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Performance of primary health care in São Paulo state, Brazil, during the period 2010-2019

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Abstract *This article presents the results of an analysis of the performance of primary health care in São Paulo state over the last decade against a backdrop of financial crisis and health funding cuts. We conducted a time series analysis (2010-2019) of performance indicators across the following dimensions based on an adapted conceptual framework: health service performance, health system, and determinants of health. Annual percentage change was calculated for each indicator using a log-linear model. Performance across the indicators was generally positive; however, there was a decline in performance across indicators of quality of care (congenital syphilis, cesarean section rate and cervical cancer screening). The findings also show a potential rise in demand for public services (due to population aging and a reduction in the percentage of the population with private health insurance) and increase in health expenditure against a backdrop of falling GDP per capita.*

Key words *Primary health care, Primary care indicators, Time series studies, Brazil*

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Introduction

Primary health care (PHC) can be defined as a point of care that offers a set of individual and collective actions coordinated via a health system aimed at delivering comprehensive care to the population[1]. In Brazil, significant advances in the organization of PHC services have been made since the implementation of the country's public health system, the *Sistema* Único *de Saúde* (SUS) or Unified Health System. The system adopted a new organizational model called primary care (PC), centered on territorialization, the affiliation of the population to health teams and the delivery of family and community-oriented care through the progressive implementation of the Family Health Strategy (FHS)[2].

To implement this model at national level, three national primary care policies (PNAB, acronym in Portuguese) have been published since the creation of the SUS (2006, 2012 and 2017)[3-5], emphasizing the centrality of the FHS and defining funding rules for the expansion of the strategy. In addition, the "More Doctors" law was created in 2013, aimed at expanding and improving the quality of medical training in the country and promoting a significant increase in the availability of doctors in primary care services[6].

In 2017 there was a shift in policy, with PC losing its centrality and the introduction of changes to the funding model, undermining the capacity of the FHS to reorientate the health system toward PHC[5-9]. In addition, constitutional amendment 95/2016 – 'the spending cap amendment' – which freezes health spending for 20 years, has adversely affected already inadequate funding of the SUS and consequently PC[10].

PHC monitoring and evaluation is key to effective public health management[11-14]. Given the above changes to public policy and the political and economic context in the country over the last two decades, there is a pressing need to better understand the effectiveness of the implementation of PC in Brazil.

This study therefore sought to analyze the development of PHC actions over the last decade in São Paulo state (SPS) using a set of performance indicators. While SPS is the country's most populated and wealthy state[15], it had the lowest FHS coverage rate in 2009, partly due to its program-based care model, characterized by the existence of a broad network of health centers prior to the implementation of the SUS[16]. In 2019, SPS had an estimated population of 45,919,049 inhabitants (22% of the national population) distributed across 645 municipalities, with 76% of the population living in 81 municipalities with over 100,000 inhabitants[15,17].

The aim of this study was to examine temporal trends in PHC performance indicators in SPS during the period 2010-2019.

Materials and methods

This ecological time series study of PHC indicators is part of a research project titled "*Participation of Social Organizations in the Management of Primary Health Care in Municipalities in São Paulo State*" (FAPSPS-PPSUS, Nº 2019/03961-8). The study period is 2010-2019.

Indicators and data sources

The selected indicators make up a conceptual framework for monitoring PC adapted from criteria proposed by the Health System Performance Assessment Project (PROADESS)[18]. The framework consists of the following dimensions: health service performance, health system, and determinants of health. For each dimension we considered the following subdimensions: health service performance (access, effectiveness and adequacy of PHC); health system (funding); determinants of health (socioeconomic and demographic determinants).

The indicators were selected based on the data available in official open access databases linked to the SUS, adopting relevant validity, reliability and sensitivity criteria[19]. The indicators, data sources and calculation methods are presented in Chart 1.

Chart 1. Indicators and respective numerators, denominators, calculation methods and data sources.

