RESEARCH ARTICLE

INEQUALITIES IN MAMMOGRAPHY IN BRAZIL: A NATIONAL ANALYSIS

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ABSTRACT

Background: Early diagnosis is the best way to reduce mortality and to improve the survival of women with breast cancer. In Brazil, there are few studies that provide detailed data on inequalities in the access of mammography. **Objective:** Investigate the inequalities associated with mammography in Brazil among women between 50 and 69 years of age. **Methods:** A cross-sectional study was carried out in Brazil. The outcome was access to mammography. The independent variables were: age, race/skin color, census region (urban/rural), macroregion, educational level, per capita income, coverage by health insurance and use of medical service in the last 12 months. Poisson regression was performed to test the association and calculate crude and adjusted models. **Results:** The prevalence of mammography was 54.2% (95%CI 53.1-55.3).The prevalence of non-mammographywas higher among women from the Northeast, living in a rural region, aged 60-69 years, with lower income and educational level and who did not have a health insurance. **Conclusions:** There are important inequalities in the access to mommagraphy in Brazil that need to be addressed by effective public policies.

INTRODUCTION

Annually the number of women diagnosed with breast cancer worldwide is around 1.5 million, accounting for 10.9% of all new cancers, approximately one quarter of all neoplasms in women (Ferlay *et al*., 2010a). Three hundred and thirty-two thousand new cases of breast cancer occurred in the European Union in 2008, and the American Cancer Society estimated that in 2010 there was around 207,090 new diagnoses of the disease in the United States (Ferlay *et al*., 2010b; Jemal *et al*., 2010). In Brazil, this is the most incident neoplasm in women (excluding non-melanoma skin tumors) and, for 2010 and 2011, 49,000 new cases were expected (Brasil, 2009). The estimate is that it is the third more common neoplasm when considered all cancers (Brasil, 2009). According to information reported by the Population-Based Cancer Registries it can be said that this was one of the most frequent cancer in the country (Brasil, 2014). Regarding the incidence rate in each region of Brazil the higher number of new cases per 100,000 women are found in the Southeast Region; South; Center-West; and Northeast (Brasil, 2014). It has been observed that in some high-income countries the incidence of breast cancer has increased, accompanied by a reduction in cancer mortality, which is associated with early detection through the introduction of screening mammography and the provision of adequate treatment. In other countries, increased incidence has been accompanied by increased mortality, which can be

attributed mainly to delayed diagnosis and to the establishment of appropriate therapy. Early diagnosis is the best way to reduce mortality and to improve the survival of women with this disease so far; and mammography is an imaging exam whose efficacy in reducing breast cancer mortality due to early diagnosis of the disease is already well demonstrated, especially in the 50-69 age group (Nelson *et al*., 2009). The real benefit of a screening strategy certainly depends on the target population's adherence to the program, which is not always adequate (Marchi and Gurgel, 2010); and political, lifestyle and socioeconomic aspects that guarantee access to exams and procedures (Hagoel *et al*., 1999; Coughlin *et al*., 2002). In Brazil, there are few studies that provide detailed data on factors related to mammography; however, the interest in this subject is increasing, with the recent inclusion of this topic in large national surveys. The objective of the present study is to investigate the inequalities associated with mammography in Brazil among women between 50 and 69 years of age.

MATERIALS AND METHODS

A cross-sectional study was carried out using secondary data from the National Survey of Household Sampling (PNAD) 2008. PNAD was carried out through a probabilistic sample of households through three stages (IBGE, 2010), municipalities, census tracts (PSU) and households.

The present study investigated the inequalities in mammography in Brazil. As a dependent variable, a breast exam was considered. This was obtained through the following question: "When was the last time you had a mammogram?". The independent variables considered for this study were: age, race/skin color, census region (urban/rural), macroregion, educational level, per capita income, coverage by health insurance and use of medical service in the last 12 months. The independent variables on educational level and per capita income were obtained through questions about the individual's years of study, and the income was obtained through questioning about the family per capita income. The independent variables about the location where the mammography was performed and health insurance coverage were obtained through the following questions: (1) "Was this last mammogram performed through SUS (public health system)?"; (2) "Was the last mammogram covered by health insurance?"; and (3) "Did you pay anything for the last mammogram you performed?" The independent variables on health service use were obtained as follows: "In the last 12 months, did you have a medical appointment?" and "Do you have health insurance?". The data were analyzed using Stata statistical software. The analyzes were performed by Brazilian regions in order to verify the different prevalences of the outcome and the factors associated to each of them. For this purpose, the svy command was used to calculate the prevalence and proportions taking into account the effect of complex samples and the sample weights. The chi-square test was performed to verify the existence of differences between the outcome and independent variables. Poisson regression was performed calculating crude and adjusted models.

