Utilization of Breast Cancer Screening in Brazil: An External Assessment of Primary Health Care Access and Quality Improvement Program

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Abstract—Breast cancer is the most frequent type of cancer in women and the second leading cause of cancer death after lung cancer in more developed countries and the leading cause of death in developing countries. The aim of this study was to analyze the association between three sets of variables and the utilization of breast cancer screening among women attending primary health care centers participating in the Primary Care Access and Quality Improvement Program in Brazil. A survey of 65,391 women was conducted across Brazil in 2012. The primary outcomes were percentage of women who never had a clinical breast examination and percentage of women who never had a mammography. Crude and adjusted analyses performed using Poisson regression assessed the association of these outcomes with service organization variables, as well as with socioeconomic and demographic variables. Results showed that 37.7% of women never had a clinical breast examination and 30.3% never had a mammography. Never having had both screening procedures decreased as the Human Development Index increased. Never having had a clinical breast examination increased with increasing population size and increasing municipal family health strategy coverage. The proportion of women never having had a clinical breast examination was highest in the northern region. White women and those who had a partner had greater utilization of screening. Women who had paid work and lived in families with higher per capita income had greater utilization of clinical breast...
examination. The proportion of women who never had a mammography was highest for women living in households with six or more people and receiving the Bolsa Família benefit. Women with lower per capita family income had higher utilization of mammography. Appropriate structures and work processes were associated with greater utilization of mammography. Investments in primary health care structure and teamwork processes are essential to improve the utilization of screening, prevention, and early diagnosis of breast cancer in Brazil.

BACKGROUND

Breast cancer accounts for close to 25% of all cancer cases diagnosed annually worldwide. It is the most frequent type of cancer in women and is the second leading cause of death after lung cancer in developed countries and the leading cause of death in developing countries, with mortality rates varying from six per 100,000 in East Asia to 20 per 100,000 in West Africa. It ranks as the first cancer type among women under 65 years of age (57%) compared to North and the Caribbean, where a greater proportion occurs in women under 65 years of age (57%) compared to North America (41%).

According to World Health Organization parameters, the estimated incidence of breast cancer in Brazil is up to 59.5 cases per 100,000 women of all ages and mortality is 14.3 cases per 100,000 women of all ages. International estimates indicate increasing breast cancer incidence trends and decreasing mortality trends, albeit at a slower pace. This decrease can be attributed to screening, principally the early detection of ductal carcinoma in situ, as well as progress with treatment achieved over time. In developed countries, breast cancer mortality decreased following the implementation of population-based screening programs.

The World Health Organization recommends that 70% of women aged 50 to 69 should have a mammogram every two years, which is considered effective coverage as long as the availability of diagnosis is linked to treatment and follow-up corresponding to the needs found.

The Consensus on Breast Cancer Control published by the Brazilian National Cancer Institute recommends that clinical breast examination should be part of comprehensive women’s health care and that it should be performed as part of clinical consultations regardless of age group. It is recommended that breasts be physically examined once a year in women aged 40 and over as part of breast cancer screening. Mammography should be performed annually (or at least every two years) in women aged 50 and over, to achieve an estimated reduction of 35% in mortality.

Studies indicate that mammography is the most effective screening tool for early diagnosis of breast cancer, because based on its results one can either opt for immediate diagnostic actions including biopsy to confirm breast cancer or recommend follow-up mammography or routine annual mammography. Slow-growing tumors can be identified by means of mammography at least two years before reaching a size that can be detected by feeling for lumps.

Brazilian breast and cervical cancer care management involves all levels of health care, with emphasis on prevention and early detection actions, which are concentrated in expanded primary health care services, as defined in the Operational Standards for Health Care. In this regard, the family health strategy (FHS) takes on a relevant role, because it is organized in a multiprofessional and interdisciplinary way, focusing on families and communities, incorporating health surveillance and comprehensive health care actions that are easily accessed by the population.

Brazil’s National Primary Health Care Access and Quality Improvement Program (Programa Nacional de Melhoria do Acesso e da Qualidade da Atenção Básica, PMAQ) was set up in 2011, focusing on changes to the various dimensions of the work process of primary health care teams. Such changes can be proposed by the teams themselves, health service managers and service users. PMAQ includes the following stages: adherence and contractualization, development, external evaluation, and recontractualization. This study is part of the PMAQ external evaluation, with particular emphasis on FHS services.

Despite the growing expansion of breast cancer screening and control coverage in Brazil caused by the extension of FHS, various studies still highlight lower coverage among women with heightened social vulnerability, principally in the country’s poorest regions. In the context of high breast cancer incidence and high mortality rates, the possibility of reducing social inequities in the utilization of screening performed in primary health care services in Brazil is an incentive for obtaining more knowledge, in particular in relation to the contribution of these services. The aim of this study was to analyze the association between three sets of variables—socioeconomic features of the local context, sociodemographic profiles of users, and basic health service organization (structure and work process)—and the utilization of breast cancer screening among women attending primary health care centers participating in the Primary Care Access and Quality Improvement Program. In our study, utilization refers to the percentage of women having a clinical breast examination during their lifetime and the percentage of women having a mammography during their lifetime.
METHODS

Study Sample
A survey was conducted during the first cycle of the external evaluation of primary health care centers (PHCs), with teams that had voluntarily adhered to PMAQ. By means of a census of service structure, 38,812 PHCs were evaluated that covered all Brazilian municipalities. Additionally, a study on work process and service users was performed in 13,843 PHCs where 17,202 primary health care teams were located that had adhered voluntarily to PMAQ in 3,965 municipalities (71.3% of Brazilian municipalities). Approximately four service users were randomly selected from each team, reaching 65,391 individuals interviewed in 17,202 primary health teams (Fig. 1).

Approximately 1000 interviewers and supervisors selected following training. The quality control strategy involved the supervision of the data collection process, the use of electronic validation, checking the consistency of each question, checking consistency between answers, and controlling the length of interview duration.

The survey instrument was composed of three modules: Module I: Health Center Observation, Module II: Interview with a Primary Care Team Health Professional and Verification of Documents at the Health Center, and Module III: Interviews at the Health Center with women health service users. In Module I, the interviewers characterized PHC structure by means of direct observation. In Module II, teamwork process was evaluated by interviewing a health professional with university-level qualifications from each health team. In Module III, interviews were performed with women attending the health center on the day of the external evaluation who had also used the services at least once during the year prior to the interview.

