

Hospitalizations owing to ambulatory care sensitive conditions in Florianópolis, Santa Catarina – an ecological study, 2001-2011*

doi: 10.5123/S1679-49742016000100008

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Abstract

Objective: to evaluate trends in rates of hospitalizations owing to ambulatory care sensitive conditions in the municipality of Florianópolis, Santa Catarina, Brazil, from 2001 to 2011, and to assess correlation with the public health expenditures Family Health Strategy (FHS) population coverage. **Methods:** this was an ecological study using Ministry of Health secondary data; data were analyzed using Poisson Regression. **Results:** the regression coefficient was 0.97, showing a decrease of 3% per year in hospitalizations owing to ambulatory care sensitive conditions, a three-fold increase in FHS coverage and seven times more financial investment per capita in health services, from R\$67.65 in 2001 to R\$471.03 in 2011; FHS investments per capita in health and population coverage were negatively correlated to the rate of hospitalizations owing to ambulatory care sensitive conditions. **Conclusion:** financial investment and FHS expansion had led to major reductions in the rate of hospitalizations owing to ambulatory care sensitive conditions.

Key words: Health Services Evaluation; Primary Health Care; Family Health; Hospitalization; Ecological Studies.

*Article elaborated from the Thesis of the Professional Master's in Public Health Based on Evidences, entitled 'Hospitalizations for ambulatory care sensitive conditions in the municipality of Florianópolis-SC, from 2001 to 2011', presented by Vinicius Paim Brasil in the Program of Post-Graduation in Epidemiology of the Federal University of Pelotas (UFPEl), in 2014.

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Introduction

Hospitalizations for ambulatory care sensitive conditions (ACSC) may be considered a health assistance quality indicator.¹ This group of diseases and conditions is characterized by health situations that, when the right and timely care is given, may reduce or fade the hospitalization occurrence, prevent diseases to emerge and allow the correct control.^{2,3}

The monitoring of ACSC-related hospitalizations has been proved to be an important tool to assess Family Health Strategy (FHS), when compared to traditional health care.^{4,5} Some studies have assessed the FHS as an equitable model on attending the population needs, for showing an inverse relation between the ACSC-related hospitalizations and structured ambulatory care,^{4,5} and pointed to the primary care as an essential strategy for reducing costs⁵ and for improving health systems.⁶

In Brazil, the consolidation of the primary health care has been encouraged by the FHS strengthening as a public health policy, with the government responsibilities in each level well defined.⁷ In turn, Florianópolis prioritizes the primary health care since 2006, when the city took over the full management of the National Health System (SUS), promoting FHS to the condition of manager of the whole municipal system, a government choice that has spread and consolidated over the past years.⁸

Primary health care plays an important role because it is the health system entry way, and, among its principles and guidelines, we can emphasize the integration, effectiveness and care coordination.⁹ In this sense, monitoring ACSC-related hospitalizations is important for improving primary health care and SUS.^{10,11}

Health financing in Brazil is essential for SUS full development.¹² Many authors have pointed out that the lack of resources may restrain or hamper the access equity and the integrality of actions, restricting the system's effectiveness.¹³⁻¹⁵ Moreover, the raising costs – many times unguided, which partly come from the introduction and indiscriminate use of medical-hospital technology – may contribute to the shortage of inputs, demanding more efficiency on managing and adequate allocation of the available funds.¹⁶

The main objective of this study is to evaluate trends in rates of hospitalizations for ambulatory care sensitive conditions in the municipality of Florianópolis, Santa Catarina, Brazil, from 2001 to 2011, and to assess correlation with the impact of Family Health Strategy

(FHS) financial investment and population coverage. Another objective was to identify the most prevalent diseases and conditions.

Methods

This is an ecological study, based on (i) secondary data of the National Hospital Information System (SIH/SUS) (available at *Datasus* website: www.datasus.gov.br), and on (ii) balances of financial transfers to the municipality (available at the Information System on Public Health Budgets (SIOPS): www.saude.gov.br/siops). The information used concerns the 2001-2011 period. The number of FHS teams and the population coverage were taken from information of the Primary Health Department of the Secretariat of Health Care/Ministry of Health (dab.saude.gov.br).

Primary health care plays an important role because it is the health system entry way, and, among its principles and guidelines, we can emphasize the integration, effectiveness and care coordination.

