Breast Cancer Mortality: a Trend Analysis in Ceará, Northeast and Brazil from 2005 to 2015

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Mortalidade por Câncer de Mama: uma Análise da Tendência no Ceará, Nordeste e Brasil de 2005 a 2015

Mortalidad del Cáncer de Mama: un Análisis de Tendencias en Ceará, Nordeste y Brasil de 2005 a 2015

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Abstract

Introduction: Information on breast cancer mortality can be useful for planning public policies. **Objective:** Analyze the trend of mortality from breast cancer in women in the state of Ceará. **Method:** Exploratory descriptive study whose variables were: year and place of death, sex, basic cause of death, and age in an age range. The statistical analysis of the data was performed in the Gretl program by means of linear regression where the breast cancer mortality rates were considered dependent variables and the years of the study period, the independent variables. The regression coefficients, their 95% confidence intervals and the respective p-values of the tests of statistical significance were presented. **Results:** 141,168 deaths from breast cancer were reported across Brazil. The state of Ceará represents 3.73% of this total and had a growth of 92.7% in the number of deaths from breast cancer. There was an increase in specific mortality rates from the age of 40 onwards, increasing until the last age group surveyed. **Conclusion:** The analysis carried out in this study showed a progressive trend in the number of deaths in Ceará, in the Northeast and in Brazil. It is essential to develop strategies that prioritize actions to shorten the delay in the management of breast cancer cases in health services so that early detection reduces the number of deaths.

Key words: Breast Neoplasms/epidemiology; Breast Neoplasms/mortality; Brazil.

Resumo

Introdução: Informações sobre mortalidade por câncer de mama podem ser úteis para o planejamento de políticas públicas. **Objetivo:** Analisar a tendência da mortalidade por câncer de mama em mulheres no Estado do Ceará. **Método:** Estudo descritivo exploratório cujas variáveis utilizadas foram: ano e local da ocorrência do óbito, sexo, causa básica de morte e a idade em faixa etária. A análise estatística dos dados foi realizada no programa Gretl, por meio de regressão linear, no qual as taxas de mortalidade por câncer de mama foram consideradas variáveis dependentes e os anos do período estudado, variáveis independentes. Foram apresentados os coeficientes de regressão, seus intervalos de confiança de 95% e os respectivos valores-p dos testes de significância estatística. **Resultados:** Foram notificados 141.168 óbitos por câncer de mama em todo o Brasil. O Estado Ceará representa 3,73% desse total e apresentou um aumento de 92,7% no número de óbitos por câncer de mama. Observou-se um aumento das taxas específicas de mortalidade a partir dos 40 anos de idade se mantendo crescente até a última faixa etária pesquisada. **Conclusão:** A análise realizada neste estudo evidenciou uma tendência progressiva no número de óbitos no Ceará, no Nordeste e no Brasil. É imprescindível a elaboração de estratégias que priorizem ações, a fim reduzir o atraso na condução dos casos de câncer de mama nos serviços de saúde para que a detecção precoce reduza o número de óbitos.

Palavras-chave: Neoplasias da Mama/epidemiologia; Neoplasias da Mama/mortalidade; Brasil.

Resumen

Introducción: la información sobre mortalidad por cáncer de mama puede ser útil para planificar políticas públicas. **Objetivo:** Analizar la tendencia de mortalidad por cáncer de seno en mujeres en el Estado de Ceará. **Método:** Estudio exploratorio descriptivo cuyas variables utilizadas fueron: año y lugar de muerte, sexo, causa básica de muerte y edad en un rango de edad. El análisis estadístico de los datos se realizó en el programa Gretl mediante regresión lineal donde las tasas de mortalidad por cáncer de mama se consideraron variables dependientes y los años del período estudiado fueron variables independientes. Se presentaron los coeficientes de regresión, sus intervalos de confianza del 95% y los respectivos valores p de las pruebas de significación estadística. **Resultados:** Se notificaron 141.168 muertes por cáncer de mama en todo Brasil. El Estado de Ceará representa el 3,73% de este total e mostró un aumento del 92,7% en el número de muertes por cáncer de seno. Hubo un aumento en las tasas de mortalidad específicas a partir de los 40 años, aumentando hasta el último grupo de edad encuestado. **Conclusión:** El análisis realizado en este estudio mostró una tendencia progresiva en el número de muertes en Ceará, en el noreste y en Brasil. Es esencial desarrollar estrategias que prioricen las acciones para reducir la demora en el manejo de casos de cáncer de seno en los servicios de salud para que la detección temprana, reduciendo así el número de muertes.

Palabras clave: Neoplasias de la Mama/epidemiología; Neoplasias de la Mama/mortalidad; Brasil.

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INTRODUCTION

Breast cancer is considered the most prevalent among females. In 2018, more than two million new cases of breast cancer appeared all over the world. According to the World Cancer Research Fund International[1], in 2018, among the countries that presented greatest incidence of breast cancer are Belgium, followed by Luxembourg and The Netherlands[1].

