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Analysis of conditions sensitive to primary care in a successful experience of primary healthcare expansion in Brazil, 1998–2015

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ABSTRACT

Objective: To analyze trends in expansion of coverage of the family health strategy and hospitalization for conditions sensitive to primary care (CSPC) in a successful experience of primary healthcare expansion in Brazil.

Study design: Ecological study with data from the Brazilian National Health Information System.

Methods: CSPC were analyzed between 1998 and 2015 in Rio de Janeiro, Brazil, by cause groups. Trends, variation, and correlation between indicators in the period were evaluated.

Results: Most of the cause groups showed a reduction in hospitalization rate, particularly cardiovascular diseases and asthma, but an increase was seen for obstetric causes. The main causes of hospitalization were heart failure, cerebrovascular diseases, and bacterial pneumonia. The contribution of vaccine-preventable diseases, cardiovascular diseases, diabetes, nutritional deficiencies, and chronic lung diseases to the total number of hospitalizations was seen to decrease.

Conclusions: Analysis demonstrates that the family health strategy, as access to the healthcare system, decreases the majority of CSPC hospitalization rates.

Introduction

Primary health care (PHC), known as the family health strategy in Brazil, is a healthcare model with the following attributes representing the main form of organization of healthcare networks: accessibility, lifelong care, care coordination, family orientation and community orientation.[1–3] Healthcare reform in PHC in Rio de Janeiro was driven by results showing improved quality of life of populations of several cities in Brazil that had already used this healthcare model.[2,4] Since 2010, emphasis has been placed on expansion of this proposal; this demonstrated a significant

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change in public health management, reaching 45% coverage among the general population in 2014 according to official data.

During the 1990s, the municipality of Rio de Janeiro had a limited supply of basic, public, and universal care services. In 2008, the coverage of family health teams corresponded to 3.5% of the population, the lowest among Brazilian capitals. After a reform of primary health care was implemented in 2009, coverage reached more than 40% of the population of Rio de Janeiro, with teams consisting of doctors, nurses, community health agents, health surveillance agents, and oral health professionals.[4] By the end of 2015, almost 50% of the population was registered.[4,5] The experience of Rio de Janeiro has demonstrated the feasibility of a reform in primary care, with the expansion of access, human resources training and health communication, and a change to a model of management based on results.[5]

In this sense, evaluation of the accessibility and effectiveness of health services can inform health management and improve health care of the population.[6,7] It is possible to improve the quality of care provided by health teams by identifying user satisfaction, studying successful experiences and incorporating actions.[8]

Conditions sensitive to primary care (CSPC) represent a set of health problems for which the effective action of primary care can reduce the risk of hospitalization.[9] In Brazil, a CSPC list was published in Ordinance No. 221 in 2008.[10] This was based on similar lists from other countries and also includes some injuries that reflect the diversity of health and disease conditions in Brazil. The list contains 19 cause groups with 74 disease diagnoses, according to the 10th revision of the International Classification of Diseases. Studies have been undertaken in the states and municipalities of Brazil to show that most of the diseases on the list are, in fact, sensitive to PHC.[11–14]

According to Deininger et al.,[7] high hospitalization rates due to CSPC may be directly related to problems with access and coverage or low efficiency at this level of care. As such, this study aimed to evaluate the trend of hospitalizations for CSPC according to groups from the Brazilian list[10] in the city of Rio de Janeiro from 1998 to 2015.

Methods

This ecological study analyzed data from hospitalizations due to CSPC. The hospitalizations, which occurred between 1998 and 2015 in the city of Rio de Janeiro, were divided into groups of causes (Supplementary file). Non-identifiable data were obtained from the Brazilian Health System database, which is in the public domain.[15] Hospitalization records from public institutions were included. Between 1998 and 2015, the population of Rio de Janeiro increased by 16%, from 5,590,000 to 6,480,000. Nevertheless, expansion of the family health strategy continued.

Initially, the average number and the annual rate of hospitalizations were calculated according to the formula below:

$$\text{Rate}_{\text{CSPC}} = \frac{n_{\text{CSPC}}}{n_{\text{inhabitants}}} \times 10,000 \quad (1)$$

In order to compare the magnitude of the total number of hospitalizations and the rates of the different conditions in each group at the beginning and end of the series, variation of the rates during the study period was calculated (as a percentage) according to the following formula:

$$\text{Variation} = \frac{R^n_{2015} - R^n_{1998}}{R^n_{1998}} \quad (2)$$

where

R^n_{1998} = hospitalization rate for group 'n' in 1998 and
R^n_{2015} = hospitalization rate for group 'n' in 2015.