Dimension and subdimension	Indicator	Numerator	Denominator	Calculation method	Data sources
1. Service performance					
Access	PHC coverage	PHC doctor working hours	Total population	[(PHC doctor working hours / 40) * 3,000] / Total population	e-Gestor AB[1]
	Estimated oral health team population coverage	PHC dentist working hours	Total population	[(PHC dentist working hours / 40) * 3,000] / Total population	e-Gestor AB[1]
Effectiveness	Hospitalization rate for asthma among children aged under 10	Number of hospitalizations for asthma among children aged under 10	Population aged 0-9 years	Number of hospitalizations for asthma among children aged 0-9 years * 100,000 / Population aged under10	SIH[3]/SEADE[2]
	Hospitalization rate for stroke among people aged between 30-59 years	Number of hospitalizations for stroke 30-59 years	Population aged 30-59 years	Number of hospitalizations for stroke among people aged between 30-59 years * 100,000 / Population aged 30-59 years	SIH[3]/SEADE[2]
	Hospitalization rate for acute respiratory infection (ARI) among children aged under 5 years	Number of hospitalizations for ARI among children aged under 5 years	Population aged under 5	Number of hospitalizations for ARI among children aged under 5 years * 10,000 / Population aged under 5	SIH[3]/SEADE[2]
	Infant mortality rate	Deaths among children aged under one	Newborns	Deaths among children aged under one * 1,000 / Newborns	SIM[4]/ SINASC[5]
	Neonatal mortality rate	Deaths among children aged under 28 days	Newborns	Deaths among children aged under 28 days * 1000 / Newborns	SIM[4]/ SINASC[5]
	Postneonatal mortality rate	Deaths among children aged 28-365 days	Newborns	Deaths among children aged 28-365 days* 1000 / Newborns	SIM[4]/ SINASC[5]
	Proportion of newborns born to mothers aged under 20 years	Newborns born teenage mothers (<20 years)	Newborns	Newborns born teenage mothers (<20 years) * 100 / Newborns	SINASC[5]
	Proportion of babies with low birth weight	Proportion of babies with low birth weight (<2,500 grams)	Newborns	Babies with low birth weight (<2,500 grams) * 100 / Newborns	SINASC[5]
	Rate of syphilis detection in pregnant women	Number of pregnant women diagnosed with syphilis	Newborns	Number of pregnant women diagnosed with syphilis * 1000 / Newborns	SINAN[6]/ SINASC[5]
	Rate of congenital syphilis	Number of reported cases of congenital syphilis	Newborns	Number of reported cases of congenital syphilis * 1000 / Newborns	SINAN[6]/ SINASC[5]
	Percentage of hospitalizations for ambulatory care sensitive conditions	Number of hospitalizations for ambulatory care sensitive conditions	Total hospitalizations	Number of hospitalizations for ambulatory care sensitive conditions * 100 / Total hospitalizations	SIH[3]

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Chart 1. Indicators and respective numerators, denominators, calculation methods and data sources.

Dimension and subdimension	Indicator	Numerator	Denominator	Calculation method	Data sources
Adequacy	Cesarean section rate	Number of cesarean sections	Total number of deliveries	Number of cesarean sections * 100 / Total number of deliveries	SINASC[5]
	Cesarean section rate on the SUS	Number of cesarean sections	Total number of deliveries on the SUS	Number of cesarean sections * 100 / Total number of deliveries on the SUS	SIH[3]
	Percentage of newborns whose mothers made at least seven antenatal visits	Number of newborns whose mothers made at least seven antenatal visits	Newborns	Number of newborns whose mothers made at least seven antenatal visits * 100 / Newborns	SINASC[5]
	Pap testing rate among women aged 25-64 years	Number of Pap tests among women aged 25-64 years	Female population aged 25-64 years	Number of Pap tests among women aged 25-64 years / (Female population aged 25-64 years / 3)	SIA[7]
	Mammography screening rate among women aged between 50-69 years and population in the same age group	Number of mammography screenings performed among women aged 50-69 years	Female population aged 50-69 years	Number of mammography screenings performed among women aged 50-69 years / (Female population aged 50-69 years / 2)	SIA[7]
2. Determinants of health					
Socioeconomic and demographic	Proportion of older people in the overall population	Number of people aged under 60	Total population	Number of people aged under 60 * 100 / Total population	SEADE[2]
	Municipal GDP per capita	GDP in reais	Total population	GDP in reais X 1,000.000/ Total population	IBGE[8]
	Percentage of the population with private health insurance	Number of people with private health insurance	Total population	Number of people with private health insurance * 100/Total population	ANS[9]/SEADE[2]
3. Health system					
Funding	Total health expenditure per capita	Total health expenditure	Total population	Total health expenditure / Total population	SIOPS[10]
	Expenditure on health as a percentage of total government expenditure	Total health expenditure	Revenue from taxes and constitutional transfers	Total health expenditure / Revenue from taxes and constitutional transfers	SIOPS[10]