The conceptual model of our study defines three hierarchical levels, the first of which is the distal that brings together the determinants of greater contextual relevance. Characteristics of social context are located at this level, which synthesize historical patterns of living conditions of the population, access to wealth, social development, and public services infrastructure, especially the health services network and PHC in Brazil. At the second level are the demographic and social characteristics of the
population, identified among the women users of PHC services. At this level, we take into account that social inequalities are expressed in all levels of complexity of populations and territories. At the proximal level, the present model identifies the structure and process characteristics of PHC services, such as furniture, equipment, support materials, and work organization strategies for health actions, which vary widely throughout the country.9 The utilization of breast cancer screening, considered the outcome of this theoretical model, expresses the performance of PHC services. Considering the lack of utilization of clinical breast examination and mammography, we explained the utilization of care offered, including the monitoring of priority health actions among regular users of services (Figure 2).

Two outcomes were evaluated, considering the total number of women aged 40 to 69 years as denominator: (1) the proportion of women in the 40–69 age group interviewed at the PHCs who had never had a clinical breast examination and (2) the proportion of women who had never had a mammogram.

The independent variables cover characteristics of social context, individual characteristics, and characteristics of PHC structure and work process. The variables used to characterize the social context were the Human Development Index (HDI) with distribution by quartiles (up to 0.658; 0.659 to 0.750; 0.751 to 0.806; 0.807 to 0.819), municipal population size (up to 30,000; 30,001 to 100,000; 100,001 to 500,000; over 500,000 inhabitants), FHS coverage (up to 29.9%; 30% to 64.9%; 65% or over), and geographical region (north; north-east; midwest; southeast; south). HDI is a marker of municipal wealth and includes data regarding life expectancy at birth, education, per capita gross domestic product, varying from zero (no human development) to one (total human development) and categorized in quartiles.14 Municipal population size can be considered to be a marker of the status of available wealth and infrastructure.9 In this study, FHS coverage is taken as a proxy of the governance decision in favor of expanding primary health services capable of promoting greater equity in health care, favoring more vulnerable populations and territories.9

The individual variables were age in full years (40 to 49; 50 to 59; 60 to 69), self-reported race/skin color according to the categories used by the Brazilian Institute of Geography and Statistics (white; black; brown or mixed race; yellow; and indigenous), marital status (does not have a partner; has a partner), number of people in a domicile (1 to 3; 4 to 5; 6 or more), Bolsa Família benefit (no; yes); paid work (no; yes),
and per capita family income in quartiles (up to R$104; R$105 to R$188; R$189 to R$300; R$301 or over per month). Considering that the value of the commercial dollar for purchase on the reference date of October 31, 2012 (half of the fieldwork period), was 2.0308 Brazilian real, the aforementioned dollar reference values would be approximately up to 51 USD; 52 to 92 USD; 93 to 147 USD; 148 USD or over per month. The number of people in a domicile who were receiving Bolsa Família benefit and per capita family income were markers of the social status of the women health service users.

With regard to the appropriateness of the structure for performing screening actions, appropriate structure was considered to be the availability of the following three items: (1) appointment with a doctor, (2) appointment with a nurse, and (3) a clinical examination table; these are markers of minimum PHC conditions for providing care and clinical examinations to women health service users and referral for mammography. If there were only two of these items, this was considered to be semi-appropriate. If there was only one of the items, or none at all, this was considered to be inappropriate. Appropriate work process was considered to be the presence and use of all eight actions: (1) scheduled availability of breast cancer prevention and follow-up; (2) keeping a record of women health service users at greater risk referred to other care services; (3) availability of protocols providing guidance on prioritizing cases for referral; (4) availability of protocols defining treatment guidelines for breast cancer; (5) requesting mammography for women aged 50 to 69; (6) access to a central appointments office for referral of service users at greater risk to other care services; (7) use of dissemination/awareness-raising strategies regarding having breast examinations done by a health professional; and (8) availability of breast cancer health education and promotion actions aimed at women. Work processes mentioning six to seven of these team actions were classified as semi-appropriate, whereas five or fewer actions were classified as inappropriate.

Statistical Methods

Stata 13.0 (Timberlake, College Station, TX) was used for all data analysis. Frequency distributions of the categorical nominal and ordinal variables were undertaken. We carried out the description of the bivariate analysis between the outcomes and the contextual and individual variables and the variables of the characteristics of health services using the chi-square test for heterogeneity (nominal categorical and dichotomous variables) and linear trends (ordinal categorical variables). Poisson regression was then used for crude and adjusted analyses, with robust variance adjustment. The adjusted analysis adopted a hierarchical model including three levels: distal (municipal HDI, population size, FHS coverage, and geographical region), intermediate (age, race/skin color, marital status, number of people in a household, Bolsa Família benefit, paid work, and per capita income), and proximal (structure and teamwork process) directly involved with breast cancer screening (Figure 1). Backward regression was performed at each hierarchical level and all variables with a $P$ value $\leq 0.20$ were kept in the model. Associations were deemed to be statistically significant effects if their partial $P$ value in the linear model was $P < 0.05$.

In order to meet the objectives of this study, sample size was estimated using the following parameters: 80% power at alpha $= 0.05$, an unexposed: exposed ratio of 1:6, and outcome prevalence of 55% among the unexposed. In order to detect prevalence ratios of 1.1 upwards, we estimated that a sample of 5325 women was required to achieve 80% power. After adding 10% for losses and refusals and 15% for the control of confounding factors, the total required sample size was 6735 women.

There was little missing information for the variables studied, with the exception of per capita income (13.9%) and process adequacy (11.9%). However, the percentages of the missing data were close to 10%. Missing data for HDI, population size, FHS coverage, and geographical region variables accounted for 2% of the total. The age, marital status, Bolsa Família benefit, and paid work variables had no missing data (0%); there was 0.9% missing information for the skin color variable and 0.3% for number of people in a household. Missing information accounted for 2.5% of the structure adequacy variable. The missing data for the dependent variables were 8.5% for the variable lack of utilization of clinical breast examination and 1.4% for lack of utilization of mammography (data not shown). These missing data were not taken into consideration in our analyses, but the lowest $n$ found in the bivariate analyses was 16,585 women with regard to the crossing of the variables lack of utilization to breast clinical examination and family income. With this number, our sample reaches a power of 100% for the analyses.

Ethics

The PMAQ external evaluation project (composed of modules I, II, and III) was submitted to the Federal University of Pelotas Research Ethics Committee and approved (approval number 38/2012) on May 10, 2012. This study was also approved by the institutional review board at Harvard T. H. Chan School of Public Health (approval number 16–0470) on May 3, 2016.

Consent to Participation

Free and informed consent was obtained from all health service respondents.
RESULTS

The 21,059 women health service users aged 40 to 69 were divided between 17,202 health teams located in 13,843 primary health care centers; 62.3% of the health centers had only one health team (Figure 2). As shown in Table 1, there was a difference in the sample distribution between the country’s geographical regions; that is, it was highest in the southeast (41.0%) and lowest in the north (4.5%).