The incidence of breast cancer in developed countries is greater, while the relative mortality is greater in underdeveloped countries[2]. A study about epidemiology, incidence and mortality of breast cancer in Asia mentioned that the increase in deaths by breast cancer is significant in comparison with European and American countries suggesting that this region has a good service in mortality reporting[3].

In Brazil, 66,280 new breast cancer cases are estimated for each year of the triennium 2020-2022. This value corresponds to an estimated risk of 61.61 new cases at each 100 thousand women. Without considering non-melanoma skin cancer, the female breast cancer occupies the first position most frequent in all Brazilian regions, with estimated risk of 81.06 per 100 thousand in the Southeast region; of 71.18 per 100 thousand in the South Regions; of 45.24 per 100 thousand in the West-Central regions; of 44.29 per 100 thousand in the Northeast Regions and of 21.4 per 100 thousand in the North Region[4].

The access to health services in Brazil have variations among the state's country towns and its respective capitals that translate disparities in the mortality rates per breast cancer in the whole country[5].

In 2014, it was investigated the impact of the stage of the disease as predictor of the survival prognosis and it was concluded that early detection of the disease minimizes the mortality by breast cancer. The authors affirm yet that breast cancer when diagnosed in initial phases, have great chances of cure with survival of 97% in five years[6], although, when it is considered carcinoma *in situ,* controversies still exist in relation to early detection of indolent tumors.

A study analyzed 43,442 new cases of breast cancer in the period from 1995 to 2002, revealing that 87.7% of the women diagnosed with breast cancer were in stages II and IV. This reality differs from the developed countries that, although with higher prevalence of the disease, have better early detection system, reducing the costs with the treatment and mortality among women. The median of the percentage of patients in Brazil in the stages II and IV is 45.3%, while in the United States, is of nearly 12%[7,8].

Information about incidence and mortality per breast cancer can be useful for the planning of public policies and implementation of evidence-based cancer control programs, however, they are not available in most of the low and medium-income countries.

In that direction, it is necessary to analyze information about the epidemiologic behavior of deaths by this pathology, allowing the growth of prevention strategies and promotion of health with reduction of public expenses with the treatment of the disease.

Further to the morosity of the health system, other factors are associated to the development of the disease and mortality. The individual factors play an important role in breast cancer, including lifestyle (nourishment, physical activity and drug abuse) and genetic constitution[9].

In 2018, a study found results demonstrating that metabolic syndrome was associated to a growth of 73% of the risk of mortality by breast cancer. The same study suggests that the circumference of the high waist, high cholesterol and hypertension were independently associated to the increase of risk of mortality by breast cancer[9].

The socioeconomic and environmental factors influence directly the problematic. According to the Ministry of Health, the most effective forms of early detection are clinical exam of the breast and mammography[10].

Ultrasound can be performed as diagnostic support, which, most of the times, provides enough data for clinical staging of the tumor and definition of the treatment. However, many women with risk profile do not have access to these exams, because the access to health services in some places in Brazil, including Ceará is still limited. In addition, the mammography in the public service is done only for the age range considered "at risk", between 50 and 59 years[11,12].

The objective of this study is to analyze the tendency of mortality by breast cancer in women in the State of Ceará, comparing the data verified in the Northeast and in Brazil between 2005 and 2015.

METHOD

Study of aggregate data of a temporal series of 11 years of mortality by breast cancer in female patients in the State of Ceará, Northeast Region and Brazil in the period from 2005 to 2015. The data about the deaths were extracted from the Online Atlas of Mortality by Cancer[13], available at the site of the National Institute of Cancer José Alencar Gomes da Silva (INCA) of the Ministry of Health and the sociodemographic data of the Brazilian Institute of Geography and Statistics (IBGE). The Atlas

about mortality utilized has as one of its main finalities to help the public health professionals in determining the required priorities to cancer prevention and control[13].

The deaths by breast cancer for the period from 2005 to 2015 were obtained, considering the code of the International Classification of Diseases and Health-Related Problems (ICD-10). The rates of mortality by female breast cancer, crude and adjusted per age, by the world and Brazilian populations, per 100 thousand inhabitants, age-range, local and per period were utilized. Only female gender was selected, which represents most of the cases. The variables investigated were: year and place where death occurred, gender, basic cause of the death and age-range. Age was grouped in the following age-ranges: (0 to 4; 5 to 9; 10 to 14; 15 to 19; 20 to 29; 30 to 39; 40 to 49; 50 to 59; 60 to 69; 70 to 79; 80 years or more and age ignored).

The data utilized were initially organized in Excel for Windows and later, analyzed in the program Gretl[14]. Analyzes of temporal tendency through linear regression were performed. After verification of the inexistence of correlation between the standard deviations during time through the test of Breusch Godfrey, it was verified the inexistence of correlation for the cases of Brazil and Northeast.

In the analysis of simple linear regression, the rates of mortality by breast cancer were considered as dependent variables (y) and the years of the period investigated as independent variable (x).