The hospitalization rates were calculated by the ratio between the number of ACSC-related hospitalizations (according to SIH/SUS) among Florianópolis residents and the total population of the municipality, in each assessed year, multiplied by 100 thousand inhabitants. The population base for rates formulation was provided by the Brazilian Institute of Geography and Statistics (IBGE), with data available at *Datasus* website. The ambulatory care sensitive conditions are those listed by the Ministry of Health.^{17,18}

For collecting the financial data on SIOPS, we used the municipal indicators of paid expenses for each year, in the field 'direct administration in health'. The total resources applied and the local values invested by the municipality in the period studied were determined. Considering the numerator to be the total resources and the denominator, the population data, the per capita investment in health per year was identified.

The trends of the rates of ACSC-related hospitalization and of hospitalizations for all causes during the period were identified. We performed the 'exponential smoothing'

of both rates through moving average for every two years and the comparisons were repeated. The trend rates of the most common causes were also described.

The total financial investments in the public health sector of Florianópolis, the local resources, the per capita investments in health, and the percentage of application of local resources in relation to the totals, for the same period, were investigated.

The number of Family Health teams and the FHS population coverage percentage between 2001 and 2011 were described.

The trend analysis of ACSC-related hospitalizations rates, of the per capita financial investments in health and of FHS population coverage was performed using the Poisson Regression. The Poisson Coefficient points to the increase or decrease of the variable in the studied period. The results description was based on the coefficients of each of the evaluated factors, with their respective 95% confidence intervals, and in the results of Wald test, which were considered significant when $p < 0,05$.¹⁹

Through the Spearman Correlation, we verified the correlation among the ACSC-related hospitalization, the FHS population coverage and the per capita financial investments in health. The correlation that presented value coefficient higher than 0.50 and $p < 0,05$ was considered significant.²⁰

For data acquisition and analysis, the following computer programs were used: Tabwin 32 and TabNet (version 3.0); Microsoft Excel 2010®; IBM SPSS Statistics (version 22), license No. 10.194.05; and Stata (version 11), license No. 50120523700.

This study was approved by the Ethics in Research Committee of the Medicine College of the Federal University of Pelotas – Decree No. 3,970, dated 5 September 2013 –, according to the National Health Council (CNS) Resolution No. 466, dated 12 December 2012.

Results

29,761 ACSC-related hospitalizations were identified between 2001 and 2011. ACSC-related hospitalization rates varied from 830.2 in 2005 to 513.7 per 100 thousand inhabitants in 2011, corresponding to a reduction of 38.1% (Figure 1).

There was a raise of 20.0% on ACSC-related hospitalization rates between 2001 and 2005, and a total reduction of 35.0% from 2006 on. We can notice

a 27.0% decrease between the first and the last moving average (Figure 1).

With regard to hospitalizations for all causes, the same trend was observed: between 2001 and 2005, there was a 10.0% raise; and from 2006 to 2011, a 14.0% decrease. The 'exponential smoothing' technique allowed a 10.0% reduction of hospitalizations for all causes, between the first and the last moving average (Figure 2).

The five groups of diseases and conditions with high ACSC-related hospitalization rates were: pneumonias, cerebrovascular diseases, heart failure, chronic respiratory diseases (CRDs) and diabetes Mellitus (DM) (Figure 3).

Pneumonias were the main hospitalization cause in the studied period, presenting rates that ranged from 132.2 to 133.2 per 100 thousand inhabitants, between 2001 and 2011. For the group of pneumonias, there was a raise of around 40.0% between 2001 and 2005, and, from that year on, a reduction in this percentage. The same pattern was observed in the group of cerebrovascular diseases that presented a raise and subsequent decrease of hospitalization rates: from 89.7/100 thousand inhabitants (2001), to 113.7/100 thousand inhabitants (2005), and from this, to a substantial decrease until it reached 49.6 per 100 thousand inhabitants (2011) (Figure 3).

The other causes presented a reduction behavior between 2001 and 2011: heart failure from 77.7 to 39.6 per 100 thousand inhabitants, a reduction of approximately 50.0%; and CRDs, from 110.9 to 66.7 per 100 thousand inhabitants, a reduction of almost 40.0%. Among the main ACSC-related hospitalizations, diabetes Mellitus presented the greater reduction, when comparing the trends presented for the five groups of selected diseases: decrease of 55.7% in the 11-year period, varying from 58.5 (2001) to 26.4 per 100 thousand inhabitants (2011) (Figure 3).

