

## Risk of misinterpretation of trends in hospital admissions for primary care sensitive conditions in local contexts: Itaboraí, Rio de Janeiro State, Brazil, 2006-2011

Risco de interpretação falaciosa das internações por condições sensíveis à atenção primária em contextos locais, Itaboraí, Rio de Janeiro, Brasil, 2006-2011

Riesgo de interpretación falaz de los internamientos por condiciones sensibles a la atención primaria en contextos locales, Itaboraí, Río de Janeiro, Brasil, 2006-2011

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doi: 10.1590/0102-311X00050915

### Abstract

*The study's objectives were to describe hospital admissions for primary care sensitive conditions (PCSCs) among residents of Itaboraí, a municipality in Rio de Janeiro State, Brazil, with a high rate of such admissions, to identify associated factors, and to explore the impact from closing a hospital. The ultimate aim was to contribute to the debate on the indicator's indiscriminate use for inferences on the expansion and quality of primary care. The study was based on data from the Hospital Information System of the Brazilian Unified National Health System. Associations between admissions for PCSCs and demographic and hospital-related variables were analyzed with the  $\chi^2$  test. Logistic regression models verified the year-by-year behavior of admissions for PCSCs. The most frequent admissions were for heart failure, asthma, gastroenteritis, chronic obstructive pulmonary disease, and diabetes mellitus. The odds of hospital admissions were higher in males, brown individuals, at age extremes, and in private and charity hospitals. The trend in the admissions rates for PCSCs over the years was influenced by the closing of a hospital, suggesting caution in attributing changes in admissions rates to quality improvement in primary care.*

*Hospitalization; Primary Health Care; Quality of Health Care*

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## Introduction

Hospital admissions for primary care sensitive conditions (PCSCs) are admissions for diseases that are sensitive to control and reduction by means of accessible and effective primary care, involving prevention and continuity of care. They have been considered indirect indicators of quality of primary healthcare services, pointing to the possibility of barriers to accessing services (geographic, cultural, financial, or organizational) and amenable to monitoring the effectiveness and performance of the primary care system<sup>1,2</sup>. Following the initiative of many countries in the previous decade, Brazil published its first List of Primary Care Sensitive Conditions in 2008, after independent initiatives in the states of Ceará (2001), Minas Gerais (2007), and Paraná (2006), not mutually comparable or appropriate for national use due to their regional specificities<sup>2</sup>. The purpose of the Brazilian list was to create an instrument that could be used for evaluating primary care in the country, contributing to health services planning and management at the national, state, and municipal levels.

In order to better understand admissions for PCSCs, Brazilian and international studies have frequently focused on their characterization and the identification of associated socio-demographic and healthcare-related variables<sup>3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18</sup>. Brazil has also seen analytical ecological studies that have associated the decline in admissions for PCSCs with the expansion of primary care by the Family Health Strategy (FHS)<sup>19,20</sup>, as well as descriptive studies on the correlation between the decline in the rates or proportions of admissions for PCSCs and the strategy's expansion in more limited geographic areas<sup>21,22,23</sup>.

The current study originated from a broader project involving epidemiological monitoring in the area reserved for implementation of the Rio de Janeiro State Petrochemical Complex (COMPERJ)<sup>24</sup>, the largest single project in the history of Petrobrás, launched in 2006 and scheduled to begin operations in 2014. The study was motivated by the observation of high admissions rates for PCSCs in Itaboraí, the municipality (county) where COMPERJ is located in Greater Metropolitan Area II, Rio de Janeiro. Estimates for the municipality in the years 2008<sup>25</sup> and 2010 and 2011 (Índice de Desempenho do Sistema Único de Saúde. <http://idsus.saude.gov.br/mapas.html>, accessed on 23/Mar/2016) indicated admissions rates for PCSCs of 41.6%, 43.1%, and 48.2%, respectively, far higher than the overall rates in the region of Rio de Janeiro State where the municipality is located, i.e., slightly over 30%.

Itaboraí has a territory of 429km<sup>2</sup> and a population of 218,008 as of 2010 (Instituto Brasileiro de Geografia e Estatística. <http://www.sidra.ibge.gov.br/pnad/default.asp>, accessed on 23/Mar/2016). The population is almost entirely urban (98.8% in 2000), with a mean population density of just over 500 inhabitants/km<sup>2</sup>, while exceeding 1,000 inhabitants/km<sup>2</sup> in more central urban areas<sup>26</sup>. According to data from the *Brazilian National Household Sample Survey* (PNAD), in 2010 only 30% of households were connected to the public water supply system, 40.8% were connected to the public sewage system or to storm drains, and 95.9% received regular garbage collection (Instituto Brasileiro de Geografia e Estatística. <http://www.sidra.ibge.gov.br/pnad/default.asp>, accessed on 23/Mar/2016). The municipality has already experienced an epidemiological transition, and the four leading causes of death are diseases of the circulatory system (23%), external causes (13%), diseases of the respiratory system – especially influenza, pneumonia, and chronic obstructive pulmonary disease (COPD) – (11%), and endocrine diseases (11%)<sup>24</sup>.

