# Polypharmacy among the elderly in the city of São Paulo, Brazil – SABE Study

## *Polifarmácia entre idosos do Município de São Paulo - Estudo SABE*

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***Abstract***

Polypharmacy for the elderly and associated factors were assessed. A cross-sectional study was conducted using data from the SABE Study (Health, Well-being and Aging), 2006. 1,115 individuals representing 422,377 elderly aged 65 or more, living in São Paulo City, were interviewed. Polypharmacy was defined as the use of five or more medications. A multivariate regression logistics was used. Polypharmacy prevalence was 36%. Female (OR = 1.7; IC 95%: 1.0; 2.9), age over 75 years (OR = 1.9; CI 95%: 1.3; 2.7), higher income (OR = 1.8; CI 95%: 1.2; 2.8), working (OR = 1.8; CI 95%: 1.1; 2.9), regular self assessed health (OR = 1.6; CI 95%: 1.1; 2.3) or poor (OR = 2.6; CI 95%: 1.4; 4.9), hypertension (OR = 2.0; CI 95%: 1.4; 2.9), diabetes (OR = 4.1; CI 95%: 2.2; 7.5), rheumatic diseases (OR = 2.3; CI 95%: 1.5; 3.6) and cardiac problems (OR = 2.9; CI 95%: 1.9; 4.5) were associated positively with polypharmacy. Using only the public health system (OR = 0.5, 95% CI: 0.3; 0.7) was inversely associated with polypharmacy. Medicines for the cardiovascular system and for the alimentary tract and metabolism were the most used. The knowledge of factors associated with polypharmacy, such as those identified in this study, may be useful to alert health professionals about the importance of identifying and monitoring the elderly groups most vulnerable to polypharmacy.

**Keywords:** Polypharmacy. Aged. Pharmacoepidemiology. Inappropriate drugs. Population-based survey. Cross-sectional studies.

## *Resumo*

Foi avaliado o uso de cinco ou mais medicamentos (polifarmácia) e seus fatores associados por idosos do município de São Paulo. Realizou-se estudo transversal de base populacional: Estudo SABE – Saúde, Bem-estar e Envelhecimento, no ano de 2006. A amostra foi composta por 1.115 idosos com 65 anos e mais, que correspondiam a 422.377 indivíduos do Município de São Paulo. Utilizou-se regressão logística múltipla. A prevalência de polifarmácia foi de 36%. Sexo feminino (OR = 1,7; IC 95%: 1,0; 2,9), idade igual ou superior a 75 anos (OR = 1,9; IC 95%: 1,3; 2,7), maior renda (OR = 1,8; IC 95%: 1,2; 2,8), estar trabalhando (OR = 1,8; IC 95%: 1,1; 2,9), auto avaliação de saúde regular (OR = 1,6; IC 95%: 1,1; 2,3) ou ruim (OR = 2,6; IC 95%: 1,4; 4,9), hipertensão (OR = 2,0; IC 95%: 1,4; 2,9), diabetes (OR = 4,1; IC 95%: 2,2; 7,5), doença reumática (OR = 2,3; IC 95%: 1,5; 3,6) e problemas cardíacos (OR = 2,9; IC 95%: 1,9; 4,5) apresentaram associação positiva com polifarmácia. Usar apenas o sistema público de saúde (OR = 0,5; IC 95%: 0,3; 0,7) associou-se inversamente à polifarmácia. Os medicamentos mais utilizados foram os de ação no sistema cardiovascular e trato alimentar e metabolismo. No âmbito da farmacoepidemiologia, o conhecimento dos fatores associados a polifarmácia, como os identificados nesse estudo, pode ser útil para alertar os profissionais da saúde quanto à importância de identificar e monitorar os grupos de idosos mais vulneráveis a polifarmácia.



**Palavras-chave:** Polimedicação. Idoso. Farmacoepidemiologia. Estudo populacional. Medicamentos inapropriados. Estudo transversal.