In 2001, Florianópolis invested around R\$67.65 per capita/year in health, being 68.1% of this value from local resources. Whist the total investment per capita has increased in almost 8 times during 11 years, reaching R\$471.32 per inhabitant/year in 2011, the municipal values invested presented a raise proportionally lower – although equally significant – of around seven times in the studied period. When the percentage of local investments was analyzed, comparing to the total of resources, we found values higher than 60.0% during the whole historic series, and the years of 2003 and 2007 presented the highest percentages: 73.7% and 76.2%, respectively (Table 1).

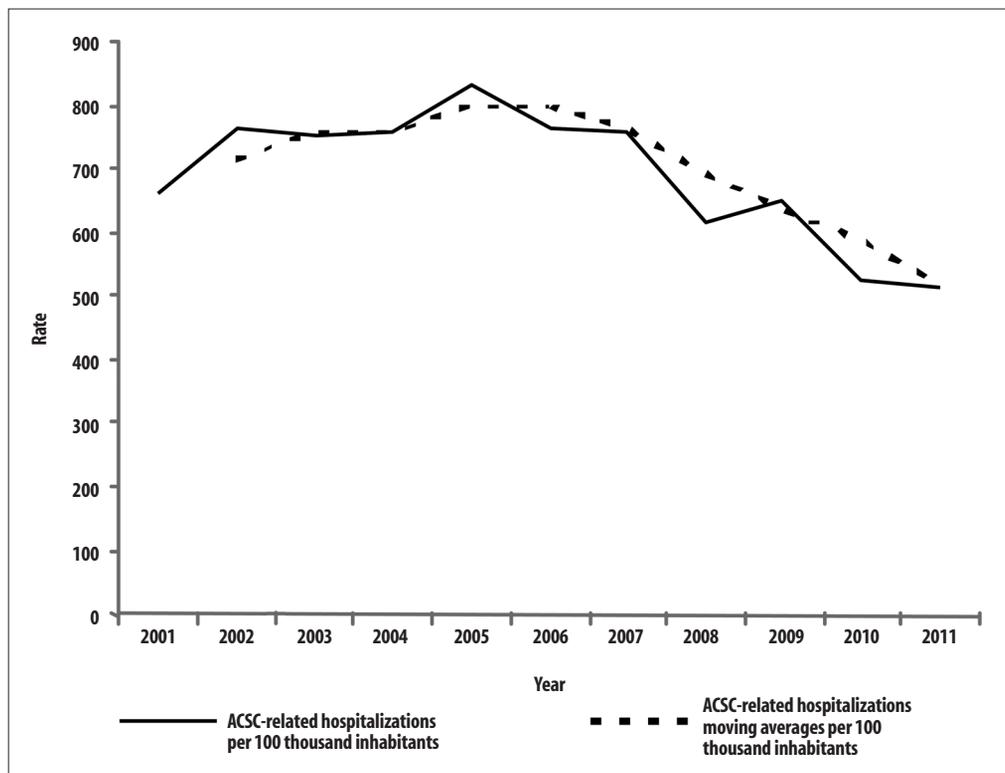


Figure 1 – Hospitalization rates for ambulatory care sensitive conditions (ACSC) (per 100 thousand inhabitants) and moving averages of the rates for every two years in the municipality of Florianópolis, Santa Catarina State, Brazil, 2001 to 2011

The financial investments presented inverse relation to the hospitalization rates: the higher the resources, the lower the hospitalizations. The increase in the investments during the 11 years studied coincided with the expansion and consolidation of FHS in Florianópolis, from a 33.3% coverage in 2001 to 89.3% in the end of 2011; i.e., around three-fold increase in the period (Table 1).

The use of Poisson Regression proved the decrease on ACSC-related hospitalizations of around 3.0% per year (regression coefficient=0.97), followed by a growth in population coverage by FHS of 10.0% and a per capita investment increase of 22.0%, which was confirmed by the coefficients 1.10 and 1.22 per year for these variables, respectively (Table 2).

The variables 'per capita investments in health' and 'population coverage of FHS' were negatively correlated to the rate of hospitalizations for ambulatory care sensitive conditions, with a coefficient of -0.59 and $p < 0.05$ through Spearman correlation, for both variables.