Around 46.0% of respondents lived in municipalities with a municipal HDI of up to 0.75, 60.5% lived in small- and medium-sized municipalities—that is, with up to 100,000 inhabitants; in addition, just over half lived in municipalities with FHS coverage of 65.0% or more and 73.0% lived in states in the northeast and southeast regions. With regard to demographic and socioeconomic characteristics, the majority were aged between 40 and 49 (37.9%), had brown skin color (44.2%), lived with a partner (67.4%), lived in a household with up to three people (54.4%), did not receive the Bolsa Família benefit (67.3%), did not have paid work (73.0%), and had a per capita income of more than R$189 (66.8%; Table 1).

With regard to health center characteristics, 90.6% of the women were interviewed in centers with adequate structure and 21.4% were interviewed in centers with adequate work processes (Table 1). Ninety-five percent of the women were interviewed in PHCs that had a clinical examination table; 91.5% had doctors’ appointments available and 95.5% had nurses’ appointments available. As to the work processes of the teams at the PHCs where the women were interviewed, at 74.7% of PHCs the team scheduled breast cancer prevention and follow-up services; at 46.6%, the team kept records of service users at greater risk referred to other services; 43.7% had protocols providing guidance on prioritizing cases needing referral; at 65.9% of PHCs the team had protocols defining breast cancer treatment guidelines; at 96.6% the primary care team requested mammography for women aged 50–69; 89.9% had a central appointments office available for referring service users at greater risk to other services; at 85.8% of PHCs the primary care team used dissemination/awareness-raising strategies regarding having breast examinations done by a health professional; and at 80.7% of PHCs the primary care team performed education and promotion actions regarding breast cancer (data not shown).

Of the total number of women in the study, 7249 (37.7%, 95% confidence interval [CI], 36.9; 38.3) reported not having had a clinical breast examination, and 6293 (30.3%, 95% CI, 29.6; 30.9) did not have a mammogram at least once during their lifetime. We found that a mammogram had been performed on 75.7% of women aged 50 to 59 and on 72.8% of women aged 60 to 69 (Figure 3).

In the bivariate and unadjusted analyses, a decreasing linear trend was found between never having had a clinical breast examination and mammography and increasing HDI ($P < 0.001$ for both examinations and analyses) and population size (bivariate $P = 0.020$ and $P < 0.001$; unadjusted $P < 0.001$ for both; Tables 1 and 2). FHS coverage was not associated with never having had a clinical breast examination ($P = 0.787$), but never having had a mammography increased in a linear manner as FHS coverage increased ($P < 0.001$). The highest prevalence rates of never having had a clinical breast examination ($P < 0.001$) and mammography ($P < 0.001$) occurred in the north, midwest, and northeast regions. Never having had both examinations was also greater among women in the 40 to 49 age group (bivariate $P = 0.006$ and $P < 0.001$, respectively; unadjusted $P < 0.001$ for both), who did not live with a partner (bivariate $P = 0.022$ and $P = 0.074$, respectively; unadjusted $P = 0.021$ and $P = 0.073$), living in a dwelling with six or more other people ($P < 0.001$ in both), who did not have paid work ($P < 0.001$ and $P = 0.015$), and who did not receive the Bolsa Família benefit ($P < 0.001$ for both). A decreasing linear trend of never having had both examinations was seen as per capita income increased ($P < 0.001$ for both). Never having had a clinical breast examination was greater among indigenous people and those with yellow skin color ($P < 0.001$), and never having had a mammography was greater among those with black and/or brown skin color ($P < 0.001$). Never having had a mammography was lower in health centers with an appropriate structure ($P < 0.001$) and an association was found between appropriate work processes at the PHCs and a lower percentage of women not having had a clinical breast examination and mammography ($P < 0.001$ for both; Tables 1 and 2).

