

# Descriptive study on the evolution of hospitalization costs for ambulatory care sensitive conditions in Brazil, 2000-2013\*

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## Abstract

**Objective:** to analyze the proportions of costs of hospitalizations for ambulatory care sensitive conditions (ACSC) in relation to total hospitalization costs funded by the Brazilian National Health System (SUS) in Brazil, in 2000, 2005, 2010 and 2013, according to sex, age and group of causes. **Methods:** this is a descriptive study, with data from SUS Hospital Information System (SIH/SUS); the proportion of hospitalization costs for ACSC was estimated in relation to total hospitalization costs. **Results:** proportions decreased from 23.6% (2000) to 17.4% (2013); higher rates occurred among women (29.8%), children (42.3%) and the elderly (31.7%); on the other hand, there was a significant increase in the proportion of hospitalization costs for angina (237.5%) and pneumonia (84.3%). **Conclusion:** there were greater reductions in costs among children, elderly and women; however, the persistence of high proportion of costs attributed to cardiovascular diseases stands out, especially hospitalizations for angina.

**Keywords:** Primary Health Care; Hospital Costs; Hospitalization; Health Expenditures; Epidemiology, Descriptive.

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## Introduction

Primary health care (PHC) can be considered the main element for the adequate performance of health systems, enabling a more accessible offer and fair service, intended to the population needs.<sup>1</sup> The strategy in this level of care is to work as the system's gateway, treating health problems in their initial phase and integrating curative care and rehabilitation, within the social context in which each individual is part of. This practice enables to solve, approximately, 85% of the population health needs,<sup>2</sup> implying lower costs when compared to those generated by hospitalizations.<sup>3</sup>

In this sense, an indirect indicator of quality was designed especially for this health care level, based on hospitalizations for ambulatory care sensitive conditions (ACSC). Such conditions are those that were supposed to be treated in PHC, with no need for hospitalizations.<sup>4</sup> The Brazilian list of ACSC consists of 19 groups of hospitalization causes and was defined after an extensive revision of the current lists from Brazil and other countries, involving PHC specialists, members of the Brazilian Society of Family and Community Medicine, besides a public consultation.<sup>4,5</sup>

*The observation and analysis of the costs that hospitalizations represent to SUS, and of how they are distributed regarding the population characteristics, can collaborate to the adoption of measures capable of preventing complications that would end up in hospitalizations.*

In Brazil, there are few recent studies of national range on ACSC-related hospitalizations,<sup>5,6</sup> and the most commons are those that include populations from specific municipalities, health regions or states.<sup>7-9</sup> In general, the proportion of hospitalizations for ACSC – in relation to the total of hospitalizations – and the ACSC rate present wide variation among the aforementioned studies (from 17 to 37% and from 11 to 25/1,000, respectively),<sup>9-12</sup> depending on the age group included in the estimates, region studied and the methodology adopted to these indicators definition (whether it excludes birth-related hospitalizations or uses primary data). Hospitalizations for ACSC are more frequent among women, children

and elderly people, and the most common conditions include infectious diseases and those related to the respiratory and cardiovascular systems.<sup>8,10,12-14</sup>

With regard to costs associated to hospitalizations for ACSC, only one study included the Brazilian population (from 20 to 79 years old) and revealed that, in 2007, 19.8% of the total expenditures with hospitalizations was assigned to ACSC.<sup>6</sup> Two other studies which have included the total of hospitalizations paid by the Brazilian National Health System (SUS), estimated a proportion of hospitalization costs for ACSC of 13.8% in São Paulo State, in 2007,<sup>11</sup> and a variation from 17% (2008) to 16.5% (2010) in the health region of São José do Rio Preto-SP.<sup>8</sup> This second study also showed that the biggest costs were assigned to hospitalizations for angina (stable angina or angina pectoris), heart failure and cerebrovascular diseases.<sup>8</sup>

The observation and analysis of the costs that hospitalizations represent to SUS, and of how they are distributed regarding the population characteristics, can collaborate to the adoption of measures capable of preventing complications that would end up in hospitalizations.<sup>15</sup> However, studies on this type of costs are incipient in the Brazilian literature, although being extremely important to understand the expenditures with hospitalizations performed by our public health system. We have not found any previous national-based study that would describe these costs evolution according to age group, sex and main hospitalization diagnosis, not enabling – so far – the identification of the most vulnerable groups in relation to the highest costs of hospitalizations for ACSC by SUS.