RESULTS

Of the women interviewed - all aged 50-69 years (n = 32,582) - most lived in the urban region (86.2%), in the Southeast macro-region (34.0%), had between 50 and 59 years of age (61.3%) and was white (51.0%) (Table 1). The prevalence of mammography was 54.2% (95% CI 53.1-55.3). It was higher among women living in the southeast (63.8%), aged 50-59 years (58.3%), white (61.2%) and with higher income; and lower among Northern women (35.2%) (Table 1). The prevalence of mammography was also higher in women with higher levels of education, who used a health service in the previous months and who had a private health plan (Table 1). 54.2% of the women underwent the exam in the last year; 6.2%, between 1 and 2 years ago; 10.7% in the 2 to 3-year period and 28.9% underwent the last mammogram exam for more than 3 years. When stratified by age, it was found that the majority of the women who underwent the examination until 2 years ago were those in the age group between 50 and 59 years. The prevalence of non-mammography, according to the crude Poisson regression analysis, was higher among women from the Northeast, living in a rural region, aged 60-69 years, with lower income and educational level, who did not have a health insurance and who did not use health services in the last 12 months (Table 1). In the adjusted analysis all the variables remained statistically associated with the outcome (Table 1): in relation to the census region, non-mammography was 7% greater in the rural region; 11% greater in the Northeast region when compared with the Southeast region; 14% greater among the poorest; 11% greater among women with lower educational level; 22% greater among those who did not use the medical service in the last 12 months; and 12% greater among women who had no private health insurance (Table 2).

DISCUSSION

The present study showed that the percentage of women who underwent mammography was 58.3% in the age group of 50 to 59 years and 47.9% in the group, represented by women aged 60 to 69 years. These numbers represent an increase in the performance of the exam when compared to previous studies (Novaes *et al.* 2006; Lima-Costa and Matos, 2007); however, the number is still below the ideal (70% in both age groups, according to Healthy People 2010). Older women - between 60 and 69 years old - presented a prevalence of non-mammography 6% higher than those aged between 50 and 59 years. Although the Ministry of Health and INCA (Brasil, 2004a) recommend bi-annual mammography, 25.9% of the women between 50-59 years old and 33.6% of the women between 60-69 years of age have undergone the examination more than 3 years previous the research. In this study, the census region, the macroregion of residence, socioeconomic factors (income and educational level), age, race/color, have used medical service in the last year and have a private health insurance showed an association with the prevalence of the mammography examination. Women with lower per capita family income, who studied less than 4 years, had no private health insurance plan, and did not use a medical service last year performed fewer mammography exams.

Regarding the macroregions of the country, the prevalence rate of non-mammography was 11% between North and Southeast. In 2004, INCA published the Household Survey on Risk Behaviors and Reported Morbidity of Noncommunicable Diseases (Brasil, 2004b), which already showed a significant difference in the performance of mammography exams between Brazilian capitals. This document presents the results of a research carried out in 2002 and 2003 that addressed several health-related topics, including the sociodemographic characteristics of the residents of the homes and the access and use of Pap smears and mammography. Among the results, it was observed, for example, that the prevalence of mammography among women aged 50-69 years was 37% in Belém, Pará, and 70% in Porto Alegre, Rio Grande do Sul. According to Lima- Costa and Matos (2007), who used data from the PNAD 2003 to analyze the prevalence and factors associated with mammography in women aged 50-69 years, the number of mammograms performed in the North region was also significantly lower than in the other macro-regions of the country. Lima-Costa and Matos (2004) also reported a strong association between socioeconomic factors and mammography; according to the author, the increase in the number of years studied and in income is associated with higher chance or performing the exam, regarding other factors. The socioeconomic inequalities in the access to preventive exams were also evidenced by Novaes *et al.* (2006) when studying factors associated with performing the Pap smears and mammography by Brazilian women. In the present study, the prevalence ratio of non-mammography was 14% higher in the first quintile of income, compared to the richest one. Poorer women, therefore, have fewer exams. With regard to schooling, women who studied 4 years or less performed 11% less exams than those who studied 12 years or more. It is interesting to note how per capita income, schooling and health status are interconnected. Income distribution and poverty level affect health status; and, on the other hand, as health is one of the components of human capital, health status of individuals can have an impact on the distribution of income.