In the adjusted analysis, women living in municipalities with HDI above 0.807 had 30% fewer women reporting not having had a clinical breast examination ($P < 0.001$) and 45% fewer women reporting not having had a mammography ($P < 0.001$). In Table 2, not having had a clinical breast examination increased in a linear manner in municipalities with larger populations ($P < 0.001$ for both). There was an association between not having had a mammography and municipality size ($P < 0.001$), decreasing from municipalities with less than 30,000 inhabitants to municipalities with 100,000 inhabitants, but municipalities with more than 500,000 inhabitants had the greatest percentage of women not having had this examination. FHS coverage was associated with not having both of these screening examinations ($P = 0.001$ and $P < 0.001$, respectively), and municipalities with FSH coverage 65.0% or over had the greatest percentage of women not having had both screening examinations.
| Variables                      | Sample Distribution | Never Having Had a Clinical Examination during Lifetime | Never Having Had a Mammography during Lifetime |
|-------------------------------|---------------------|-------------------------------------------------------|-----------------------------------------------|
|                               | N                  | %              | P Value | N                  | %              | P Value |
| Contextual characteristics    |                    |                |         |                    |                |         |
| Categorized HDI              |                    |                |         |                    |                |         |
| Up to 0.658                  | 4473               | 21.7           | <0.001* | 45.0               | 43.5–46.4      | <0.001* |
| 0.659–0.750                  | 4966               | 24.1           | 41.7    | (40.3–43.2)        | 35.8           | (34.4–37.1) |
| 0.751–0.806                  | 5421               | 26.3           | 34.9    | (33.5–36.2)        | 24.0           | (22.8–25.1) |
| 0.807–0.919                  | 5779               | 28.0           | 32.2    | (30.9–33.4)        | 19.8           | (18.8–20.8) |
| Population size              |                    |                |         |                    |                |         |
| Up to 30,000                 | 8256               | 40.0           | 37.0    | (35.9–38.1)        | 34.9           | (33.5–35.9) |
| 30,001–100,000               | 4236               | 20.5           | 39.7    | (38.1–41.2)        | 35.9           | (34.5–37.4) |
| 100,001–500,000              | 3802               | 18.4           | 37.2    | (35.6–38.8)        | 23.6           | (22.2–24.9) |
| 500,001 or over              | 4345               | 21.1           | 36.7    | (35.2–38.2)        | 21.5           | (20.2–22.7) |
| FHS coverage                 |                    |                |         |                    |                |         |
| Up to 30.0                   | 1731               | 8.4            | 37.8    | (35.4–40.2)        | 24.1           | (22.0–26.1) |
| >30.0–65.0                   | 7269               | 35.2           | 37.8    | (36.6–38.8)        | 25.5           | (24.4–26.5) |
| >65.0                        | 11,639             | 56.4           | 37.3    | (36.4–38.2)        | 34.1           | (33.2–35.0) |
| Geographic region            |                    |                |         |                    |                |         |
| North                        | 930                | 4.5            | 63.2    | (60.0–66.5)        | 57.5           | (54.2–60.7) |
| Northeast                    | 6595               | 32.0           | 42.8    | (41.6–44.1)        | 39.0           | (37.8–40.2) |
| Southeast                    | 8468               | 41.0           | 30.6    | (29.6–31.6)        | 22.0           | (21.1–22.9) |
| South                        | 3318               | 16.1           | 33.7    | (32.0–35.3)        | 22.7           | (21.2–24.1) |
| Midwest                      | 1328               | 6.4            | 47.0    | (44.1–49.8)        | 38.2           | (35.6–40.9) |
| Individual characteristics   |                    |                |         |                    |                |         |
| Categorized age              |                    |                |         |                    |                |         |
| 40–49                        | 7987               | 37.9           | 39.0    | (37.9–40.1)        | 38.0           | (36.9–39.0) |
| 50–59                        | 7246               | 34.4           | 37.1    | (35.9–38.2)        | 24.3           | (23.3–25.3) |
| 60–69                        | 5826               | 27.7           | 36.4    | (35.1–37.7)        | 27.2           | (26.0–28.3) |
| Race/skin color              |                    |                |         |                    |                |         |
| White                        | 8481               | 40.7           | 34.7    | (33.6–35.8)        | 24.7           | (23.8–25.6) |
| Black                        | 2445               | 11.7           | 39.7    | (37.7–41.8)        | 33.9           | (32.0–35.8) |
| Yellow                       | 533                | 2.6            | 40.4    | (36.0–44.8)        | 31.0           | (27.1–35.0) |
| Brown or mixed race          | 9231               | 44.2           | 39.3    | (38.2–40.3)        | 34.3           | (33.4–35.3) |
| Indigenous                   | 175                | 0.8            | 43.6    | (35.7–51.5)        | 33.3           | (26.2–40.5) |
| Marital status               |                    |                | 0.022   | 0.074              |                |         |
| No partner                   | 6866               | 32.6           | 38.8    | (37.6–40.1)        | 31.1           | (30.0–32.2) |
| Has a partner                | 14,193             | 67.4           | 37.1    | (36.3–37.9)        | 29.9           | (29.1–30.7) |
| Number of people in household|                    |                |         |                    |                |         |
| One to three                 | 11,411             | 54.4           | 36.7    | (35.8–37.6)        | 26.9           | (26.1–27.7) |
| Four to five                 | 6948               | 33.1           | 38.0    | (36.8–39.1)        | 31.7           | (30.6–32.8) |
| Six or more                  | 2631               | 12.5           | 41.2    | (39.2–43.2)        | 41.4           | (39.5–43.3) |
| Bolsa Familia benefit        |                    |                | <0.001* | <0.001*            |                |         |
| No                           | 14,162             | 67.3           | 35.7    | (34.8–36.5)        | 25.3           | (24.6–26.1) |
| Yes                          | 6897               | 32.8           | 41.7    | (40.4–42.9)        | 40.4           | (39.3–41.6) |
| Paid job                     |                    |                | <0.001* | 0.015              |                |         |
| No                           | 15,371             | 73.0           | 38.9    | (38.1–39.7)        | 30.8           | (30.0–31.5) |
| Yes                          | 5688               | 27.0           | 34.3    | (33.0–35.6)        | 29.0           | (27.8–30.2) |
| Per capita income (in quartiles)|                  |                | <0.001* | <0.001*            |                |         |
| Up to 104                    | 3427               | 18.9           | 40.5    | (38.7–42.2)        | 37.4           | (35.8–39.0) |
| 105–188                      | 2586               | 14.3           | 40.3    | (38.4–42.3)        | 36.3           | (34.5–38.2) |
| 189–300                      | 3484               | 19.2           | 36.2    | (34.5–37.9)        | 28.8           | (27.2–30.3) |
| 301 or more                  | 8636               | 47.6           | 34.7    | (33.6–35.7)        | 23.1           | (22.2–24.0) |

(continued on next page)
Breast cancer screening was significantly worse in the northern region and better in the southeast and southern regions. Screening utilization rates were intermediate in the midwest and northeast regions ($P < 0.001$ for both; Table 2).

The percentage of women having had a clinical breast examination increased as the women’s age increased, without being statistically significant ($P = 0.076$). Compared to older women (aged 60–69), the proportion of women not having had a mammography was lower among women aged 50 to 59 ($PR = 0.84$; 95% CI, 0.79–0.90; Figure 3).

Prevalence of both outcomes was lowest among women with white skin color ($P = 0.0181$ and $P < 0.001$, respectively). Not having had a clinical breast examination and mammography was 7% greater ($P = 0.004$) and 16% greater ($P < 0.001$), respectively, among women who did not have a partner. The proportion of women not having had a mammography was 9% greater ($P = 0.002$) among those who received the Bolsa Familia benefit. Among those who did not have paid work, the proportion of women not having had a clinical breast examination was 10% greater ($P = 0.001$). More women with per capita family income above R$300 had a mammography when compared to those with per capita income of up to R$104 ($P < 0.001$). The percentage of women not having had a mammography in health services with a semi-appropriate structure was 11% greater and in those with an inappropriate structure it was 23% greater than in services with an appropriate structure.

### TABLE 1. Description of the Sample and Bivariate Analysis Between Outcomes and Contextual, Individual and Health Service Characteristics Variables, Brazil, PMAQ, 2012

| Variables                              | Sample Distribution | Never Having Had a Clinical Examination during Lifetime | Never Having Had a Mammography during Lifetime |
|----------------------------------------|---------------------|--------------------------------------------------------|-----------------------------------------------|
|                                        | $N$ | %       | $P$ Value       | $P$ Value       |
| Health service characteristics         |     |         |                 |                 |
| Structure appropriateness$^b$           |     |         |                 |                 |
| Inappropriate                          | 445 | 2.2    | 37.1 (32.3–41.8) | 38.2 (33.7–42.8) |
| Semi-appropriate                       | 1449| 7.3    | 38.9 (36.3–41.5) | 37.0 (34.6–39.5) |
| Appropriate                            | 18,590 | 90.6 | 37.4 (36.7–38.1) | 29.6 (28.9–30.2) |
| Process appropriateness$^c$            |     |         | $<0.001^*$                    | $<0.001^*$                    |
| Inappropriate                          | 5993 | 32.3   | 41.7 (40.4–43.0) | 34.0 (32.8–35.2) |
| Semi-appropriate                       | 8599 | 46.3   | 35.8 (34.7–36.8) | 29.1 (28.1–30.1) |
| Appropriate                            | 3963 | 21.4   | 34.2 (32.7–35.8) | 25.7 (24.4–27.1) |
| $^a$PMAQ = Primary Care Access and Quality Improvement Program; HDI = Human Development Index; FHS = family health strategy. |
| $^b$Five structure items. |
| $^c$Eight actions. |
| $^*$P value: chi-square test for linear trend. |

