

Distribution of mammograms and mammography offering in relation to the parametric care of the Public Health Care System in Pernambuco

Maria Tatiane Alves da Silva ¹
Valdecir Barbosa da Silva Júnior ²
Jorgiana de Oliveira Mangueira ³
Garibaldi Dantas Gurgel Junior ⁴
Eliane Maria Medeiros Leal ⁵

¹⁻³ Universidade Federal de Pernambuco. Rua Alto do Reservatório, s.n. Bela Vista. Vitória de Santo Antão, PE, Brasil. CEP: 55.608-680.

E-mail: mtatianealves@hotmail.com

^{4,5} Instituto Aggeu Magalhães – Fundação Oswaldo Cruz/Pernambuco. Recife, PE, Brasil.

Abstract

Objective: to describe the distribution of available mammograms in the Sistema Único de Saúde (SUS) (Public Health Care System) and the mammography offering were carried out by this system, throughout the health regions in Pernambuco State, and compared them with the parametric care recommended by the Ministry of Health.

Methods: this is a descriptive cross-sectional study that used secondary mammograms data in December 2016 by the Cadastro Nacional de Estabelecimentos de Saúde (National Registry on Health Establishments); and about mammography performed at SUS in 2016 by the Sistema de Informação Ambulatorial (Ambulatory Information System). The parametric care document No. 1.631/2015 was used as a comparability standard in relation to the distribution of the equipment and the mammography offering.

Results: Pernambuco State presented approximately the double amount of mammograms and mammography was performed about 46% below the recommended parameter used in this study. All the health regions presented sufficient quantity of mammograms. However, the use of the installed capacity was less than 50% in all the health regions in the state.

Conclusions: this study shows the need for a better use of the installed capacity for mammograms in Pernambuco State taken by the insufficient mammography offering and the poor distribution of the equipment in its territory.

Key words Mammography, Parameters, Breast neoplasm, Health Service Accessibilities



Introduction

Breast cancer is the main type of neoplasm in the Brazilian female population,^{1,2} representing a relevant public health problem.^{2,3} In 2014, breast cancer was accounted for 2.75% of female deaths, equivalent to 14,622 deaths.⁴ For 2016, 57,960 new cases were estimated in Brazil.⁵

The main strategies for previous detection of breast cancer are the early diagnosis in people with the first signs and/or symptoms of the disease and perform screening in asymptomatic women to identify suggestive lesions of neoplasia.¹

For screening, the main method is the mammography examination, the only exam that revealed to be effective for this purpose.^{2,6,7} Mammography is a breast x-ray and allows to detect lesions caused by neoplasia.²

In 2012, the Programa Nacional de Qualidade em Mamografia (National Program on Mammography Quality) was established in Brazil by the Ministry of Health, aimed to ensure the quality of the mammograms examinations offered to the population.⁸ The exams which presented low quality could mask the results, thus leading to an inadequate therapeutic conduct.²

The Brazilian Ministry of Health adopts mammography as a key exam for screening and controlling breast cancer. The Programa Nacional de Controle do Câncer de Mama (National Breast Cancer Control Program), established by the Instituto Nacional de Câncer (INCA) (National Cancer Institute), works on the perspective to boost a quantitative expansion and promote access of this program in all the regions in the country.¹

However, the lack of means to diagnose patients at home and/or nearby territories becomes an important barrier in guaranteeing access to perform preventive examinations. There are locations that have sufficient number of equipment, but fail in offering them, although providing individuals with better socioeconomic conditions a greater access for screening exams, such as mammography, for example.^{2,9}

The increase of breast cancer mortality in Brazil occurs due to the delay of the diagnosis at the right time and place. In several locations in the country, especially those that are the most remote and distant from the large urban centers, the lack of equipment result in the long distance displacement to perform the mammography. The association between the longest distance to the nearest mammogram and the lack in performing a prior mammography is already a reality in the Brazilian territory.¹⁰

The service for mammography offering, which needs the mammogram, should be available to the population in a regionalized manner,¹¹ thus facilitating women's access to the diagnostic services in a timely manner. The Ministry of Health has a document No. 1631/2015, on the criteria and parameters of actions and services in the *Sistema Único de Saúde* (SUS),¹² (Public Health Care System) to verify the adequacy of offering actions and services.

The use of the parametric care and the analysis on geographical distribution of mammograms allows to identify inequalities present in the access, making it possible to verify the equity in the allocation of the services. Therefore, this present study may provide information that subsidizes health planning and the formulation of public policies driven for breast cancer prevention.

Thus, the objective of this study was to describe the distribution of available mammograms for SUS and the mammography offering by this system, throughout the health regions in Pernambuco State and compared them with the parametric care recommended by the Ministry of Health.