## Introduction

The concept of health proposed by the World Health Organization as complete physical, mental and social wellbeing and not merely the absence of illness may not be adequate for describing health for the elderly.[1] An elderly individual is considered healthy when functionally capable, socially integrated and able to manage his/her own life in an independent fashion.

The ageing of the population is a phenomenon seen throughout the world. In Brazil, the segment of the population aged 60 years or older totaled 14.1 million in 2002 and is expected to reach 33.4 million by 2025.[2] While this may be considered a major victory, it also constitutes a huge challenge. The increase in life expectancy leads to an increase in the number of individuals with non-transmissible chronic diseases (NTCDs), which require continuous care. Medications play an important role in this scenario, as a large percentage of elderly individuals use medications on a regular basis.[3,4,5] The treatment protocol for various NTCDs involves the combination of several medications and the combined prescriptions of an elderly individual with one or more NTCDs are likely to be classified as polypharmacy, which is the concomitant use of five or more medications.[6,7]

In recent years, there has been a considerable increase in geriatric polypharmacy. More than 40% of individuals aged 65 years or older take five or more medications per week and 12% take ten different agents.[7] Elderly individuals take a disproportional number of prescription medicines; approximately one third purchase medications from more than one drugstore and half receive prescriptions from more than one prescriber.[8] The number of medications, complexity of therapeutic regimens (especially in the presence of co-morbidities) and the pharmacokinetic and pharmacodynamic changes inherent to the ageing process are elements that increase the vulnerability of this age group to adverse drug events due to either adverse reactions or drug-drug

interactions.[9] Adverse drug events can compromise the functional capacity of elderly individuals exposed to polypharmacy and also constitute excess cost to the healthcare system.[10] Thus, medications can contribute to preserving functional capacity, but can also compromise it. Therefore, the risk--benefit of medications prescribed to elderly individuals must be evaluated adequately.

The aim of the present study was to quantify the use of polypharmacy (5 or more medications) and analyze factors associated with this practice among elderly residents of the city of São Paulo (Brazil).

## Methods

### Population surveyed

A population-based cross-sectional study, entitled the *Saúde, Bem-Estar e Envelhecimento* (SABE [Health, Wellbeing and Ageing]) study, was carried out with individuals aged 60 years or older who resided in metropolitan São Paulo in 2000.[11]

The intentional probabilistic cluster sample was comprised of two segments: the first, resulting from randomized selection by lots, corresponded to 1,568 individuals and the second was made up of 575 residents in districts in which the previous interviews were held. The latter segment corresponded to an increase applied to compensate for the mortality rate of the population over 75 years of age and achieve the desired number of interviews in this age group. Thus, information on 2,143 individuals was obtained.

To ensure the representativeness of the population, the sample size was calculated adjusting for gender, age group and socioeconomic status. Based on this calculation, sample weights were attributed to enable the analysis of a complex sample. Further details on the sample selection procedure are presented by Lebrão and Duarte.[11]

In 2006, the SABE study became longitudinal as the first follow up of the population surveyed in 2000 was performed. Data from the São Paulo State Data Analysis System, which analyzes economic, social and demographic data from the state of São Paulo, and the Mortality Information Program, which collects and analyzes mortality data in the city of São Paulo, were used to identify individuals who died between 2000 and 2006. Among the individuals interviewed in 2000, 1,115 were re-interviewed in 2006. Losses were due to deaths (649), refusals to participate (177), change in address (51), institutionalizations (12) and failure to locate individuals (139). Participants of the sample of the present study were 65 years or older at the time.

### Variables

The 2006 SABE questionnaire had 15 sections addressing aspects related to the life of the elderly individual, such as personal information, health status, functional status, cognitive evaluation, use and access to health services and medications, family support, work history, sources of income, housing characteristics, anthropometrics, flexibility and mobility. The questionnaire is available at http://www.fsp.usp.br/sabe.