**FIGURE 3.** Percentage of Women Never Having Had a Clinical Breast Examination (dark) and Mammography (light) by Age Group, Brazil, PMAQ, 2012
| Variables                      | Crude Analysis | Adjusted Analysis | Crude Analysis | Adjusted Analysis |
|-------------------------------|----------------|------------------|----------------|------------------|
|                               | PR (95% CI)    | PR (95% CI)      | PR (95% CI)    | PR (95% CI)      |
| Contextual characteristics    |                |                  |                |                  |
| HDI-M                         |                |                  |                |                  |
| Up to 0.658                   | 0.97 (0.71–0.75) | 0.93 (0.87–0.98) | 0.80 (0.76–0.84) | 0.79 (0.74–0.84) |
| 0.659–0.75                    | 0.81 (0.77–0.85) | 0.78 (0.72–0.84) | 0.53 (0.50–0.57) | 0.60 (0.55–0.66) |
| 0.751–0.806                   | 0.75 (0.92–1.02) | 0.70 (0.63–0.79) | 0.44 (0.41–0.47) | 0.55 (0.49–0.62) |
| 0.807–0.919                   | 1.00            | 1.00             | 1.00           | 1.00             |
| Population size (inhabitants) |                |                  |                |                  |
| Up to 30,000                  | 1.00            | 1.00             | 1.00           | 1.00             |
| 30,001–100,000                | 1.07 (1.02–1.13) | 1.07 (1.02–1.13) | 1.03 (0.98–1.08) | 0.98 (0.88–1.08) |
| 100,001–500,000               | 1.01 (0.95–1.06) | 1.11 (1.04–1.19) | 0.68 (0.63–0.72) | 0.88 (0.81–0.95) |
| 500,001 or over               | 0.99 (0.94–1.04) | 1.30 (1.19–1.41) | 0.62 (0.58–0.66) | 1.09 (1.03–1.15) |
| FHS coverage (%)              |                |                  |                |                  |
| Up to 30.0                    | 1.00            | 1.00             | 1.00           | 1.00             |
| >30.0–65.0                   | 0.99 (0.92–1.06) | 1.02 (0.95–1.09) | 1.06 (0.96–1.16) | 1.06 (0.97–1.16) |
| Geographic region             |                |                  |                |                  |
| North                         | 2.06 (1.94–2.20) | 1.87 (1.75–2.01) | 2.61 (2.44–2.80) | 2.08 (1.92–2.25) |
| Midwest                       | 1.53 (1.43–1.64) | 1.52 (1.41–1.63) | 1.77 (1.68–1.86) | 1.56 (1.44–1.69) |
| Northeast                     | 1.39 (1.34–1.46) | 1.25 (1.17–1.33) | 1.74 (1.60–1.88) | 1.25 (1.13–1.30) |
| South                         | 1.10 (1.04–1.17) | 1.20 (0.86–1.10) | 1.03 (0.96–1.11) | 1.05 (0.97–1.14) |
| Individual characteristics    |                |                  |                |                  |
| Age (years)                   |                |                  |                |                  |
| 40–49                         | 1.07 (1.02–1.12) | 1.06 (1.01–1.13) | 1.40 (1.33–1.47) | 0.84 (0.79–0.90) |
| 50–59                         | 1.02 (0.97–1.07) | 1.02 (0.97–1.08) | 0.90 (0.84–0.95) | 1.26 (1.19–1.35) |
| Race/skin color               |                |                  |                |                  |
| White                         | 1.00            | 1.00             | 1.00           | 1.00             |
| Brown or mixed race           | 1.13 (1.09–1.18) | 1.00 (0.97–1.08) | 1.39 (1.33–1.46) | 1.00 (0.95–1.04) |
| Black                         | 1.14 (1.08–1.22) | 1.07 (1.00–1.14) | 1.38 (1.29–1.47) | 1.07 (1.00–1.14) |
| Yellow                        | 1.16 (1.04–1.30) | 1.07 (0.94–1.21) | 1.26 (1.10–1.44) | 1.07 (0.94–1.21) |
| Indigenous                    | 1.26 (1.05–1.51) | 1.07 (0.87–1.32) | 1.35 (1.09–1.68) | 1.07 (0.87–1.32) |
| Marital status                |                |                  |                |                  |
| No partner                    | 1.05 (1.01–1.09) | 1.07 (1.02–1.11) | 1.04 (1.00–1.09) | 1.16 (1.11–1.22) |
| Has a partner                 | 1.00            | 1.00             | 1.00           | 1.00             |
| Number of people in household |                |                  |                |                  |
| One to three                  | 1.00            | 1.00             | 1.00           | 1.00             |
| Four to five                  | 1.03 (0.99–1.08) | 0.98 (0.94–1.06) | 1.17 (1.12–1.23) | 1.01 (0.95–1.07) |
| Bolsa Familia benefit         |                |                  |                |                  |
| No                            | 0.86 (0.83–0.89) | 0.99 (0.94–1.04) | 0.63 (0.60–0.65) | 0.92 (0.87–0.97) |
| Yes                           | 1.00            | 1.00             | 1.00           | 1.00             |
| Paid job                      |                |                  |                |                  |
| No                            | 1.13 (1.09–1.19) | 1.10 (1.05–1.16) | 1.19 (1.08–1.31) | 1.00 (1.05–1.16) |
| Yes                           | 1.00            | 1.00             | 1.00           | 1.00             |

(continued on next page)
With regard to work process adequacy, the proportion of women not having had a clinical breast examination was 2% greater in health services with semi-appropriate work processes, whereas it was 15% greater in those with inappropriate work processes \( (P < 0.001) \); Table 2).

**DISCUSSION**

Our study identified a strong association between a set of contextual, individual, and health service characteristics and not having had a clinical breast examination and mammography among women attending primary health care centers participating in the Primary Care Access and Quality Improvement Program in Brazil. According to the study, among women aged 40 to 69 using Brazilian primary health care services in 2012, 61.3% had had a clinical breast examination and 69.7% had had a mammogram during their lifetime. Considering the presence of the respondents at the PHCs that they had attended at least once during the last year, never having had the screening procedures recommended in Brazil and globally is the extreme end of the problem with utilization of screening in primary health care. Its measurement reflects opportunities lost by the service (PHCs) in guaranteeing the universality of breast screening actions and in promoting social equity in health care.