Discussion

In the municipality of Florianópolis, the ACSC-related hospitalizations decreased between 2001 and 2011. Despite the fact that there was a clear growth on hospitalization rates until the first half of the 2000's, the reduction was greater in the following years.

We compared the rates of ACSC-related hospitalizations with the hospitalizations for all causes, in order to exclude the possibility of the observed decrease being consequence of the hospitalizations' reduction as a whole. The reduction of ACSC-related hospitalizations was higher than the decrease observed among hospitalizations for all causes. This finding was even more evident with the 'exponential smoothing' of the rates through the moving averages, and was confirmed with the reduction observed after applying the Poisson Regression. This behavior may be partly explained by the fact that the municipal government has prioritized the Family Health Strategy (FHS) as the guide of health assistance in Florianópolis.⁸ It is important to highlight that the

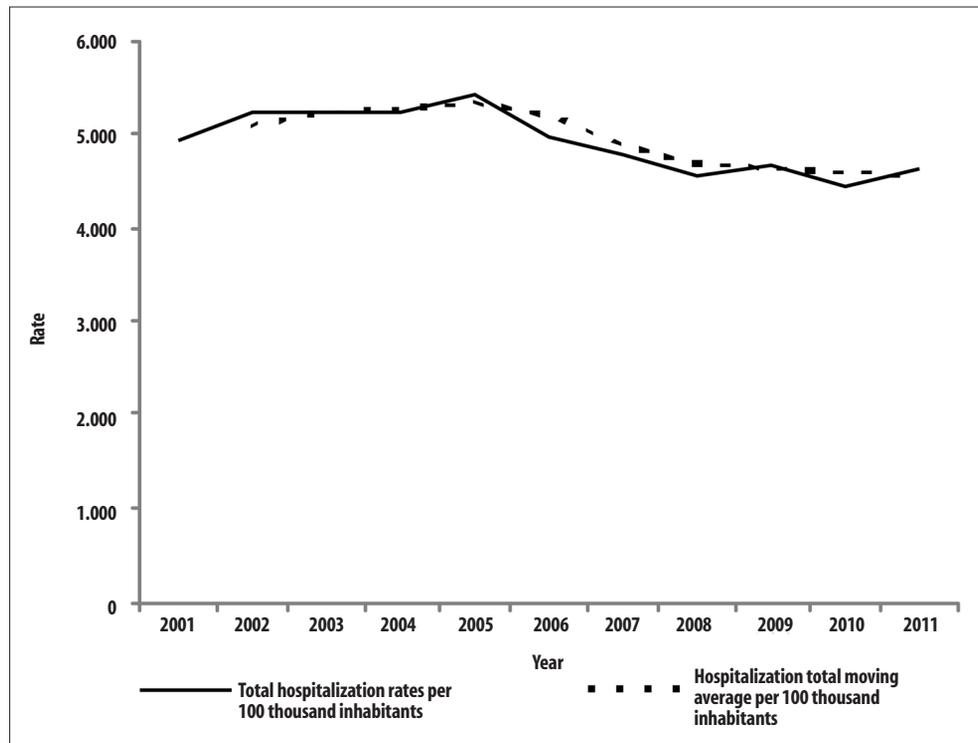
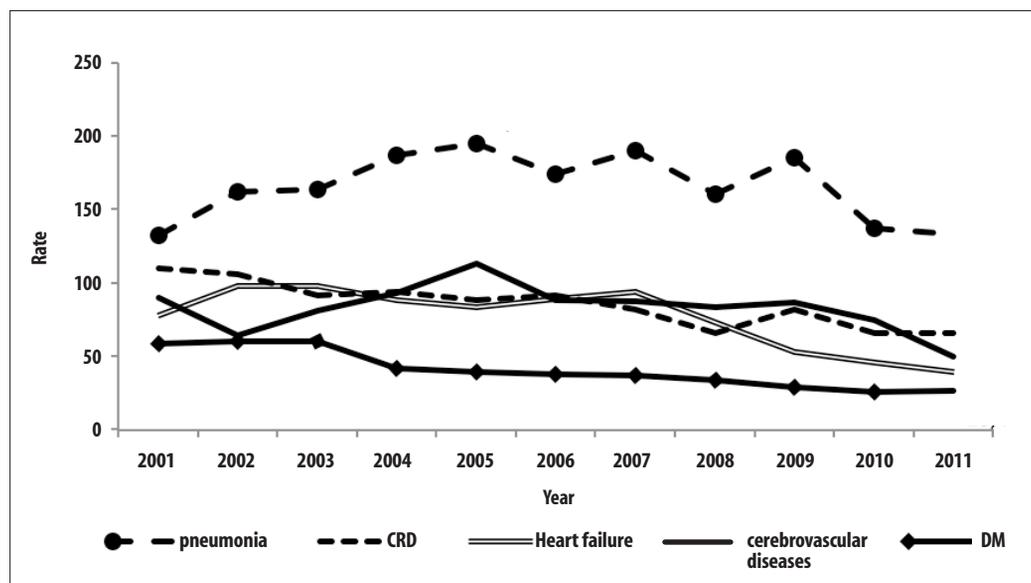