Table 1 –Sample description Brazil, 2008

	Sample		Prevalence of mammography
	n	(%)	% (CI$_{95\%}$)
All women	32,582	(100.0)	54.2 (53.1-55.3)
Region			
Urban	28,089	(86.2)	58.3 (57.3-59.3)
Rural	4,493	(13.8)	29.5 (27.3-31.7)
Macroregion			
North	3,041	(9.3)	35.2 (32.2-38.3)
Northeast	9,605	(29.5)	39.8 (37.6-42.0)
Southeast	11,085	(34.0)	63.8 (62.4-65.1)
South	5,620	(17.3)	55.1 (53.0-57.2)
Center-West	3,231	(9.9)	52.4(49.5-55.2)
Age group (years)			
50-59	19,957	(61.3)	58.3 (57.1-59.4)
60-69	12,625	(38.7)	47.9 (46.6-49.3)
Race/Color			
White	16,417	(51.0)	61.2 (60.0-62.3)
Brown	13,178	(40.9)	45.2 (43.8-46.6)
Black	2,618	(8.1)	48.5 (46.3-50.7)
Per capita income			
Quintile 1	6,679	(20.5)	33.2 (31.5-34.9)
Quintile 2	7,423	(22.8)	41.7 (40.1-43.3)
Quintile 3	5,419	(16.7)	52.3 (50.6-53.9)
Quintile 4	6,586	(20.3)	64.8 (63.4-66.2)
Quintile 5	6,406	(19.7)	78.5 (77.3-80.0)
Schooling (years)			
12 or more	3,671	(11.3)	82.3 (80.9-83.7)
9 a 11	5,514	(17.0)	71.1 (69.7-72.5)
5 a 8	5,816	(17.9)	60.5 (59.0-62.0)
4 or less	17,498	(53.8)	41.8 (40.5-43.2)
Medical appointment in the last 12 months			
Yes	27,679	(85.0)	60.1 (59.0-61.2)
No	4,903	(15.0)	21.1 (19.6-22.6)
Health insurance			
Yes	9,970	(30.6)	78.1 (77.1-79.2)
No	22,612	(69.4)	43.4 (42.2-44.6)

Table 2 . Crude and adjusted Poisson regression between on-mammography screening and exploratory variables Among women between 50 and 69 years of age Brazil, 2008

	Prevalenceratio$_{crude}$ (CI$_{95\%}$)	Prevalenceration $_{adjusted}$ (CI$_{95\%}$)
Region		
Urban	1,00	1,00
Rural	1,20 (1,19-1,22)	1,07 (1,06-1,08)
Macroregion		
North	1,21 (1,18-1,23)	1,11 (1,09-1,12)
Northeast	1,18 (1,16-1,20)	1,07 (1,05-1,08)
Southeast	1,00	1,00
South	1,06 (1,06-1,11)	1,05 (1,04-1,07)
Center-West	1,08 (1,06-1,11)	1,05 (1,04-1,07)
Age group (years)		
50-59	1,00	1,00
60-69	1,07 (1,06-1,08)	1,06 (1,05-1,07)
Race/Color		
White	1,00	1,00
Brown	1,11 (1,10-1,13)	1,02 (1,01-1,03)
Black	1,09 (1,07-1,11)	1,02 (1,00-1,04)
Per capita income		
Quintile 1	1,37 (1,35-1,39)	1,14 (1,12-1,16)
Quintile 2	1,30 (1,28-1,32)	1,11 (1,09-1,12)
Quintile 3	1,22 (1,20-1,23)	1,07 (1,06-1,09)
Quintile 4	1,11 (1,10-1,13)	1,03 (1,02-1,05)
Quintile 5	1,00	1,00
Schooling (years)		
12 or more	1,00	1,00
9 a 11	1,09 (1,08-1,11)	1,01 (1,00-1,03)
5 a 8	1,18 (1,17-1,20)	1,04 (1,03-1,06)
4 or less	1,34 (1,32-1,36)	1,11 (1,09-1,12)
Medical appointment in the last 12 months		
Yes	1,00	1,00
No	1,28 (1,27-1,30)	1,22 (1,11-1,13)
Health insurance		
Yes	1,00	1,00
No	1,28 (1,27-1,30)	1,12 (1,11-1,13)

Empirical evidence strongly suggests that education is the variable with the greatest explanatory power for Brazilian inequality; and states that if the goal is to understand the generation and reproduction of these inequalities, the focus should be on improving educational opportunities in the country. Two other factors had a strong association with non-mammography. First, mammography was 12% lower among those who did not have a private health insurance. This result reinforces the acknowledged lower access to this technology in the public health sector assistance routines. Second, among women who did not attend a medical visit in the last 12 months, the prevalence of mammograms performed was 22% lower. These results are similar to those found in previous studies (Novaes *et al*., 2006; Lima-Costa and Matos, 2007).

Conflict of Interest: The authors declare no conflict of interest

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