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Hospitalization for primary care susceptible conditions, health spending and Family Health Strategy: an analysis of trends

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Abstract *The goal of this study was to analyze the trend over time of hospitalizations due to conditions susceptible to primary healthcare (HCSPC), and how it relates to healthcare spending and Family Health Strategy (FHS) coverage in the city of São Leopoldo, Rio Grande do Sul State, Brazil, between 2003 and 2012. This is an ecological, time-trend study. We used secondary data available in the Unified Healthcare System Hospital Data System, the Primary Care Department and Public Health Budget Data System. The analysis compared HCSPC using three-year moving averages and Poisson regressions or negative binomials. We found no statistical significance in decreasing HCSPC indicators and primary care spending in the period analyzed. Healthcare spending, per-capita spending and FHS coverage increased significantly, but we found no correlation with HCSPC. The results show that, despite increases in the funds invested and population covered by FHS, they are still insufficient to deliver the level of care the population requires.*

Key words *Quality of healthcare, Primary care, Family health, Healthcare funding*

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Introduction

Primary Healthcare (PHC) was designed to meet the population's need for healthcare, as per the guidelines of the Brazilian Unified Healthcare System (SUS)[1,2]. Fernandes et al.[3] believe that strengthening and structuring PHC is essential for organizing healthcare systems, and that primary care is the main gateway into the system; 80.0% of the population's health issues are resolved at this level.

The Family Health Strategy (FHS) was created to strengthen PHC in Brazil and achieve the SUS objectives. The FHS was designed to be a model for primary care and facilitate access to healthcare services. FHS was conceived to be the first point of contact with healthcare services, provide comprehensive care, and coordinate with other services, providing care that is focused on family and community, overcoming inequalities and seeking system equality[4,5].

Already there is evidence of the positive impact of FHS, such as better primary care, expanded universal access to healthcare, extended coverage, better intake and a stronger bond, coordinated services and family focus[5,6]. However, FHS implementation is an ongoing process[5]. To become the core element of healthcare transformation in the country it must expand in major cities, covering a significant share of the population[7,8].

Together with FHS expansion, there is also a need to continuously assess healthcare programs and policies as the best way to check effectiveness. This assessment enables avoiding wasting resources in ineffective programs, and helps make decisions regarding the population's healthcare needs and demands, thus improving the solutions offered by the system[3,9].

To assess the effectiveness of PHC, a number of indicators of access to quality care have been proposed. One of these is known as hospitalization for conditions susceptible to primary healthcare (HCSPC), which is a list of health problems that, if treated in a timely and suitable way, reduce the risk of hospitalization, either keeping them from arising in the first place, or as a result to proper handling in the case of chronic diseases[10,11].

To make it possible to assess the quality of PHC in Brazil, the Ministry of Health prepared its own list of conditions susceptible to primary healthcare. This list has enabled studies to analyze the level of primary healthcare in Brazil, starting from the principle that high levels of HCSPC can suggest problems of access to, or effectiveness of care[11]. Thus, HCSPC is an important indicator for monitoring and assessment[11]. Looking at how HCSPC have evolved over time can help assess the quality of the healthcare system, in particular primary care, and may show the impact of measures introduced in the healthcare system, such as changes in the care model from implementing the FHS, and those arising from expanded funding.

While analyzing the healthcare system is required, it is also possible to discuss another problem that impacts SUS development – under-funding of healthcare in this country. Funding for healthcare in Brazil is below what is required to ensure universal, comprehensive, quality public healthcare[12]. Insufficient federal funds affect the three levels of care differently. The most affected is the PHC, responsible for 20.0% of the total invested in health[13,14].

Thus, this study focuses on analyzing the evolution in time of hospitalizations for conditions susceptible to primary healthcare, relating these to spending in healthcare and FHS coverage in the city of São Leopoldo, in the Brazilian state of Rio Grande do Sul, between 2003 and 2012.

Methods

This is an ecological time series trend study conducted in the city of São Leopoldo, in metropolitan Porto Alegre, Rio Grande do Sul between 2003 and 2012.

According to the 2010 census, the population of São Leopoldo is 214,087. It belongs to the 1st Regional Health Coordination headquartered in Porto Alegre. Services provided by the City Health Department are made up of a health vigilance center, two specialized care services, three psychosocial care centers, six healthcare centers, nine Primary Healthcare Units, and nine FHS. The city also has a budget pharmacy and a 219-bed hospital for SUS patients.