Methods

This is a descriptive cross-sectional study using secondary data, in which the data were collected on the mammogram equipment in December 2016 at the *Cadastro Nacional de Estabelecimentos de Saúde* (CNES) (National Registry on Health Establishments) and the data on mammography performed at SUS in 2016 by the *Sistema de Informação Ambulatorial* (SIA) (Ambulatory Information System).

Pernambuco State is located in the Northeast region in the country and has an area of 98,076 km², divided into 185 cities with an estimation of 9,473,266 inhabitants in 2017.¹³ The *Plano Diretor de Regionalização* (PDR) (Regionalization Plan Director) in Pernambuco divides the state into twelve health regions with a host city for each region.¹⁴

For this study, the female population in the state was considered between the ages of 40 to 59 years old, about 1,126,469 women in 2016.¹⁵ This age group was used to be recommended to calculate the number of mammography and mammograms according to the document No. 1631/2015, which approves the parameters for planning and programming health actions and services at SUS.¹²

The study considered the following variables regarding mammograms:

- Existing and available mammograms at SUS;

- Geographic location;
- Type of management (state, city or state/city);
- Type of health establishment (outpatient and hospital).

Regarding to the use of mammograms, the need for mammography and mammograms, were calculated as the following indicators according to the document Nº. 1631/2015:¹²

Considering as the maximum productivity of the equipment to perform 6,758 tests per year:¹²

1. The capacity used of the equipment **(CUE) = PE / 6.758 * 100**

On:

ECU = the percentage of the capacity used of the equipment.

PE = productivity of the equipment, calculated by dividing the number of exams performed in the period by the amount of available equipment at SUS.

2. The necessity of Mammography /year **(NM/a) = D1 + D2 + R1 + Or**

On:

NM/year = A required number of mammography estimated per year.

D1 = 10% of the indication to diagnose mammography in women aged 40 to 49 years old.

D2 = 8.9% of the indication to diagnose women aged 50 to 59 years old.

R1 = 50% of the indication for screening women aged 50 to 59 years old.

Or = 10% of other indications on women aged 40 to 49 years old.

3. The necessity of Mammograms (Nm) = **(NM/a) /6.758**

On:

Nm = Required number of estimated mammograms.

NM/a = Necessity of mammography/year

The Tabnet platform from the Departamento de informática do SUS (DATASUS) (SUS IT department) of the Brazilian Ministry of Health is used for collecting data and mapping analysis and is available online and the *Instituto Brasileiro de Geografia e Estatística* (IBGE) (Brazilian Institute of Geography and Statistics) an online platform concentrates all the Brazilian population's data..

The analysis process was done through the Excel software, where the data were expressed in tables

considering descriptive statistics and described variables in absolute and relative frequencies. The data were systematized by health region using the PDR division.¹⁴

In this present study, the research with human beings' protection was guaranteed based on the *Resolução do Conselho Nacional de Saúde* (National Health Council Resolution) No. 466/2012.¹⁶ As the secondary data do not bring personal information and guarantee confidentiality the submission to the Ethics and Research Committee is not required.

Results

In December 2016, 195 mammograms were available in Pernambuco State, in which 113 were for SUS, equivalent to 58%. The spatial distribution of available mammograms for SUS according to the health region and cities is shown in Figure 1.

Among the 185 cities in the state, 147 (79%) did not have any mammogram available in each city; 19 (10%) cities had one mammogram available in each city; 5 (3%) cities had two mammograms in each city; 5 (3%) cities had three mammograms in each city; and 9 (5%) cities presented above three mammograms in each city..

In the VII, VIII, IX, X and XI health regions, only one city in each region had the mammography equipment; such regions concentrated approximately 15% of the population in the state and 18% of the mammograms.

The first health region concentrated approximately 46% of the population in the state and had 42% of mammograms. The second health region concentrated approximately 7% of the population in the state and 11% of mammograms. The III, IV, V, VI and XII health regions concentrated approximately 32% of the population in the state and 29% of the mammograms.