The objective of the present study was to analyze the proportions of costs of hospitalizations for ambulatory care sensitive conditions (ACSC) in relation to total hospitalization costs funded by the Brazilian National Health System (SUS) in Brazil, in 2000, 2005, 2010 and 2013, according to sex, age and group of causes.

## Methods

This is a descriptive study on the costs with hospitalizations for ACSC within the Brazilian National Health System, in the years of 2000, 2005, 2010 and 2013. The database used was the National Hospital Information System (SIH/SUS), available at the website of SUS IT Department (Datusus) (<http://datusus.saude.gov.br>).

SIH/SUS is powered by data from the Inpatient Hospital Authorization (IHA). IHA includes several information about each hospitalization that has occurred, in all hospitals that are part of SUS network, including patient's characteristics, procedures that were performed, main hospitalization diagnosis, reasons for hospital discharge, and values paid, among others.<sup>16</sup>

We used data from all hospitalizations funded by SUS in each studied year, per place of residence. The total costs of hospitalizations, regarding all IHA paid were considered in the calculation. The costs were stratified by sex (female; male), age group (in years: up to 4; 5-19; 20-59; 60 or over) and hospitalization causes; these latter were selected according to the International Statistical Classification of Diseases and Related Health Problems 10<sup>th</sup> Revision (ICD-10).

To select the costs related to hospitalizations for ACSC, we used the list of sensitive conditions published by the Brazilian Ministry of Health, which includes 19 diagnostic groups: 1) Vaccine-preventable diseases; 2) Infectious gastroenteritis and its complications; 3) Anemia; 4) Nutritional deficiencies; 5) Infections of ear, nose and throat; 6) Bacterial pneumonias; 7) Asthma; 8) Pulmonary diseases; 9) Hypertension; 10) Angina; 11) Heart failure; 12) Cerebrovascular diseases; 13) Diabetes *mellitus*; 14) Epilepsies; 15) Kidney and urinary tract infections; 16) Skin and subcutaneous tissue infection; 17) Female pelvic inflammatory diseases; 18) Gastrointestinal ulcer; and 19) Prenatal and delivery-related diseases.<sup>4</sup>

The indicator adopted by this study was the proportion of costs with hospitalizations for ACSC, in relation to the total cost with hospitalizations funded by SUS – excluded hospitalizations for deliveries, because they represent a natural event of pregnancy and not a disease. The following formula was used:

$$\text{Proportion of costs with hospitalizations for ACSC} = \frac{\text{costs with ACSC}_{\text{sex, age group, year}}}{\text{Total costs with hospitalizations}_{\text{sex, age group, year}}} \times 100$$

We chose to use this indicator because it considers the annual variation of the total values paid to IHA (denominator); i.e., this proportion is not influenced by resources availability or by the differences between values paid to each procedure throughout the analyzed period. Besides that, the use of absolute values would demand adjustments for inflation and changes of values refunded by SUS, to each procedure.

The percentage variation of the costs proportion in the studied period was calculated based on the following formula:

$$\Delta(\%) = \frac{\text{Proportion of costs with hospitalizations for ACSC}_{\text{year 2013}} - \text{Proportion of costs with hospitalizations for ACSC}_{\text{year 2000}}}{\text{Proportion of costs with hospitalizations for ACSC}_{\text{year 2000}}} \times 100$$

The absolute values (in BRL) of the costs with hospitalizations for ACSC for each year, sex, and age group were also described.

The data were tabulated with the program Tabwin version 3.6, using IHA files from all federation units and from the files of fields' definitions (*formato.def*) of information related to hospitalizations. The data analysis was performed through the program Microsoft Excel® version 2013.

The analysis was performed using secondary data, of public access, with no possibility of individual identification of the information. Thus, in accordance with the Resolution of the National Health Council (CNS) No. 466, dated December 12<sup>th</sup>, 2012, the ethics principles of researches that involve human beings were respected, being exempted from the approval by an ethics research committee.