This study used secondary data provided by DATASUS, the Unified Healthcare System IT Department, which in turn is based on SIH/SUS - the Unified Healthcare System Hospital Data System. These sources provided the number of HCSPC and all-cause hospitalizations (excluding obstetrics) in the resident population. We used the national list of hospitalizations for conditions susceptible to primary healthcare, as per Ministry of Health Directive 221 of 17 April 2008[11].

Demographic data was provided by the IBGE, the Brazilian Institute for Geography and

Statistics. Annual population covered by the FHS was taken from data provided by the Ministry of Health Basic Healthcare Department (BHD).

Financial data was taken from the Summary Budget Reports issued by the city and available on SIPS, the Public Health Budget Data System. We used total healthcare and total primary healthcare spending data. Per-capita healthcare spending and primary care as a percent of the total were calculated. A deflator was used to eliminate or minimize the influence of inflation on prices[15,16]. Values were adjusted using the IPCA (Ample Consumer Price Index) published by the IBGE. This is the official indicator used by the Federal Government to measure inflation.

HCSPC and all-cause hospitalization data was generated and tabulated using DATASUS' *TabWin*® program. We later exported this data to *Microsoft Excel*® spreadsheets to calculate indicators, along with data on total healthcare and primary care spending, the number of FHS and their percent coverage.

The gross HCSPC per 1,000 inhabitants in the city of São Leopoldo was calculated, along with gross all-cause (excluding obstetrics) hospitalization indicators per 1,000 inhabitants. Later, to eliminate the influence of differences due to age, the indicators were standardized[17] using the population of the State of Rio Grande do Sul in 2010 as a reference. To eliminate fluctuations in annual trends, we used a three-year moving average to smooth out the series and minimize random variations[18].

The data was then transferred to Stata® 11.2 for statistical analysis. Initially a trend analysis was performed using a Poisson regression, where HCSPC, all-cause hospitalizations, total healthcare spending, FHS spending, per-capita spending and FHS coverage were the dependent variables, and the year the independent variable. We tested for over-dispersion using the poisgof command. If the result of this command was significant we proceeded with a negative binomial regression. The results were expressed as the mean ratios and 95% confidence intervals, and the results of the Wald test[19].

We ran a Spearman correlation to test the association between HCSPC and total healthcare spending, primary healthcare spending, per-capita healthcare spending and FHS coverage, with values over 0.50 and < 0.05 being considered significant[20].

The research project was approved by the Vale do Rio dos Sinos University (UNISINOS) Research Ethics Committee.

Results

Looking at the number of all-cause hospitalizations in São Leopoldo, we find a 13.6% reduction in the period, going from 10,272 hospitalizations in 2003 to 8,878 in 2012. The HCSPC indicator dropped 7.8%, from 2,503 in 2003 to 2,309 in 2012 (Table 1).

Regarding standardized indicators of all-cause hospitalizations, the largest was in 2006, with 67.4 hospitalizations per 1,000 inhabitants, and the smallest in 2012, with 44.5/1,000, a 34.0% drop. The highest incidence of HCSPC was also in 2006, or 15.5/1,000, and the smallest (11.5/1,000) in 2008, a 25.9% drop. HCSPC as a percent of all-cause hospitalization increased 6.7% in the period. In other words, in 2003 conditions susceptible to primary healthcare accounted for 24.4% of all-cause hospitalizations, and in 2012 for 26.0% (Table 1).

The three-year moving averages also show a trend in all-cause hospitalizations and enables comparing hospitalization behavior. The only decrease was in all-cause hospitalization (Graphic 1).

Total healthcare spending increased gradually, from R$ 72,596,849.01 in 2003 to R$ 124,073,298.63 in 2012, a 70.9% variation. Per-capita healthcare spending also increased, from R$ 260.38 in 2003 to R$ 571.27 in 2012, a 58.5% difference (Table 2).

Data on FHS spending varied significantly and no clear trend was found. The lowest amount was spent in 2006 (R$ 7,600,363.65) and the largest 2005 (R$ 28,058,033.18). Comparing 2003 (R$ 8,463,079.10) and 2012 (10,303,620.23), we find a 21.8% increase. FHS as a percent total healthcare spending also shows no trend over this period, ranging from a high of 35.4% in 2005 to a low of 7.7% in 2011. This percentage dropped to 11.7% in 2003 and 8.3% in 2012 (Table 2).

Regarding percent FHS coverage, in 2005 1.7% of the population was covered, increasing to 14.5% in 2012 (Table 2).

Results of the regression analysis shows no statistically significant change in the HCSPC indicator or FHS spending over the period analyzed. On the other hand, all-cause hospitalizations dropped, while total healthcare and per-capita spending increased significantly, as did FHS coverage (Table 3).