The variable of interest was polypharmacy, which is defined herein as the use of five or more medications. Polypharmacy was determined based on the answers to the following questions: "Can you show me the medications that you are currently taking?" and "Can you tell me the names of the medications you take?" Associations were determined between polypharmacy and socio-demographic variables, clinical variables, access to health services and self-reported health conditions extracted from personal information, health status, medications, access to health services, work history and sources of income sections of the questionnaire. Chart 1 displays the variables included in the analysis.

Medications were classified based on the Anatomical Therapeutic Chemical (ATC) classification system,[12] which is divided into five levels, the first of which is subdivided into 14 main anatomical groups. Levels 2 and 3 correspond to therapeutic/pharmacological subgroups. Level 4 represents the

therapeutic/pharmacological/chemical group and Level 5 represents chemical substances. In the present study, Level 5 was used to classify the medications.

**Data analysis**

For the descriptive analysis, mean and standard error values were estimated for continuous variables and proportions were estimated for categorical variables. Differences between groups were determined using the Wald test of mean equality and the Rao-Scott test,[13] which considers sample weights for the estimate of population weights. Logistic regression analysis with the forward stepwise method was performed in the evaluation of factors associated with polypharmacy, in which variables with a p-value < 0.20 in the univariate analysis were selected, maintaining those that remained significant ($p < 0.05$) or adjusted the estimation measure (OR) by at least 10%. Inferences took into account the sampling weights of the study design. Data analysis was performed using the *Stata*® statistical package (version 11).[14] Values of variables that did not obtain a response (missing data) were excluded from the analysis. To avoid response bias regarding self-reported items, responses were excluded from the analysis when an individual exhibited an inability to answer, as measured by objective evaluations present in the questionnaire.

The present study received approval from the Human Research Ethics Committee of the School of Public Health of the University of São Paulo (Process number: 67/99) and the National Research Ethics Committee (Project number: 315/99). All interviewees or proxies signed a statement of informed consent. There are no conflicts of interest related to this study.

**Chart 1** - Definitions, references and contrasts of independent variables used to analyze the practice of polypharmacy among elderly residents in São Paulo - SABE Study, 2006

***Quadro 1*** *– Definições, referências e contrastes das variáveis independentes utilizadas na análise do uso de polifarmácia por idosos residentes no Município de São Paulo – Estudo SABE, 2006.*

| Variables | Definition | Reference | Contrast |
|---|---|---|---|
| Age | In years | 65 to 74 years | ≥ 75 years |
| Gender | | Male | Female |
| Terciles of income | Income of individual in relation to minimum salary | | |
| Schooling | Year of study completed | No schooling | ≥ 1 year of study |
| Work status | Currently working | Active | Inactive |
| Living arrangement | Lives alone or with others | Alone | With others |
| Health coverage | Has health insurance beyond public healthcare | Private | Public |
| Self-rated health | Self-reported health status | Excellent | Fair, poor/very poor |
| Hospitalization in previous year | Self-reported hospitalization in previous year | None | 1 or more |
| Hypertension | Self-reported hypertension | No | Yes |
| Diabetes | Self-reported diabetes | No | Yes |
| Lung disease | Self-reported lung disease | No | Yes |
| Rheumatic disease | Self-reported rheumatic disease | No | Yes |
| Heart disease | Self-reported heart disease | No | Yes |
| Fall in previous 12 months | Self-reported fall in previous 12 months | No | Yes |
| Cancer | Self-reported cancer | No | Yes |

## Results

Among the 1,115 elderly individuals of the baseline cohort of the SABE study and who were re-interviewed in 2006, 999 were users of medications, corresponding to 422,377 individuals aged 65 years or older in the city of São Paulo. The number of medications in this group ranged from one to 16, with a mean of 3.6 medications per individual.