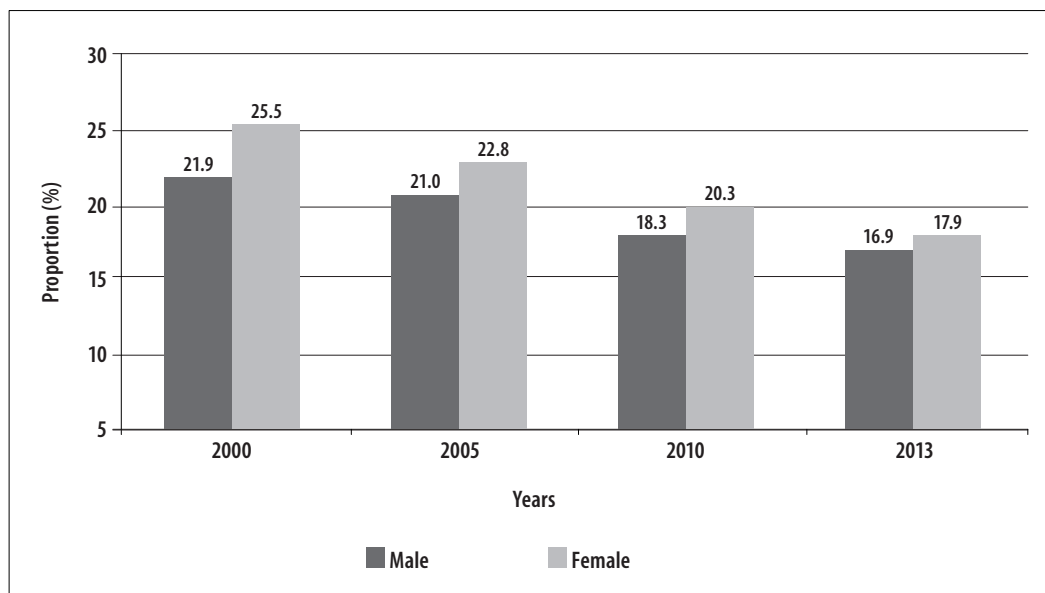
## Results

In general, the proportions of hospitalization costs for ACSC decreased in the period studied: 2000 (23.6%), 2005 (21.8%), 2010 (19.2%) and 2013 (17.4%). In the last evaluated year, costs corresponded to approximately BRL1.9 billion (Table 1). This proportional reduction was also observed in both sexes, being a little more significant among women, who reduced this proportion in 29.8%, whilst men presented a reduction of 22.9% (Figure 1).

The proportions between male and female individuals in the age groups  $\leq 4$  years and 60 years or over, in every analyzed year, did not present greater differences. However, the proportion of costs with ACSC is consistently higher in the female population between 5 and 59 years of age. Elderly people, from both sexes, have presented the biggest proportions of costs with ACSC, in the whole analyzed period, with estimated cost of, approximately, BRL2.8 billion in the evaluated years. Major changes were observed in the edges of the age distribution, with bigger reductions observed in the group of children under five years of age (43% in the female group; 41.7% in the male group), followed

**Table 1 – Expenditures with hospitalizations for ambulatory care sensitive conditions (ACSC) and with general hospitalizations, Brazil, 2000, 2005, 2010 and 2013**

Year	ACSC (in BRL)	General hospitalizations (in BRL)	% of expenditures with ACSC
2000	988,455,167.28	4,194,931,756.57	23.6
2005	1,311,443,521.88	6,010,421,649.44	21.8
2010	1,809,552,953.93	9,428,920,889.36	19.2
2013	1,975,859,100.07	11,382,880,067.48	17.4

**Figure 1 – Proportion of hospitalization costs for ambulatory care sensitive conditions (ACSC) according to sex, Brazil, 2000, 2005, 2010 and 2013**

by the elderly population (33.5% in the female group; 30% in the male one) (Table 2).

The proportions of costs with ACSC between men and women according to age group and group of causes are described in Table 3. In the two younger age groups, the three most frequent groups of causes were the hospitalizations for infectious gastroenteritis and its complications, bacterial pneumonias and asthma. The exception to this profile was kidney and urinary tract infection, as the third cause with the highest cost proportion in 2000 in the population aged 5 to 19 years, rather than bacterial pneumonias, although it began to appear as the fourth cause from 2005 on.