Next, the time series of hospitalizations were determined for each condition group in the population. Trends were analyzed using a polynomial model, where the dependent variable (Y) represented hospitalization rates, and the independent variable (X) was represented by time. The following regression models were tested: linear ($y = \beta_0 + \beta_1 X$); quadratic ($Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2$); and cubic ($y = \beta_0 + \beta_1 X + \beta_2 X_2 + \beta_3 X_3$).

In order to avoid multicollinearity between the terms of the regression equation, the midpoint of the historical series was chosen as the independent variable, rather than working with calendar years. Thus, for the period between 1998 and 2015, the term (X - 2007) represents the mid-year variable, according to the following formalization of the model (e.g. for the linear model tested):

$$Y_R = \beta_0 + \beta_1 (X - 2007) \quad (3)$$

where

Y_R = hospitalization rate; X = year; β_0 = mean coefficient; and β_1 = annual average change.

The choice of the best model depended on the analysis of dispersion diagram, the coefficient of determination (R^2), and the residue analysis (to check the homoscedasticity assumption and adherence to normal distribution). When two models were statistically similar, the simplest model was chosen (in other words, the most parsimonious model was chosen). A significant trend was considered in which the estimated model presented $P < 0.05$.

In order to evaluate the correlation between CSPC rates and PHC coverage during the study years, Spearman correlation coefficients were calculated. Finally, in order to evaluate the potential impact of PHC expansion (started in 2009) on the occurrence of CSPC hospitalizations, annual hospitalization rates were estimated between 2008 and 2015 for overall causes and for each group. Adopting the year of 2008 as a reference, the rate ratios for each year and their respective confidence intervals (95% CI) were calculated according to the formula below:

$$\text{Rate Ratio (RR)} = \frac{HR^n_i}{HR^n_{2008}} \quad (4)$$

where

HR^n_i = hospitalization rate for 'n' group in i-year; and
HR^n_{2008} = hospitalization rate for 'n' group in year 2008.

Data were analyzed using R, Version 3.1.2.

Table 1 – Temporal variation of causes sensitive to primary care indicators, Municipality of Rio de Janeiro, Brazil, 1998–2015.

Code	Groups of causes	Average number of hospitalizations	CSPC rates (per 10,000)			% total CSPC		
			1998	2013	Variation (%)	1998	2013	Variation (%)
1	Vaccine-preventable diseases and other sensitive conditions	1822	5.28	1.71	−67.6	6.28	4.27	−32.1
2	Infectious gastroenteritis and complications	1513	3.89	1.19	−69.4	4.63	2.98	−35.7
3	Anemia	139	0.25	0.17	−32.0	0.30	0.42	39.6
4	Nutritional deficiencies	802	2.49	1.01	−59.4	2.96	2.52	−14.9
5	Ear, nose, and throat infections	168	0.51	0.30	−41.2	0.60	0.75	24.2
6	Bacterial pneumonia	3415	4.32	4.41	2.1	5.14	11.04	114.9
7	Asthma	1342	6.9	0.56	−91.9	8.20	1.39	−83.0
8	Pulmonary diseases	2248	7.18	2.18	−69.6	8.53	5.45	−36.1
9	Hypertension	2002	5.82	1.13	−80.6	6.92	2.82	−59.2
10	Angina	1538	3.39	1.46	−56.9	4.03	3.65	−9.6
11	Heart failure	4342	12.98	4.01	−69.1	15.43	10.02	−35.0
12	Cerebrovascular diseases	4174	12.22	5.37	−56.1	14.52	13.42	−7.6
13	Diabetes mellitus	2481	6.51	2.37	−63.9	7.74	5.93	−23.4
14	Epilepsy	510	0.94	0.89	−5.3	1.12	2.23	100.1
15	Kidney and urinary tract infections	1792	2.64	3.13	18.6	3.14	7.83	149.6
16	Skin and subcutaneous tissue infections	2560	3.50	5.40	54.3	4.16	13.52	224.8
17	Female pelvic inflammatory diseases	448	0.90	0.54	−40.0	1.07	1.35	26.4
18	Gastrointestinal ulcer	1399	3.63	1.24	−65.8	4.32	3.09	−28.4
19	Obstetric conditions	1005	0.76	2.92	284.2	0.91	7.31	706.3
Total		33701	84.12	39.98	−52.5	–	–	–

CSPC rate, hospitalization rate for conditions sensitive to primary care.