1.Primary Care Information and Management - e-Gestor AB (https://egestorab.saude.gov.br/), 2. State Data Foundation (https://www.seade.gov.br/), 3. Hospital Information System (http://sihd.datasus.gov.br/principal/index.php), 4. Mortality Information System (http://www2.datasus.gov.br/DATASUS/index.php?area=060701), 5. Newborn Information System (http://www2.datasus.gov.br/DATASUS/index.php?area=060702), 6. National Notifiable Diseases Information System (https://portalsinan.saude.gov.br/), 7. SUS Ambulatory Care Information System (http://sia.datasus.gov.br/versao/versao.php), 8. Brazilian Institute of Geography and Statistics (https://www.ibge.gov.br/), 9. National Health Agency (https://www.gov.br/ans/pt-br), 10. Public Health Budget Information System (https://www.gov.br/saude/pt-br/access-a-informacao/siops)

Source: Authors.

The indicators were obtained from the following health information systems: the Mortality Information System (SIM); the Live Birth Information System (SINASC); the National Health Facility Registry (CNES); the National Notifiable Diseases Information System (SINAN); the National Immunization Program Information System (SI-PNI); and the Public Health Budget Information System (SIOPS). They were extracted from the following platforms: Primary Care Information and Management (e-Gestor AB); São Paulo Department of Health (SES-SP); the SUS's Department of Informatics (DATASUS); and the State Data Foundation (SEADE). Annual GDP per capita and health expenditure per capita were inflation adjusted based the national consumer price index (IPCA) using the IPCA calculator. The databases used in this study are online and open access and provide annual indicator rates.

Statistical analysis

Indicator trends were analyzed using a log-linear model, where the independent variable was the year and the dependent variables were the indicator rates. The annual percent change (APC) in rates was calculated using the Joinpoint Regression Program 4.8.0.0. Joinpoints in the trend curves were detected to identify statistically significant changes in the APC over the study period.

When joinpoints were detected, we calculated the APC corresponding to each segment of the curve. In addition, we calculated the average annual percent change (AAPC) over the study period. We also calculated 95% confidence intervals (95%CI).

Ethical considerations

The study protocol was approved by the Santa Casa de Misericórdia hospital's research ethics committee (reference code no. 4.007.368).

Results

The annual rates for each of the 23 indicators are shown in Table 1. The following trends were observed in the dimension service performance: an increase in PHC coverage from 51.03% to 60.33%; a reduction in hospitalization rates (for asthma among children aged under 10; strokes among people aged 30-59, and ARI among children aged under 5); a slight reduction in the rate of infant mortality and its components; a reduction in babies born to teenage mothers (< 20 years) and with low birth weight; a reduction in the percentage of hospitalizations for ambulatory care sensitive conditions. Rates of congenital syphilis and syphilis detection in pregnant women increased. In addition, there was an increase in the cesarian section rate among SUS deliveries and a decrease in Pap testing rates in the 25-64 year age group.

In the dimension determinants of health, there was an increase in the proportion of older people in the overall population throughout the study period.

As regards the dimension health system, the findings reveal an increase in total health expenditure per capita between 2010 and 2014, and a reduction between 2015 and 2018 followed by a slight increase in 2019.

The results of the temporal trend analysis are presented in Table 2. The AAPC for PHC coverage was 1.9% (95%CI 1.4; 2.5), while estimated oral health team population coverage showed a constant reduction over the study period (APC = -0.4; 95%CI: -0.8; -0.1) (service performance dimension).