In adults (aged 20 to 59 years) and elderly people (60 years or over), costs with hospitalizations for circulatory system-related diseases appeared to be very expressive, and heart failure, angina and

cerebrovascular diseases stood out. Here, the exception was the group of pulmonary diseases, which usually stood out in 2000 as the second and third causes responsible for the highest costs proportion in the elderly and adult population, respectively. Although this group of causes lost its importance throughout time, it remained in the fourth position among the elderly population in 2013 (Table 3).

The ACSC with the biggest variations in hospitalization costs between 2000 and 2013, considering the total population, were angina and bacterial pneumonias, with increases of 237.5% and 84.3%, respectively. Heart failure reduced in 43.4% its participation in hospitalization costs. It is important to mention that this analysis has not showed expressive variations in relation to sex (data not showed), being presented only to the total population.

**Table 2 – Values and proportion of hospitalization costs for ambulatory care sensitive conditions (ACSC) according to sex and age group, Brazil, 2000, 2005, 2010 and 2013**

Sex and age group (in years)	Years								Δ% <sup>a</sup>
	2000		2005		2010		2013		
	Value (in BRL)	%	Value (in BRL)	%	Value (in BRL)	%	Value (in BRL)	%	
<b>Male</b>									
≤4	78,239,209.45	21.8	115,454,286.00	24.5	119,637,003.84	15.8	104,118,704.03	12.7	41.7
5-19	35,109,418.02	14.9	43,130,213.64	14.1	57,756,912.50	13.6	51,050,877.48	10.8	27.4
20-59	171,990,809.80	15.8	232,542,525.96	14.7	327,813,010.57	13.7	364,512,114.52	12.8	18.8
≥60	212,765,039.91	36.1	300,427,428.17	32.0	445,139,756.26	27.3	540,845,494.52	25.3	30.0
<b>Female</b>									
≤4	63,530,722.25	22.0	93,908,751.33	24.2	100,678,208.05	15.7	86,890,798.17	12.5	43.0
5-19	36,276,004.90	22.0	45,772,010.99	21.5	62,210,373.66	20.8	57,424,694.83	17.4	21.1
20-59	180,421,449.03	19.6	206,140,316.84	16.4	288,544,335.80	15.6	298,671,650.34	13.4	31.8
≥60	210,122,513.92	38.3	274,067,988.95	32.0	407,773,353.25	28.5	472,344,766.18	25.5	33.5
<b>Total population</b>									
≤4	141,769,931.70	21.9	209,363,037.33	24.4	220,315,211.89	15.7	191,009,502.20	12.6	42.3
5-19	71,385,422.92	17.8	88,902,224.63	17.1	119,967,286.16	16.5	108,475,572.31	13.5	24.2
20-59	352,412,258.83	17.5	438,682,842.80	15.5	616,357,346.37	14.5	663,183,764.86	13.1	25.5
≥60	422,887,553.83	37.2	574,495,417.12	32.0	852,913,109.51	27.9	1,013,190,260.70	25.4	31.7

a) Percentage variation of the proportion of hospitalization costs for ACSC in 2013 using as reference the year of 2000.

## Discussion

The present study showed that, in general, there has been a significant reduction in the costs proportion of hospitalizations for ACSC in relation to the total costs of SUS with all hospitalizations. Some aspects of the analysis must be highlighted: (i) this reduction was relatively bigger among women and in the edges of the age groups ( $\leq 4$  and  $\geq 60$  years); (ii) the female population from 5 to 59 years old has presented higher cost proportion, comparing to men in the same age, for all the analyzed period; (iii) the groups of causes responsible for most of ACSC costs were infectious gastroenteritis, bacterial pneumonias and asthma, in the population under 20 years, and heart failure, angina and cerebrovascular diseases, among adults and elderly individuals; and (iv) there was a significant increase in costs proportion for angina and bacterial pneumonia in the total population, and considerable costs reduction in hospitalizations for heart failure.