The majority was 75 years or age or older (83.6%), female (63.0%), had studied between one and six years (64.2%), did not work (79.1%), did not live alone (84.1%) and had not been hospitalized in the year prior to the survey (87.8%). Approximately half had private health insurance (49.4%) and self-rated their health as either excellent (41.5%) or fair (48.6%). Regarding diseases, 67.8% reported having hypertension, 23.6% reported having diabetes, 10.6% reported having lung disease, 36.4% reported having rheumatic disease and 25% reported having heart disease. Approximately half the sample (49.7%) reported having fallen in the 12 months prior to the interview.

Thirty-six percent of the interviewees, representing 151,902 elderly individuals, reported taking five or more medications. The following variables were significantly associated with polypharmacy ($p < 0.05$): age, gender, working status, type of health coverage, self-rated health, hospital admission in the previous year, hypertension, diabetes, rheumatic disease, lung disease and heart disease (Table 1). The multiple regression analysis revealed that the following factors remained positively associated with polypharmacy: female gender; age over 75 years; higher income; health self-rated as fair and poor/very poor; self-reported hypertension, diabetes, rheumatic disease and heart disease; and being currently

**Table 1** - Association between polypharmacy, socio-demographic variables and indicators of health status among elderly residents in São Paulo - SABE Study, 2006

***Tabela 1** - Associação entre polifarmácia, variáveis sociodemográficas e indicadores de condição de saúde da população idosa residente no Município de São Paulo – Estudo SABE, 2006.*

| Variables | Medications | | OR (95% CI) | p |
|---|---|---|---|---|
| | 1 - 4 (%) | ≥ 5 (%) | | |
| **Age** | | | | |
| 65 to 74 years | 65.7 | 34.3 | 1.0 | |
| 75 years or older | 55.7 | 44.3 | 1.5 (1.1 – 2.0) | 0.004 |
| **Gender** | | | | |
| Male | 72.0 | 28.0 | 1.0 | |
| Female | 59.4 | 40.6 | 1.8 (1.2 – 2.6) | 0.005 |
| **Terciles of income (x MS)** | | | | |
| 1 (0.03 – 1.30) | 69.5 | 30.5 | 1.0 | |
| 2 (1.31 – 2.71) | 61.0 | 39.0 | 1.5 (1.0 – 2.2) | 0.057 |
| 3 (2.72 – 42.85) | 62.8 | 37.2 | 1.3 (0.9 – 1.9) | 0.090 |
| **Schooling (years)** | | | | |
| 0 | 63.4 | 36.6 | 1.0 | |
| 1 to 3 | 68.8 | 31.2 | 0.8 (0.5 – 1.3) | 0.339 |
| 4 to 11 | 62.4 | 37.6 | 1.0 (0.6 – 1.7) | 0.859 |
| 12 to 22 | 55.1 | 44.9 | 1.4 (0.6 – 3.1) | 0.380 |
| **Work status** | | | | |
| Active | 73.8 | 26.2 | 1.0 | |
| Inactive | 61.6 | 38.4 | 1.8 (1.1 – 2.7) | 0.010 |

***Table 1** - Association between polypharmacy, socio-demographic variables and indicators of health status among elderly residents in São Paulo - SABE Study, 2006 (continuation)*
***Tabela 1** - Associação entre polifarmácia, variáveis sociodemográficas e indicadores de condição de saúde da população idosa residente no Município de São Paulo – Estudo SABE, 2006 (continuação)*

