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Evaluation of actions concerning systemic arterial hypertension in primary healthcare

ABSTRACT

OBJECTIVE: To evaluate the efficiency of the Family Health Strategy in actions related to hypertension.

METHODS: Evaluative, cross-sectional quantitative research based on secondary data of 66 small municipalities located in the state of Santa Catarina, Southern Brazil, with maximum potential coverage of 100% by the Family Health Strategy in 2007. Input indicators, products and results were evaluated. The municipalities' efficiency of services production and results production was compared through data envelopment analysis.

RESULTS: The municipalities were more efficient in services production (37.8%) than in results production (16.6%). Forty-one municipalities (62.2%) were inefficient in the services: enrolment in the Hypertension and Diabetes Information System, individual assistance and home visit for hypertensive users, and 55 (83.3%) were inefficient in the production of impact against hypertension.

CONCLUSIONS: The evaluation model used in this study proved to be capable of measuring efficiency in primary healthcare by evaluating the productivity of services and results.

DESCRIPTORS: Hypertension, prevention & control. Family Health Program. Health Services Evaluation. Primary Health Care. Cross-Sectional Studies.

INTRODUCTION

Public expenditure on health is increasing and is related to factors such as population aging, new health technologies, improvement in income levels, consolidation of the wellbeing state and universalization of sanitary coverage.[a] In these circumstances, the use of economic methodological instruments in the field of health is justified by the criterion of scarcity and by the difficulty in resources allocation.[16]

Data envelopment analysis (DEA), created in the 1980s, measures productive efficiency in the social area. It was developed to evaluate public programs in such a way that the organizations' financial aspect is not the only one that is considered. This tool is applied to studies on the productivity and technical

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[a] Ministério da Saúde. Secretaria-Executiva. Área de Economia da Saúde e Desenvolvimento. Avaliação econômica em saúde: desafios para gestão no Sistema Único de Saúde. Brasília (DF); 2008.

efficiency of productive units that employ multiple inputs to generate multiple products, and it enables to identify the best practices by means of empirical frontiers of linear programming.[6]

Since its implementation, Sistema Único de Saúde (SUS – National Health System) has dealt with lack of resources, given the adverse scenario from the economic point of view at the time it was created. Programa Saúde da Família (PSF – Family Health Program) emerged in light of the initial criticism of being a care program that had restrictive characteristics. However, its rapid expansion in the last years and its importance have transformed it in a conversion strategy of the primary healthcare model. The control and diagnosis of hypertension have been an attribution of the Family Health Program, have a character of priority action in the adult's health in its initial phase and have become a strategic action after the Pacto em Defesa da Vida (Pact for Life Defense), of 2005.[1] Systemic Arterial Hypertension (SAH) is a highly prevalent chronic non-communicable disease whose diagnosis and control are fundamental in the handling of serious diseases like congestive heart failure, cerebrovascular diseases, acute myocardial infarction, hypertensive nephropathy, peripheral vascular disease and hypertensive retinopathy.

Evaluation of the efficiency of SAH-related services, with the identification of strong points of action of reference municipalities, could represent an important management and planning tool. It would enable the improvement in the provided care by identifying municipalities and actions with efficient impact, thus subsidizing information on how to produce services and results with more efficiency. The present study aimed to evaluate the efficiency of Estratégia Saúde da Família (ESF – Family Health Strategy) in the actions related to hypertension.

METHODS

In the study, 66 small municipalities located in the state of Santa Catarina, Southern Brazil, were selected, whose model of Atenção Primária à Saúde (APS – Primary Healthcare) was ESF for the entire population.

Information on the above-mentioned municipalities referring to 2007 was collected in the databases of Sistema de Informação da Atenção Básica (SIAB – Primary Healthcare Information System), Sistema de Informação de Internação Hospitalar (Hospital Admission Information System), Cadastro Nacional de Estabelecimentos de Saúde (National Record of Healthcare Establishments), the population basis of Instituto Brasileiro de Geografia e Estatística (Brazilian Institute of Geography and Statistics), Sistema de Informação Orçamentária Pública em Saúde (Health Public Budget Information System), and Sistema de Informação sobre Hipertensão e Diabete (SISHIPERDIA – Hypertension and Diabetes Information System).