This finding of costs reduction with hospitalizations for ACSC was similar to a study carried out in 20 municipalities of São José do Rio Preto region,

countryside of São Paulo State, where the proportion of costs was 17.5% in 2008 and 16.5% in 2010;<sup>8</sup> as well as to the result of a research in São Paulo State, where some reductions in the proportion of costs with ACSC from 2000 to 2007 were observed, decreasing from 14.7% to 13.8%.<sup>11</sup> Notwithstanding, this present study shows higher costs proportion with hospitalizations for ACSC when the total population of the country is considered (23.6% in 2000 and 17.4% in 2013), which is possibly the result of the non-exclusion of childbirths from the total of hospitalizations evaluated in the two aforementioned studies; this finding can also reflect the different scenarios in the country, suggesting that there are regions where hospitalizations for ACSC are still responsible for important portions of costs with hospitalizations paid by SUS.

Costs reduction with hospitalizations for ACSC can derive from the consolidation of primary health care, given the increasing coverage of Family Health Strategy (FHS) in the country. Such fact has been associated to a significant reduction of hospitalization for ACSC from 1999 to 2007, highlighting FHS important role to improve de the Brazilian health system's performance,<sup>17</sup>

**Table 3 – Proportion of hospitalization costs for ambulatory care sensitive conditions (ACSC) according to group of causes and age group, Brazil, 2000, 2005, 2010 and 2013**

ACSC causes group	2000						2005						2010						2013					
	≤4		5-19		20-59		≥60		≤4		5-19		20-59		≥60		≤4		5-19		20-59		≥60	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	
Vaccine-preventable diseases	0.2	0.6	0.8	0.2	0.2	0.4	0.6	0.2	0.2	0.3	0.5	0.2	0.4	0.2	0.5	0.2	0.4	0.2	0.5	0.2	0.4	0.2	0.5	0.2
Infectious gastroenteritis and its complications	9.0	4.2	1.2	1.2	9.3	5.0	1.3	1.4	5.1	5.0	1.1	1.0	2.9	3.3	0.7	0.7	2.9	3.3	0.7	0.7	3.3	0.7	0.7	0.7
Anemia	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Nutritional deficiencies	1.0	0.4	0.3	0.6	0.6	0.3	0.3	0.6	0.6	0.3	0.2	0.5	0.3	0.2	0.2	0.4	0.3	0.2	0.2	0.2	0.3	0.2	0.2	0.4
Infections of ear, nose and throat	0.2	0.3	0.1	0.1	0.1	0.1	-	-	0.1	0.2	0.3	0.1	0.2	0.3	0.1	-	0.2	0.3	-	-	0.2	0.3	-	-
Bacterial pneumonias	1.6	0.7	0.4	0.6	6.7	1.8	0.5	0.8	3.7	2.1	0.6	1.2	3.0	1.7	0.6	1.3	3.0	1.7	0.6	1.7	0.6	0.6	1.3	1.3
Asthma	7.1	6.1	1.5	1.3	4.7	4.0	0.8	0.7	2.7	3.1	0.6	0.5	1.9	2.2	0.3	0.3	1.9	2.2	0.3	0.3	2.2	0.3	0.3	0.3
Pulmonary diseases	1.0	0.3	1.6	6.9	0.8	0.1	0.8	3.8	1.4	0.6	0.6	2.3	1.6	0.5	0.5	1.8	1.6	0.5	0.5	0.5	0.5	0.5	1.8	1.8
Hypertension	-	0.1	0.5	1.0	-	0.1	0.6	1.3	-	-	0.3	0.6	-	-	0.2	0.5	-	-	-	-	-	-	0.2	0.5
Angina	-	-	1.2	2.4	-	-	2.4	5.1	-	-	3.2	6.4	-	-	3.6	7.4	-	-	-	-	-	-	3.6	7.4
Heart failure	0.4	0.8	3.4	12.3	0.3	0.7	2.7	9.5	0.5	0.5	2.3	7.1	0.5	0.4	1.9	5.6	0.5	0.4	1.9	5.6	0.5	0.4	1.9	5.6
Cerebrovascular diseases	0.1	0.3	2.2	6.6	-	0.2	1.7	5.1	-	0.2	2.0	4.9	-	-	4.5	4.5	-	-	-	-	-	-	0.3	1.7
Diabetes melitus	0.1	0.5	0.9	1.7	0.1	0.5	0.8	1.3	0.1	0.6	0.8	1.4	0.1	0.6	0.8	1.1	0.1	0.6	0.8	1.1	0.6	0.8	1.1	1.1
Epilepsies	0.3	0.6	0.4	0.1	0.4	0.8	0.4	0.1	0.4	0.7	0.3	0.1	0.4	0.9	0.3	0.1	0.4	0.9	0.3	0.1	0.9	0.3	0.1	0.1
Kidney and urinary tract infections	0.4	1.4	0.7	0.5	0.5	1.5	0.9	0.6	0.5	1.4	0.8	0.7	0.4	1.4	0.7	0.7	0.4	1.4	0.7	0.7	1.4	0.7	0.7	0.7
Skin and subcutaneous infections	0.3	0.6	0.3	0.3	0.4	0.8	0.4	0.4	0.4	0.9	0.4	0.4	0.4	0.9	0.5	0.5	0.4	0.9	0.4	0.4	0.9	0.5	0.5	0.5
Female pelvic organs inflammatory disease	-	0.3	0.8	-	-	0.2	0.4	-	-	0.1	0.3	-	-	-	0.2	-	-	-	-	-	-	0.1	0.2	-
Gastrointestinal ulcer	0.1	0.3	1.0	1.2	0.1	0.3	0.8	1.0	0.1	0.1	0.4	0.4	0.1	0.1	0.3	0.4	0.1	0.1	0.3	0.4	0.1	0.1	0.3	0.4
Prenatal and delivery-related diseases	0.2	0.1	-	-	0.2	0.2	0.1	-	0.2	0.2	0.1	-	0.2	0.2	0.1	-	0.3	0.2	0.1	-	0.3	0.2	0.1	-