| Variables | Medications | | OR (95% CI) | p |
|---|---|---|---|---|
| | 1 - 4 (%) | ≥ 5 (%) | | |
| **Living arrangement** | | | | |
| Lives alone | 62.7 | 37.3 | 1.0 | |
| Lives with others | 64.2 | 35.8 | 0.9 (0.6 – 1.4) | 0.743 |
| **Health coverage** | | | | |
| Private | 56.3 | 43.7 | 1.0 | |
| Public | 71.6 | 28.4 | 0.5 (0.4 – 0.7) | 0.000 |
| **Self-rated health** | | | | |
| Excellent | 73.00 | 27.00 | 1.0 | |
| Fair | 60.8 | 39.2 | 1.7 (1.3 – 2.4) | 0.001 |
| Poor/very poor | 44.0 | 56.0 | 3.4 (2.0 – 6.0) | 0.000 |
| **Hospitalization in previous year** | | | | |
| None | 66.7 | 33.3 | 1.0 | |
| One or more | 45.0 | 55.0 | 2.4 (1.6 – 3.7) | 0.000 |
| **Hypertension** | | | | |
| No | 77.7 | 22.3 | 1.0 | |
| Yes | 57.5 | 42.5 | 2.6 (1.8 – 3.6) | 0.000 |
| **Diabetes** | | | | |
| No | 71.6 | 28.4 | 1.0 | |
| Yes | 38.8 | 61.2 | 4.0 (2.7 – 5.8) | 0.000 |
| **Lung disease** | | | | |
| No | 65.5 | 34.5 | 1.0 | |
| Yes | 52.9 | 47.1 | 1.7 (1.1 – 2.7) | 0.024 |
| **Rheumatic disease** | | | | |
| No | 72.1 | 27.9 | 1.0 | |
| Yes | 50.1 | 49.9 | 2.6 (1.9 – 3.5) | 0.000 |
| **Heart disease** | | | | |
| No | 71.4 | 28.6 | 1.0 | |
| Yes | 41.3 | 58.7 | 3.6 (2.5 – 5.1) | 0.000 |
| **Fall in previous 12 months** | | | | |
| No | 59.4 | 40.6 | 1.0 | |
| Yes | 57.2 | 42.8 | 1.1 (0.8 – 1.5) | 0.598 |
| **Cancer** | | | | |
| No | 64.4 | 35.6 | 1.0 | |
| Yes | 58.0 | 42.0 | 1.3 (0.7 – 2.3) | 0.342 |

SM = salário mínimo nacional vigente à época da pesquisa = R$ 350,00[28]
*MS = national minimum salary at time of survey = R$ 350[28]*

**Table 2** - Factors associated with polypharmacy (use of five or more drugs) among elderly residents in São Paulo after multivariate regression analysis - SABE Study, 2006
***Tabela 2*** *– Fatores associados com polifarmácia (uso de 5 ou mais medicamentos) entre idosos residentes no Município de São Paulo após análise de regressão múltipla – Estudo SABE, 2006.*

| Variables | Adjusted OR* (95% CI) | p-value |
|---|---|---|
| Age (75 years or more) | 1.9 (1.3 – 2.7) | 0.001 |
| Female gender | 1.7 (1.0 – 2.9) | 0.036 |
| 2nd tercile of income | 1.3 (0.8 – 2.2) | 0.219 |
| 3rd tercile of income | 1.8 (1.2 – 2.8) | 0.008 |
| Work status (active) | 1.8 (1.1 – 2.9) | 0.020 |
| Health coverage (public system) | 0.5 (0.3 – 0.7) | 0.001 |
| Health self-rated as fair | 1.6 (1.1 – 2.3) | 0.021 |
| Health self-rated as poor/very poor | 2.6 (1.4 – 4.9) | 0.003 |
| Hospitalization in previous year | 1.7 (1.0 – 2.9) | 0.059 |
| Hypertension | 2.0 (1.4 – 2.9) | 0.000 |
| Diabetes | 4.1 (2.2 – 7.5) | 0.000 |
| Rheumatic disease | 2.3 (1.5 – 3.6) | 0.000 |
| Heart disease | 2.9 (1.9 – 4.5) | 0.000 |

*OR ajustado por 2º tercil de renda e internação no último ano.
**OR adjusted for 2nd tercile of income and hospital admission in previous year*