The Unified Health System program focuses on mammography being performed on women aged 50 to 69. Although women aged 40–49 are not the focus of the program, according to Brazilian federal legislation (Law #11.664/2008), which was in force at the time of data collection in this study, and also according to a Brazilian Society of Mastology recommendations, whereby screening should be guaranteed annually to all women from 40 years of age onwards, we decided to include all women between the ages of 40 and 49 taking part in cycle 1 of the PMAQ external evaluation. In the 50 to 69 age group, mammography utilization surpassed the target recommended by the Brazilian Unified Health System and by the World Health Organization, reaching 75.7% of women aged 50 to 59 and 72.8% of women aged 60 to 69. This finding is similar to that of a study conducted in Brazilian state capitals and federal district that found 77.4% utilization of mammography among women aged 50 to 69, thus confirming progress with expanding screening among poorer women. Women aged 40 to 49 (38%–39%) had the highest proportion of never having had any screening.

### TABLE 2. Crude and Adjusted Analyses Between Outcomes and Contextual, Individual, and Health Service Characteristic Variables, PMAQ, Brazil, 2012

| Variables | Never Having Had a Clinical Examination during Lifetime | Never Having Had a Mammography during Lifetime |
|-----------|------------------------------------------------------|---------------------------------------------|
|           | Crude Analysis | Adjusted Analysis | Crude Analysis | Adjusted Analysis |
| Per capita income (in quartiles) |  |  |  |  |
| Up to 104 | $P < 0.001^*$ | $P = 0.720$ | $P < 0.001^*$ | $P < 0.001^*$ |
| 105–188 | 1.17 (1.11–1.23) | 1.01 (0.95–1.07) | 1.62 (1.52–1.71) | 1.20 (1.13–1.28) |
| 189–300 | 1.16 (1.10–1.23) | 1.04 (0.97–1.11) | 1.57 (1.47–1.67) | 1.20 (1.11–1.30) |
| 301 or more | 1.04 (0.99–1.10) | 1.00 (0.94–1.06) | 1.24 (1.16–1.33) | 1.11 (1.03–1.18) |
| Health service characteristics |  |  |  |  |
| Structure appropriatenessa | $P = 0.524$ | $P = 0.735$ | $P = 0.001^*$ | $P = 0.001^*$ |
| Inappropriate | 1.04 (0.97–1.12) | 1.05 (0.92–1.20) | 1.29 (1.15–1.46) | 1.23 (1.07–1.41) |
| Semi-appropriate | 0.99 (1.87–1.13) | 1.01 (0.94–1.09) | 1.25 (1.17–1.34) | 1.11 (1.02–1.21) |
| Appropriate | 1.00 | 1.00 | 1.00 | 1.00 |
| Process appropriatenessc | $P < 0.001^*$ | $P = 0.001^*$ | $P = 0.001^*$ | $P = 0.338$ |
| Inappropriate | 1.22 (1.15–1.29) | 1.15 (1.09–1.22) | 1.32 (1.24–1.41) | 1.04 (0.97–1.12) |
| Semi-appropriate | 1.04 (1.05–1.26) | 1.02 (0.97–1.08) | 1.13 (1.06–1.20) | 1.00 (0.94–1.07) |
| Appropriate | 1.00 | 1.00 | 1.00 | 1.00 |

PMAQ = Primary Care Access and Quality Improvement Program; PR = prevalence ratio; CI = confidence interval; HDI-M = Human Development Index; FHS = family health strategy.

aFive structure items.
bEight actions.

*P value: Wald’s linear trend test.
procedure. This finding suggests the need to prioritize women aged 40 to 49 with regard to breast cancer actions in primary health care and in the Unified Health System. Notwithstanding controversies, there is evidence of an estimated 20% reduction in breast cancer mortality among women using mammography before the age of 50. A decision in this respect implies more in-depth analysis of the cost–benefit and cost-effectiveness of mammography among younger women.

It is noteworthy that the prevalence of mammography, which is recommended for screening among women aged 50 and over, was greater than the utilization of clinical breast examination, which should be a routine procedure for women attending clinical appointments, regardless of their age group. This finding may indicate fragmentation of medical and nursing care as a result of the overvaluing of complementary examinations that facilitate medical or nursing consultations and, on the other hand, the undervaluing of clinical examinations. A study conducted in the Brazilian municipality of Monteiro (Paraíba State) with 3608 women aged 40 to 69 found 53.2% mammography coverage and 56.8% clinical breast examination coverage among women aged 50 to 69, thus showing the proximity of coverage of the two examinations.

Not having had a clinical breast examination during at least one annual medical appointment is a lost health care opportunity and reaffirms the need for improved health care team performance. Considering the scope of the FHS and investments in infrastructure, overcoming this problem is practicable and appears to depend more on better organization of the daily actions of the health teams than on additional work. The linkage of health teams to PMAQ and to the More Doctors Program (Programa Mais Médicos), strengthened by incentives relating to physical structure, staff availability, and training and service organization, is a new opportunity for significantly reducing the lack of access found and for strengthening equity in the Brazilian Unified Health System.

The proportion of women never having had a clinical examination increased as municipality size and FHS coverage increased. Although the capacity for investment and qualification of health teams and the improvement of socioeconomic conditions may be expected in larger municipalities, this was not reflected in the utilization of breast cancer screening. Another study also highlighted barriers to primary care performance in large municipalities arising, for instance, from the profile of their urbanization, characterized by great social inequality and concentrations of poor people, particularly in the metropolitan regions surrounding large cities, together with inequitable distribution of health services with organizational problems, which may result in it taking a longer time and being more expensive for their users to reach them. A study that analyzed breast cancer mortality in some Brazilian states and their respective capital cities, according to the degree of urbanization, between 1980 and 2009, found that in more urbanized states and capitals the average breast cancer mortality rate was higher than in those that were less urbanized.

Problems with the utilization of breast cancer screening were significantly greater in the north, midwest, and northeast regions, thus making regional inequalities evident. A study using data from the National Household Sample Survey (Pesquisa Nacional de Amostra por Domicílio) found that 30.1% of women in Brazil had never had a clinical breast examination, with the highest proportion (greater than 45%) in the north and northeast regions. It also found that the highest percentage of women who had never had a mammogram were located in the northern region, followed by the northeast region. The same study found that 31.0% of Brazilian women aged 50 to 69 had never had a mammogram, with the highest proportion in the northern region (51.2%), followed by the northeast (46.1%) and midwest (34.9%) regions.

The geographic distribution and operational capacity of x-ray equipment in Brazil are still unequal, resulting in the regional differences found, and this may partly explain increased breast cancer deaths in Brazil. Other factors may include lack of access to timely treatment in some regions, as well as the quality of diagnostic examinations that still need to be improved.

The screening program utilization problems were fewer among women with white skin color. Never having had a clinical breast examination was greater among indigenous women or women with yellow skin color, and never having had a mammography was greater among women with brown and black skin colors. A study conducted by Amorim et al. among women aged 40 and over living in the city of Campinas, São Paulo State, Brazil, found that not having a clinical breast examination was significantly more frequent among women who reported not having a partner and among those in the lowest per capita family income bracket, whereas not having a mammogram was significantly more frequent among women who stated that their skin color was black or brown and who were in the lowest per capita family income bracket.