Figure 2 – Hospitalization rates for all causes (per 100 thousand inhabitants) and moving averages of the rates for every two years in the municipality of Florianópolis, Santa Catarina State, Brazil, 2001 to 2011



CRD – chronic respiratory diseases
DM – diabetes Mellitus

Figure 3 – Hospitalization rates (per 100 thousand inhabitants) of most frequent causes for ambulatory care sensitive conditions (ACSC) to primary health care in the municipality of Florianópolis, Santa Catarina State, Brazil, 2001 to 2011

Table 1 – Total financial investments, with municipality and per capita resources in health (in BRL), number of teams and population coverage of the Family Health Strategy (FHS) in the municipality of Florianópolis, Santa Catarina State, Brazil, 2001 to 2011

Year	Total investments (BRL)	Local investments (BRL)	Per capita in health (BRL)	Investments Local/total (%)	Family Health Strategy teams (N)	Family Health Strategy coverage (%)
2001	23,839,405.80	16,236,510.71	67.65	68.1	34	33.3
2002	31,018,898.27	21,926,632.28	86.02	70.7	42	41.1
2003	38,134,227.13	28,096,243.82	103.32	73.7	43	41.1
2004	50,618,784.02	34,606,245.33	134.07	68.4	48	44.9
2005	61,542,538.87	43,838,972.85	155.11	71.2	66	61.7
2006	73,934,334.41	52,244,369.38	181.85	70.7	78	67.9
2007	85,803,777.82	65,341,555.77	206.13	76.2	84	71.3
2008	120,287,420.56	82,182,110.87	298.97	68.3	91	75.1
2009	148,998,776.76	94,588,623.97	365.05	63.5	94	80.6
2010	176,801,334.31	112,607,248.10	419.72	63.7	100	84.5
2011	201,268,818.17	125,083,143.40	471.03	62.1	109	89.3

Table 2 – Trends of Poisson Regression Coefficient according to hospitalizations for ambulatory care sensitive conditions (ACSC), population coverage of Family Health Strategy (FHS) and per capita investments in health in the municipality of Florianópolis, Santa Catarina State, Brazil, 2001 to 2011

Variables	Regression Coefficient	95% Confidence Interval	p-value ^a
Hospitalizations for ambulatory care sensitive conditions	0.97	0.96-0.98	<0.001
Family Health Strategy population coverage	1.10	1.07-1.12	<0.001
Per capita investments in health	1.22	1.20-1.23	<0.001

a) Wald test

percentage of FHS population coverage was always above 50.0% from 2005 on.

The reduction of ACSC-related hospitalizations may be related to the expansion and consolidation of the FHS in the studied period. The priority received by

the Family Health Strategy has already been proved in other studies as an important factor in the reduction of ACSC-related hospitalizations.^{4,5} It is noteworthy that other important variables, such as socioeconomic, demographic and services access characteristics, also

deserve to be mentioned as factors that contribute to diminishing these hospitalizations, although they were not evaluated in this study.¹⁰

This research showed an important financial funding to local Public Health, mainly from local resources – participating with more than 60.0% of the invested resources –, during the evaluated period. This local participation was higher than other capital cities of the Brazilian South region, which invested 48.0% (Curitiba) and 49.7% (Porto Alegre) of local resources. At the same time we can observe Florianópolis efforts to be the main investor in its own health system, this increase in financial responsibilities²¹ must come with continuous improvement of government management, and health services offered to the population.