**Table 3** – The 20 drugs most used by elderly individuals practicing polypharmacy (5 or more medications) according to ATC* Classification, city of São Paulo, SABE Study, 2006
***Tabela 3*** *- Os 20 medicamentos mais utilizados pelos idosos usuários de polifarmácia (5 ou mais medicamentos), segundo a Classificação ATC *, Município de São Paulo, Estudo SABE, 2006.*

| Medications | ATC* classification (5th level) | % |
|---|---|---|
| Acetylsalicylic acid | B01AC06 | 5.51 |
| Hydrochlorothiazide | C03AA03 | 4.00 |
| Enalapril | C09AA02 | 3.55 |
| Captopril | C09AA01 | 3.23 |
| Simvastatin | C10AA01 | 3.08 |
| Metformin | A10BA02 | 2.58 |
| Glibenclamide | A10BB01 | 2.05 |
| Atenolol | C07AB03 | 1.80 |
| Levothyroxine | H03AA01 | 1.69 |
| Omeprazole | A02BC01 | 1.56 |
| Amlodipine | C08CA01 | 1.26 |
| Ranitidine | A02BA02 | 1.17 |
| Alendronate | M05BA04 | 1.14 |
| Chlorthalidone | C03BA04 | 1.10 |
| Dipyrone | N02BB02 | 1.08 |
| Furosemide | C03CA01 | 1.07 |
| Calcium carbonate and vitamin D | A11AA02 | 1.03 |
| Atorvastatin | C10AA05 | 1.01 |
| Paracetamol (acetaminophen) | N02BE01 | 0.97 |
| Diclofenac | M01AB05 | 0.93 |

* Classificação *Anatomical Therapeutic Chemical*
* *Anatomical Therapeutic Chemical* Classification

employed. Exclusive use of the public healthcare system was associated with a lower number of medications (Table 2). Among the 20 medications most often used by the individuals with polypharmacy, 10 (50%) acted on the cardiovascular system (Groups B and C – AAS). The second most frequent class was of medications acting on the alimentary tract and metabolism (Group A) (Table 3).

## Discussion

Taking five or more medications was reported by 36% of the elderly individuals. This finding may have several explanations. To a certain extent, it is the consequence of the higher prevalence of NTCDs in this age group. Another aspect is the fact that elderly individuals are often treated by different specialists within a short span of time without being asked what drugs are currently in use, which contributes to the use of multiple medications. Moreover, prescriptions are often filled repeatedly because patients are not oriented with regard to the duration of treatment.[15] At times, adverse reactions to medications are mistakenly interpreted as new clinical conditions and treated with new agents, thereby constituting an iatrogenic cascade.[16] Advertising directed at consumers also contributes to polypharmacy by increasing the demand for particular medications and encouraging self-medication.[17]

The prevalence of polypharmacy in the present study was greater than that reported in other population-based studies carried out in Brazilian elderly individuals that also define this phenomenon as the use of five medications or more. Previous studies report prevalence values ranging from 14.3% in metropolitan Belo Horizonte[18] to 27% in the city of Porto Alegre[19] and 32.7% among retirees in Rio de Janeiro.[10] These differences may be related to the characteristics of the populations surveyed and the methodology employed in the different inquiries.[8] For example, a large portion of the present sample was made up of individuals aged 75 years or older who took a greater mean number of medications than those in the aforementioned studies.

The analysis of socio-demographic characteristics revealed an association between polypharmacy and the female gender, age over 75 years, greater income and being currently employed (Table 2). Previous studies also report the female gender to be associated with this practice.[6,18,19,20,21] Irrespective of polypharmacy, the reasons for the use of medications predominantly among elderly women may be linked to issues of a biological, psychological and socio-cultural nature, as women are more exposed to non-fatal health problems, worry more about physical symptoms, place greater focus on health problems, use healthcare services more often throughout life and are more familiar with medications.[18]

With regard to age, polypharmacy was associated with the older age group (75 years or older). This finding is likely related to the greater occurrence of health problems in this age group, which are generally chronic and of greater severity.[7,18,20]

Elderly individuals with a higher income took more medications. Previous surveys also report a positive association between higher income and the use of medications,[3] particularly polypharmacy.[22] In contrast, the exclusive use of the public healthcare system was inversely associated with polypharmacy. These individuals may only use medications provided by the public healthcare system, which may limit the number of medications used.