which is corroborated by other studies carried out in the country.<sup>18-19</sup> The fact that previous studies have not investigated the contribution of population groups and groups of causes responsible for this reduction is intriguing. In this present study this investigation allowed a more detailed analysis of this profile.

With regard to the differences between sexes, women represent, proportionally, higher costs with hospitalizations for ACSC, when comparing to the male population, and this difference was more evident in the age groups from 5-19 and from 20-59 years. These costs are related to the highest rates of hospitalizations for ACSC found in the Brazilian female population, given the fact that women have higher life expectancy,<sup>6</sup> followed by bigger mortality rates due to external causes in the male population, mostly the younger ones.<sup>20</sup> If in the evaluated period, these costs were smaller among men, the percentage reduction observed was also smaller among them, as observed in ACSC rates of the Brazilian population between 1999 and 2007,<sup>6</sup> which contributes to reinforce these differences in participation between the sexes, mostly in adults (from 20 to 59 years). This scenario reinforces the need of introducing men into primary health care and of making their access to these units easier,<sup>21</sup> which can favor not only costs reduction with ACSC, but also the reduction of male morbidity and mortality.

Concerning costs distribution per age group, children under five years old present the highest percentage reduction in the period (42.3%), a fact equally observed to the same age population resident in Pernambuco State, from 1999 to 2009, when FHS expansion in that state and the improvements in social conditions of its population were important factors to the reduction of hospitalizations for ACSC.<sup>14</sup> These factors can explain the significant reduction in the proportion of hospitalization costs for ACSC in this age group of the Brazilian population.

The groups of causes that had bigger participation in costs of hospitalizations for ACSC were similar for the two younger age groups, and they were consistent throughout the whole studied period (infectious gastroenteritis and its complications, pneumonia and asthma). These data corroborate other data found in studies conducted in Montes Claros-MG<sup>22</sup> and in the region of São José do Rio Preto-SP,<sup>8</sup> places where these causes were the main responsible to children's hospitalizations. Although they are causes in which

FHS has resources to perform accurate diagnosis and to initiate the adequate treatment, their prevention extrapolates primary health care, because they can be related to social and environmental problems – such as access to clean water and sewage treatment, in the case of infectious gastroenteritis. In Brazil, sewage treatment is still uneven, which contributes to this disease persistence,<sup>23</sup> highlighting the importance of health policies to cover not only direct care with individuals health, but also to improve social and environmental determinants.<sup>14,24-25</sup>