An evaluative model was constructed as recommended by Rabetti (2009).[b] The data were organized into SAH-related inputs and products in primary healthcare. Financial resources, material resources and workforce were considered inputs for services production, and actions for SAH control and diagnosis, as products. The generated services were transformed into inputs, and their product was the control of the immediate and mediate health conditions deriving from SAH (Figure 1).

The inputs were: financial resource (the total amount employed by the municipality to defray the cost of primary healthcare); material resource (weekly hours of occupation of offices destined to primary healthcare), and workforce (average weekly working hours of the Family Health teams per month).

Enrolment (number of enrolled individuals with SAH); individual assistance (number of SAH assistances performed by the ESF), and home visit (number of visits of community health agents to users with SAH) were the considered services.

The SAH-related services performed by ESF were classified as inputs in the stage of results production. The number of observed services was corrected to number of services projected for efficiency by the DEA tool, in order to maintain the relationship with the initial inputs.

A result indicator or rate was created that represented protection to cardiovascular (CV) outcomes. This rate was called rate of SAH-related hospitalizations potentially avoided by primary healthcare, calculated by the formula: rate = [(population between 20 and 65 years – number of hospitalizations due to SAH, Congestive Heart Failure and Cerebrovascular Diseases in individuals between 20 and 65 years): population between 20 and 65 years] * 10,000.

DEA was employed to construct empirical frontiers of productive efficiency, that is, a grouping of the best observed productivities, forming a set of units of maximum productivity, and no productive unit is above this limit. One of its greatest advantages is the identified efficiency, which is real and not calculated as a theoretical combination of the best that could be done in ideal conditions.[c]

[b] Rabetti AC. A eficiência das ações relacionadas à Hipertensão Arterial Sistêmica: uma avaliação na atenção básica em saúde nos municípios catarinenses [Master's dissertation]. Florianópolis: Universidade federal de Santa Catarina; 2009.
[c] Calvo MCM. Análise da eficiência produtiva de hospitais públicos e privados no Sistema Único de Saúde (SUS). In: Piola SF, Jorge EA. Prêmio em economia da saúde: 1º prêmio nacional, 2004: coletânea premiada. Brasília (DF): Instituto de Pesquisa Econômica Aplicada; 2005.
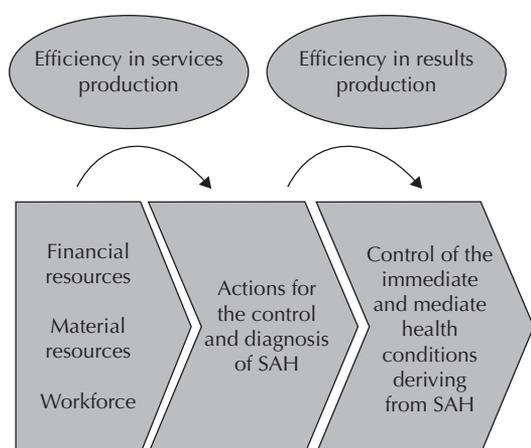
Figure 1. Theoretical model of efficiency in the production of services and results of actions related to systemic arterial hypertension (SAH) in primary healthcare. Santa Catarina, Southern Brazil, 2007.

In the DEA methods, the units of analysis are evaluated according to the utilization of inputs for the production of a certain amount of products. Weights are attributed to each input and to each product aiming at a more efficient relationship.

DEA was chosen due to the possibility of complex analyses for multiple inputs and multiple products; because it does not require predetermined existence of a mathematical model that relates inputs and products (the only maintained hypothesis is that the weighted sum of inputs and products of any municipality results in a "virtual municipality" of viable technology); because it compares units directly with their pair or with a combination of pairs; and because inputs and products can be expressed in different units (for example: number of employed teams and invested values in reais).[8]

DEA's main limitations are the measurement errors and the presence of outliers, which interfere in the formation of the frontier. Due to this, checking for the presence of influent observations and outliers is recommended.[8]

Restrictions were established to control for the municipalities' heterogeneity and to ensure they would be structurally comparable: same size ($\leq$ 10 thousand inhabitants) and same ESF coverage (100% of maximum potential coverage). To control for outliers, 37 municipalities (35.9%) were excluded due to lack of data or to measurement errors that could not be corrected. DEA was applied to the two productive stages by means of the program IDEAS®.[c] The variable scale model was used, in light of the hypothesis that variation in the municipality's size might interfere in the production scale of services and results. DEA was oriented to products, with the arrangement of invested inputs, which searched for the best productivity and increased the number of products.