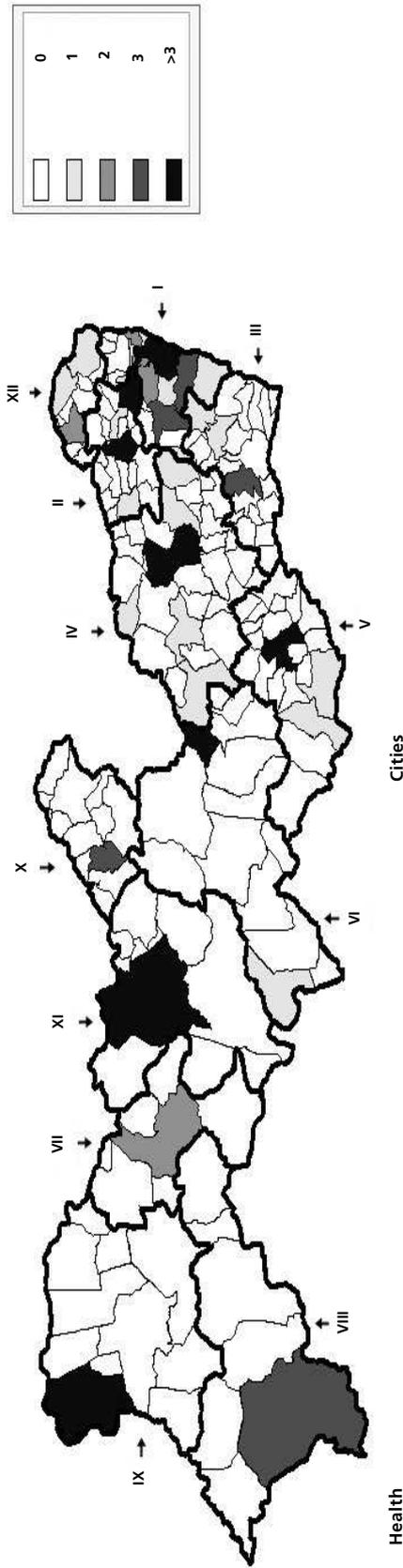
The distribution of available mammograms for SUS according to the type of management, health region and the type of establishment is shown in Table 1. In the three types of management (state, city and both), 78 (69%) of the mammograms were located in the outpatient clinic; and 35 (31%) mammograms in hospitals.

Mammograms were mostly concentrated in the management of the city with 53 (47%) mammograms; the management in the state concentrated 29 (26%) mammograms; and both managements concentrated 31 (27%) mammograms.

The capacity used on the mammography equipment available in SUS according to the health region is shown in Figure 2. No health region was able to

Figure 1

Spatial mammograms offering available to SUS according to the health regions and cities. Pernambuco, December 2016.



Health Regions

- I Abreu e Lima, Araçoiaba, Fernando de Noronha, Igarassu, Ilha de Itamaracá, Itapissuma, Olinda, Paulista, Recife, Camaragibe, Chã de Alegria, Chã Grande, Glória do Goitá, Pombos, São Lourenço da Mata, Vitória de Santo Antão, Cabo de Santo Agostinho, Ipojuca, Jaboatão dos Guararapes e Moreno.
- II Bom Jardim, Casinhas, Cumaru, Feira Nova, João Alfredo, Limoeiro, Machados, Orobó, Passira, Salgadinho, Surubim, Vertente do Lério, Buenos Aires, Carpina, Lagoa de Itaenga, Lagoa do Carro, Nazaré da Mata, Paudalho, Tracunhaém e Vicência.
- III Água Preta, Amaraji, Barreiros, Belém de Maria, Catende, Cortês, Escada, Gameleira, Jaqueira, Joaquim Nabuco, Lagoa dos Gatos, Marajá, Palmares, Primavera, Quipapá, Ribeirão, Rio Formoso, São Benedito do Sul, São José da Coroa Grande, Sirinhaém, Tamandaré e Xexéu.
- IV Agrestina, Altinho, Caruaru, Cupira, Ibirajuba, Jurema, Painéis, Riacho das Almas, São Caitano, Barra de Guabiraba, Bezerros, Bonito, Camocim de São Félix, Gravatá, Sairé, São Joaquim do Monte, Alagoinha, Belo Jardim, Cachoeirinha, Pesqueira, Poção, Sanharó, São Bento do Uma, Tacaimbó, Brejo da Madre de Deus, Frei Miguelinho, Jataúba, Santa Maria do Cambucá, Santa Cruz do Capibaribe, Taquaritinga do Norte, Toritama e Vertentes.
- V Águas Belas, Angelim, Bom Conselho, Brejão, Calçado, Caetés, Canhotinho, Capoeiras, Correntes, Garanhuns, Iati, Italva, Jucati, Jupi, Lagoa do Ouro, Lajedo, Palmeirina, Paranatama, Saloá, São João e Terezinha.
- VI Arcoverde, Buique, Custódia, Ibirimir, Manari, Pedra, Sertânia, Tupanatinga, Venturosa, Inajá, Jatobá, Petrolândia e Tacaratu.
- VII Belém de São Francisco, Cedro, Mirandiba, Salgueiro, Serrita, Terra Nova e Verdejante.
- VIII Afrânio, Cabrobó, Dormentes, Lagoa Grande, Orocó, Petrolina e Santa Maria da Boa Vista.
- IX Araripina, Bodocó, Exu, Granito, Ipubi, Ouricuri, Parnamirim, Santa Cruz, Santa Filomena, Trindade e Morelândia.
- X Afogados da Ingazeira, Brejinho, Carnaíba, Igaraci, Ingazeira, Itapetim, Quixaba, Solidão, Santa Terezinha, São José do Egito, Tabira e Tuparetama.
- XI Betânia, Calumbi, Caruaru, Flores, Floresta, Itacuruba, Santa Cruz da Baixa Verde, Serra Talhada e Triunfo.
- XII Aliança, Camutanga, Condado, Ferreiros, Goiana, Itambé, São Vicente Férrer, Itaquitinga, Macaparana e Timbaúba.