Results

Table 1 shows temporal variations of CSPC hospitalizations. It describes the average number of cases between 1998 and 2015 and shows that the causes that contributed the most to hospitalizations were heart failure, cerebrovascular diseases, and bacterial pneumonia. When analyzing the variation of indicators on the basis of the first and last period of the series, the hospitalization rates in most of the groups of conditions were reduced, particularly cardiovascular diseases and asthma. However, there were also increased rates, mainly in the group of obstetric conditions. Regarding the contribution of the groups among the total number of hospitalizations (%), there was a decline in the contribution of vaccine-preventable diseases, cardiovascular diseases, diabetes, nutritional deficiencies, and chronic lung diseases. However, there was an increase in the contribution of chronic conditions, such as epilepsy and specific infectious conditions, such as ear, nose and throat infections, skin infections, and urinary tract infections. Attention must be paid to obstetric conditions due to a 700% increase in the contribution of this condition.

Considering the time series analysis (Table 2), there was a decreasing trend in the rates of most groups; in particular, the trends for cardiovascular diseases (angina, hypertension and heart failure), gastrointestinal ulcers and female pelvic inflammatory diseases were linear and more pronounced. The rates of hospitalization due to skin infections, kidney and urinary tract infections, epilepsy and obstetric conditions, which showed increasing trends, are also highlighted. However, it should be pointed out that the hospitalization rate due to anemia remained stable during the period.

It was important to analyze the relationship between the groups of conditions because all the conditions should have been equally sensitive; it was expected that there would be a correlation between them (Table 3). The data showed that the majority of groups had positive and significant correlations. However, anemia did not correlate with any other group, and ear, nose, and throat infections and bacterial pneumonia only correlated with a few groups. Overall, the correlation was inverse and statistically significant between primary care coverage and groups of causes (i.e. the higher the coverage, the lower the hospitalization rate). However, it should be mentioned that no significant correlation was found between primary care expansion and hospitalizations due to anemia; ear, nose, and throat infections; and bacterial pneumonia. Furthermore, hospitalizations due to kidney and urinary tract infections, skin infections, and obstetric conditions presented positive and significant correlations with primary care expansion.

The rate ratios for each condition group were obtained year by year, taking 2008 (year before expansion) as a reference (Table 4). This analysis showed that, in general, rates were lower each year, particularly for vaccine-preventable diseases, infectious gastroenteritis and chronic lung diseases. For cardiovascular diseases, diabetes, and female pelvic inflammatory diseases, the impact was positive. An increase was observed in the year-on-year rates for gastrointestinal and obstetric groups.

Discussion

A reduction in hospitalization rate was observed for most groups of sensitive conditions, particularly cardiovascular

Table 2 – Trends in hospitalization rates for causes sensitive to primary care, according to condition groups, Municipality of Rio de Janeiro, Brazil, 1998–2015.

