ORIGINAL PAPER

Analysis of basic health units construction in Brazil

Análise sobre construções de unidades básicas de saúde no Brasil

Análisis de las construcciones de unidades básicas de salud en Brasil

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ABSTRACT
This paper is about the analysis of expenditure on the construction of Basic Health Units (BHU) in Brazil from 2010 to 2018. Its aim is to verify the relationship between the construction of BHU and the financial source, whether it is the executive branch or parliamentary amendment. The numerical data were used together with descriptive statistics to examine the number of proposals for BHU construction, the amount paid, and the achievement of success or failure and cancellation. The study also analyzed the relation with population, area, MHDI, and per capita GDP of the municipality where the BHU was located. When exploring the type of allocated resource, the effectiveness of BHU implemented with resources from the governmental program is verified in comparison with proposals with resources via parliamentary amendment, presenting a success rate of 76.8% for the Ministry of Health's resources and 57.4% for buildings constructed with funds from parliamentary amendments. It was also possible to observe the effect of the economic crisis on the success rate.
Keywords: Health Centers; Primary Health Care; Investments in Health; Brazil.

RESUMO
Este trabalho trata da análise dos gastos com a construção de Unidades Básicas de Saúde (UBS) no Brasil, no período de 2010 a 2018, e tem o objetivo de verificar a relação entre a construção das UBS e a fonte de recurso próprio do Poder Executivo ou por emenda parlamentar. Os dados numéricos foram utilizados, juntamente com a estatística descritiva, para a análise da quantidade de propostas de construção de UBS, do montante pago e da obtenção, ou não, de sucesso em sua construção, ou de fracasso, com seu cancelamento. Avaliou-se, ainda, a relação com a população, a área, o IDHM e o PIB *per capita* do município onde estava localizada a obra. Ao explorar o tipo de recurso destinado, verifica-se a eficácia das UBS implementadas com recursos do programa do próprio governo em comparação às propostas com recursos por emenda parlamentar, com uma taxa de sucesso de 76,8% para recursos próprios do Ministério da Saúde (MS) e de 57,4% para construções finalizadas com recursos de emendas parlamentares. Observou-se, também, o efeito da crise econômica sobre a taxa de sucesso.
Palavras-chave: Centros de Saúde; Atenção Primária à Saúde; Investimentos em Saúde; Brasil.

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RESUMEN
El trabajo aborda el análisis de gastos con la construcción de Unidades Básicas de Salud (BHU) en Brasil, en el período de 2010 a 2018, y tiene como objetivo verificar la relación entre la construcción de BHU con la fuente del propio Ejecutivo o por enmienda parlamentaria. Los datos numéricos se utilizaron junto con la estadística descriptiva para examinar la cantidad de propuestas para la construcción de UBS, el monto pagado y si tuvieron éxito en su construcción o fracasaron con su cancelación. También se analizó la relación con la población, el área, el IDHM y el PIB per cápita del municipio donde se ubicó la obra. Al explorar el tipo de recurso asignado, se verifica la efectividad de las UBS implementadas con recursos del propio programa del gobierno en comparación con propuestas con recursos vía enmienda parlamentaria, con una tasa de éxito del 76,8% para recursos propios del Ministerio de Salud y 57,4% para edificios terminados con fondos de enmiendas parlamentarias. También fue posible observar el efecto de la crisis económica en la tasa de éxito.
Palabras-clave: Centros de Salud; Atención Primaria de Salud; Inversiones en Salud; Brasil.

1 Introduction

The Brazilian Unified Health System (SUS), provided for in the 1988 Federal Constitution (CF/88), seeks the population's universal access to the public health system with no requisite. Before the constitutional determination, the worker had to be included in the social security system in order to have access to public health care. This study focuses on the construction of Basic Health Units (BHU). The BHU is considered the entrance door to SUS, which according to the Ministry of Health aims at providing assistance to 80% of the population's health problems, with no need of referral to other services. The main characteristic of BHU is that care is provide closer to the population's place of residence, as to avoid the need to use transportation and the over load in other health care units. The care provided at a BHU is performed by teams of nurses, dentists, and health agents, most of them specialized in family and community medicine. The number of team members in each BHU differs according to its size.