The maximum productivities that were observed formed an empirical frontier of efficiency among Santa Catarina's small municipalities. Maximum productivity assumed a score equal to 1 and was classified as efficient; scores above 1 were categorized as inefficient.

By means of DEA, efficient productivity goals were calculated to the inefficient units and inefficiency for each product was evaluated.

RESULTS

Of the 66 municipalities, 25 (37.8%) were efficient in the production of services related to SAH and 41 were inefficient (62.2%).

The scores of the inefficient municipalities ranged from 1.06 to 2.09 (productivities 0.6 to 1.9 lower than the maximum productivity that was observed). The efficient municipalities with similar input arrangements were able to produce more services and became reference to the others.

Municipalities that were considered inefficient had more than one municipality as reference. Table 1 shows the benchmarks in services and the characteristics of their practices. The total of references was higher than the total of observations, because there were municipalities with more than one reference.

Five municipalities were reference only to themselves, i.e., the others did not obtain projections for their practices from their arrangements.

Of the municipalities, 41 were inefficient concerning the production of the three types of services: user enrolment, individual assistance and home visit (Table 2).

The greatest inefficiency was in user enrolment, measured by the record of users with SAH in SISHIPERDIA, with an average of 47.3% in the state. The number of enrolled users was incompatible with the other activities observed in some municipalities (Table 2). The municipality of Irani, the most inefficient one, had three enrolled users when it should have 312; however, it offered 7,623 individual consultations regarding this activity, and a little more than 10 thousand home visits, which suggests a specific deficiency in user enrolment.

The municipalities needed to expand production by 43.16% on average for individual assistance. The municipality of Paial had the highest inefficiency in individual assistance, having offered 48 consultations for users with SAH in one year. In order to become efficient, its productive goal was of 896 consultations/year, which would mean a 94.7% increase in this product. Inefficiency was lower in the other services (approximately 40%) for this municipality.

Table 1. Benchmark reference municipalities in the production of assistance services to systemic arterial hypertension performed by the Family Health Strategy, their inputs and products. Santa Catarina, Southern Brazil, 2007.

Municipalities	Number of times of reference	Consumed Inputs			Produced Services		
		Investment in primary healthcare (millions of reais)	Working hours of Family Health Teams(h/week)	Utilization of Offices for primary healthcare (h/week)	User Enrolment	Individual Assistance	Home Visits
Petrolândia	25	1,178.40	80	40	362	570	10,103
Serra Alta	15	1,300.00	40	40	491	547	4,737
Descanso	14	1,968.25	113	120	821	4,834	13,967
Bandeirante	11	1,365.64	37	40	280	225	4,988
Zortéa	11	271.55	40	40	123	3,283	3,076
Tunápolis	10	1,214.14	80	40	689	3,599	6,878
Major Gercino	9	1,037.98	37	120	133	5,254	4,310
Abdon Batista	8	1,001.41	33	40	252	275	3,978
Jaborá	6	605.83	80	120	648	1,147	6,779
Novo Horizonte	6	559.77	40	40	283	1,820	3,006
Quilombo	6	3,568.30	160	240	667	17,759	5,684
Cunhataí	5	1,035.30	27	40	101	3,466	3,064
São Pedro de Alcântara	5	1,392.86	63	240	448	5,502	6,684
Trombudo Central	5	1,638.81	80	40	227	7,799	7,825
Vargem Bonita	5	2,197.73	80	240	963	2,593	7,500
Águas Frias	3	1,154.12	40	40	386	2,136	3,900
Bom Retiro	3	1,685.64	120	240	1.072	670	11,592
São João do Oeste	3	1,518.50	80	80	732	1,723	8,789
Erval Velho	2	1,476.89	77	80	764	351	6,921
Rio dos Cedros	2	2,438.33	157	160	324	7,147	13,771
Alfredo Wagner	1	2,071.48	120	160	871	4,875	11,513
Imbuia	1	494.63	80	80	250	1,272	6,194
Jupiá	1	888.40	33	40	224	1,834	2,675
Luzerna	1	1,558.99	80	120	778	2,175	8,618
Nova Itaberaba	1	1,647.62	80	80	98	9,174	5,779

The lowest degree of inefficiency was observed for home visits. Santiago do Sul was the most inefficient municipality in home visits, with 998 visits and a goal to achieve efficiency of 3,414. The inefficiency of this municipality was equally distributed among the three services.