Group[a]	Equation	R^2	P-value	Trend
1	$y = 0.02x^2 - 0.20x + 2.51$	0.73	<0.01	Non-linear decreasing
2	$y = -0.01x^2 - 0.12x + 2.74$	0.72	<0.01	Non-linear decreasing
3	$y = -0.01x^2 - 0.01x + 0.25$	0.09	0.535	Stable
4	$y = 0.01x^2 - 0.09x + 1.14$	0.94	<0.01	Non-linear decreasing
5	$y = -0.01x^3 + 0.04x^2 - 0.02x + 0.17$	0.93	<0.01	Non-linear decreasing
6	$y = -0.04x^2 - 0.06x + 6.53$	0.42	0.03	Non-linear decreasing
7	$y = 0.03x^2 - 0.30x + 1.55$	0.91	<0.01	Non-linear decreasing
8	$y = 0.02x^2 - 0.25x + 3.19$	0.93	<0.01	Non-linear decreasing
9	$y = -0.23x + 3.35$	0.89	<0.01	Decreasing
10	$y = -0.13x + 2.56$	0.76	<0.01	Decreasing
11	$y = 0.03x^2 - 0.44x + 6.57$	0.93	<0.01	Decreasing
12	$y = 0.06x^2 - 0.36x + 5.42$	0.86	<0.01	Non-linear decreasing
13	$y = 0.02x^2 - 0.23x + 3.77$	0.89	<0.01	Non-linear decreasing
14	$y = 0.05x^2 + 0.02x + 0.72$	0.67	<0.01	Non-linear increasing
15	$y = 0.07x + 2.94$	0.65	<0.01	Increasing
16	$y = 0.19x + 4.18$	0.73	<0.01	Increasing
17	$y = -0.02x + 0.74$	0.66	<0.01	Decreasing
18	$y = -0.19x + 2.34$	0.88	<0.01	Decreasing
19	$y = 0.01x^2 + 0.09x + 1.38$	0.85	<0.01	Non-linear increasing
Total	$y = 0.16x^2 - 2.16x + 51.84$	0.85	<0.01	Non-linear decreasing

R^2, determination coefficient.

[a] 1, vaccine-preventable diseases and sensitive conditions; 2, infectious gastroenteritis and complications; 3, anemia; 4, nutritional deficiencies; 5, ear, nose and throat infections; 6, bacterial pneumonia; 7, asthma; 8, pulmonary diseases; 9, hypertension; 10, angina; 11, heart failure; 12, cerebrovascular diseases; 13, diabetes mellitus; 14, epilepsy; 15, kidney and urinary tract infections; 16, skin and subcutaneous tissue infections; 17, female pelvic inflammatory diseases; 18, gastrointestinal ulcer; 19, obstetric diseases.

Table 3 – Correlation matrix for groups of sensitive causes and correlation with global rate of conditions sensitive to primary care (CSPC) and primary healthcare (PHC) coverage, Municipality of Rio de Janeiro, Brazil, 1998–2015.