The construction of a BHU should consider the demographic density of the region to be assisted, the performance and types of teams needed for the local assistance, the population's profile, and the health interventions and services to be performed. From 10,777 proposals of BHU to be built between 2010 and 2018 at the cost of R$ 3.2 billion, there were 6,401 concluded at the expenditure of R$ 2.354 billion. The remaining construction works have been or are being cancelled, an indicator of "failure" that totalizes 2,380 proposals.

According to Article 2 Subsection I of Decree nr. 9203/2017, that disposes on the governance policy of the federal public administration, agencies, and foundations, public governance is a set of mechanisms of leadership, strategy, and control in order to evaluate, give direction and monitor management, with the purpose of conducting public policies and providing services in the interest of society. In this sense, it is important to conduct a more detailed analysis of these constructions.

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Therefore, the following research question was formulated: which variables contribute to explain the success or failure of BHU construction in Brazil in recent years?

The choice of a BHU relates to it being the population's first access to health care. For the public administration, in accordance with the precepts of SUS, basic care – which has family health as priority strategy for its organization – presents as a fundament to enable the universal and continuous access to quality and resolutive health services, characterized as the preferential entrance door to the health care system[1].

This analysis was made using descriptive statistical data and BHU construction data; its aim was to point out whether the Brazilian public management allowed the constructions in a responsible way. Public governance highlights the need of planning and creating strategic management by the government, striving for efficiency and productivity of public goods or services, assisting in decision making about the quality of expenditure, and demonstrating wastage of public money due to lack of planning.

After this introduction, the paper presents five other sections. In the second section are presented the theoretical framework and the normative aspects of BHU that were the bases for the research and data analysis. Sections four and five present the outcomes and the discussion on data analysis. Finally, there are the final considerations.

2 Literature review

The concept of governance appeared initially with private firms. Governance arose with the aim of ensuring that the interests of each group are aligned towards the firm's success by means of monitoring, control and diffusion of information. The term governance appeared with the purpose of deepening the knowledge of the conditions that ensure an efficient State[2].

In Brazil, the good practices code appeared in the 1980s. These concepts were in the core of the discussion of the State's role in the post CF/88 context[3]. Public governance practices become more important with the privatization of public companies and market opening. Thus, international guidelines and principles were adopted in the adequacy of legislation, performance of regulatory agencies and elaboration of recommendation.

Governance in institutions comprises the rules in force and is defined as a set of norms used to determine who is eligible to make decisions in a given area, what actions are allowed or not, what rules will be applied, what procedures will be performed, and what compensations will be attributed to individuals[4].

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Governance concerns community self-organization and up to a point it releases from, but does not exclude, interventions of players of the market and the State. In this line of thought, governance is configured as the capacity of communities to become organized, in different places and moments, and manage a common good by means of conditions that make it more effective, efficient ad stable, therefore avoiding its scarcity[5].

Ostrom[4] proposes design principles characterized as a robust governance system that enables the exploitation of a good in a sustainable manner without violating the principles of justice and community possession. The author lists eight principles for the best governance of common goods: well-defined boundaries, coherence between the rules of appropriation and provision and the local conditions, collective decision arrangements, monitoring, gradual sanctions, conflict resolution mechanisms, recognition of minimal organization rights, and intersectoral alignment and articulation in management.

The public sector is presented as a non-interchangeable activity in the contemporary world, which makes a good governance a decisive factor for the efficient, efficacious and effective use of public resources, having as reference the generation of the society's common good[7]. Public governance arose to supply the need of transparency and the aspiration of citizens to be involved in the decision-making process. It is increasingly necessary that the public administration has a responsible management, with good practices of public governance, especially in scenarios of budgetary restrictions.