Source: *Cadastro Nacional de Estabelecimentos de Saúde*, 2016. (National Registry on Health Establishments)

Table 1

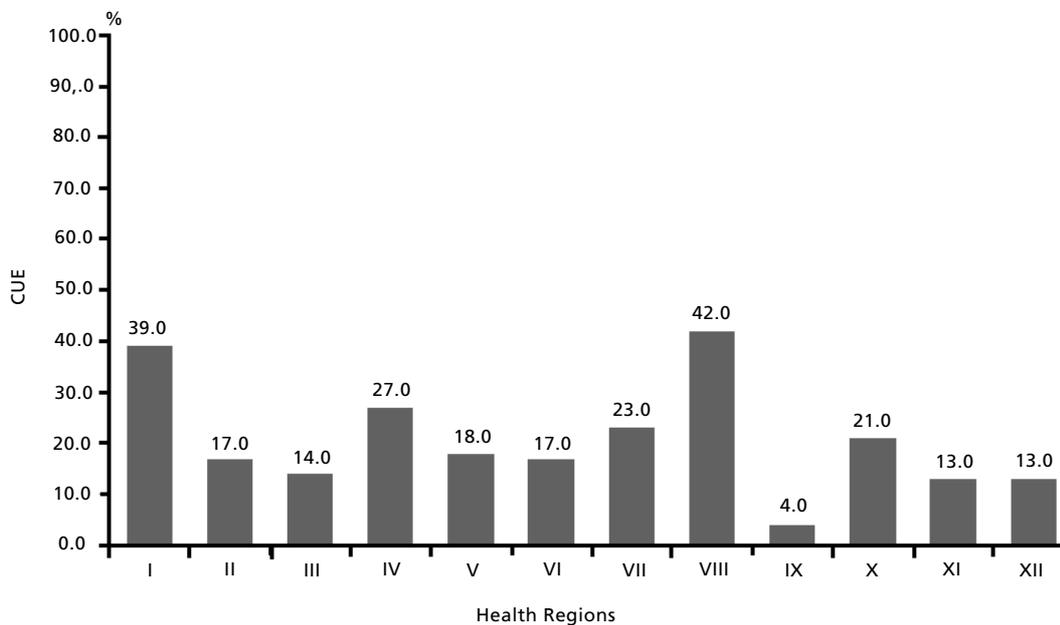
Mammograms offering available for SUS according to the type of management, health region and type of establishment. Pernambuco, December 2016.

Health Region	Both		State		Cities	
	Outpatient Care	Hospital	Outpatient Care	Hospital	Outpatient Care	Hospital
I	3	4	7	7	24	3
II	4	2	1	0	3	2
III	1	0	0	0	3	1
IV	2	2	1	2	2	1
V	1	1	0	2	2	1
VI	2	1	2	1	1	0
VII	0	0	2	0	0	0
VIII	0	0	0	2	1	0
IX	2	0	0	0	3	0
X	1	1	1	0	0	0
XI	2	2	1	0	2	0
XII	0	0	0	0	4	0
Total	18	13	15	14	45	8

Source: *Cadastro Nacional de Estabelecimentos de Saúde 2016* (National Registry on Health Establishments). SUS= *Sistema Único de Saúde* (Public Health Care System).

Figure 2

Capacity used of mammography equipment (CUE) available for SUS according to the health region, Pernambuco, Brazil, 2016.



Source: *Cadastro Nacional de Estabelecimentos de Saúde 2016* (National Registry on Health Establishments), *Sistema de Informação Ambulatorial – Ministério da Saúde 2016* (Outpatient Information System - Ministry of Health 2016).

CUE= *Capacidade Utilizada dos Equipamentos* (Capacity used of mammography equipment), SUS= *Sistema Único de Saúde* ((Public Health Care System).

Table 2

Distribution of mammography and mammograms offering available for SUS according to the health region and the necessity parameters, Pernambuco, Brazil, 2016.