Of the 11 indicators in the subdimension effectiveness, nine showed a downward trend during the study period (Table 2), including percentage of hospitalizations for ambulatory care sensitive conditions, which declined over the study period (APC = -1.4; 95%CI: -1.5; -1.3).

In the same subdimension, rate of congenital syphilis showed an APC of 25.0% (95%CI: 20.6; 29.6) between 2010 and 2015. During the period 2015-2019 the APC was not statistically significant. However, the AAPC over the period for this indicator was high (AAPC = 14.3; 95%CI: 11.7; 17.0). The rate of syphilis detection in pregnant women increased considerably between 2010 and 2017 (APC = 24.1; 95%CI: 19.5; 28.9), stabilizing thereafter. The AAPC for this indicator was 19.3% (95%CI: 19.3; 25.8).

In the subdimension adequacy, while the overall cesarian section rate in both public and private sector health services showed a statistically significant reduction during the period 2013-2019, the rate among deliveries performed on the SUS showed an upward trend over the study period (AAPC = 1.1%; 95%CI: 0.3; 1.8). Pap testing rates showed a constant reduction over the study period (APC = -3.3%; 95%CI: -4.1; -2.5). There were no statistically significant trends in the screening mammography rate among women (Table 2).

Table 1. Annual rates for PHC indicators by dimension and subdimension (2010-2019).

Dimension	SD	Indicator	Year									
			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Service performance	Access	PHC coverage	51.03	51.72	53.74	54.81	57.88	58.75	60.56	59.94	60.30	60.33
		Estimated oral health team population coverage	35.26	35.45	35.91	35.67	35.27	35.32	35.43	34.11	34.15	34.46
	Effectiveness	Hospitalization rate for asthma among children aged under 10	190.17	173.08	160.67	171.61	138.30	166.36	139.29	139.36	160.01	129.49
		Hospitalization rate for strokes among people aged 30-59	62.65	62.22	58.21	56.42	56.04	55.44	56.40	55.29	56.95	55.89
		Hospitalization rate for ARI among children aged under 5	244.77	233.96	224.30	215.53	197.92	186.65	195.65	193.89	193.41	186.45
		Rate of infant mortality	11.86	11.58	11.52	11.53	11.45	10.80	11.08	10.90	10.76	11.05
		Neonatal mortality rate	8.13	7.90	7.91	7.86	7.87	7.57	7.66	7.66	7.44	7.77
		Postneonatal mortality rate	3.73	3.68	3.61	3.67	3.58	3.22	3.42	3.23	3.33	3.28
		Proportion of babies born to teenage mothers (< 20 years)	14.77	14.77	14.85	14.94	14.55	13.82	13.18	12.10	11.20	10.43
		Proportion of babies born with low birth weight	9.12	9.30	9.28	9.30	9.13	9.10	9.12	9.15	9.17	9.37
		Rate of congenital syphilis	1.90	2.40	3.10	3.90	4.80	5.40	6.10	6.70	6.60	6.00
		Rate of syphilis detection in pregnant women	3.60	5.30	6.30	8.20	10.20	11.20	14.00	17.50	20.50	18.90
		Percentage of hospitalizations for ambulatory care sensitive conditions	16.82	16.58	16.37	15.93	15.72	15.66	15.40	15.28	14.99	14.74
	Adequacy	Cesarian section rate overall deliveries	58.68	59.97	60.89	61.88	61.41	59.32	59.00	59.16	58.57	58.82
		Cesarean section rate on the SUS	40.35	41.15	42.65	43.51	43.50	42.78	43.31	43.89	43.72	44.69
		Percentage of newborns whose mothers made at least seven antenatal visits	77.75	77.89	75.57	75.78	76.07	76.93	78.12	79.65	79.72	80.20
		Pap testing rate among women aged 25-64 years	0.53	0.52	0.51	0.49	0.46	0.43	0.45	0.42	0.43	0.38
		Mammography screening rate among women aged 50-69 years	0.26	0.30	0.30	0.31	0.32	0.30	0.31	0.31	0.30	0.31
Determinants of health	Socioeconomic and demographic	Proportion of older people in the overall population	11.57	11.88	12.20	12.52	12.85	13.19	13.60	14.01	14.43	14.86
		GDP per capita	51318.08	52869.29	53549.59	55020.73	55965.72	54061.51	50952.22	49944.48	48206.62	
		Percentage of the population with private health insurance	42.16	42.34	42.92	43.78	43.85	42.22	40.19	39.26	38.99	38.61
Health system	Funding	*Total health expenditure per capita*	751.86	801.64	852.36	919.36	971.80	938.21	931.34	911.99	931.50	960.92
		Expenditure on health as a percentage of total government expenditure	21.24	21.48	22.26	23.01	23.91	24.42	25.86	25.44	24.12	23.54