Using Spearman's correlation, we found that the variables had a very weak to moderate negative correlation. In other words, increasing total healthcare, FHS and per-capital spending, and

FHS coverage decreased HCSPC indicators. No statistically significant association was found (Table 4).

Discussion

This study found no trend towards decreasing HCSPC in the city of São Leopoldo between 2003 and 2012.

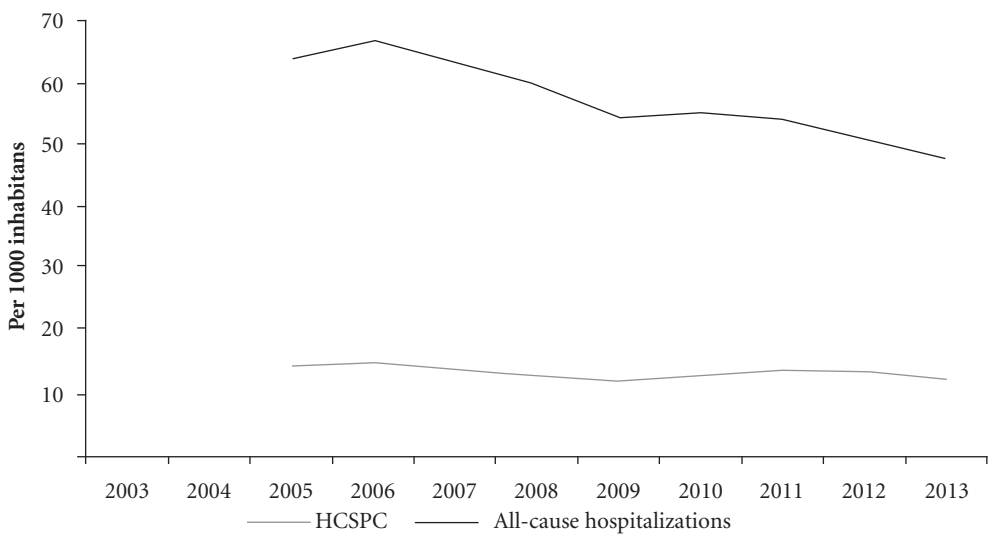
The strategy used to analyze the trends in indicator behaviors was based on comparing HCSPC and all-cause hospitalizations when creating three-year moving averages and in the Poisson or negative binomial regression. Results show no decrease in HCSPC, which was confirmed by the behavior of the moving averages and the absence of any statistical significance in the Poisson regression.

Numerous studies have signaled a decrease in HCSPC in different parts of Brazil[21-23], often related to expanding FHS[3,4,24-27]. The goal of this study was to bring these results to light. In the period analyzed, HCSPC as a percent all-cause hospitalizations increased 3.7%, showing that HCSPC dropped less than all-cause hospitaliza-

Table 1. All-cause hospitalizations (ACH) and Hospitalizations for Conditions Susceptible to Primary Healthcare (HCSPC). São Leopoldo, 2003-2012.

Ano	Total ACH	Total HCSPC	% HCSPC/ACH	Coeficiente padronizado ITC*	Standardized HCSPC hospitalization*
2003	10.272	2.503	24,4	61,0	15,3
2004	11.052	2.431	22,0	66,4	15,1
2005	11.093	2.184	19,7	65,8	14,5
2006	11.510	2.329	20,2	67,4	15,5
2007	10.572	2.235	21,1	56,3	13,2
2008	10.294	2.041	19,8	55,4	11,5
2009	10.010	2.475	24,7	53,1	13,5
2010	11.415	3.017	26,4	57,7	15,5
2011	10.303	2.626	25,5	52,0	13,6
2012	8.878	2.309	26,0	44,5	11,6

*per 1,000 inhabitants.



Graph 1. Moving three-year averages for all-cause hospitalization and hospitalizations due to conditions susceptible to primary care (HCSPC). São Leopoldo, 2003-2012.

tions. Furthermore, the Poisson regression shows that the decrease in all-cause hospitalization was statistically significant while the decrease in HCSPC in the city was not.

Alfradique et al.[11] found similar results, with HCSPC accounting for 28.3% of all SUS hospitalizations in 2006. However, between 2000 and 2006 HCSPC dropped 15.8% across the country, a larger decrease than in hospitalizations not susceptible to primary healthcare. An ecological study in Belo Horizonte conducted by Mendonça et al.[22] found 26.4% HCSPC. Over the four-year period analyzed, HCSPC dropped 17.9%, compared to 8.3% for non-susceptible hospitalizations. Following standardization, we found that HCSPC indicators dropped 15.6% in the period.