Health Region	Mammography			Mammograms		
	Performed	Necessity	Performed/ Necessity Ratio	Available for SUS	Necessity	Available for SUS / Necessity Ratio
I	125.318	194.646	0.64	48	29	1.7
II	13.741	23.577	0.58	12	3	3.4
III	4.886	20.980	0.23	5	3	1.6
IV	18.072	50.321	0.36	10	7	1.3
V	8.733	19.793	0.44	7	3	2.4
VI	7.998	14.471	0.55	7	22	3.3
VII	3.170	5.005	0.63	2	1	2.7
VIII	8.535	15.974	0.53	3	2	1.3
IX	1.520	11.229	0.14	5	2	3.0
X	4.163	7.423	0.56	3	1	2.7
XI	6.230	8.556	0.73	7	1	5.5
XII	3.624	12.107	0.30	4	2	2.2
Total	205.990	384.081	0.54	113	57	2.0

Source: *Cadastro Nacional de Estabelecimentos de Saúde 2016*; (National Registry on Health Establishments) *Sistema de Informação Ambulatorial – Ministério da Saúde 2016* (Outpatient Information System - Ministry of Health).
SUS= *Sistema Único de Saúde* (Public Health Care System)

use 50% of the mammography capacity. The VIII health region had the highest capacity used, equivalent to approximately 42%. The IX health region presented the lowest capacity used, equivalent to approximately 4%.

The distribution of mammography and mammograms available for SUS according to the health region is shown in Table 2. In Pernambuco State, approximately 46% of the mammography performed was less than the amount required according to the parameters established by the Ministry of Health. The IX health region was lower than recommended, performing 86% less of the mammography. The XI health region was the one that mostly approached the need of mammography, performing 27% less of the mammograms.

Pernambuco State presented approximately twice as many mammograms as recommended. The XI health region was the one that presented more mammograms above the required amount, approximately 450% more. The IV and VIII health regions were the ones closest to the required number of mammograms, the amount was higher than the number suggested in the document.

Discussion

Screening for breast cancer through the access of mammography is an effective measure in the public health. In this regard, it is essential to identify the mammograms offering and the regional distribution of these equipment and the exams performed.² Despite the occurrence in the increased number of mammography performed in Brazil between 2003 and 2008, there are still many women who have never performed this exam due to the absence of the physician's request.¹⁷

There has been an observation in the increase of breast cancer incidence in developed countries, followed by a reduction in mortality, which is related to its early detection by performing screening mammography and a treatment in a timely manner. In Brazil, as the incidence and mortality of breast cancer have increased this situation may occur due to the delay in the diagnosis.⁷

Screening and early detection of breast cancer are attributed to the sphere of the city management of SUS and are performed at the *Atenção Primária à Saúde* (Primary Health Care) level, and the profes-

sionals are responsible for the active search of women between 40 and 59 years old to perform a mammography. However, in the cities there may be a deficiency of *Atenção Primária* (Primary Care) coverage, and thus, women living in uncovered areas are not located in the active search.^{1,2}

This study evidences that 79% of the cities in Pernambuco did not have mammograms, indicating that there is a concentration of equipment in certain locations. This may be the possibly of the main factors which makes it difficult to expand the access for mammography. Thus, there may be women who perform exams beyond the necessities and women who have never performed them. The inexistence of mammograms in the territory may indicate financial difficulties and/or offer an agreement with other neighbouring cities and in the state.

Of the total number of mammograms in Pernambuco State about half of them were available for SUS. As this was the case in Bahia State,¹⁸ in 2010 to 2012, in which an average of the mammograms were approximately 47% available for SUS. A study carried out in Rio de Janeiro² in 2015, showed that mammograms predominated in private institutions, as for only 26% was performed at SUS.

The percentage of the mammograms offering is close to the percentage of the population's distribution according to the health regions in Pernambuco State. Such evidence corroborates the data presented in Rio de Janeiro² in which the mammograms offering accompanied the population, even if it was not in an equitably matter. According to the study, the most populous cities held approximately 75% of the population and 59% of the mammograms available for SUS. A national study conducted in 2015,¹⁹ showed that there were 2,083 mammograms available for SUS in the country; of these, 4.5% were concentrated in the cities of São Paulo and Rio de Janeiro, the most populous states in the country.

The spatial offering of mammograms is not balanced in the state territory. While some regions are concentrated in a large portion of service offerings and others live far away from locations that offer mammograms. Therefore, it continues to bring coverage to the same amount of women but a lack of care for others.

A concentration of mammograms was observed mainly in first region where the state capital is located. Thus, as proven for Rio de Janeiro² state, the first metropolitan region - which locates the state capital - concentrated approximately 42% of the mammograms available for SUS and Goiás State²⁰ where the Central region concentrated approximately 36% of them.

According to the document N° 1631/201512 in Pernambuco State, no deficit was found in relation to the number of mammograms available for SUS. The State had twice as many mammograms beyond the necessity. A national study carried out in 2014⁷ also showed an excess of mammograms in Pernambuco State, as well as in the states of Espírito Santo, Santa Catarina, Minas Gerais, Paraná and Rio Grande do Sul. The surplus number of mammograms in relation to the parametric care characterizes a situation of over offering.²¹

In 2015, the 2,083 mammographs available for SUS throughout Brazil would be sufficient to perform approximately 14 million exams in a year. On the other hand, the need of mammography calculated by the ministerial parameters totalled in about 12.5 million exams, with an excess of offering 11.1%.¹⁹ In this regard, this study shows that Pernambuco State does not comply with this national trend of over offering of mammograms performed by SUS.