Primary health care in the municipality was initially organized in the 1990 and was consolidated with the Family Health Program (FHP)/FHS in the 2000s, with some 45 teams – each consisting of one physician, nurse, and nurse technician and six community health workers – distributed across 34 units, with approximately 70% population coverage (Ministério da Saúde. [http://dab.saude.gov.br/portaldab/historico\\_cobertura\\_sf.php](http://dab.saude.gov.br/portaldab/historico_cobertura_sf.php), accessed on 23/Mar/2016). From 2009 to 2012 there were problems with administrative discontinuity, insufficient resources, and low capacity for coordination of the health teams' work<sup>27</sup>. In 2012, the performance of the Brazilian Unified National Health System (SUS) in the municipality was assessed as precarious (4.95, on a scale from 0 to 10), close to that of the Rio de Janeiro State as a whole (4.58) and below the national average (5.47) (Índice de Desempenho do Sistema Único de Saúde. <http://idsus.saude.gov.br/mapas.html>, accessed on 23/Mar/2016).

This article aims to analyze hospital admissions for PCSCs among residents of Itaboraí, identify factors associated with their occurrence among all admissions of residents in the municipality cov-

ered by the SUS, and explore the impact of closing a hospital on admissions rates for PCSCs, thereby contributing to an on-going debate on the indiscriminate use of this indicator for inferences on the expansion and quality of primary care<sup>28,29,30</sup>. The target period is 2006 to 2011, when coverage by the FHP/FHS in the municipality varied irregularly from approximately 65% to 71% (Índice de Desempenho do Sistema Único de Saúde. <http://idsus.saude.gov.br/mapas.html>, accessed on 23/Mar/2016).

## Methods

The study was based on secondary data from the Hospital Information System of the SUS (SIH/SUS), including all hospital admissions covered by the SUS for residents of the municipality of Itaboraí, Rio de Janeiro State, from 2006 to 2011, excluding cases involving long-term hospitalization or childbirth.

A databank was built by linkage of files from reduced Authorizations for Hospital Admissions (AIH), available on the DATASUS website (<http://www.datasus.gov.br>). The electronic files, obtained in zipped dbc format, were combined and unzipped in dbf format, using TabWin from DATASUS.

In building the databank, we selected variables on the hospitals (identification, type, and municipality), patients (date of birth, sex, and race/color), and admissions (admission date, discharge date, principal diagnosis, outcome, amount paid by the SUS, and amount paid for use of the intensive care unit – ICU). The analyses here refer to two three-year periods, 2006-2008 and 2009-2011.

For the overall characterization of admissions for PCSCs, the respective hospitalization rates were calculated as the number of patients admitted for diagnoses classified by the Brazilian Ministry of Health *Directive 221/MS/SAS* of April 17, 2008<sup>31</sup>, as PCSCs in the municipality divided by the municipality's total population, multiplied by 10,000; the municipality's population was obtained from the Brazilian Institute of Geography and Statistics (IBGE).

Bivariate analyses were performed to explore associations between admissions for PCSCs (versus other causes) and potential explanatory variables for the variation, available in the databank. Since the independent variables were categorized, we used the chi-square test ( $\chi^2$ ), verifying the null hypothesis of non-association. Logistic regression models were explored to identify the explanatory variables' independent effect on admissions for PCSCs, opting to consider possible differences in their odds year by year, with 2009 as the reference. All statistical analyses used SAS version 9.2 (SAS Inst., Cary, USA).

The research project was approved by the Institutional Review Board of National School of Public Health, Oswaldo Cruz Foundation (case review number 09410712.7.0000.5240).