Governance practices in the public sector comprise essentially the mechanisms of leadership (recognition), strategy (plan), and control (monitoring) performed to evaluate, direct, and monitor management, in order to conduct public policies and services delivery of interest to the society[6]. For these mechanisms to function satisfactorily it is necessary that citizens assume a pro-active posture by requiring that their government and managers perform a good public governance[7], through accountability of what has been accomplished and the demonstration of its outcomes.

In the literature there is currently no theme on public governance applied to BHU construction policies. Recent research are related to the care delivered by BHU to the population, such as the health of the elderly, women, men, and children, diabetes, among others.

The values transferred to municipalities for the construction of BHU have been undergoing changes since 2009, as shown on Tables 1 and 2. The value base is the concept of size. The size is differentiated according to the physical size and the number of family health care teams that will work in the unity.

Table 1 – **Transfer values for the construction of BHU per size**

Year	Size	Value (in R$)
from 2009 to 2012	BHU I	200,000
	BHU II	400,000
from 2013 to 2016	BHU I	408,000
	BHU II	512,000
	BHU III	659,000
	BHU IV	773,000

Source: Ministry of Health.

It is noteworthy that in 2009 the transfer values were divided in only two sizes; but in latest change, in 2017, besides having four different sizes, it became also made according to the region of the country, as shown on Table 2.

Table 2 – **Transfer values for the construction of BHU per size and region**

Year	Size	Value (in R$)				
		North	Northeast	Southeast	South	Center-West
As from 2017	BHU I	726,000	663,000	750,000	746,000	725,000
	BHU II	814,000	743,000	841,000	836,000	813,000
	BHU III	1,012,000	924,000	1,045,000	1,040,000	1,011,000
	BHU IV	1,042,000	951,000	1,076,000	1,071,000	1,041,000

Source: Ministry of Health.

With the purpose of implementing public policies and delivering services of interest to the society for the assistance to riverside populations, the Ministry of Health launched in 2011 the Fluvial Basic Health Unit (FBHU), conducting the design of public policies in various areas with the adequacy to the place where they are necessary.

Eligible only for municipalities in the Brazilian Legal Amazon and the Pantanal of South Mato Grosso, the FBHU are boats that can carry work teams and are comprise setting, furniture and equipment necessary to provide assistance to riverside populations and dispersed communities whose access is made by fluvial way. It is an innovative model of public policy for health assistance to the population that is distributed in the riverside regions; it goes where people live, adapting health interventions and services to local realities and access hindrances. The costs are higher than that of BHU, with only one transfer value of R$ 1,889,450. Even though the investment for the construction of a FBHU is high, on the medium- and long-term there is a reduction of costs and of the number of urgency and emergency patients. However relevant, the construction of FBHU has not been included

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in the analysis of this research.

3 Methodology

The main data source of this research has been the Ministry of Health. Data included were the following in each proposal: localization, type of construction, proposal number, year of habilitation, type of resource (amendment resource, congressperson's name and political party), proposal status, proposal value, value and date of tranches, date of construction work start and date of construction work conclusion. Other data obtained were: approved values, transferred values, construction work stage, and situation of execution. The Ministry of Health forwarded a spreadsheet with data of 33,695 proposals, but only 10,777 referred to construction work. The remaining data referred to expansion or renovation. Other data obtained were population, area, per capita GDP, and Municipal Human Development Index (MHDI) of the municipality where the BHU was located, as shown on Table 3. With the creation of five municipalities after the 2010 Census, estimate data were used for 2013 for the municipalities of Paraíso das Águas/MS, Mojuí dos Campos/PA, Pescaria Brava/SC, Balneário Rincão/SC and Pinto Bandeira/RS.

