations of this study, the use of self-reported data to estimate polypharmacy and chronic diseases should be considered, as they may affect the estimates of these conditions due to memory problems or even lack of diagnosis. In addition, this study considered only the medications of regular or continuous use, which may have underestimated the total number of medications used by the participant. Furthermore, PNS does not include institutionalized older adults which generally have a higher burden of morbidity and use more medications than individuals living in the community [28]. We also did not consider the type of medication used, which would make it possible to verify the adequacy of the observed polypharmacy. However, this study presents novel findings of a representative sample of the Brazilian population whose data were collected in the scope of the National Health Survey, which is considered the gold standard of Brazilian health surveys since it is the largest, most complete, and

comprehensive health survey in the country and, given its continuous realization, allows the comparison of findings over time to provide opportunities for monitoring and implementation of public policies.

The results of this study show a considerable prevalence of polypharmacy in the Brazilian older population that may be exposed to the potential risks of this practice. Additionally, they demonstrate that there are important socioeconomic inequalities associated with polypharmacy. However, it should be noted that polypharmacy may be necessary for patients with complex or multiple conditions [57]. In this case, the use of the medication should be optimized to minimize the risk of adverse events and adherence and therapeutic goals should be agreed with the patient [1]. Thus, future studies should investigate the use of potentially inappropriate medications by users of multiple medications, including those marketed without a prescription, to evaluate the determinants of inappropriate polypharmacy.

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