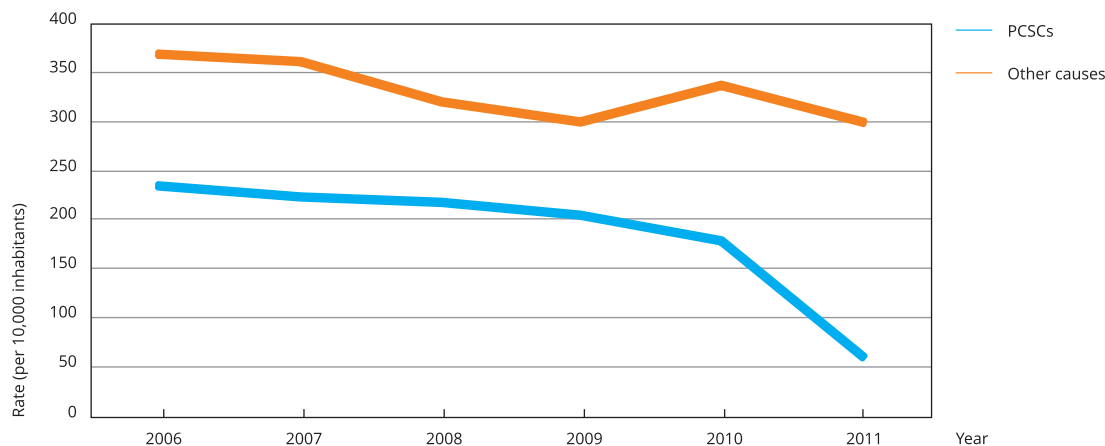
## Results

Excluding long-term hospitalizations and admissions for childbirth, there were 38,702 and 30,910 admissions covered by the SUS for residents of Itaboraí in 2006-2008 and 2009-2011, of which 39.2% and 32.4% were for PCSCs, respectively. In both three-year periods, patients admitted for PCSCs were significantly older on average (2006-2008,  $48.3 \pm 27$ , 3 years; 2009-2011,  $44.0 \pm 29$ , 1 year) than those admitted for other causes (2006-2008,  $34.5 \pm 22$ , 6 years; 2009-2011,  $35.0 \pm 22$ , 7 years). Admissions for PCSCs also showed lower mean cost and narrower range (2006-2008, BRL  $447.90 \pm 376.70$ ; 2009-2011, BRL  $546.60 \pm 525.10$ ) compared to admissions for other causes (2006-2008, BRL  $574.50 \pm 1,154.30$ ; 2009-2011, BRL  $742.50 \pm 1,902.80$ ).

Figure 1 shows the trend in rates per 10,000 inhabitants for admissions due to PCSCs, versus admissions for other causes, over the six years of study, indicating a downward trend in both from 2006 to 2009, with 2010 showing a peak increase in admissions for other causes and an abrupt drop in admissions for PCSCs. During the study period, the admissions rate for PCSCs dropped gradually from 234.7 to 179.8/10,000 inhabitants, from 2006 to 2010, while from 2010 to 2011 it showed a sharp drop, reaching 60 admissions per 10,000 inhabitants. The admissions rate for other causes showed a more gradual drop, ranging between approximately 360 and 300 admissions/10,000 inhabitants.

**Figure 1**

Trend in hospital admissions rates for primary care sensitive conditions (PCSCs) and for other causes per 10,000 inhabitants of Itaboraí, Rio de Janeiro State, Brazil, 2006-2011.



As shown in Table 1, Itaboraí showed a highly concentrated distribution pattern in admissions for PCSCs according to causes, with the first five accounting for 69.7 and 62.7% of the total in 2006-2008 and 2009-2011, respectively. Heart failure was the leading cause of admissions for PCSCs in both three-year periods, followed by asthma, gastroenteritis, other COPD, and diabetes mellitus. Despite the drop in the absolute number of admissions for the five causes, the fact stands out that they are the same ones, and in the same order, in the two three-year periods. From the first three-year period to the second, there was a drop in the relative frequency of heart failure and an increase in that of asthma. However, there was an absolute drop in both.

Among admissions for PCSCs in persons 60 years or older, there was a striking concentration of chronic diseases, especially heart failure, stroke, COPD, hypertension, and diabetes mellitus. Meanwhile, in children 1 to 4 years of age there was a concentration of admissions for gastroenteritis, bacterial pneumonia, and asthma.

Table 2 explores possible associations between admissions for PCSCs (versus admissions for other causes) and socio-demographic and hospital-related variables. Both periods showed more admissions for PCSCs in persons 1 to 4 years of age or 60 and older, as well as in males. The race variable was only included recently on SIH/SUS, and the data from the first three-year period are practically invalidated by the high proportion of cases missing this information. However, from 2009 to 2011 the admissions rates for PCSCs were higher in individuals classified as brown (mixed-race) (40.6%). Table 2 further shows the concentration of admissions for PCSCs in private hospitals outsourced by the SUS and in the municipality of Itaboraí itself. There was a clear drop in these admissions from the first period to the second in outsourced hospitals, but maintaining their proportion in total admissions at greater than 65%.