Considering results production, 11 municipalities (16.7%) were efficient concerning SAH care in primary healthcare; the other 55 (83.3%) were inefficient.

The efficiency frontier in results production was constituted of fewer municipalities than the services frontier. The scores of the inefficient municipalities were close to 1, which suggests that their maximum productivity was almost reached. The variation of the inefficient scores was of 1.000014 to 1.006635.

Of the 11 efficient municipalities in results production, nine (81.9%) became reference for other inefficient ones. Two (18.1%), despite being efficient, had no municipalities that could be projected for their practices (Table 3). The municipality of Jaborá was the one that most served as reference (36 municipalities can achieve its results without modifying their inputs). This benchmark presented two hospitalizations for the selected causes. Thus, 9,991 every 10 thousand people of the susceptible population were protected from CV outcomes, which indicates that the services developed by the ESF protected this part of the population. This rate applied to the susceptible population showed that there was the maximum protection that the service could obtain.

In the inefficient municipalities, on average, 18:10,000 adults were not protected from CV outcomes and were hospitalized due to avoidable causes that were sensitive to SAH-related primary healthcare (Table 4).

Table 2. Efficiency score, observed services, deficit and efficient production goals of services in systemic arterial hypertension for each inefficient municipality. Santa Catarina, Southern Brazil, 2007.

Municipality	Score	Enrolment				Individual Assistance				Home Visit			
		Goal	Observed	Deficit absolute	%	Goal	Observed	Deficit absolute	%	Goal	Observed	Deficit absolute	%
Calmon	2.90	598	206	392	65.5	2,050	682	1,368	66.7	9,022	3,109	5,913	65.5
Santiago do Sul	2.90	328	113	215	65.5	1,982	683	1,299	65.5	3,414	998	2,416	70.8
Palma Sola	2.49	668	92	576	86.2	3,408	1,274	2,134	62.6	12,675	5,092	7,583	59.8
Irati	2.29	151	25	126	83.4	4,109	1,794	2,315	56.3	4,565	1,993	2,572	56.3
Ibiam	2.12	212	100	112	52.9	2,307	1,086	1,221	52.9	4,838	2,277	2,561	52.9
Matos Costa	2.12	349	165	184	52.8	2,690	479	2,211	82.2	5,968	2,818	3,150	52.8
Santa Rosa de Lima	2.12	190	90	100	52.7	2,431	161	2,270	93.4	3,589	1,696	1,893	52.7
Timbó Grande	2.10	592	29	563	95.1	2,702	1,168	1,534	56.8	12,035	5,725	6,310	52.4
Modelo	1.95	484	248	236	48.8	1,603	291	1,312	81.8	8,554	4,379	4,175	48.8
Leoberto Leal	1.91	503	264	239	47.6	1,404	736	668	47.6	8,587	4,503	4,084	47.6
Paulo Lopes	1.86	821	357	464	56.5	4,834	1,481	3,353	69.4	13,967	7,519	6,448	46.2
Arvoredo	1.81	243	134	109	44.8	3,544	1,955	1,589	44.8	4,804	2,650	2,154	44.8
Paial	1.80	403	224	179	44.3	896	48	848	94.6	4,521	2,516	2,005	44.3
Treze Tílias	1.80	491	233	258	52.6	1,876	1,045	831	44.3	10,080	5,615	4,465	44.3
Bom Jesus do Oeste	1.78	243	136	107	43.9	1,858	1,042	816	43.9	4,719	2,646	2,073	43.9
Planalto Alegre	1.77	299	169	130	43.6	994	561	433	43.6	5,069	2,861	2,208	43.6
Marema	1.75	468	268	200	42.8	686	366	320	46.6	4,548	2,398	2,150	47.3
Lacerdópolis	1.70	470	277	193	41.0	678	334	344	50.7	4,559	2,132	2,427	53.2
Ermo	1.69	272	76	196	72.1	549	326	223	40.7	5,168	3,067	2,101	40.7
Xavantina	1.65	535	46	489	91.4	2,501	1,520	981	39.2	10,052	6,110	3,942	39.2
São Bernardino	1.64	250	135	115	46.0	684	136	548	80.1	4,633	2,826	1,807	39.0
Romelândia	1.57	343	215	128	37.3	490	286	204	41.7	8,923	5,678	3,245	36.4
Bom Jardim da Serra	1.50	536	357	179	33.4	1,017	677	340	33.4	7,420	4,940	2,480	33.4
Anchieta	1.47	377	122	255	67.7	726	494	232	32.0	10,100	6,873	3,227	32.0
Iraceminha	1.47	674	459	215	31.9	1,518	773	745	49.1	8,715	5,938	2,777	31.9
Painel	1.47	268	28	240	89.6	401	273	128	31.9	4,977	3,389	1,588	31.9
Alto Bela Vista	1.44	186	129	57	30.7	4,909	3,402	1,507	30.7	4,433	2,594	1,839	41.5
Bela Vista do Toldo	1.39	525	378	147	28.1	5,477	3,940	1,537	28.1	8,335	5,996	2,339	28.1
Tigrinhos	1.29	233	180	53	22.7	3,192	2,466	726	22.7	3,621	2,460	1,161	32.1
Treze de Maio	1.28	1,061	831	230	21.7	846	290	556	65.7	11,692	9,154	2,538	21.7
Belmonte	1.24	211	171	40	19.1	3,833	3,102	731	19.1	4,093	2,982	1,111	27.1