Sources: Primary Care Information and Management (e-Gestor AB); Mortality Information System (SIM); Hospital Information System (SIH); Newborn Information System (SINASC); National Notifiable Diseases Information System (SINAN); Ambulatory Care Information System (SIA); State Data Foundation (SEADE); Public Health Budget Information System (SIOPS); National Supplementary Health Agency (ANS); National Health Facility Registry (CNES); e Brazilian Institute of Geography and Statistics (IBGE).

Table 2. Annual percentage change (APC) for each indicator and average annual percent change (AAPC) for indicators where joinpoints were detected on the trend curve and respective 95% confidence intervals (95%CI).

Dimension	Subdimension	Indicators	Period	APC	95%CI	AAPC	IC 95%
Service performance	Access	PHC coverage	2010 - 2016	3.0	2.4 - 3.6	1.9	1.4 - 2.5
			2016 - 2019	-0.2	-1.9 - 1.6		
		Estimated oral health team population coverage	2010 - 2019	-0.4	-0.8 - -0.1		
	Effectiveness	Hospitalization rate for asthma among children aged under 10	2010 - 2019	-3.1	-5.2 - -0.9		
		Hospitalization rate for strokes among people aged 30-59	2010 - 2013	-4.0	-6.6 - -1.3	-1.4	-2.2 - -0.5
			2013 - 2019	0.0	-1.0 - 0.9		
		Hospitalization rate for ARI among children aged under 5	2010 - 2015	-4.9	-6.0 - -3.8	-2.8	-3.5 - -2.1
			2015 - 2019	-0.1	-1.7 - 1.5		
		Infant mortality rate	2010 - 2019	-1.0	-1.4 - -0.5		
		Neonatal mortality rate	2010 - 2019	-0.7	-1.1 - -0.2		
		Postneonatal mortality rate	2010 - 2019	-1.6	-2.4 - -0.9		
		Proportion of babies born to mothers aged under 20	2010 - 2014	0.1	-0.9 – 1.0	-3.7	-4.2 - -3.3
			2014 - 2019	-6.7	-7.3 - -6.0		
		Proportion of babies born with low birth weight	2010 - 2019	0.0	-0.3 - 0.3		
		Rate of congenital syphilis	2010 - 2015	25.0	20.6 - 29.6	14.3	11.7 - 17.0
			2015 - 2019	2.2	-2.8 - 7.5		
		Rate of syphilis detection in pregnant women	2010 - 2017	24.1	19.5 – 28.9	19.3	13.2 - 25.8
			2017 - 2019	3.9	-21.7 – 37.8		
		Percentage of hospitalizations for ambulatory care sensitive conditions	2010 - 2019	-1.4	-1.5 - -1.3		
	Adequacy	Cesarian section rate overall deliveries	2010 - 2013	1.4	-0.5 - 3.4	-0.2	-0.7 - 0.4
			2013 - 2019	-0.9	-1.6 - -0.3		
		Cesarean section rate on the SUS	2010 - 2012	3.1	-0.9 - 7.3	1.1	0.3 - 1.8
			2012 - 2019	0.5	0.0 – 1.0		
		Percentage of newborns whose mothers made at least seven antenatal visits	2010 - 2013	-1.10	-2.5 - 0.4	0.4	-0.1 - 0.8
			2013 - 2019	1.1	0.6 - 1.6		
		Pap testing rate among women aged 25-64 years	2010 - 2019	-3.3	-4.1 - -2.5		
		Mammography screening rate among women aged 50-69 years	2010 - 2012	8.0	-0.7 - 17.5	1.6	0.0 - 3.2
			2012 - 2019	-0.2	-1.3 - 0.9		
Determinants of health	Socioeconomic and demographic	Proportion of older people in the overall population	2010 - 2015	2.7	2.6 - 2.7	2.8	
			2015 - 2019	3.0	3.0 – 3.0		
		GDP per capita (reais)	2010 - 2014	2.1	0.9 - 3.3	-0.9	-1.5 - -0.3
			2014 - 2018	-3.8	-4.9 - -2.7		
		Percentage of the population with private health insurance	2010 - 2013	1.6	-1.3 - 4.6	-1.1	-1.9 - -0.2
			2013 - 2019	-2.3	-3.3 - -1.4		