Table 3 shows two models that identify the independent effect of factors associated with admissions for PCSCs in Itaboraí from 2006 to 2011, considering inclusion versus non-inclusion of the independent variable "administrative classification" (i.e., of the hospital, whether outsourced, charitable, etc.). Both models excluded individuals classified as Asian-descendant or indigenous (due to their small numbers). The hospital's administrative classification had a major impact on the estimates, comparing outsourced, charitable, and other hospitals, particularly showing a change in the behavior of the indicators for year of hospitalization. Model 1, which did not adjust for the hospital's administrative classification, maintained a consistently downward gradient in the odds of admissions for PCSCs, while in model 2, which did not make this adjustment, the gradient was not maintained.

**Table 1**

Frequency, proportions, and rates of the five leading causes of hospital admissions for primary care-sensitive conditions (PCSCs) in residents of Itaboraí, Rio de Janeiro, Brazil, 2006 to 2011.

Group of causes (ICD-10)	2006-2008				2009-2011			
	n	% admissions for PCSC	% total admissions	Rate *	n	% admissions for PCSC	% total admissions	Rate *
1. Heart failure	4,184	27.6	10.8	186.70	2,085	20.8	6.8	93.73
2. Asthma	2,151	14.2	5.6	96.00	1,897	18.9	6.1	85.28
3. Gastroenteritis	1,638	10.8	4.2	73.10	1,125	11.2	3.6	50.57
4. Other COPD	1,399	9.2	3.6	62.40	611	6.1	2.0	27.47
5. Diabetes mellitus	1,196	7.9	3.1	53.40	574	5.7	1.9	25.80

COPD: chronic obstructive pulmonary disease; ICD-10: International Classification of Diseases, 10th revision.

\* Rate per 10,000 inhabitants.

**Table 2**

Distribution of categorical socio-demographic and hospital-related variables according to admissions for primary care-sensitive conditions (PCSCs) and for other causes covered by the Brazilian Unified National Health System (SUS) in residents of Itaboraí, Rio de Janeiro State, Brazil, 2006-2011.

Variable	2006-2008				p-value *	2009-2011				p-value *
	PCSCs		Others causes			PCSCs		Others causes		
	n	%	n	%		n	%	n	%	
Age (years)					< 0.0001					< 0.0001
< 1	525	31.0	1,171	69.0		424	32.0	901	68.0	
1-4	1,556	55.8	1,233	44.2		1,001	46.7	1,142	53.3	
5-17	1,275	29.1	3,108	70.9		1,577	37.0	2,680	63.0	
18-59	5,377	27.6	14,249	72.6		3,055	19.5	12,621	80.5	
60-69	2,723	62.1	1,661	37.9		1,629	49.5	1,659	50.5	
70-79	2,380	63.2	1,385	36.8		1,493	55.0	1,219	45.0	
≥ 80	1,322	64.2	737	35.8		830	55.0	679	45.0	
Sex					< 0.0001					< 0.0001
Male	7,599	45.8	8,991	54.2		4,776	37.7	7,893	62.3	
Female	7,559	34.2	14,553	65.8		5,233	28.7	13,008	71.3	
Race					< 0.0001					< 0.0001
White	741	48.7	782	51.3		1,862	26.6	5,134	73.4	
Black	118	37.5	197	62.5		518	17.5	2,449	82.5	
Brown	3,389	65.4	1,790	34.6		7,042	40.6	10,307	59.4	
Yellow	0	0.0	2	100.0		1	14.3	6	85.7	
Indigenous	-	-	-	-		1	12.5	7	87.5	
Not informed	10,910	34.4	20,773	65.6		585	16.3	2,998	83.7	
Hospital's administrative classification					< 0.0001					< 0.0001
Outsourced	12,830	65.1	6,894	34.9		7,047	69.3	3,119	30.7	
Federal	245	8.4	2,676	91.6		218	7.5	2,683	92.5	
State	48	5.7	788	94.3		277	29.0	678	71.0	
Municipal	1,979	13.4	12,782	86.6		2,371	14.5	13,942	85.5	
Charitable	56	12.2	404	87.8		96	16.7	479	83.3	
Municipality of hospitalization					< 0.0001					< 0.0001
Itaboraí	14,189	46.5	16,332	53.5		8,999	36.7	15,523	63.3	
Niterói	510	13.2	3,363	86.8		501	24.2	1,566	75.8	
Rio de Janeiro	97	4.8	1,901	95.2		145	6.1	2,230	93.9	
Other	362	15.7	1,948	84.3		364	18.7	1,582	81.3	
<b>Total</b>	<b>15,158</b>	<b>39.2</b>	<b>23,544</b>	<b>60.8</b>		<b>10,009</b>	<b>32.4</b>	<b>20,901</b>	<b>67.6</b>	<b>&lt; 0.0001</b>

\* Chi-square test.