Table 3 – **Data bases added to the analysis**

Data	Description	Year	Source
Area	Total area of the municipality in square kilometers	2010	IBGE
Population	Estimate population in latest Census	2010	IBGE
Per capita GDP	Gross Domestic Product per inhabitant - indicator that helps to measure the economic development degree of a country or region	2010	IBGE
MHDI	Municipal Human Development Index – comparative measure for the classification of municipalities per degree of human development	2010	Firjan

The analysis was delimited by the construction of BHU considering the value to be used for the construction work. The selection of the period seeks to reflect the policies adopted by different national administrations and respective economic policies.

The interpretation of numerical data used descriptive statistics aiming to identify the relationship between the data ensembles. The test of means was also used, having been adopted as acceptance criterion a level of significance of 5%. Logistic regression was used to determine the variables that influenced "success/failure" of BHU. For the calculation of logistic regression, the Forward LR method was used, taking into account the fact that there is no sedimented theory on this subject, i.e., the model only considers the independent variables that help to explain the behavior of the dependent

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variable. Twenty interactions were used for the calculation, sufficient for this type of case[8]. Given that the model is explicative, and not predictive, the option was not to divide in two groups (for the construction of the model and for the test).

The binary logistic regression calculated can be written in the following way:

Success = f(POPULATION, AREA, GDP, MHDI, RESOURCE TYPE, PROPOSAL VALUE)

Where:

Success – dependent binary variable, with the 8,781 BHU being classified as failure (those that were built and were not operating yet) and success (those that were built and were operating). This binary variable assumes value 1 when success occurs and assumes 0 when this does not occur; POPULATION – corresponds to the population of the municipality where the BHU is situated, according to IBGE estimate for 2010; AREA – refers to the municipality's size in square kilometers; GDP – corresponds to per capita GDP in R$ of each municipality in 2010, according to IBGE estimate; MHDI – municipal human development index, according to Firjan, also for 2010, with this index considering social variables (education and longevity) and income; RESOURCE TYPE – corresponds to a binary variable, with 1 for parliamentary amendment and 0 for program, and if the Legislative expresses the population's wish, there is a higher chance of success; PROPOSAL VALUE – defined in monetary unities and includes effectively paid values, as shown on Table 2.

Regarding the dependent variable, it should be stressed that the definition of success is quite broad, since it does not consider the social impact of the BHU, the effects on the population's health, and other variables of social effects. For the purpose of this study, the "success" cases were the concluded BHU. Among the analyzed cases, 2,380 BHU assumed value 0 and 6,400 assumed value 1. From the set of observations, the observation of the model was not calculated for one of them, due to the inexistence of MHDI data (Paraíso das Águas/MS).

4 Results

For the analysis of data on the 10,777 proposals of the period 2010 to 2018, it was used only data of the proposals presented as concluded, operative, canceled, and being canceled, totalizing 8,781 proposals, as shown on Table 4.

Table 4 – **Proposals in the period from 2010 to 2018**

Variable	Types of proposals	Quantity	Nominal value (in R$ million)
Success	Concluded	1,426	549

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	Operative	4,975	1,805
Failure	Canceled	1,438	131
	Being canceled	942	217
	Sum	**8,781**	**2,703**
	Expansion or renovation	1,996	505
	General total	10,777	3,209

Source: Based on data provided by the Ministry of Health.

The demonstration of the proposals per state/region shows that the Southeast region has the highest rate of failure. The analysis per state shows that in the Federal District, the Amazon, Rio de Janeiro, and Amapá the failure rate is higher than 50% in the period 2010-2018.

The updated value of "Cancelled" and "Being Canceled" proposals totalizes R$ 446 million, using the IPCA (Extended National Consumer Price Index) of the month of the tranche transfer to the municipality until December 31, 2018. According to the Ministry of Health's Ordinance nr 340, of March 4, 2013, which redefines the construction component of the Program of Basic Health Units Requalification, in the hypothesis of non-compliance with the deadline, the beneficiary state or Federal District shall return the transferred financial resources with due monetary correction. However, these values will not return to the originally destined action of construction in the health field, because they are inscribed in the remainder amount to be paid, which will be returned to the National Treasury. Cancelling can occur due to non-compliance with the deadline or by requirement from the municipality.