To be continued

Table 2 continuation

Municipality	Score	Enrolment				Individual Assistance				Home Visit			
		Goal	Observed	Deficit absolute	%	Goal	Observed	Deficit absolute	%	Goal	Observed	Deficit absolute	%
Guatambú	1.22	807	662	145	17.9	2,320	1,904	416	17.9	7,198	4,822	2,376	33.0
Sta T. do Progresso	1.21	241	117	124	51.4	958	793	165	17.3	4,845	4,009	836	17.3
Itá	1.17	786	671	115	14.7	8,720	7,441	1,279	14.7	7,109	6,066	1,043	14.7
Caibi	1.16	672	578	94	14.0	1,842	546	1,296	70.4	7,972	6,856	1,116	14.0
Vidal Ramos	1.13	673	596	77	11.4	3,345	1,321	2,024	60.5	6,700	5,613	1,087	16.2
Águas Mornas	1.11	390	7	383	98.2	849	763	86	10.2	10,098	9,070	1,028	10.2
Canelinha	1.09	484	445	39	8.0	6,236	5,738	498	8.0	9,403	8,652	751	8.0
Ipira	1.08	723	672	51	7.0	3,863	3,591	272	7.0	6,966	5,409	1,557	22.4
Irani	1.07	312	3	309	99.0	8,167	7,623	544	6.7	10,914	10,187	727	6.7
Antônio Carlos	1.06	904	855	49	54.0	3,456	2,297	1,159	33.5	13,181	12,466	715	5.4
Mean	1.65				47.30				43.16				36.83
Minimum	1.06				5.43				6.66				5.43
Maximum	2.90				99.04				94.65				70.77

In Bom Jardim da Serra, the municipality that had the highest inefficiency in results production, the number of avoided hospitalizations might be increased by approximately 66 adults every 10,000. Considering its adult population, 15 people might have been protected and would not have been hospitalized due to SAH, congestive heart failure or cerebrovascular diseases. The value observed in this city was of 17 hospitalizations, when it could have reduced the number of hospitalizations to two to be efficient.

Of the 11 efficient municipalities in results production, nine (81.9%) were efficient also in the production of SAH care services with impact (p = 0.001) (Table 5).

DISCUSSION

The evaluation model developed in the present study proved to be capable of measuring efficiency in primary healthcare by evaluating the productivity of services and results.

The employed methodology can be a useful tool for municipal managers concerning the reorientation of primary healthcare in the search for efficiency. It enables to identify types of underused resources, the increase in services that might occur with the utilized resources and the potential of avoidable hospitalizations as a consequence of SAH.

The selection of SAH-related hospitalizations due to causes that are sensitive to primary healthcare and their transformation into potentially avoidable hospitalizations in the susceptible population resulted in the creation of the rate of potentially avoided hospitalizations, a marker of the impact of primary healthcare. Its employment proved to be useful to evaluate the efficiency of results.