**Table 3**

Logistic regression – factors associated with admissions for primary care sensitive conditions (PCSCs) covered by the Brazilian Unified National Health System (SUS) in residents of Itaboraí, Rio de Janeiro State, Brazil, 2006-2011.

Variable	Model 1		Model 2	
	OR	95%CI	OR	95%CI
Age (years)				
< 1	1.479	1.355-1.615	1.493	1.350-1.650
1-4	2.916	2.728-3.117	1.727	1.602-1.861
5-7	1.419	1.343-1.498	1.122	1.054-1.195
18-59 (reference)	1.000		1.000	
60-69	4.109	3.883-4.348	3.336	3.129-3.557
70-79	4.370	4.115-4.641	3.570	3.334-3.823
≥ 80	4.418	4.091-4.771	3.819	3.499-4.168
Sex				
Female	0.685	0.661-0.710	0.881	0.846-0.918
Male (reference)	1.000		1.000	
Race				
Black	0.596	0.536-0.663	0.932	0.830-1.047
Brown	1.693	1.594-1.797	1.087	1.016-1.164
White (reference)	1.000			
Not informed	0.274	0.251-0.300	1.065	0.971-1.167
Municipality of hospitalization				
Itaboraí (reference)	1.000		1.000	
Niterói	0.298	0.277-0.321	0.655	0.604-0.710
Rio de Janeiro	0.080	0.070-0.092	0.226	0.196-0.262
Other	0.262	0.240-0.285	0.099	0.091-0.109
Year				
2006	4.290	3.911-4.707	0.654	0.591-0.723
2007	4.288	3.908-4.705	0.720	0.651-0.796
2008	1.671	1.566-1.783	0.800	0.745-0.859
2009 (reference)	1.000		1.000	
2010	0.762	0.717-0.808	0.813	0.759-0.872
2011	0.384	0.356-0.414	0.954	0.880-1.035
Hospital's administrative classification				
Outsourced			13.831	13.161-14.534
Public (reference)			1.000	
Charitable			5.860	4.812-7.137
	Agreement = 77.4%; c = 0.782		Agreement = 84.9%; c = 0.851	

95%CI: 95% confidence interval; OR: odds ratio.

Note: the models excluded observations on admissions of individuals classified as yellow (Asian-descendant) and indigenous.

The results in model 2 show that considering the age variable and taking 18 to 59 years as the reference age bracket, the odds of occurrence of admissions for PCSCs (versus non-occurrence) were higher among younger individuals (< 1 year, OR = 1.493; 1-4 years, OR = 1.727; 5-17 years, OR = 1.122) and especially among the elderly (60-69 years, OR = 3.336; 70-79 years, OR = 3.570; ≥ 80 years, OR = 3.819). Maintaining the other variables constant, the odds of admissions for PCSCs were 11.9% lower in females and 8.7% higher in those classified as brown, when compared, respectively, to males and whites. Considering the hospital's administrative classification, admissions for PCSCs were higher in private outsourced and charitable hospitals. Finally, the multivariate analysis showed admissions rates for PCSCs among Itaboraí residents hospitalized in the municipality itself, and

higher odds of admissions for PCSCs in 2009, taken as the reference year, and in which the admissions rate for PCSCs only failed to differ statistically from the rate for 2011.

## Discussion

An important contribution by this study and that corroborates other recent studies is the need for caution when interpreting results and making inferences associating a reduction in admissions for PCSCs with success in primary care interventions such as the FHS, although more robust ecological studies may be relevant and efficient in more global evaluations<sup>19,20</sup>. In more localized studies, it is essential to grasp contextual issues, sometimes highly specific, that can help explain the event. A superficial observation of the results obtained here could easily suggest an association between the drop in admissions for PCSCs and expansion of the FHP/FHS in Itaboraí, starting in the 1990s and covering 71.2% of the population in 2011 according to data from the Ministry of Health's Department of Primary Care ([http://dab.saude.gov.br/portaldab/historico\\_cobertura\\_sf.php](http://dab.saude.gov.br/portaldab/historico_cobertura_sf.php), accessed on 23/Mar/2016). Other factors clearly intervened, although it was not possible to analyze socioeconomic conditions or distribution and access to services by the population, also potentially relevant. Although the paradigm shift in the organization of the healthcare model through the implementation and expansion of the FHP/FHS since the 1990s reorganized and upgraded health services in Itaboraí, it would not be possible to correlate the drop in admissions for PCSCs with the improvement in healthcare.