	Gr. 1	Gr. 2	Gr. 3	Gr. 4	Gr. 5	Gr. 6	Gr. 7	Gr. 8	Gr. 9	Gr. 10	Gr. 11	Gr. 12	Gr. 13	Gr. 14	Gr. 15	Gr. 16	Gr. 17	Gr. 18	Gr. 19
Gr. 1	1	0.63**	0.05¥	0.59*	0.24¥	−0.35¥	0.83**	0.81**	0.82**	0.58*	0.83**	0.50*	0.71**	0.09¥	−0.65**	−0.64**	0.75**	0.63**	−0.61*
Gr. 2		1	0.41¥	0.70**	−0.22¥	0.04¥	0.83**	0.81**	0.83**	0.90**	0.81**	0.50*	0.77**	−0.26¥	−0.50*	−0.62**	0.73**	0.74**	−0.98**
Gr. 3			1	−0.01¥	−0.19¥	0.45¥	0.11¥	0.11¥	0.30¥	0.30¥	0.10¥	0.09¥	0.17¥	−0.26¥	0.01¥	−0.03¥	0.27¥	0.17¥	−0.48¥
Gr. 4				1	0.12	−0.33¥	0.88**	0.89**	0.80**	0.81**	0.88**	0.79**	0.87**	0.07¥	−0.70**	−0.75**	0.77**	0.92**	−0.67**
Gr. 5					1	−0.40¥	0.06¥	0.07¥	0.05¥	−0.06¥	0.07¥	0.32¥	0.06¥	0.90**	−0.06¥	0.16¥	0.08¥	0.10¥	0.22¥
Gr. 6						1	−0.33¥	−0.24¥	−0.13¥	0.02¥	−0.31¥	−0.23¥	−0.22¥	−0.26¥	0.57*	0.51*	−0.04¥	−0.18¥	−0.07¥
Gr. 7							1	0.98**	0.92**	0.82**	0.99**	0.67**	0.93**	−0.04¥	−0.78**	−0.84**	0.86**	0.89**	−0.80**
Gr. 8								1	0.94**	0.83**	0.99**	0.65**	0.92**	−0.03¥	−0.74**	−0.80**	0.89**	0.92**	−0.79**
Gr. 9									1	0.82**	0.93**	0.60*	0.86**	−0.04¥	−0.69**	−0.73**	0.94**	0.88**	−0.82**
Gr. 10										1	0.82**	0.64**	0.85**	−0.00¥	−0.52*	−0.60*	0.81**	0.85**	−0.90**
Gr. 11											1	0.62**	0.93**	−0.04¥	−0.79**	−0.84**	0.88**	0.90**	−0.79**
Gr. 12												1	0.73**	0.35¥	−0.32¥	−0.42¥	0.64**	0.74**	−0.47¥
Gr. 13													1	0.03¥	−0.70**	−0.75**	0.90**	0.87**	−0.78**
Gr. 14														1	0.129¥	0.30¥	0.07¥	0.08¥	0.25¥
Gr. 15															1	0.88**	−0.60*	−0.66**	0.51*
Gr. 16																1	−0.62**	−0.75**	0.59*
Gr. 17																	1	0.87**	−0.75**
Gr. 18																		1	−0.72**
Gr. 19																			1
PHC coverage	−0.82**	−0.82**	−0.16¥	−0.88**	−0.03¥	0.32¥	−0.98**	−0.97**	−0.91**	−0.84**	−0.98**	−0.63**	−0.94**	0.08	0.82**	0.87**	−0.85**	−0.88**	0.81**
CSAP rate	0.76**	0.83**	0.20¥	0.87**	0.06¥	−0.08¥	0.93**	0.95**	0.95**	0.87**	0.92**	0.75**	0.92**	0.04	−0.57*	−0.67**	0.94**	0.92**	−0.81**