The present study evaluates a level of care that has an extensive action spectrum, but it focuses on the set of services related to SAH control, which can be considered a limitation. Camargo Jr et al[4] state that evaluation can be restricted to certain conditions or pathologies considered "representative" of the responsibilities of the assistance system. Therefore, many studies on health systems, programs or services use these "tracers" as a way of evaluating the whole of a program.

Assistance to SAH is not exclusive of primary healthcare, but the best opportunities of action happen in this level of care. The hypertensive disease can be considered a "tracer" of Family Health, as it is a health condition that is prioritized in the adult health care and, although it is a specific disease, it is also characterized by the need of longitudinal care, which is characteristic of primary healthcare.[17]

When the productivity of this action was evaluated, no exclusive inputs for this health condition were found.

Table 3. Reference Municipalities for production of primary healthcare results related to systemic arterial hypertension and their inputs and products. Santa Catarina, Southern Brazil, 2007.

Municipality	Times of reference	Consumed Inputs			Product
		User enrolment	Individual Assistance	Home visit	Rate of avoided hospitalizations (per 10 thousand)
Jaborá	37	648	1,147	6,779	9,991.61
Jupiá	32	224	1,834	2,675	9,991.57
Quilombo	32	667	17,759	5,684	9,994.72
Belmonte	12	211	3,833	4,093	9,991.68
Petrolândia	11	362	570	10,103	9,988.04
Serra Alta	10	491	547	4,737	9,988.21
Abdon Batista	8	252	275	3,978	9,972.09
Cunhataí	7	101	3,466	3,064	9,990.30
Santa Terezinha do Progresso	5	241	958	4,845	9,981.38
Bandeirante	1	280	225	4,988	9,961.09
Nova Itaberaba	1	98	9,174	5,779	9,983.82

The municipality is considered inefficient concerning a specific action and not the action of the ESF as a whole, as the inputs are shared for all actions executed in this level of care.

Another restriction of the study regards the utilization of secondary data. The utilization of data from the Sistemas de Informações em Saúde (SIS – Health Information Systems) should be made with caution and critical analysis, as the risk of under-recording and the low quality of the data are well known.

Authors of baseline studies on primary healthcare disagree on the theme. Camargo Jr et al[4] analyzed three information systems and concluded that SIAB has adequate coverage and reliability and that these data should be used in order to value the information systems and to stimulate their use as monitoring and evaluation instruments. Fachini,[9] on the other hand, argues that the information provided by the SIS is fragmented, is not updated and its quality is low. According to Cordeiro et al,[7] data from SIAB are not valued by the team's nurse, a fact that may influence the quality of their collection, since these professionals are the supervisors of the Community Health Agents.[7] Although Brazil has not achieved total excellence in the quality of official data, the qualification of these data has advanced and their utilization contributes to this advance.

It was not possible to evaluate the efficiency of 37 municipalities due to undernotification or to measurement errors registered in the secondary databases. The qualification of the records, mainly concerning the enrolment of patients in SISHIPERDIA, may improve the evaluations of SAH care in primary healthcare.

The publications on health efficiency measurement concentrate on analyses of national health systems and hospital services. There are few studies on primary healthcare.

A review study carried out in 2000 on efficiency frontier studies in primary healthcare identified that such studies emerged after the decade of 1990 and concentrated on a few countries: England, Spain and the United States. There were few studies on primary healthcare when compared to efficiency studies in the health sector. Twenty-five publications on the theme were found, of which 21 used DEA as the efficiency measurement method. Among 12 Spanish studies, the majority used secondary data in the investigation.[14]

Puig-Junoy[14] (2000) criticizes the efficiency studies in primary healthcare that use only services indicators and do not evaluate their quality, which is shown by the results indicators. According to the author, only two works employed this type of indicator in Spain.[14]

In the present study, a result indicator was used, as the rate of prevention of hospitalizations due to causes that are sensitive to primary healthcare indicates the obtention of results, the quality of the assistance provided in individualized consultations and home visits, and the user's connection with the healthcare team.

In Brazil, there are few publications on efficiency in primary healthcare. In a study with inputs, products and results indicators in municipalities located in the state of Ceará, Northeastern Brazil, higher efficiency was observed in services than in results. In this study, all the executed primary healthcare activities were considered as services indicators and only child mortality and child hospitalization due to diarrhea were considered as results indicators.[d] This might cause the decrease in the number of efficient municipalities in results production. This same result was perceived in the present study,

Table 4. Inefficiency in the avoided hospitalizations rate, goal of reduction in cardiovascular outcomes, observed outcomes and deficit in protection to outcomes related to the control of systemic arterial hypertension in primary healthcare. Santa Catarina, Southern Brazil, 2007.