Various authors have identified limitations in the use of admissions for PCSCs as an indicator of quality of primary care, depending on the culture of use of health services by the study population, hospital admissions policy, morbidity and disease prevalence, individual factors related to hospitalization, and the very definition of "primary care sensitive" diseases<sup>1,32</sup>. The indicator's use for inferences on the expansion and quality of care does not eliminate the need to consider factors related to health services organization and practice. Rodrigues-Bastos et al.<sup>28</sup>, in an ecological study, found no correlation between areas with expansion of coverage by the FHP/FHS and a decrease in admissions for PCSCs in municipalities in Minas Gerais State, Brazil, from 2000 to 2010. A study in Mexico<sup>29</sup> concluded that admissions for PCSCs were not a valid measure of the effectiveness of primary care in the country from 2001 to 2011, given the expansion of health insurance coverage. However, the authors confirmed the indicator's applicability for comparing different regions or to make regional comparisons, as long as health insurance coverage was considered and allowed the identification of possible differences in provision of primary health care services. Gonçalves et al.<sup>30</sup>, using a validated instrument for evaluation of primary health care – *PCATool Brazil* – in a cohort study in Porto Alegre, Rio Grande do Sul State, found that improvement in the supply of public healthcare services did not influence the admissions rate for PCSCs in a context of previously limited services supply. Finally, a study in Espírito Santo State, Brazil, using bivariate analysis, found a positive association between coverage of the FHP/FHS and admissions for PCSCs. According to the authors, this result could be explained by the prior scarcity of access to (and availability of) healthcare services; to the extent that services began to be supplied, a brief increase in hospitalizations would result from serving a repressed demand<sup>33</sup>.

In light of all the above, this study's results indicated a downward trend in hospital admissions in Itaboraí, as well as a decline in admissions for PCSCs, which accounted for 39.2% of all admissions in 2006-2008 and 32.4% in 2009-2011.

When transformed into rates, both admissions for PCSCs and admissions for other causes in Itaboraí declined over the course of the six years. However, admissions rates for PCSCs experienced a sharp drop in 2010-2011, which appears to be explained largely by the closing of a hospital outsourced by the SUS and which had received a large share of these admissions in the municipality<sup>34</sup>.

The downward trend in total hospital admissions and in admissions rates for PCSCs has been shown in many studies published in Brazil.

Another study also based on data from SIH/SUS, from 1998 to 2009, found a 3.7% annual reduction in the admissions rates for PCSCs in Brazil<sup>15</sup>. Other studies in Brazil found a 15.8% drop in hospitalizations for PCSCs and 10.1% for other causes, respectively, from 2000 to 2006, and a 5% decline in admissions rates for PCSCs from 1999 to 2007<sup>2,35</sup>.



The more abrupt drop in admissions for PCSCs observed in this study, largely related to the closing of a hospital, raises doubts concerning both the real need for a large share of the previous admissions (which appears not to have been redistributed) and the data's trustworthiness. The multivariate analysis, by considering the effect of private hospitals outsourced by the SUS, suggests an increase in the odds of admissions for PCSCs as part of overall admissions from 2006 to 2009, a drop in 2010, and an admissions rate for PCSCs for 2011 that was not statistically different from the rate in 2009.

The three leading groups according to the International Classification of Diseases, 10th revision (ICD-10), observed in Itaboraí in the two three-year periods were heart failure, asthma, and gastroenteritis, with a reduction over time in the first and third groups and an increase in the relative frequency of asthma from 2006 to 2011. Importantly, there was a pattern of high rates in certain diagnostic groups that were well-established in the municipality over the course of both study periods.

Other studies have addressed the importance of heart failure among overall admissions for PCSCs in Brazil, although the rates observed here were far higher. Heart failure was identified as the second leading cause of admissions for PCSCs in the country, with 16.8 per 10,000 inhabitants in 2006<sup>2</sup>. Heart failure was also identified as the second cause of admissions for PCSCs in a study in the Federal District (Brasília), with 14.4 admissions per 10,000 inhabitants in 2008, mainly in males and in the 60 and older age bracket<sup>10</sup>. A study from 1995 to 2004 in Pelotas, Rio Grande do Sul State, found that heart failure was the leading cause of admissions for PCSCs in males during eight of the ten years studied<sup>17</sup>.