The tests with the model assumption showed the inexistence of multicollinearity. However, the linearity test resulted in negative results for Population, GDP and MHDI. To solve this problem, the binary logit was used with the Neperian logarithm of variables Population, GDP and MHDI, with the results presented on Table 5, in which the BHU habilitation year was also inserted.

Table 5 - **Results of the Binary Logit Model**

	B	Sign
Area	-0.0000084	0.0154989
Habilitation year	-0,0819909	0,0024560
Resource type	-0.7692740	0.0000000
NLPOP	-0.9599612	0.0000000
NLMHDI	4.3762745	0.0000002
NLVALUE	-0.8772907	0.0003478
NLGDP	-1.0441475	0.0000000
Constant	180.5241105	0.0007608

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Accuracy %	77.70
Hosmer and Lemeshow (sig)	0.000
R2 Nagelkerke	0.180

Source: Elaborated on IBM SPSS System - Version 25.

Since there has been no restriction for this model, the outcomes on Table 6 can be considered the final result. All variables showed significance at 5%. It was observed that the success of a BHU is inversely related to area, habilitation year, type of resource, population, and GDP. Thus, the greater the area, population, GDP, and value of the proposal, the smaller will be the chance of success. The MHDI has an important role, since there is a direct relation: the greater the MHDI, the greater will be the BHU conclusion rate.

5. Discussion of results

From the outcomes of the binary logistic regression, several additional data analyses were made, since some outcomes were contrary to common sense. This includes the population signal. As it has been previously detailed, the population variable was important to explain the success of the dependent variable. A test of means was performed to measure this influence. The successful BHU were located in towns with an average population of 104 thousand inhabitants, whereas the average population of cities with failure was 498 thousand inhabitants. The test of difference of two means resulted in a Student statistics of 18.4828, a significant value, which indicates that the two means are different. The same statistics testing was performed for Area ($t = 5.7231$), GDP ($t = 18.718$) and MHDI ($t = 17.2022$), and the outcomes indicated that municipalities with greater area, GDP, MHDI and population presented higher chances of failure, as shown on Table 6. The test of means was also performed for the proposal value. The outcome indicated that the failure proposals had greater values than those of success ($t = 16.8458$).

Table 6 – **Descriptive statistical analyses of verified mean variables**

	N	Mean	Deviation
Sample Total			
Population	8781	210781	903609
Area	8781	2427	6963
GDP	8781	13679	13256
MHDI	8780	0.6665	0.0814
Failure			
Population	2380	497558	1549315
Area	2380	3123	8856

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GDP	2380	17938	16468
MHDI	2380	0.6906	0.0865
Success			
Population	6401	104152	431193
Area	6401	2168	6092
GDP	6401	12095	11446
MHDI	6400	0.6575	0.0775

Source: Elaborated on IBM SPSS System – Version 25

Table 7 shows the outcomes per region of the statistical test, which makes evident that municipalities with greater area, GDP, MHDI, and population present higher chances of failure. When analyzing the means, it is verified that GDP is inversely proportional to success. The other variables did not show influence on the outcomes, as presented on Table 7.