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Table 2. Annual percentage change (APC) for each indicator and average annual percent change (AAPC) for indicators where joinpoints were detected on the trend curve and respective 95% confidence intervals (95%CI).

Dimension	Subdimension	Indicators	Period	APC	95%CI	AAPC	IC 95%
Health system	Funding	*Total health expenditure per capita*	2010 - 2014	6.0	4.1 - 7.9	2.3	1.5 - 3.2
			2014 - 2019	-0.5	-1.8 - 0.8		
		Expenditure on health as a percentage of total government expenditure	2010 - 2016	3.5	2.9 – 4.0	1.4	0.9 - 1.9
			2016 - 2019	-2.7	-4.3 - -1.1		

Source: Authors.

Joinpoints were detected in the indicators of the dimension determinants of health, revealing differing trends. The proportion of older people in the overall population showed an upward trend throughout the study period (AAPC = 2.8%; 95%CI: 2.8; 2.8). The percentage of the population with private health insurance showed a downward trend during the period 2013-2019, with an APC of -2.3% (95%CI: -3;3; -1.4). GDP per capita showed an upward trend up to 2014 (APC = 2.1%; 95% CI: 0.9; 3.,3), followed by a downward trend thereafter up to the end of the study period (APC = -3,8%; 95%CI: -4.9; -2.7).

In the dimension health system, joinpoints were detected in the indicators total health expenditure per capita and expenditure on health as a percentage of total government expenditure, with an initial statistically significant upward trend in both indicators followed by a period of stabilization in total health expenditure and decline in expenditure on health as a percentage of total expenditure, from 2014 and 2016, respectively.

Chart 2 presents a synthesis of the results by dimension, highlighting trends over the entire study period and joinpoints.

Discussion

Our findings clearly show that, despite an improvement in access to PHC in SPS during the study period, performance across care quality indicators was poor, revealing that SPS faces major challenges in improving the quality of PC. It was observed that most of the performance indicators in the access and effectiveness subdimensions showed a favorable trend, with only the congenital syphilis incidence rate showing a downward trend. Performance across indicators of adequacy was poor or stable over the study period, indicating that while access to care in the state has improved, care quality remains a challenge.

With regard to access, PHC coverage increased up to 2016. This may be related to the introduction of the More Doctors Program[20], which allocated 14,256 professionals to family health teams across the country during the first two years of the initiative[6]. The stabilization of coverage rates in the following period may be due to several factors, including the effects of financial constraints on health actions, the reorientation of the PNAB and a reduction in the number of PHC doctors, especially after 2018[10,21]. There was a downward trend in estimated oral health team population coverage over the study period. In this respect, a study using national data reported an increase in oral health team population coverage between 2008 and 2015, followed by a slight reduction in 2016 and stabilization thereafter. In the same study, the authors found an upward trend in the transfer of resources for oral health up to 2010, followed by stabilization[22]. Another study investigating oral health care coverage across Brazil's regions showed that expansion of coverage during the period 2001-2013 was lowest in the Southeast[23].