Although, Pernambuco State had more quantity of mammograms than the necessity in 2016, and it did not performed the necessary amount of mammograms and the incidence of breast cancer is still alarming. INCA estimated 2,550 new cases of the disease in the state in 2016. The most frequent disease in women in this state is cancer.²² In 2016, 3,479 people were hospitalized for breast cancer and in the period of 2011 to 2015, 3,248 people died of the disease in the state.²³

For document N° 1631/2015, the allocation of mammograms should consider the access of the users to perform mammography. For this purpose, the document proposes that the detachment time and the distance to perform the exam should not exceed of 60 minutes or 60 kilometers.¹²

This study shows that Pernambuco State does not follow this parameter as a whole, since some regions such as: VI, VII, VIII, IX, X and XI are distant from the cities where the health units are located with available mammograms and the cities where the patient's lives exceed the recommended distance and time. This creates a strong imbalance between the offering and the demand.

Although this study is not about access, it addresses aspects related in some way, since the mammography exam is effective in screening breast cancer. In this context, the distance is an important factor that exerts influence so that demand is met by offering the equipment. However, the access to health services has a multidimensional character that is related to issues such as acceptability of the users in the health system, contact with the health profes-

sionals, adequacy of the professionals for the provision in the health services, lack of information, transportation costs, socio-cultural e economic barriers, etc.^{24,25} This leads us to affirm that even if the equipment is available, this does not guarantee access, but without the availability of it there is no access any way.¹⁹

The capacity used on the mammography equipment did not reach 50% in all the health regions in the state, ranging from 4% to 42%. A national study carried out in 2016⁶ showed the relation between low mammography coverage for the population and the aspects related to socioeconomic conditions in the Regions and States can generate this difference, as well as the poor distribution of the equipment.

The national average use of the mammograms was below 50% of the installed capacity of the equipment. This low level of use points to possible problems that go beyond the geographical distribution of this equipment and this can happen with other exams such as computed tomography, as it was evidenced by a study conducted in Brazil in 2014.²⁶

The document No.1631/2015 considers the productivity of mammograms exams in a year of 6,758 exams. On the other hand, INCA considers the production capacity of a simple mammogram ideal at 80%, which is equivalent to 5,069 mammography, this is 3 exams per hour with an 8-hour working shifts for 22 working days in 12 months per equipment.^{7,10} However, in the present study, it was observed that the mammograms capacity used was lower than recommended by the document, as also it was observed in another study in 2010 in Brazil⁷ where the capacity used was 13% to perform mammography exams in an age group of women between 40 to 69 years old.

The city manager, ensuring the right for health to the inhabitants, should assume responsibilities in order to reduce risks, deaths and incidence of preventable diseases, such as breast cancer. Therefore, it is the city that has the duty to offer services to prevent diseases and injuries, as well as other important services in promoting and protecting the health.²⁷ The medical and hospital equipment acquisitions are the states and cities' responsibilities. In this study, most (47%) of the mammograms were under the city management and 69% in the outpatient setting. However, about 80% of the cities in the State did not have any equipment. This may reflect a current reality in which the cities are investing in their own diagnostic services for the population, but these are still concentrated, making the access difficult for the target population to perform the exam.²⁸

In many cities with areas of low demographic

density and economically disadvantaged, where there is no viability to install and maintain a conventional mammography screening services. In 2012, the Ministry of Health established a mobile mammography program by SUS (Document No 2304/2012), which objective to articulate actions that aimed to increase mammographic coverage in order to strengthen the regional development of collaborative care networks among the cities and states, in order to overcome these problems of a fixed allocation to perform mammograms in the cities.⁸

The criteria for allocating the equipment in territories in the State should comply with a process to agree with the actions between the city managers in capable of guaranteeing access and saving time in waiting for the early diagnosis. According to a study carried out in São Paulo²⁹ in 2014, the mean delay for a breast cancer diagnosis was 142.5 days (2.4 times greater than the recommended 60 days) and the delay of the mammography corresponded to 25% of this time. This reinforces the necessity to implement care in the breast cancer health care network as an example, an organized screening program to strengthen the regionalization process and criteria based on scientific evidence for mammograms offering.

Limiting aspects of this study should be considered. The great majority of the studies related to the analysis of parametric care and the real situation of the territories of offering equipment in the country are still considering the values of the prior document No.1001/2002. This made it difficult to evaluate equivalent comparability aspects of parameters, since the new document No. 1631/2015 of SUS parameters was considered, Another important point that cannot go unnoticed is the limitation of the CNES database. This information system is not always updated systematically by the federated entities, in addition to the limitations on the quality of information.² However, they are public data and are widely used to support necessary information for decision making.