In this study, prevalence of both outcomes was lower among women who had a partner. Never having had a mammography was higher among women living in households with six or more other people, compared to those who lived in households with fewer people. Utilization of clinical breast examination was lower among women who had paid work. Utilization of mammography was higher among women with per capita family income above R$ 300 when compared to those with per capita income of up to R$ 104. In a study conducted by Schneider et al., having a partner and...
being in the fourth quartile of per capita family income increased utilization of mammography every year.

Never having had a mammography was significantly more frequent among women receiving the Bolsa Família benefit compared to those who did not. Those receiving the benefit had increased social vulnerability. A study conducted using National Household Sample Survey data found that, as a general rule, the higher the income, the greater the number of clinical breast examinations and that having a mammogram was more frequent among those in the higher income quintiles than among those in the lower income quintiles.29

Adequate PHC structure was associated with increased utilization of mammography and adequate health service work processes were associated with an increase in clinical breast examination. The results of our study with regard to the evaluation of breast cancer screening utilization confirm the importance of appropriate structures and processes.9

A limitation of this study is that respondents were interviewed at the PHCs. This indicates that utilization-related problems could be even greater if we were to apply the findings to an evaluation using a population-based study. The final results expressed in the health conditions of the population—for example, the occurrence of breast cancer—are difficult to evaluate in cross-sectional studies, because the impact of the policy initiative on the response of the services is complex and depends on a longer exposure/induction time. Thus, intermediate objectives, such as those of our study, are important results for assessing the utilization of PHC.9

Our study showed a strong positive effect of structure and work process characteristics in PHC centers on the utilization of the breast screening and clinical examination. The effect remained after multivariable analysis, controlling for confounders related to context and population, reinforcing the internal validity.33 The results can be generalized for Brazilian PHCs and are useful to understand the patterns and trends of breast cancer screening and clinical examination throughout the country, considering the context and population characteristics examined. The sample is representative of women age 40–69 who are users of PHCs in the country, reinforcing the external validity of the study. Investment in PHC structure and health teamwork processes (paying special attention to keeping records of service users at greater risk referred to other health care services, protocols providing guidance on prioritizing cases needing referral, and protocols defining breast cancer treatment guidelines) is necessary in order to improve utilization of the breast cancer screening program in Brazil. The importance of PMAQ is highlighted as a means of inducing improvements to utilization of the structure and functioning of PHCs, as well as qualifying health teamwork processes.

CONCLUSION

The improvement of living conditions along with investments in primary health care structure and teamwork processes are essential to improve the utilization of screening, prevention, and early diagnosis of breast cancer in Brazil.

Availability of Data and Materials

The data sets supporting the conclusions of this article are included within the article (and its additional files).

ABBREVIATIONS

| Abbreviation | Description |
|--------------|-------------|
| PMAQ         | Primary Care Access and Quality Improvement Program |
| HDI          | Human Development Index |
| PNQM         | National Program for Mammography Quality |
| FHS          | family health strategy |
| WHO          | World Health Organization |
| INCA         | National Cancer Institute of Brazil |
| PHCs         | primary health care centers |
| CEP          | Research Ethics Committee |
| UFPel        | Federal University of Pelotas |
| IRB          | institutional review board |
| R$           | real (Brazilian currency) |
| PNAD         | National Household Sample Survey |

DISCLOSURE OF POTENTIAL CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

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AUTHOR CONTRIBUTIONS

M. R. B. B. is the principal investigator for this study. All authors participated in designing the study. M. R. B. B. and L. A. F. performed the study and data analysis and worked together with T. R. R. and B. P. N. to interpret the data and the outcomes. M. R. B. B. prepared the first draft of the article, which was revised by L. A. F., T. R. R., B. P. N., S. M. S. D., and M. R. B. B., M. C., R. C. D. L., and E. T. participated in the critical revision for the intellectual content. All authors have approved the final version of the article for publication.

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REFERENCES

1. World Health Organization, International Agency for Research on Cancer. Globocan 2008. Lyon (France): International Agency for Research on Cancer; 2012 [accessed 2016 Apr 2]. http://globo can.iarc.fr/.

2. Pan American Health Organization. Breast cancer. 2012 [accessed 2017 Aug 23]. http://www.paho.org/hq/index.php?option=com_content&view=article&id=5041&Itemid =3639&lang=en.

3. Ontario Health Technology Assessment. Cancer screening with digital mammography for women at average risk for breast cancer, magnetic resonance imaging (MRI) for women at high risk: an evidence-based analysis. Ont Health Technol Assess Ser. 2010;10(3):1–55.

4. World Health Organization. Early detection. Cancer control: knowledge into action: WHO guide for effective programs module 3. Geneva (Switzerland): World Health Organization; 2007.

5. Stein AT, Zelmanowicz AM, Zerwas FP, Biazus JVN, Lázaro L, Franco LR. Rastreamento do câncer de mama: recomendações baseadas em evidências [Breast cancer screening: evidence-based recommendations]. Rev AMRIGS. 2009;53(4):438–446 [accessed 2015 Jun 15]. http://www.amrigs.com.br/revista/53-04-24-Rastreamento_unimed.pdf.

6. Ministério da Saúde, Instituto Nacional do Câncer. Controle do câncer de mama. Documento de consenso: normas e recomendações do Ministério da Saúde. [Breast cancer control. Consensus Document: Ministry of Health standards and recommendations]. Revista Brasileira de Cancerologia. 2004;50(2):77–90.

7. Alagöz O, Chhatwal J, Burnside ES. Optimal policies for reducing unnecessary follow-up mammography exams in breast cancer diagnosis. Decis Anal. 2013;10(3):200–224.

8. Ministério da Saúde. Norma Operacional da Assistência à Saúde NOAS–SUS 01/2001. Portaria Nº 95, de 26 de Janeiro de 2001 [Unified Health System Operational Health Care Standards. Ordinance No. 95, dated January 26th 2001]. Brasília (Brazil): Ministério da Saúde; 2001 [accessed 2016 May 11]. http://siops. datasus.gov.br/Documentacao/Noas%2001%20de%202001.pdf.

9. Facchini LA, Thumé E, Nunes BP, Silva SM, Fassa AG, Garcia LP, Tomasi E. Governance and health system performance: national and municipal challenges to the Brazilian family health strategy. In: Michael RR, Keizo T, editors. Governing health systems: for nations and communities around the world. 1 ed. Boston (MA): Lamprey & Lee; 2015. p. 203–236 [accessed 2016 May 11]. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/114/2013/05/GoverningHealthSystems_Cover-front-matter.pdf.