The costs with hospitalizations due to bacterial pneumonia also need to be highlighted, once they have presented increase in their proportion throughout time, especially among children under five years old. This increase was also demonstrated in Minas Gerais State, from 2008 to 2012, with a total of BRL1,075,568.317 paid for this type of hospitalization. In the municipality of Lages, Santa Catarina State, from 1998 to 2007, bacterial pneumonia appeared in the third position among the main causes of costs with hospitalization (10.4%).<sup>25</sup> Future studies must be conducted to understand the actual increase of these values, since FHS expansion and the available resources to primary health care are enough to treat this disease without the need of hospitalization.<sup>26</sup>

The age group of elderly individuals was responsible for the biggest proportion of hospitalization costs for ACSC, confirming other studies results that have evidenced higher rates and proportion of hospitalization for ACSC in this population group.<sup>9,24</sup> Although some studies reveal decrease in hospitalization for ACSC rates among elderly people throughout time,<sup>10,13</sup> the highest costs are still concentrated in this age group: from 2000 to 2006, the costs with hospitalization for ACSC among elderly Brazilians represented a third of the costs (BRL3.5billion) with general hospitalizations.<sup>24</sup>

With regard to the participation of the main groups of causes in the costs with hospitalization for ACSC among adults and elderly individuals, higher proportions were observed to cardiovascular diseases (heart failure, angina and cerebrovascular diseases), similar to the proportion found in studies that analyzed both rates and proportion of hospitalizations<sup>8,18,10,12</sup> and costs with hospitalizations.<sup>27</sup> Heart failure – although being the main hospitalization cause and implying in elevated costs<sup>25,27</sup> – presented reduction of costs proportion with hospitalization for

ACSC, according to this study, suggesting that, throughout time, primary health care has been acting to control this disease, adequately monitoring patients and, thus, helping in the reduction of hospitalizations.<sup>15</sup> In turn, the cost with hospitalizations due to pectoris angina has suffered the biggest increase in the analyzed period (237.5%), contributing to the highest costs proportion of hospitalizations for ACSC in the adult and elderly Brazilian population. These data can be confirmed by national<sup>25</sup> and international<sup>28</sup> studies, highlighting the great economic impact of this event when applying high cost procedures. However, it must be highlighted that the treatment and control of hypertension can significantly reduce these hospitalizations and, in the cases in which the disease already exists, an adequate monitoring can avoid complications that may lead to hospitalization.<sup>28</sup>

In general, in Brazil, there is a great offer of hospital beds, which leads to a bigger demand for their usage.<sup>6</sup> Because of this, it is important to strengthen Family Health Strategy and the health care networks, so the system can become less fragmented, enabling a more effective and efficient service to the population.<sup>3</sup>

This study presents some limitations to be discussed. First of all, we have to highlight the use of secondary data from SIH/SUS, an information system powered with IHA information and linked to administrative and finance matters, which may have diagnosis underestimation for lower refund.<sup>29</sup> Besides that, according to a study conducted in a general hospital in São Paulo, SIH/SUS presented bigger probability of correctly registering diagnosis not related to ACSC, which could lead to underestimation of hospitalizations and costs with these diseases from this information system.<sup>30</sup> Notwithstanding, SIH/SUS has been used in

many studies and its results appear to be consistent and coherent with reality.<sup>29</sup>

This study allowed us to understand the costs evolution with hospitalizations for ACSC in Brazil, considering, for the first time, differences among age group, sex and hospitalization diagnosis throughout the analyzed period, especially concerning the reduction in these costs in the total expenditures with hospitalizations by SUS. Moreover, we observed the prominent presence of elderly and women, responsible for elevated proportions of costs, and children under five years old, who presented the highest percentage reduction in costs with these hospitalizations. According to causes, the persistence of infectious gastroenteritis in children stands out, as well as the increase of expenditures with angina in the general population.

Finally, we must highlight the importance of subsidizing policies that can strengthen the primary health care in Brazil, which also cover programs designed to improve health social determinants, besides the constant monitoring of indicators related to hospitalizations for ACSC, including the costs involved in these procedures.

### Authors' contributions

Souza DK contributed to conception of the study, data collection, analysis and interpretation, and to drafting the article. Peixoto SV contributed to the conception of the study, data interpretation and critical revision of the article. Both authors have approved the final version and are responsible for all aspects of the study, ensuring its accuracy and integrity.

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