FHS population coverage and the per capita financial investments in health rose in the studied period and presented direct relation with the reduction of the ACSC-related hospitalizations, which may lead to the conclusion that the investments on FHS were translated into important reduction of these hospitalization rates. This study showed that the percentage coverage of FHS higher than 60.0% and per capita investments in health of around R\$170.00 favored the reduction on ACSC-related hospitalization rates.

Other studies have also found a reduction on ACSC-related hospitalization rates linked to the raise of FHS coverage. An ecological study conducted in Belo Horizonte, where the FHS coverage reached 75.5%, showed a reduction of ACSC-related hospitalizations in a four-year period;²² also in Minas Gerais State, a cross-sectional study conducted in Montes Claros, with FHS coverage of around 50.0% pointed that, among other associated factors, that health check-ups conducted outside FHS increased in more than twice the prevalence of ACSC-related hospitalizations.⁴ Another ecological study, when estimating ACSC-related hospitalization trends, between 1999 and 2007, taking all the Brazilian regions into consideration, pointed that the higher the FHS coverage, the lower the hospitalization rates.⁵

There was moderate correlation among the ACSC-related hospitalization rates, per capita investments in health, and FHS coverage expansion, with negative – and meaningful – coefficients between hospitalizations and variables of interest.

With regard to the most prevalent ACSC-related hospitalization causes, five of them stood out and confirmed the weight of epidemiological transition and

disease burden on the current national health system, showing the simultaneous control of infectious diseases and conditions and non-communicable chronic diseases by *SUS*.²³ The pneumonias were the main groups of infectious diseases in the period, presenting a raise behavior in the first half of the evaluated period, followed by a reduction in the following years. This finding proved the importance of the FHS and its expansion contributed to the reduction of hospitalization rates due to pneumonias, corroborating with the result of a study conducted in 2004, in the south of Santa Catarina state, in which the researchers showed a strong relation between the higher FHS coverage and a reduction of hospitalizations due to pneumonia, a typical condition of primary health care.²⁴

In the group of the five chronic and degenerative diseases and conditions, four of them presented continuous reduction in hospitalizations during the studied years: cerebrovascular diseases presented growth and then reduction, thus they are exception in this continuous drop. Given the importance of these diseases to the general health conditions of the Brazilian population,^{11,23,25} these results will be able to direct the planning actions and financial resources allocation destined to improve these sensitive conditions to hospitalizations, their prevention, promotion and health recovery.

Nevertheless, an issue concerning the limitation of ecological studies must be remembered: the aspects verified in the group of ACSC-related hospitalizations may not reflect the real condition of Florianópolis population (ecological fallacy)²⁶, given the fact that the rates found for this type of hospitalization were related to the total population of Florianópolis and not to specific population groups. The analysis unit is composed of the ACSC-related hospitalizations, in a way that it is impossible to infer, among the hospitalized individuals, which ones were benefitted by the investments in health and which ones used the services of Family Health Strategy. Other limitations of this study are related to *SUS* hospital information system – *SIH/SUS* –, which only provides information of public health hospitalizations, and is not able to identify the double and triple entrances of a user in the system (re-admissions).² Besides, factors such as wrong reporting and underreporting of hospitalizations, inclusion of new procedures over the years, classification errors – many times related to

the lack of training by the health professionals or the non-comprehension of the importance of information in health – may all determine the evaluation of the impact of ACSC-related hospitalizations in the health situation of the municipality.²⁷⁻²⁹ However, a recent study showed the validity and usefulness of *SIH/SUS* and *Datasus* data, ensuring the consistency of the presented data.³⁰

In Florianópolis, in the first half of the 2000s, the expansion and consolidation of the FHS came with a reduction of the hospitalizations for ambulatory care sensitive conditions and a substantial increase of the per capita investments in health, showing that this is an important political strategy to structure the whole municipal health system. The most recent

confirmation of the promising results showed here was recently announced: according to data from the Primary Health care Department of the Primary Health care Secretariat/Ministry of Health, in 2015, the Family Health Strategy achieved 100% of coverage for the population of Florianópolis.

Authors' contributions

Brasil VP and Dias da Costa JS contributed to the study conception and design, to the analysis and interpretation of data, drafting and critical review of the intellectual content and final approval of the manuscript.

Both authors declared to be responsible for all aspects of the work, ensuring its accuracy and integrity.

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Received on 15/12/2014
Approved on 04/12/2015