10. Ministério da Saúde. Portaria n° 1.654, de 18 de julho de 2011 [Ordinance N° 1654, dated July 18th 2011]. Brasília (Brazil): Ministério da Saúde; 2011 [accessed 2015 Apr 28]. http://www.brasilsus.com.br/legislacoes/gm/108814-1654.html.

11. Malta DC, Jorge AO. Análise de tendência de citologia oncólica e mamografia das capitais brasileiras [Analysis of oncologic cytology and mammography in Brazilian state capitals]. Cien Cult. 2014;66(1):25–29 [accessed 2016 Jun 15]. http://cienciaecultura.bvs.br/scielo.php?script=sci_arttext&pid=S00 09-67252014000100012.

12. Instituto Nacional de Cancer, Coordenação de Prevenção e Vigilância. Estimativa 2016–2017: incidência de câncer no Brasil [Estimates: cancer incidence in Brazil]. Rio de Janeiro (Brazil): Instituto Nacional de Câncer; 2015.

13. Ministério da Saúde. Instrumento de avaliação externa do Saúde Mais Perto de Você—acesso e qualidade [External evaluation instrument of the Health Closer to You Programme—access and quality]. Brasília (Brazil): Ministério da Saúde; 2012.

14. Instituto Brasileiro de Geografia e Estatística. Panorama da saúde do Brasil: acesso e utilização dos serviços, condições de saúde e fatores de risco e proteção a saúde (PNAD, 2008) [Panorama of Brazil’s Health: service access and use, health status and health risk and protection factors (2008 National Household Sample Survey)]. Rio de Janeiro (Brazil): Instituto Brasileiro de Geografia e Estatística; 2010.

15. Barros AJ, Hirakata VN. Alternatives for logistical regression in cross-sectional studies: an empirical comparison of models that directly estimate the prevalence ratio. BMC Med Res Methodol. 2003;3(1):1–13. doi:10.1186/1471-2288-3-21.

16. Ministério da Saúde, Instituto Nacional do Câncer. Controle do câncer de mama. Documento de consenso: normas e recomendações do Ministério da Saúde. Revista Brasileira de Cancerologia. 2004;50(2):77–90.

17. Conselho Nacional dos Secretários de Saúde. Programa Nacional de Controle do Câncer do Colo do Útero e de Mama. Proposta de Fortalecimento das Ações de Prevenção, Diagnóstico e Tratamento do Câncer de Colo do Útero e de Mama. Nota Técnica 09/2011 [Proposal for the Strengthening of Cervical and Breast Cancer Prevention, Diagnosis and Treatment Actions. Technical Note 09/2011] [accessed 2016 Jan 31]. http://www.conass.org.br/notas%20tecnicas/NT%2009%202011%20%20Cancer%20de%20 Colo%20de%20%20C3%20Atero%20%20Mama%20%20.pdf.

18. Facchini LA, Piccini RX, Tomasi E, Thumé E, Silveira DS, Siqueira V, Rodrigues MA. Desempenho do PSF no South e...
26. Viana ALÁ, Rocha JSY, Elias PE, Iba
23. Barreto ASB, Mendes MFM, Thuler LCS. Avalia
21. Caleffi, M. Mastologista e presidente volunt
22. Bobbio MC. O doente imaginado [The imaginary patient]. S
20. Presidênci
19. Irvin VL, Kaplan RM. Screening mammography & breast cancer
24. Macinko J, Harris MJ. Brazil’s family health strategy—delivering
12871, dated October 22nd 2013]. Brasileira de Entidades Filantr
11664, dated April 29th 2008]. Brasileira de Entidades Filantr
19. Irvin VL, Kaplan RM. Screening mammography & breast cancer
25. Presidênci
11. Silva NC, Rocha TAH, Rodrigues RB, Barbosa ACQ. Equidade na
27. Machado CV, Lima LD, Viana LS. Configuração da atenção básic
28. Ribeiro MS, Abreu NA, Borges TFF, Guimarães RM, Muzzi CD.
22. Bobbio MC. O doente imaginado [The imaginary patient]. São Paulo (Brazil): Bamboo Editorial, 2014.
23. Barreto ASB, Mendes MFM, Thuler LCS. Avaliação de uma estratégia para ampliar uma adesão ao rastreamento do câncer de mama no Nordeste brasileiro [Evaluation of a strategy to scale up adherence to breast cancer screening in Northeast Brazil]. Rev Bras Ginecol Obstet. 2012;31(2):86–91. doi:10.1590/ S0100-72032012000200008.
24. Macinko J, Harris MJ. Brazil’s family health strategy—delivering community-based primary care in a universal health system. N Engl J Med. 2015;372:2177–2181. doi:10.1056/NEJMhp1501140.
25. Presidência da República, Casa Civil. Subchefia para Assuntos Jurídicos. Lei n° 12.871, de 22 de outubro de 2013 [Law No. 12871, dated October 22nd 2013]. Brasília (Brazil): Casa Civil; 2013 [accessed 2016 Apr 28]. http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/ Lei/L12871.htm.
26. Viana ALÁ, Rocha JSY, Elias PE, Ibanez N, Novaes MH. Modelos de atenção básica nos grandes municípios paulistas: efetividade, eficácia, sustentabilidade e governabilidade [Primary health care models in large municipalities in the State of São Paulo: effectiveness, efficacy, sustainability and governability]. Cien Saude Colet. 2006;11:577–606. doi:10.1590/S1413-81232006003000015.
19. Irvin VL, Kaplan RM. Screening mammography & breast cancer mortality: meta-analysis of quasi-experimental studies. PLoS One. 2014;9(6):e98105. doi:10.1371/journal.pone.0098105.
20. Presidência da República, Casa Civil. Subchefia para Assuntos Jurídicos. Lei n° 11.664, de 29 de abril de 2008 [Law No. 11664, dated April 29th 2008]. Brasília (Brazil): Casa Civil; 2008 [accessed 2017 Sep 5]. http://www2.camara.leg.br/legin/fed/lei/2008/lei-11664-29-abril-2008-574731-publicacaaoorig nal-97838-pl.html.
21. Caleffi, M. Mastologista e presidente voluntário da Federação Brasileira de Entidades Filantrópicas de Apoio à Saúde da Mama (Femama) [Mastologist and volunteer president of the Brazilian Federation of Breast Health Support Charitable Organizations (FEMAMA)]. Correio Brasiliense, 14 dez. 2015. http://www.sbmastologia.com.br/index.php?option=com_content&view=article&id=915:portaria-restrinje-acesso-a-mammografia&catid=79&Itemid=574.
22. Bobbio MC. O doente imaginado [The imaginary patient]. São Paulo (Brazil): Bamboo Editorial, 2014.