Municipality	Inefficiency in the avoided hospitalizations rate per 10 thousand	Susceptible adult population	Goal of reduction in CV outcomes (absolute figures)	Observed CV outcomes	Deficit in protection to CV outcomes in %
Bom Jardim da Serra	65.9	2,257	14.86	17	87.4
Xavantina	59.6	2,509	14.94	17	87.9
Alto Bela Vista	47.6	1,067	5.07	6	84.6
Novo Horizonte	43.3	1,546	6.69	8	83.7
Major Gercino	42.8	1,537	6.57	8	82.1
Alfredo Wagner	41.9	4,641	19.42	23	84.5
Bom Jesus do Oeste	41.0	1,215	4.97	6	82.9
Lacerdópolis	38.1	1,414	5.38	7	76.9
Tunápolis	31.2	2,554	7.97	10	79.7
Santa Rosa de Lima	31.2	1,252	3.90	5	78.1
São João do Oeste	30.2	3,118	9.41	12	78.5
Treze de Maio	27.8	4,227	11.73	16	73.3
Ermo	26.7	1,237	3.30	6	55.0
Palma Sola	26.0	4,125	10.71	14	76.5
Paial	24.4	1,122	2.73	4	68.4
Arvoredo	24.2	1,236	2.98	4	74.6
Vargem Bonita	23.5	2,532	5.94	8	74.3
Bela Vista do Toldo	23.1	3,258	7.51	10	75.1
Bom Retiro	22.7	4,731	10.74	16	67.2
Vidal Ramos	22.2	3,315	7.35	10	73.6
Planalto Alegre	21.9	1,382	3.03	5	60.6
Timbó Grande	20.3	3,870	7.85	11	71.4
Modelo	19.2	2,174	4.18	6	69.7
São Pedro de Alcântara	18.5	2,293	4.24	6	70.7
Irati	18.5	1,090	2.01	3	67.0
Leoberto Leal	18.0	1,897	3.40	5	68.1
Tigrinhos	17.8	1,150	2.04	3	68.2
Marema	17.6	1,378	2.42	4	60.7
Trombudo Central	17.5	3,507	6.12	9	68.0
Canelinha	17.0	5,703	9.71	14	69.4
Matos Costa	15.5	2,108	3.26	5	65.3
Iraceminha	14.6	2,185	3.18	5	63.6
Zortéa	13.6	1,734	2.36	4	59.0
Descanso	13.3	4,762	6.33	10	63.3
Anchieta	11.8	3,030	3.56	7	50.9
Rio dos Cedros	10.1	5,645	5.72	10	57.2
Ipira	8.0	3,151	2.51	5	50.3
São Bernardino	7.1	1,378	0.97	4	24.5
Calmon	7.0	1,964	1.38	3	46.0
Guatambú	7.0	2,645	1.83	4	46.0
Paulo Lopes	6.2	3,589	2.23	5	44.7
Luzerna	5.7	3,593	2.05	5	41.1
Águas Mornas	5.4	3,076	1.66	5	33.2

To be continued

Table 4 continuation

Municipality	Inefficiency in the avoided hospitalizations rate per 10 thousand	Susceptible adult population	Goal of reduction in CV outcomes (absolute figures)	Observed CV outcomes	Deficit in protection to CV outcomes in %
Caibi	4,2	3,219	1.33	4	33.5
Treze Tílias	4.0	3,253	1.29	4	32.4
Imbuia	3.3	2,975	0.99	5	19.8
Santiago do Sul	2.7	900	0.24	1	24.7
Painel	1.7	1,535	0.26	4	6.5
Erval Velho	1.6	2,397	0.38	6	6.5
Antônio Carlos	1.4	4,254	0.61	4	15.3
Irani	1.4	5,509	0.78	5	15.8
Romelândia	0.8	2,363	0.18	4	4.5
Ibiam	0.4	1,122	0.04	1	4.5
Águas Frias	0.3	1,159	0.03	1	3.5
Itá	0.1	4,219	0.05	3	2.0
Total		145,102	250,60	387	64,8

CV: Cardiovacular

although we considered here only the actions related to the specific health condition as services indicators.