All indicators in the effectiveness subdimension except for congenital syphilis showed favorable APC, with the highest reductions being found in rates of hospitalization for asthma, stroke and ARI. Hospitalization rates for these conditions, which are on Brazilian List of Hospitalizations due to Ambulatory Care Sensitive Conditions[24], have been shown to decrease with improving PHC quality. The percentage of hospitalizations for ambulatory care sensitive conditions decreased throughout the study period.

Chart 2. Synthesis of the results by dimension and subdimension, showing mean trends during the period, presence of joinpoints, and trend in each segment from the joinpoint.

Dimension	Subdimension	Indicator	Mean trend over the period 2010-2019 *	Joinpoint	Trend in each segment*
Service performance	Access	PHC coverage	Upward	In 2016	Upward/stable
		Estimated oral health teams population coverage	Downward	No	
	Effectiveness	Hospitalization rate for asthma among children aged under 10	Downward	No	
		Hospitalization rate for strokes among people aged 30-59	Downward	In 2013	Downward/stable
		Hospitalization rate for ARI among children aged under 5	Downward	In 2015	Downward/stable
		Infant mortality rate	Downward	No	
		Neonatal mortality rate	Downward	No	
		Postneonatal mortality rate	Downward	No	
		Proportion of babies born to teenage mothers (<20 years)	Downward	In 2014	Stable/downward
		Proportion of babies born with low birth weight	Stable	No	
		Rate of congenital syphilis	Upward	In 2015	Upward/stable
		Rate of syphilis detection in pregnant women	Upward	In 2017	Upward/stable
		Percentage of hospitalizations for ambulatory care sensitive conditions	Downward	No	
	Adequacy	Cesarian section rate overall deliveries	Downward	In 2013	Stable/downward
		Cesarean section rate on the SUS	Upward	In 2012	Stable/upward
		Percentage of newborns whose mothers made at least seven antenatal visits	Stable	In 2013	Stable/stable
		Pap testing rate among women aged 25-64 years	Downward	No	
		Mammography screening rate among women aged 50-69 years	Stable	In 2012	Stable/stable
Determinants of health	Socioeconomic and demographic	Proportion of older people in the overall population	Upward	In 2015	Upward/upward
		GDP per capita	Downward	In 2014	Upward/downward
		Percentage of the population with private health insurance	Downward	In 2013	Stable/downward
Health system	Funding	*Total health expenditure per capita*	Upward	In 2014	Upward/stable
		Expenditure on health as a percentage of total government expenditure	Upward	In 2016	Upward/downward

* Statistically significant variation.

Source: Authors.

This may be explained by increased coverage of PHC and the FHS. In this respect, ecological studies have reported an association between increased FHS coverage and a decrease in hospitalizations and mortality due to ambulatory care sensitive conditions[25-28].

Although the considerable increase in syphilis detection in pregnant women indicates ad-

equate screening among pregnant women, the upward trend in the rate of congenital syphilis, with an APC of 25% between 2010 and 2015, is worrying[29], indicating persistent flaws in antenatal care and treatment of the disease during pregnancy. A study investigating trends in mean congenital syphilis rates in Brazil between 2010 and 2015 observed rising rates over the period and a correlation between congenital syphilis and screening for maternal syphilis and infant death, miscarriage and stillbirth rates, suggesting gaps in basic health care for pregnant women[30].

The indicators of adequacy of care reveal little progress and that some backward steps were taken. The high cesarean section rate in the SUS and deliveries performed in the private sector reveal a care model that favors the interests of professionals and parturient women, often resulting in unnecessary interventions during labor and child birth[31]. Despite the measures proposed by the *Rede Cegonha* (Stork Network)[32] to improve labor and childbirth care on the SUS, the results obtained were unsatisfactory, suggesting gaps in the quality of PHC services.

Also regarding indicators of adequacy, the percentage of newborns whose mothers made at least seven antenatal visits oscillated between 75% and 80%, showing a slight increase during the period 2013-2019. However, this result was not statistically significant throughout the whole period. In a nationwide study conducted with PHC patients in 2012 and 2013, 89% of respondents reported having made at least six antenatal visits, with only 69% having access to all recommended tests, 60% receiving all recommended guidance, and 24% undertaking all physical examinations, thus raising questions about the quality of antenatal care[33]. A literature review of articles on antenatal care in Brazil reported an increase in coverage between 2005 and 2015, with variability in care quality, including not only the number of antenatal visits but also routine tests, health guidance and basic technical procedures[34].