Asthma appeared as the second leading group of admissions for PCSCs in Itaboraí. Importantly, the disease has become a major public health problem, with increasing incidence in the last three decades and 15-20% prevalence rates in Australia, England, New Zealand, Ireland, Brazil, and Costa Rica<sup>36</sup>. Many factors associated with asthma prevalence have been described in the literature: environmental allergens, increasing air pollution, climate variations, and smoking<sup>12</sup>. Admissions for asthma have been associated with female gender, age 60-69 years, low schooling, low family income, family history of asthma, personal atopy, smoking, and minor psychiatric disorders<sup>37</sup>. Focusing on the pediatric population, factors associated with the development of this disease and described in the literature are genetic load, diet, stress, antibiotics, cesarean delivery, breastfeeding, exposure to animals, and family size and structure<sup>38</sup>. An important risk factor for the high asthma rate in Itaboraí is pollution, since the municipality is historically famous for its brick and tile factories, and the new petrochemical complex tends to further increase such pollution.

Gastroenteritis was the third leading cause of admissions for PCSCs in Itaboraí during both periods. Studies in Espírito Santo (2005-2009) and Minas Gerais (1998-2004) that included gastroenteritis among the leading causes of admissions for PCSCs found that the disease was highly prevalent in areas with heavily concentrated poverty and precarious sanitation<sup>16,39</sup>. Precarious sanitation conditions are typical in Itaboraí, where an association has been reported between admissions for diarrhea in children and factors like disordered urban growth and increasing population density in peripheral urban and rural areas<sup>40</sup>.

Chronic non-communicable diseases weighed heavily as causes of admissions for PCSCs, showing the consistency between the current study's results and another study on these admissions in elderly residents of Rio de Janeiro State from 2000 to 2010, which particularly evidenced the relevance of chronic obstructive pulmonary disease and heart failure<sup>41</sup>. Chronic diseases are now high on the list of challenges for the organization and coordination of health services, assuming the essential role of effective primary care and including the detection of exposed populations, adequate treatment, and continuity of care in reducing hospitalizations.

According to the results, increased likelihood of admission for a PCSC in Itaboraí in the SUS was associated with: male gender, age extremes (especially 1-4 years and 60 years or older), self-reported brown skin color, hospitalization in outsourced or charitable hospitals in the SUS, and hospitalization in Itaboraí itself. The study did not prioritize the application of the theoretical model proposed by Nedel et al.<sup>42</sup> to analyze the impact of primary care on admissions for PCSCs, which would have placed greater emphasis on the inclusion of health system performance indicators (proximal factors related to organization, structure, governability, and model of care). However, the results are relevant to the model, identifying the strong weight of the "administrative classification" variable, which certainly reflects relevant organizational differences. Among the socio-demographic variables, age was



found to be extremely important, but gender and race appeared less so. The identification of more admissions due to PCSCs in males has been widely reported in the literature. A study in 2002 concluded that women use preventive health services more, while men are more like to use emergency services<sup>43</sup>. Higher alcohol and drug use and smoking are other factors that expose men to greater lifetime health risk when compared to women<sup>44</sup>. Marques<sup>41</sup> found that the elderly male population in Rio de Janeiro State had a higher risk of hospitalization for PCSCs, especially due to COPD.

Generally speaking, the positive association between admissions for PCSCs and age extremes in this study has also been identified in other studies<sup>9,10</sup>. Among younger individuals, this highlights the higher admissions rates for PCSCs in the 1 to 4 year age bracket, compared to infants (< 1 year). In the Federal District of Brazil, high admissions rates for PCSCs were found in infants (< 1 year), an important reduction in the subsequent age brackets (1 to 29 years), and then a gradual increase with age<sup>35</sup>. A study in Bagé, Rio Grande do Sul State, also found higher admissions rates for PCSCs in age extremes, in both males and females<sup>44</sup>. More specifically, another study found a statistically significant association between admissions for PCSCs and age 60 years or older<sup>18</sup>.

Interpretations of the results pertaining to the “race” variable are somewhat complicated by the high rate of missing data in the first three-year period. However, the decision not to ignore the high rate of admissions for PCSCs among individuals with brown skin color is justified by the results’ consistency, despite the limitations. Brown race is by far the most common, and together with blacks, brown are associated with less favorable socioeconomic conditions. The higher admissions rates for PCSCs among brown individuals, observed consistently here, can be explained by less favorable socioeconomic conditions and the resulting difficulties in access to health services. However, from this perspective the lower admissions rate for PCSCs among blacks when compared to whites is surprising, but did not reach statistical significance. This difference should be better explored and explained in future studies.