The most efficient services production, without the consequent efficient results production, may be related to lack of quality in the services, which was also hypothesized by Trompieri Neto et al (2008).[d]

Varela et al[e] measured the efficiency of primary healthcare services of 599 municipalities of São Paulo, Southeastern Brazil. The authors used secondary data and verified a change in the score of services efficiency when they analyzed other non-controllable variables related to the population's characteristics, the scale of the healthcare establishments and the percentage of the municipalities' own resources invested in health. These factors were not analyzed in the present study, but a large part was controlled by size restrictions and integral coverage by the ESF. It is known that there are factors which are external to the selected indicators that influence services productivity and results productivity,[e] but they are unknown in the present study.

Evaluations of effectiveness predominate over efficiency in national and international evaluative research related to programs for control of cardiovascular diseases. These programs were evaluated in primary healthcare in the United States, Norway, Pakistan and Sweden. Although they are applied in different forms, all of them have the objective of reducing cardiovascular risk factors, including SAH.[10,11,13,18]

Table 5. Association between efficiency in service production and in impact production related to systemic arterial hypertension and performed by the Family Health Strategy in municipalities located in Santa Catarina. Santa Catarina, Southern Brazil, 2007.

Efficiency in service production	Efficiency in impact production					
	Yes		No		Total	
	n	%	n	%	n	%
Yes	9	36.0	16	64.0	25	37.9
No	2	4.9	39	95.1	41	62.1
Total	11	16.7	55	83.3	66	100.0

z = 3.28 (p=0.001)

In Brazil, studies on the theme also concentrate on the analysis of effectiveness. In one of them, 98% of adherence and impact of PSF of 57% regarding blood pressure control were observed, with a mean of 10.1, ± 3.9 consultations per year in the state of Bahia, Northeastern Brazil.[2] In São Paulo, effectiveness in one primary care unit (not related to the PSF) was of 44%, with two to four annual consultations.[15] One of the benchmarks in services production presented 1.6 individual consultations per year for its patients enrolled in SISHIPERDIA in Santa Catarina. Besides the individual consultations, approximately 27 home visits were performed per year. Petrolândia (Santa Catarina) obtained efficiency in the results based on these services.

Hospitalization rates due to Conditions that are Sensitive to Primary Healthcare (CSPH) are used as indicator of quality and resolution capacity of primary

[d] Trompieri Neto N, Lopes DAF, Barbosa MP, Holanda MC. Determinantes da Eficiência dos Gastos Públicos Municipais em Educação e Saúde: O Caso do Ceará. IV Encontro Economia do Ceará em Debate. Fortaleza; 2008.
[e] Varela PS, Martins GA, Favero LPL. Desempenho e Accountability dos Municípios Paulistas: uma Avaliação de Eficiência na Atenção Básica à Saúde. Anais do III ANPCONT - International Accounting Congress. São Paulo; 2009.

healthcare in many studies.[5,12] Among the inefficient municipalities, 387 hospitalizations were observed. To achieve efficiency in results, it would be necessary that 250.6 potentially avoidable hospitalizations had not occurred, that is, 64.8% could have been prevented in these municipalities, in case they had adopted the benchmarks' practices.

Bermúdez-Tamayoa et al[3] (2004) correlated the hospitalizations due to CSPH in hospitals of Granada, Spain, with type of care, distance from hospital and sociodemographic factors and they found differences in the hospitalization rates due to CSPH associated with the organization characteristics of primary healthcare, size of municipality and distance from hospital.[3] The inefficiency found in the present study was not subject to size or type of care, as the municipalities formed a homogeneous group that had the same size and type of primary healthcare (ESF). Distance from hospital was not analyzed. In the Spanish study,[4] this variable was related to the municipality's size and was an influent factor in the large municipalities, which were excluded from the present study. The hospitalization patterns can be influenced by other factors, such as the culture of use of services by the population, the admission policies in hospitals and the very quality of the provided services, which were also not evaluated.

The applied methodology enables the evaluation of avoidable costs, and it is possible to calculate the public expenditure on potentially avoidable hospitalizations in municipalities and estimate the wasted expenditure in Santa Catarina due to lack of efficiency in primary healthcare.

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