Cervical and breast cancer screening are key prevention strategies aimed at reducing mortality due to these diseases. The related indicators in this study suggest low screening coverage, with a downward trend for cervical screening and stationary breast cancer screening rates. However, studies reveal a reduction in mortality from breast and cervical cancer in state capitals in the Southeast, due mainly to early diagnosis and treatment. This reduction was more pronounced for cervical cancer[35,36]. A study evaluating cervical and breast cancer screening in Brazil using data from the Surveillance of Risk and Protection Factors for Chronic Diseases by Telephone Survey (VIGITEL) for the period 2007-2017 found an upward trend in breast cancer screening rates and stabilization in cervical screening rates. Coverage of cervical and breast cancer screening in SPS was above 90% and 80%, respectively, in 2018[37]. It is important to note that the VIGITEL methodology consisted of phone interviews conducted with people living in state capitals. The difference in indicator values between the VIGITEL study and our study may be partially due to variations in calculation methodology – with the present study considering only screening performed on the SUS – and bias arising from phone interviews.

Our findings suggest the need to step up cervical cancer screening efforts in PHC services to increase the coverage of testing, which is generally performed in health centers. With regard to breast cancer, efforts need to be intensified to increase the referral of women to services that perform mammograms. In this respect, PHC services need to develop strategies to promote mammography screening among target women affiliated to family health teams and other PHC teams.

In the dimension determinants of health, the selected indicators reveal a trend towards population aging and consequently growing demand for related services and actions, such as the treatment of neoplastic and circulatory system diseases and neurological complications resulting from strokes. The so-called "demographic transition" and population aging give rise to changes in the morbidity and mortality profile[38] that need to be recognized to adapt public health policy to address the challenges of population aging[39].

In addition to population aging, declining GDP per capita and the reduction in the percentage of the population with private health insurance put increasing pressure on the SUS, and consequently PHC services.

It is important to highlight that there was an initial upward trend in both health expenditure per capita and expenditure on health as a percentage of total government expenditure. However, the joinpoints observed reveal a decline in funding in recent years against a backdrop of falling GDP per capita and increased demand for public health services, pointing to a potentially unfavorable scenario for the SUS and PHC. This is probably due to the influence of changes made during the same period, including the reorientation of primary care policy (review of the PNAB in 2017) and recent modifications to fund-

ing rules, especially Constitutional Amendment 95/2016.

In the dimension health system, the funding indicators were certainly impacted by the financial crisis that emerged in 2015. This inflection in health funding adds to the strain on the SUS and PHC services[40].

One of the limitations of this study is the fact that the data were not disaggregated by region or municipal characteristics, meaning that it was not possible to capture more pronounced trends in PHC performance in more homogeneous groups of municipalities.

Conclusion

In the last decade, national primary health care policy[4-6] has expanded coverage and improved access to health services. However, recent years have seen a reorientation of this policy[8,10]. In SPS, the expansion of PHC coverage up to 2016, followed by a period of stabilization reflect this shift in policy.

The indicators in the dimensions health system and determinants of health reveal important changes to the structure of the health system and health demands in the second half of the decade. The decline in health funding and economic slowdown (fall in GDP per capita) have potentially weakened the response of PHC to the challenges posed by population aging and the growing proportion of the population who depend exclusively on SUS.

Finally, the negative or stationary trends in indicators of adequacy of PHC and mother-to-child transmission of syphilis are worrying, pointing to persistent gaps in care quality. These gaps need to be addressed by the state's public health managers.

Collaborations

A Sala, CG Luppi, GA Wagner e N Carneiro Junior: substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; and drafting the work or reviewing it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. RVB Pinheiro Junior: drafting the work or reviewing it critically for important intellectual content; and final approval of the version to be published; and agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All authors: agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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