Table 7 – **Comparison of the verified means per region**

	Success Means				Failure Means			
Region	**Population**	**MHDI**	**Area**	**GDP (R$ 1.00)**	**Population**	**MHDI**	**Area**	**GDP (R$ 1.00)**
Center-West	91,354.58	0.7030	4,160,14	17,996.35	711,808.56	0.7401	4,603.92	25,573.38
Northeast	95,383.68	0.6089	1,135.69	6,860.10	175,186.79	0.6285	981.78	9,420.81
North	69,590.42	0.6147	8,714.47	9,129.49	283,452.19	0.6202	13,844.59	12,934.94
Southeast	190,209.63	0.7204	729.80	18,267.38	839,093.72	0.7418	651.63	23,585.10
South	55,031.92	0.7304	618.50	18,768.32	230,881.83	0.7399	1,030.18	22,212.86
Overall Total	**104,151.97**	**0.6575**	**2,167.90**	**12,095.24**	**497,558.50**	**0.6906**	**3,123.29**	**17,937.83**

Source: Elaborated on IBM SPSS System – Version 25.

Another important factor verified refers to the type of resource used for the release of BHU construction, which can be program resource or parliamentary amendment. The program resource is performed by the government with the budget allocation for health, according to the demand of the region, the beneficiary population, and the necessary size. The parliamentary amendment resource, on the other hand, is analyzed by the technical team but the region's demand is not taken into consideration, only the technical feasibility of the construction. Through the Amendments System, the congressperson indicates the construction of a BHU in the municipality of his choice, with a mandatory character for its realization. The funds transferred by program resource obtained 76.8% of success and 23.2% of failure; whereas the amendment resources obtained 57.4% of success and

42.6% of failure. The data make evident that the parliamentary amendments, which have resources transferred through a congressperson's indication, present a high rate of failure.

The economic crisis that started in mid-2014 caused a severe economic recession, leading to a GDP decrease during two consecutive years. Figure 1 shows that the recession influenced the construction of BHU in the period 2010 to 2016, when the number of failures was higher than the number of successes. The revenue expectancy was lower and there was the increase of the payment of interests and amortization of the public debt, which resulted in a decrease of resources for other investments. In the analysis of the budget, action 8581 – Structuring of the Network of Basic Health Care Service, it is verified that there was a reduction of the investment liquidation in 2014 and 2015, as shown on Table 8.
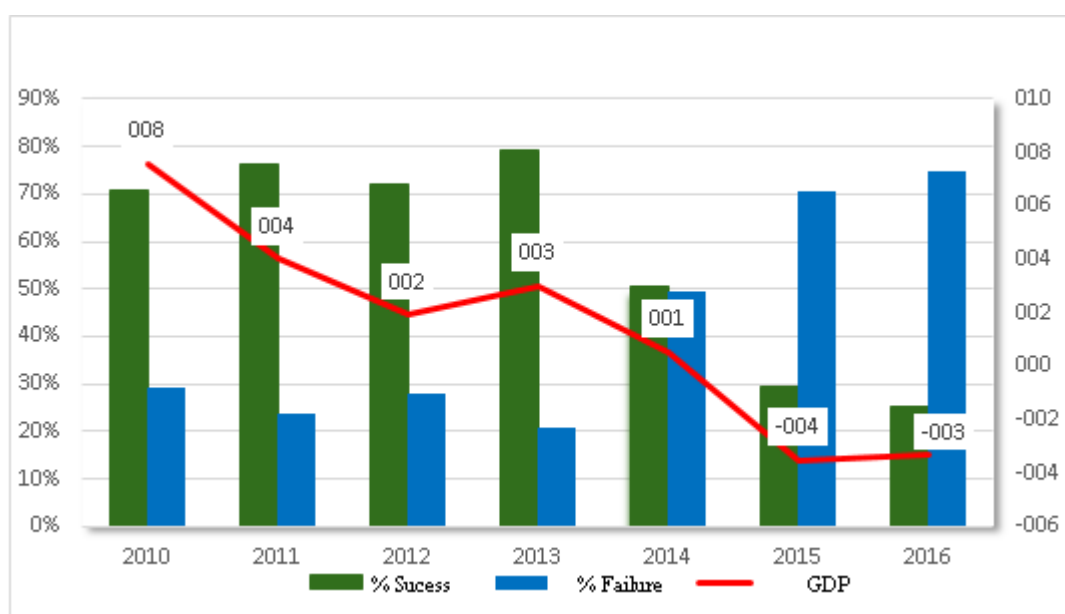

Figure 1. Performance of Success versus Failure per year and GDP Evolution (2010 a 2016).
Source: Data verified in the research and on IBGE website.