The findings in this study show that the total number of mammograms in use in Pernambuco State available for SUS is sufficient to attend the target population, according to the parameters recommended for these equipment by the document No. 1631/2015. However, when considering the maximum distance of 60 km as a limit to reach the offering, there are health regions in the State where part of the population remains without mammography coverage. Nonetheless, in other health regions, the concentration of equipment is higher

than necessary, indicating a deficiency in the distribution of mammograms in the territory of the State.

The presence of most equipment under the city scope demonstrates the important investment of this government sphere on breast cancer prevention in the State, but they are still concentrated and without the necessary coverage.

The results of this study demonstrate that the coverage of access to mammography exams in Pernambuco State can be amplified through a reassessment of the population's necessity in the region *versus* the mammograms offering in the territory of the State, considering that the current disposition of the equipment in the State does not guarantee effectiveness and access to all users in an appropriate manner.

Measures that encourage health managers to plan actions and improve equipment distribution

processes based on the parameters care calculations by the document Nº. 1631/2015, can avoid wasting SUS resources, and improve and expand the possibility of geographical access for women to perform mammography exams and consequently to prevent breast cancer by reducing inequalities and boosting equity.

As this was a research using a secondary database, it was not possible to investigate the trajectory of each woman regarding the access to perform mammography exams. However, we possibly suggest that the same women should have easier access, independently which region they live in. The findings indicate that there may be flaws in screening and accessing the service. Thus, this study demonstrates the necessity for further investigation to answer this hypothesis.

References

1. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Instituto Nacional de Câncer. Programa Nacional de Controle do Câncer de Mama. [acesso em 10 abr 2017]. Disponível em http://www2.inca.gov.br/wps/wcm/connect/fad72d004eb684b68b379bf11fae00ee/pncc_mama.pdf?MOD=AJPERES
2. Villar VCFL, Souza CTV, Delamarque EV, Seta MH. Distribuição dos mamógrafos e dos exames mamográficos no estado do Rio de Janeiro, 2012 e 2013. *Epidemiol Serv Saúde*. 2015; 24(1): 105-14.
3. Batiston AP, Tamaki EM, Souza LA, Santos MLM. Conhecimento e prática sobre os fatores de risco para o câncer de mama entre mulheres de 40 a 69 anos. *Rev Bras Saúde Mater Infant*. 2011; 11(2): 163-71.
4. Brasil. Ministério da Saúde. Instituto Nacional de Câncer. Atlas de mortalidade por câncer. Vigilância do Câncer e fatores de risco. [acesso em 10 abr 2017]. Disponível em: <https://mortalidade.inca.gov.br/MortalidadeWeb/>
5. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Instituto Nacional de Câncer. Tipos de câncer. [acesso em: 10 abr 2017]. Disponível em: http://www2.inca.gov.br/wps/wcm/connect/tiposdecancer/site/home/mama/cancer_mama+
6. Xavier DR, Oliveira RAD, Matos VP, Viacava F, Carvalho CC. Cobertura de mamografias, alocação e uso de equipamentos nas Regiões de Saúde. *Saúde debate*. 2016; 40(110): 20-35.
7. Alves CS, Gomes MMF, Brasil LM. Disponibilidade de mamógrafos no Brasil: desempenho na produção de exames de mamografia de rastreamento. In: XXIV Congresso Brasileiro de Engenharia Biomédica – CBEB 2014. [acesso em 31 mar 2017]. Disponível em: http://www.canal6.com.br/cbeb/2014/artigos/cbeb2014_submission_108.pdf
8. Brasil. Ministério da Saúde. Portaria 2.898, de 28 de novembro de 2013. Institui o Programa Nacional de Qualidade em Mamografia (PNQM). *Diário Oficial da República Federativa do Brasil, Brasília (DF)*, 2012 mar 27; Seção 1:91 [acesso em 11 abr 2017]. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/gm/2013/prt2898_28_11_2013.html
9. Godinho ER, Koch HA. Rastreamento de câncer de mama: aspectos relacionados ao médico. *Radiol Bras*. 2004; 37(2): 91-9.
10. Renck DV, Barros F, Domingues MR, Gonzalez MC, Scowitz ML, Caputo EL, Gomes LM. Equidade no acesso ao rastreamento mamográfico do câncer de mama com intervenção de mamógrafo móvel no sul do Rio Grande do Sul, Brasil. *Cad Saúde Pública*. 2014; 30(1): 88-96.
11. Brasil. Presidência da República. Decreto nº 7.508, de 28 de junho de 2011. Regulamenta a Lei nº 8.080, 19 de setembro de 1990, para dispor sobre a organização do Sistema Único de Saúde - SUS, o planejamento da saúde, a assistência à saúde e a articulação interfederativa, e dá outras providências. Brasília, 28 jun 2011; 190º da Independência e 123º da República. [acesso em 11 abr 2017]. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2011/decreto/d7508.htm
12. Brasil. Ministério da Saúde. Aprova critérios e parâmetros para o planejamento e programação de ações e serviços de saúde no âmbito do SUS. Portaria nº 1.631, de 1º de outubro de 2015. [acesso em: 11 abr 2017]. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/gm/2015/prt1631_01_10_2015.html
13. Brasil. Instituto Brasileiro de Geografia e Estatística. Estados@. [acesso em 13 abr 2017]. Disponível em: <https://cidades.ibge.gov.br/brasil/pe/panorama>
14. Brasil. Secretaria de Saúde do Estado de Pernambuco. Plano Diretor de Regionalização 2011. [acesso em 13 abr 2017]. Disponível em: http://portal.saude.pe.gov.br/sites/portal.saude.pe.gov.br/files/pdrconass-versao_final1.doc_ao_conass_em_jan_2012.pdf