Gr.1, vaccine-preventable diseases and sensitive conditions; Gr.2, infectious gastroenteritis and complications; Gr.3, anemia; Gr.4, nutritional deficiencies; Gr.5, ear, nose and throat infections; Gr.6, bacterial pneumonia; Gr.7, asthma; Gr.8, pulmonary diseases; Gr.9, hypertension; Gr.10, angina; Gr.11, heart failure; Gr.12, cerebrovascular diseases; Gr.13, diabetes mellitus; Gr.14, epilepsy; Gr.15, kidney and urinary tract infections; Gr.16, skin and subcutaneous tissue infections; Gr.17, female pelvic inflammatory diseases; Gr.18, gastrointestinal ulcer; Gr.19, obstetric diseases.
*$P < 0.01$. **$0.01 \leq P < 0.05$; ¥Non-significant.

Table 4 – Rate ratio for temporal association of coverage indicators and hospitalization rate for causes sensitive to primary care before and after primary healthcare expansion, Municipality of Rio de Janeiro, 2009–2015.[a]

Year	RR	95% CI	RR	95% CI	RR	95% CI
	Group 1		Group 2		Group 3	
2009	1		1		1	
2010	0.78	0.65–0.91	0.89	0.74–1.03	1.28	0.83–1.72
2011	0.64	0.54–0.75	0.77	0.64–0.89	1.72	1.12–2.32
2012	0.61	0.50–0.71	0.72	0.60–0.84	0.83	0.54–1.12
2013	0.59	0.49–0.68	0.56	0.47–0.65	0.94	0.61–1.27
2014	0.57	0.49–0.65	0.4	0.16–0.64	1.05	0.73–1.37
2015	0.55	0.47–0.63	0.24	0.00–0.48	1.16	0.84–1.48
	Group 4		Group 5		Group 6	
2009	1		1		1	
2010	1.32	1.15–1.50	0.97	0.90–1.03	1.31	1.04–1.59
2011	1.14	0.95–1.34	1.07	0.89–1.24	0.94	0.61–1.27
2012	1.17	0.97–1.37	1.13	0.95–1.32	0.83	0.54–1.12
2013	1.31	1.09–1.53	1.00	0.84–1.16	0.75	0.49–1.01
2014	1.45	1.28–1.62	0.87	0.73–1.01	0.67	0.41–0.93
2015	1.59	1.42–1.76	0.74	0.60–0.88	0.59	0.33–0.85
	Group 7		Group 8		Group 9	
2009	1		1		1	
2010	0.78	0.65–0.91	0.92	0.85–1.00	0.87	0.67–1.06
2011	0.73	0.61–0.86	0.90	0.82–0.97	0.89	0.69–1.09
2012	0.63	0.53–0.74	0.86	0.80–0.93	0.56	0.43–0.69
2013	0.54	0.45–0.63	0.78	0.71–0.84	0.47	0.36–0.57
2014	0.45	0.29–0.61	0.7	0.58–0.82	0.38	0.13–0.63
2015	0.36	0.20–0.52	0.62	0.50–0.74	0.29	0.04–0.54
	Group 10		Group 11		Group 12	
2009	1		1		1	
2010	1.16	1.02–1.30	0.97	0.86–1.08	1.15	1.07–1.23
2011	0.96	0.85–1.08	0.90	0.80–1.01	1.11	1.03–1.18
2012	1.17	1.03–1.31	0.81	0.72–0.90	1.01	0.94–1.08
2013	0.88	0.78–0.99	0.72	0.64–0.80	1.02	0.95–1.08
2014	0.59	0.25–0.93	0.63	0.47–0.79	1.03	0.97–1.09
2015	0.3	0.04–0.60	0.54	0.38–0.70	1.04	0.98–1.10
	Group 13		Group 14		Group 15	
2009	1		1		1	
2010	1.05	0.91–1.18	0.99	0.91–1.07	1.12	1.04–1.19
2011	0.95	0.83–1.08	1.03	0.95–1.11	1.03	0.96–1.11
2012	0.80	0.70–0.91	1.18	1.09–1.27	0.96	0.89–1.03
2013	0.73	0.63–0.83	1.00	0.92–1.08	0.93	0.86–0.99
2014	0.66	0.48–0.84	0.82	0.63–1.01	0.9	0.81–0.99
2015	0.59	0.41–0.77	0.64	0.45–0.83	0.87	0.78–0.96
	Group 16		Group 17		Group 18	
2009	1		1		1	
2010	1.13	1.07–1.20	0.91	0.83–1.00	1.22	1.09–1.35
2011	0.99	0.94–1.05	0.91	0.83–1.00	1.29	1.15–1.42
2012	1.01	0.95–1.07	0.80	0.73–0.87	1.17	1.04–1.29
2013	1.00	0.94–1.06	0.77	0.70–0.84	1.15	1.03–1.27
2014	0.99	0.93–1.05	0.74	0.65–0.83	1.13	1.06–1.20
2015	0.98	0.92–1.04	0.71	0.62–0.80	1.11	1.04–1.18
	Group 19		Total			
2009	1		1			
2010	1.07	0.85–1.29	1.06	0.97–1.15		
2011	1.14	0.91–1.38	0.96	0.88–1.04		
2012	1.38	1.10–1.67	0.90	0.82–0.97		
2013	1.50	1.19–1.81	0.84	0.77–0.91		
2014	1.62	1.36–1.88	0.78	0.66–0.90		
2015	1.74	1.48–2.00	0.72	0.60–0.84		

RR, rate ratio; CI, confidence interval.

[a] Group codes. 1, vaccine-preventable diseases and sensitive conditions; 2, infectious gastroenteritis and complications; 3, anemia; 4, nutritional deficiencies; 5, ear, nose and throat infections; 6, bacterial pneumonia; 7, asthma; 8, pulmonary diseases; 9, hypertension; 10, angina; 11, heart failure; 12, cerebrovascular diseases; 13, diabetes mellitus; 14, epilepsy; 15, kidney and urinary tract infections; 16, skin and subcutaneous tissue infections; 17, female pelvic inflammatory diseases; 18, gastrointestinal ulcer; 19, obstetric diseases.

diseases and asthma. It is known, based on other studies carried out in Brazil,[11–18] that asthma is a disease for which PHC actions can have a very positive impact on reducing hospitalizations due to associated complications, especially when this condition is included in the services portfolio.[19] The services portfolio shows the list of services provided in PHC and aims to guide the PHC actions provided to the population of Municipality of Rio de Janeiro (MRJ), including guidelines for the performance of care and dispensing medication for both chronic and acute treatment, such as asthma attacks and chronic obstructive pulmonary disease.[20]