Junqueira and Duarte[28] found an HCSPC indicator of 121.0 per 10 thousand inhabitants, accounting for 19.5% of all hospitalizations in the Federal District in 2008. Numbers close to this were found in a study by Campos and Theme-Filha[25] in Campo Grande, Mato Grosso do Sul, between 2000 and 2009. Those authors found an indicator of 132.1 per 10 thousand inhabitants (19.0%) in 2000, dropping to 55.1 per 10 thousand inhabitants (10.2%) in 2009.

While studies in other Brazilian locations also show a decline in HCSPC, São Leopoldo went against this trend. Thus, a further analysis of the factors associated with these unfavorable results is required.

FHS coverage of the population has expanded across the country, but unevenly when we compare regions, major urban centers and small and mid-sized cities and towns. We found limited FHS coverage in state capitals and cities with more than 100 thousand inhabitants[7,8,29]. 2012 data available on BHD show 54.8% coverage in

Table 2. Total annual healthcare spending, per capita spending on healthcare, spending on primary healthcare (PHC), healthcare spending as a percent of total, and population covered by Family Health Strategy (FHS). São Leopoldo, 2003-2012.

Year	Total healthcare spending (HS)*	Per-capital healthcare spending	PHC spending (PHCS)*	% PHCS/HS	% FHS coverage
2003	R$ 72.596.849,01	R$ 360,38	R$ 8.463.079,10	11,7	0,0
2004	R$ 77.592.018,43	R$ 380,46	R$ 25.946.174,96	33,4	0,0
2005	R$ 79.271.149,14	R$ 378,18	R$ 28.058.033,18	35,4	1,7
2006	R$ 82.785.992,08	R$ 389,58	R$ 7.600.363,65	9,2	4,9
2007	R$ 84.238.861,25	R$ 391,16	R$ 8.372.976,83	10,0	4,9
2008	R$ 97.459.660,45	R$ 463,77	R$ 10.160.565,22	10,4	8,1
2009	R$ 102.143.895,33	R$ 482,58	R$ 13.373.378,56	13,1	11,5
2010	R$ 106.561.747,09	R$ 497,75	R$ 14.314.783,74	13,4	11,4
2011	R$ 118.891.667,59	R$ 551,28	R$ 9.176.700,18	7,7	11,3
2012	R$ 124.073.298,63	R$ 571,27	R$ 10.303.620,23	8,3	14,4

*Adjusted using the ample Consumer Price Index (IPCA) through 2012.

Table 3. Ratio of the mean coefficients for hospitalization for conditions susceptible to primary care (HCSPC), all-cause hospitalizations, total healthcare spending, primary healthcare (PHC) spending, per capita spending and FHS coverage by year. São Leopoldo, 2003-2012.

Variables	Mean ratio	95% CI	p
HCSPC	0,98	0,92 a 1,04	0,4858*
All-cause hospitalization	0,97	0,94 a 0,99	0,0157*
Total healthcare spending	1,06	1,06 a 1,07	<0,001#
PHC spending	0,93	0,85 a 1,02	0,1600#
Per capita spending	1,06	1,05 a 1,07	<0,001*
FHS coverage	1,32	1,20 a 1,46	<0,001*

*Poisson Regression; #Negative binomial regression.

Table 4. Spearman's rank correlation coefficient for hospitalizations for conditions susceptible to primary care (HCSPC), in relation to total expenditure on health, expenditure on primary healthcare (PHC), per capita expenditure on health and family health strategy (FHS) coverage. Sao Leopoldo, 2003-2012.

Variables	r	r²	p
Total expenditure on health	-0,4424	19,6%	0,2004
Expenditure on primary healthcare (PHC)	-0,0303	0,1%	0,9338
Per capita expenditure on health	-0,4303	18,5%	0,2145
FHS coverage	-0,3769	14,2%	0,2830

Brazil. A region by region analysis shows that FHS coverage is greatest in the northeast (72.6%), and lowest in the southeast (44.2%).

Differences in coverage are also found between municipalities in the same region. Looking at 2012 BHD data for the southern region, we find 40.3% coverage in Rio Grande do Sul, 57.6% in Paraná and 70.0% in Santa Catarina. Rio Grande do Sul had the third lowest coverage in the country, behind São Paulo (30.7%) and the Federal District (17.6%).

Studies show that HCSPC goes down with expanding FHS coverage, in areas with coverage larger than São Leopoldo. In a study conducted in Campo Grande, Campos and Theme-Filha[25] found an inverse relationship between FHS coverage and HCSPC indicators, with 26.6% population coverage. In a study in Belo Horizonte, Mendonça et al.[22] found 74.5% FHS coverage and a significant drop in HCSPC.