Polypharmacy was associated with current employment. Elderly individuals continuing in the job market depends on an adequate health status, which may be maintained, in part, by the use of medications that control NTCDs.

Polypharmacy was associated with health self-rated as fair and poor/very poor, as reported in previous surveys carried out in Brazil[18,21] and other countries.[19,23] This finding was expected, as there is an obvious connection between health problems and the use of medications. Individuals who become ill or perceive themselves as being ill

seek a solution or relief for their symptoms through the use of medications.[18]

In agreement with a previous study on polypharmacy carried out in Brazil,[10] the individuals in the present study who reported hypertension, diabetes, heart disease and rheumatic disease were more prone to polypharmacy. This finding was also expected, as these conditions are prevalent in the elderly population, the control of which generally requires several different medications. Moreover, elderly individuals often have several concomitant conditions, leading to the need for polypharmacy.

Hospital admissions in the previous year were associated with polypharmacy, which is likely related to a poorer health status.

The list of the 20 most used medications among the individuals practicing polypharmacy (Table 3) reflects the most prevalent NTCDs. The most used medications were for the treatment of cardiovascular conditions (hypertension, coronary disease) and diabetes (particularly type 2). Two medications on this list (ranitidine and omeprazole) reduce gastric acid and are indicated for the treatment of conditions in which the physiopathology involves the secretion of gastric acid, such as peptic ulcers and reflux esophagitis. The wide (and not always rational) prophylactic use of these medications has been documented, which may at least partially explain the high frequency of use in the present sample.[24]

The present study has limitations that should be addressed. Despite its inherent value, the cross-sectional design does not allow establishing the temporality of the associated factors. Thus, longitudinal studies involving the elderly participants of the SABE study are needed, and are currently underway. Another point that merits attention is that self-reported conditions may lead to the underestimation of the prevalence of disease due to problems of memory or even a lack of diagnosis. Elderly individuals may also overestimate their health status in order to demonstrate self-sufficiency due to a fear of requiring care or being institutionalized. Some of the questionnaires were filled out by proxy, which may have affected the responses. Moreover, cultural differences associated with lower levels of schooling and income as well as lower expectations regarding the health status of elderly individuals may affect evaluations of health performed by a third-party informant.[25]

The results of the present study demonstrate that polypharmacy is highly prevalent among elderly individuals in the city of São Paulo, which may lead to serious consequences for this age group. Considering the particularities of the geriatric population with regard to the prevalence of NTCDs and respective treatments, to take into account the number of medications as the only parameter for the assessment of pharmacotherapy among the elderly may be inadequate from the standpoint of public health. It is necessary to assess the suitability of what is being used in terms of both the choice of medications and dosages.[9,26] It should be stressed that individuals in the elderly population come from very heterogeneous groups with regard to functional capacity, which is the result of a complex interaction of multiple factors, such as genetics, lifestyle, past illnesses, the quality of healthcare, etc. Thus, functional capacity can be very different between two individuals of the same age and gender.[27] Likewise, the intensity of the pharmacokinetic and pharmacodynamic alterations that accompany the ageing process and the consequences of polypharamacy can differ considerably between individuals. Prescribers need to consider this variability when selecting medications and dosages so that the functional capacity of elderly patients is not compromised.[9] The rational use of medications in the growing elderly population is a huge public health challenge. This complex issue involves the responsibility of all links in the medication chain – from the pharmaceutical industry, regulatory agencies and healthcare systems to health professionals and patients. Educational and administrative measures are needed to ensure quality drug therapy for the geriatric population.

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