Regarding the proportion of hospitalizations, a lower contribution was identified for vaccine-preventable diseases, cardiovascular diseases, diabetes, nutritional deficiencies, and chronic pulmonary diseases, showing a positive correlation between the expansion of PHC and a decrease in the number of hospitalizations related to these causes. It is important to highlight that some factors, such as socioeconomic conditions, population life habits, professional qualifications, and number of medical professionals in the region, can interfere in these diseases. Above all, among other factors related to the expansion of PHC in the city of Rio de Janeiro, it is worth mentioning the stimulus to change the population's lifestyle with implementation of the 'Carioca Health Academy Program', which is potentially capable of reducing the cardiovascular risks of patients.[21] Vaccine-preventable diseases and other diseases sensitive to primary care, such as tuberculosis and non-congenital syphilis, showed a significant reduction after 2008. These results indicate that, due to primary care expansion, vaccine availability in people's residences increased, and health surveillance actions improved.[22,23] In addition, vaccination of children, adolescents, and adults is a requirement of income transfer programmes such as the 'Bolsa Família Program' and the 'Carioca Family Card', which may also have influenced the increase in vaccination coverage and the reduction of diseases related to nutritional deficiencies.[24]

The increasing incidence of tuberculosis in the city of Rio de Janeiro, one of the largest cities in Brazil, may have contributed to the significant reduction in the CSPC hospitalization rate in this group, as primary care provides improved population screening, avoiding hospitalization. In fact, there are well-structured guidelines to identify index cases (symptomatic respiratory search) in communities and treatment protocols such as directly observed treatment.[25,26] Moreover, the number of cases of infectious gastroenteritis showed a significant reduction after the expansion of primary care in Rio de Janeiro. It has been assumed that there is a relationship between early treatment of acute cases of gastroenteritis, an increase in the supply of oral rehydration serum treatment in all cases and the availability of antibiotics in cases of bacterial infections.[27,28]

This analysis showed that based on variations between the first and last periods and variations in trends of the all-time series, hospitalization rates increased for obstetric conditions. The same results were observed in other studies undertaken in Brazil,[11–14,22] and this suggests that primary care helps to focus on identifying injuries that were not previously perceived and, thus, guides patients to hospital appropriately. On the other hand, it may mean that primary care is failing in the care devoted to these conditions. Considering that prenatal care and childbirth are priorities in public health policies in Brazil,[29] it is important that managers and professionals are aware of this trend in order to identify possible failures in primary care for this at-risk group. Congenital syphilis, one of the diseases in this group, increased from 862 in 2009 to 1771 in 2013,[30] which means an increase in professionals sensitive to the notification of this complaint, and able to fix inadequate notifications of cases treated by maternity hospitals. It is also important to consider the failure of primary care to treat syphilis during pregnancy because it is considered to be a disease that could possibly be controlled at this level. The trajectory for assisting pregnant women with syphilis presents deficiencies, mainly where late prenatal onset, absence of pregnancy diagnosis, and absence of partner treatment have occurred.[30]

The results also show a stable trend for anemia throughout the analyzed period, and demonstrate that this condition—as well as ear, nose, and throat infections; epilepsy; and bacterial pneumonia—is not significantly correlated with the expansion of primary care in the city of Rio de Janeiro. These data enable discussion regarding whether these causes are, in fact, sensitive to primary care. Finally, it is important to note that universal health coverage can play an important role in achieving the sustainable development goals[8,31] on health issues, including reducing inequalities. It is important to mention that strong health governance is a possible key to universal health coverage.[32] However, there is evidence that, despite increases in the funds invested and the population covered by primary care,[33,34] it is also vital to improve the quality of primary care aiming to resolve population needs.

Conclusion

This study contributes to the evaluation of health services in the city of Rio de Janeiro, which underwent successful primary care expansion within a few years. There was a gradual reduction in hospitalization rates, mainly for vaccine-preventable diseases, infectious gastroenteritis and chronic lung disease. Over a longer time interval, reductions were also seen in hospitalization rates for cardiovascular diseases, diabetes and female pelvic inflammatory diseases.

Results for obstetric conditions require further study in order to confirm whether hospitalization rates are really increasing, or whether screening in primary care has improved. In addition, it is worth analyzing other studies to determine whether anemia; ear, nose, and throat infections; epilepsy; and bacterial pneumonia are sensitive to primary care. The expectation is that this research will assist the decision-making of managers and improve health education.

Author statements

Ethical approval

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Competing interests

None declared.

Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.puhe.2018.05.011.

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