Although FHS coverage in São Leopoldo increased quite a bit over the period analyzed, reaching 14.4% of the population, this is still well below the numbers recommended by the Ministry of Health. The target coverage for cities with 100 to 500 thousand inhabitants is 60.0% for consolidation of PROESF, the Program to Expand and Consolidate Family Health[30]. Using the same criterion of population covered by FHS, locations with less than 30.0% coverage can be classified as incipient[31,32].

The negative results found in this study may indicate problems of access or effectiveness of the local healthcare system[11]. It is known that healthcare service structure and performance are closely linked[33]. As seen before, São Leopoldo has only nine FHS for an estimated 226,988 inhabitants. Clearly a service structure such as this is unable to meet the PHC demand of the population, placing a greater burden on tertiary care, which may be a reason for high HCSPC.

Another important point to consider is how healthcare is funded. Ensured access to healthcare services assumes that not only the physical hurdles will be removed, enabling the required services on time and in suitable locations, but also sufficient funds to ensure the supply of services[33].

We found a significant increase in total healthcare spending in São Leopoldo, however this was not related to any decrease in HCSPC. Using the Brazilian Central Bank US Dollar exchange rate for each year, per-capita spending went from US$ 124.77 in 2003 to US$ 279.64 in 2012. This is still far below the nation's per-capita spending, which in 2013 was US$ 474.00. Compared to other countries in Latin America, the gap is even larger. For example, per-capital healthcare spending is US$ 562.00 in Chile, US$ 851.00 in Argentina and US$ 740.00 in Uruguay[34]. This clearly underscores that there is insufficient funding for healthcare in Brazil, and especially in the city of São Leopoldo.

In terms of FHS spending in São Leopoldo, values fluctuate significantly, especially in 2004 and 2005, immediately following PROESF, when 33.4% and 35.4% of healthcare funds were invested in FHS. In 2013 Federal funds accounted for 21.0% of the total spent. Spending in São Leopoldo was below the country average across the entire period, except for 2004 and 2005. If we compare the start and end of the period analyzed, we found a decrease in FHS as a percent total healthcare spending.

Historically not enough is spent on healthcare, however the differences in level of care are felt much more in primary healthcare. Data for 1995 shows that the Ministry of Health spent 5.4

times as much on secondary and tertiary care than it did on primary care. Despite the increase in FHS funding in recent years, it is still not enough to properly develop the system, given the characteristics of different regions with different types of care[13,14].

According to Mendes[34], FHS centered healthcare systems perform better, for example by lowering costs, improving equality, increased access to preventive services and a reduction in urgent care. In Brazil 21.0% of the funds are spent on FHS, which handles 80.0% of the demand for healthcare[14].

This study found no trend to decreasing HCSPC, nor any association between lower HCSPC and total healthcare and FHS spending, per-capita spending or FHS population coverage.

Hospitalization depends on a number of factors, such as morbidity, socioeconomics, individual factors and external, structural determinants. Among these we point out to the availability of beds and user link to healthcare services. While in theory the number of beds available is part of the data published by the National Record of Healthcare Establishments, the numbers are unreliable and often vary according to individual hospital needs and arrangements. Furthermore, São Leopoldo, like the majority of cities in Brazil, has no formal regionalization mechanism to clearly link inhabitants and a given system gateway. Thus, individual information on preferred use of the healthcare system could improve the set of analysis and pinpoint exactly where the user entered the system. For this reason, we recommend further studies to deepen the discussion and analyze the impact of this indicator on improving the healthcare system, bearing in mind individual factors.

Ecological studies that analyze historical trends have limitations, such as the fact that aggregate analyses do not control confusion factors, and problems resulting from the quality of the data sources, along with under-notifying and classification errors. The analysis in this study used a number of measures to attempt to minimize these limitations, such as smoothing and standardizing indicators.

Finally, we point out that creating the Brazilian HCSPC list enabled developing national studies and comparing results. Studies using this list help improve and consolidate this indicator in the Brazilian context. Studies that analyze HCSPC indicators, their trends and relationship with FHS and healthcare spending are important to enable planning and formulating policies and strategies to reduce these indicators. As unnecessary hospitalizations drop, this makes room for possibilities to optimize the system, releasing beds for unavoidable hospitalizations, and reducing the spending on healthcare to enable reinvesting in the system.

Collaborations

TM helped design the project, gather, interpret and analyze the data, discuss the results and draft and review the article. JSDC helped design the project, interpret and analyze the data, discuss the results and draft and

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