Table 8 - **Action 8581** - **Structuring of the Network of Basic Health Care Service** - **Investments**

Year	Initial allocation	Current allocation	Committed (A)	Liquidated	Paid (B)	(A)/(B)
2010	487,129,471	501,739,226	294,839,979	20,867,499	20,667,499	7.08
2011	237,356,206	488,741,064	376,185,071	48,814,762	48,664,762	12.98
2012	2,726,155,999	2,902,137,668	659,046,396	166,803,986	166,803,986	25.31
2013	1,223,065,614	1,242,442,614	505,492,268	102,300,371	102,300,371	20.24
2014	1,914,500,000	2,037,663,762	1,378,129,999	10,881,557	10,881,557	0.79
2015	2,008,570,385	2,026,014,023	688,529,954	33,232,299	33,232,299	4.83
2016	1,198,063,457	1,200,990,394	929,168,436	303,021,409	303,021,409	32.61
2017	1,252,102,372	1,501,845,724	1,291,883,543	13,187,063	13,187,063	1.2
2018	955,999,930	1,147,074,490	1,119,856,678	649,543,468	649,543,468	58.00

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Source: Elaborated with data from SIOP/SOF, November 2019.

The economic crisis in Brazil from 2014 to 2017 originated from a series of clashes between demand and supply, mostly caused by mistakes in economic policies that reduced the country's capacity of economic growth and generated high fiscal costs[9]. The rate of the potential production growth of the country's economy decreased from 4% per year to less than 2% per year. Simultaneously, the public sector abandoned a primary surplus of 2.2% in 2012 and generated a primary deficit of 2.7% in 2016.

Final considerations

In some regions in Brazil the first access to health care happens at the BHU. When the public administration, through health care policies, delivers the necessary service to the population in the region of residence there is a reduction in the incidence of diseases that imply higher demand of specialized care, since the interventions can be performed with greater effectivity and economicity. In this approach, there is the needed that governance occurs with a set of mechanisms of leadership, strategy, and control that aim to evaluate, direct, and monitor management for the implementation of public policies and the delivery of services in the interest of the society[7].

Therefore, in order that governance in the public sector complies with the basic principles of the right to public, comprehensive and quality health care, the way of selection for the construction of new BHU should take into account the quality of the decision-making process and its effectiveness, considering the legitimacy, equity, responsibility, efficiency, probity, transparency, and accountability, prioritizing the construction of programed BHU, after studies have been conducted on the technical and financial feasibility.

It becomes increasingly necessary that the Government conducts a responsible management with good practices of public governance. For this purpose, the public administration should analyze the profile of public expenditure on the construction of BHU and the variables associated to the success of the investment on this rubric, through the mensuration of the strategy and the criteria of prioritization in decision-making for the construction of new unities. It should also be considered whether the municipality will have the capacity to provide the equipment and hire the family health care team for the BHU operation.

The population should require from their government that studies are made on the needs of their region, in order to avoid the waste of taxpayer money resulting from the high rate of failure in the parliamentary amendments directed to the construction of BHU. Therefore, BHU should only start to

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be implemented after technical and financial feasibility studies are conducted by the Ministry of Health – regardless of the resource origin, whether it is by program or parliamentary amendments –, taking into account the health needs of the local population.

For future research, it is suggested to verify the demand for BHU expansion and renovation, since the demand for construction tends to decrease because investments made in recent years have consolidated the establishment of a basic structure. Another strategy would be to verify the number of BHU operating in rented premises and prioritize the construction of new BHU in these places.

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