15. Brasil. Instituto Brasileiro de Geografia e Estatística. Projeção da população do Brasil e das Unidades da Federação. [acesso em 13 abr 2017]. Disponível em: <http://www.ibge.gov.br/apps/populacao/projecao/>
16. Brasil. Ministério da Saúde. Resolução nº 466, de 12 de dezembro de 2012. 2012. [acesso em 21 abr 2017]. Disponível em: http://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466_12_12_2012.html
17. Brasil. Instituto Brasileiro de Geografia e Estatística. Pesquisa nacional por amostra de domicílios: um panorama da saúde no Brasil, acesso e utilização dos serviços, condições de saúde e fatores de risco e proteção à saúde 2008. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2010. [acesso em 18 jul 2017]. Disponível em: http://www.ibge.gov.br/home/estatistica/populacao/panorama_saude_brasil_2003_2008/default.shtm
18. Abreu GRF, Silva SALS. Distribuição geográfica e acesso ao mamógrafo no estado da Bahia. *Rev Baiana Saúde Pública*. 2015; 39(1): 88-104.
19. Amaral P, Luz L, Cardoso F, Freitas R. Distribuição espacial de equipamentos de mamografia no Brasil. *Rev Bras Estud Urbanos Reg*. 2017; 19(2): 326-41.
20. Corrêa RS, Freitas-Junior R, Peixoto JE, Rodrigues DCN, Lemos MEF, Marins LAP, Silveira EA. Estimativa da cobertura mamográfica no Estado de Goiás, Brasil. *Cad Saúde Pública*. 2011; 27(9): 1757-67.
21. OPAS(Organização Pan-Americana da Saúde). Série Técnica do Projeto de Desenvolvimento de Sistemas e Serviços de Saúde/Organização Pan-Americana da Saúde, Brasília, 2002. [acesso em 10 ago 2017]. Disponível em: <http://sna.saude.gov.br/download/Projeto%20de%20Desenvolvimento%20de%20Sistema%20e%20Servicos%20de%20Saude.pdf>
22. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação de Prevenção e Vigilância. Estimativa 2016: incidência de câncer no Brasil. [acesso em 14 ago 2017]. Disponível em: <http://santacasadermatoazulay.com.br/wp-content/uploads/2017/06/estimativa-2016-v11.pdf>
23. Brasil. Ministério da Saúde. Departamento de Informática em Saúde. Sistema de informação ambulatorial (SIA), Brasília, 2017. [acesso em 24 de agosto de 2017]. Disponível em: <http://datasus.saude.gov.br/sistemas-e-aplicativos/ambulatoriais/sia>
24. Assis MMA, Jesus WLA. Acesso aos serviços de saúde: abordagens, conceitos, políticas e modelo de análise. *Ciênc Saúde Coletiva*. 2012; 17(11): 2865-75.
25. Viegas APB, Carmo RF, Da Luz ZMP. Fatores que influenciam o acesso aos serviços de saúde na visão de profissionais e usuários de uma unidade básica de referência. *Saúde Soc*. 2015. 24(1): 100-12.
26. Santos DL, Leite HJD, Rasella D, Silva SALS. Capacidade de produção e grau de utilização de tomógrafo computadorizado no Sistema Único de Saúde. *Cad Saúde Pública*. 2014; 30(6): 1293-304.
27. Brasil, Ministério da Saúde, Secretaria-Executiva. Departamento de Apoio à Descentralização. O SUS no seu município: garantindo saúde para todos. Brasília, DF. 2ed; 2009, 46p.
28. Amorim AS, Pinto JVL, Shimizu HE. O desafio da gestão de equipamentos médico-hospitalares no Sistema Único de Saúde. *Saúde debate*. 2015; 39(105): 350-62.
29. Traldi MC, Galvão P, Morais SS, Fonseca MRCC. Demora no diagnóstico de câncer de mama de mulheres atendidas no Sistema Público de Saúde. *Cad Saúde Coletiva*. 2016; 24(2): 185-91.

Received on September 20, 2017

Final version presented on June 13, 2018

Approved on August 20, 2018