Finally, this study indicates that when other variables are maintained constant, admissions for PCSCs are concentrated in the age extremes (children and elderly), with a pattern featuring mostly chronic diseases in the elderly, but also gastroenteritis and bacterial pneumonias in children.

The study confirms the importance of exercising caution in inferences on the meaning of decreasing admissions rates for primary care-sensitive conditions in local situations, more limited and heavily context-dependent. The capacity for trustworthy inferences in ecological studies can be favored by a robust data set, dealing with a diversity of contexts and allowing compensations between realities and appreciation of average behavior. Meanwhile, at a more specific level, the study confirms the high rate of PCSCs in Itaboraí, with a pattern featuring chronic diseases in the elderly but also with a strong presence of gastroenteritis and bacterial pneumonias in children. Such results appear not only to reveal persistent problems in the health system, and more specifically in access to primary care services, consistent with precarious performance by the SUS in the municipality, but also reflect inadequate sanitation conditions, as described previously. The results highlight the need for monitoring these conditions and an on-going analysis of the issue of health services organization in a municipality that is expected to experience the impact of a petrochemical complex.

## Contributors

J. F. Botelho contributed to the data compilation and interpretation and writing of the scientific study. M. C. Portela contributed to the research project design, data supply, revision, and formatting.

## Acknowledgments

The authors wish to thank the National School of Public Health, Oswaldo Cruz Foundation and the entire team of the Executive Master's Program in Health Surveillance of the Eastern Region of Rio de Janeiro State for contributing to the exchange of ideas.

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## Resumo

*Este artigo objetiva caracterizar as internações por condições sensíveis à atenção primária (ICSAP), identificar fatores associados e explorar o impacto sobre elas do fechamento de um hospital, entre residentes de Itaboraí, um município com elevadas taxas de ICSAP no Estado do Rio de Janeiro, Brasil, alimentando o debate sobre o uso indiscriminado do indicador para inferências acerca da expansão e qualidade da atenção primária. O estudo foi baseado em dados do Sistema de Informações Hospitalares do Sistema Único de Saúde. Associações entre a ocorrência de ICSAP com variáveis demográficas e inerentes aos hospitais foram analisadas com o teste  $\chi^2$ . Modelos de regressão logística averiguaram o comportamento das ICSAP ano a ano. As internações mais frequentes foram por insuficiência cardíaca, asma, gastroenterites, doença pulmonar obstrutiva crônica e diabetes mellitus. Suas chances de ocorrência foram maiores para o sexo masculino, pardos, nos extremos de idade e em hospitais privados e filantrópicos. A evolução das taxas de ICSAP no decorrer dos anos foi influenciada pelo fechamento de um hospital, sugerindo cautela na sua atribuição à melhoria da qualidade da atenção primária.*

*Hospitalização; Atenção Primária à Saúde; Qualidade da Assistência à Saúde*

## Resumen

*El Este artículo tiene por objetivo caracterizar los internamientos por condiciones sensibles a la atención primaria (ICSAP) entre residentes de Itaboraí, un municipio con elevadas tasas de estos internamientos en el Estado de Río de Janeiro, Brasil, identificando factores asociados y explorar el impacto sobre ellas del cierre de un hospital, alimentando el debate sobre el uso indiscriminado del indicador para inferencias acerca de la expansión y calidad de la atención primaria. El estudio se basó en datos del Sistema de Información Hospitalaria del Sistema Único de Salud. Asociación entre la ocurrencia de ICSAP con variables demográficas e inherentes a los hospitales fueron analizadas con el test  $\chi^2$ . Modelos de regresión logística averiguaron el comportamiento de los ICSAP año a año. Los internamientos más frecuentes fueron por insuficiencia cardíaca, asma, gastroenteritis, enfermedad pulmonar obstructiva crónica y diabetes mellitus. Sus oportunidades de ocurrencia fueron mayores en el sexo masculino, mestizos, en los extremos de edad y en hospitales privados y filantrópicos. La evolución de las tasas de ICSAP en el transcurso de los años fue influenciada por el cierre de un hospital, sugiriendo cautela en su atribución a la mejora de la calidad de la atención primaria.*

*Hospitalización; Atención Primaria de Salud; Calidad de la Atención de Salud*

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Submitted on 28/May/2015

Final version resubmitted on 28/Oct/2015

Approved on 06/Apr/2016