With the objective of estimating the increase or decrease of the rates of mortality, it were presented the regression ratios, its confidence intervals of 95% and the respective values-p of the tests of statistical significance. In addition, it was calculated the annual percentage variation through the regression ratio in relation to the rate of mortality in the beginning of the period investigated.

The data utilized in this study are public and available at the database of the Online Mortality Atlas[13] without identification of the individuals. For this reason, it was not necessary to submit the study to an Institutional Review Board for approval.

RESULTS

In the period investigated, 141,168 deaths were reported by breast cancer in Brazil. Of these, 139,635 were of females, representing a percentage of 98.91% of the total of the cases. In Ceará, it were notified 5,213 deaths of females by breast cancer, which corresponds to 3.73% of the total, as demonstrated in Table 1.

In the period between 2010 and 2014 the crude rates of mortality of Ceará remained relatively stable, with minimum variations in consecutive years. In 2015, Ceará reached the highest crude mortality rate (14.05). Considering the whole period investigated, when it comes to the last year, the crude rate of mortality of this state reached almost the double of the value when compared to the value found in the first year investigated.

Table 1. Rates of mortality per breast cancer, crude and adjusted per age, world and Brazilian population of 2010 per 100 thousand women. Ceará, 2005-2015

Year	Absolute Value (number of deaths)	Crude Rate of Mortality Ceará	World rate of mortality adjusted	Rate of Mortality Adjusted Brazil
2005	331	8.01	8.6	9.35
2006	403	9.64	10.48	11.12
2007	413	9.77	10.34	11.07
2008	455	10.65	11.12	11.8
2009	431	9.98	10.07	10.86
2010	492	11.36	10.49	11.3
2011	492	11.19	10.86	11.72
2012	491	11.07	10.6	11.36
2013	531	11.87	11.02	11.97
2014	536	11.89	10.99	11.73
2015	638	14.05	12.49	13.53
Total	5,213			

Source: IBGE[15]; INCA[13].

The period from 2010 to 2012 stands out, because it was observed stability in the number of deaths that varied between 491 and 492, with a slight reduction in the last year. During the years 2010 to 2012, it was verified a reduction of the crude rates of mortality and growing again from 2013 on. Another outstanding factor is the difference between the first year investigated and the last as shown in Figure 1.

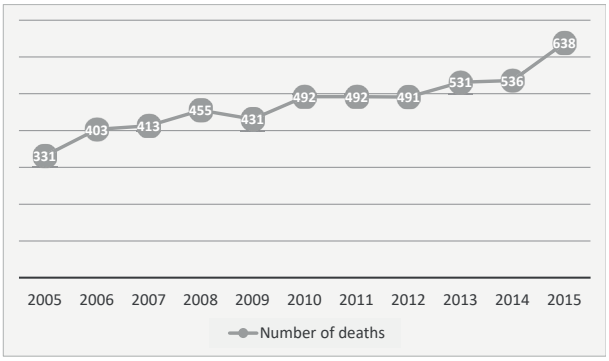

Figure 1. Tendency of deaths per breast cancer in males and females. Ceará, 2005-2015

Source: INCA[13].

In 11 years, the State of Ceará presented a significant increase in the number of deaths by breast cancer. The number of deaths by this type of cancer grew 92% comparing the first and the last year investigated.

Table 2 presents the tendency of deaths in women in the period investigated and the tendency of the specific rates of mortality per age range, with consecutive increase of the number of deaths up to the age range of 60-69 years. Therefore, it was observed that the Northeast Region and the State of Ceará repeated the Brazilian epidemiological behavior.

Considering Brazil, Northeast and Ceará in Table 2, it was concluded that the age range between 40 and 59 years presented the highest number of deaths with reduction in the age range of 60 years.

In relation to specific rates of mortality per age range, it was observed that from the age-range of 40-49 years, occurred a gradual increase of these rates in Brazil, that presents the highest rates and Ceará with rates bigger than the Northeast for all age ranges.

It is identified an increase of more than eight times of the specific rates of mortality between the age range

Table 2. Rates of Mortality by breast cancer, crude and adjusted per age, by the world and Brazilian population of 2010 per 100 thousand women. Brazil, Northeast and Ceará, 2005-2015

	Brazil		Northeast		Ceara	
Age range (in years)	Absolute value (number of deaths)	Specific Rate	Absolute value (number of deaths)	Specific Rate	Absolute value (number of deaths)	Specific rate
0 to 4	-	-	-	-	-	-
5 to 9	-	0	0	0	-	-
10 to 14	1	0	1	0	-	-
15 to 19	25	0.03	11	0.04	2	0.04
20 to 29	1,135	0.6	294	0.53	56	0.65
30 to 39	9,213	5.5	2,306	5.03	407	5.78
40 to 49	24,378	17.45	5,530	15.68	988	17.56
50 to 59	34,414	32.61	7,064	27.95	1213	30.29
60 to 69	29,355	44.39	5,583	33.5	1059	39.3
70 to 79	22,598	60.08	4,141	42.54	770	47.74
80 or more	18,499	100.22	3,563	74.05	717	88.33
Age ignored	14	0	4	0	1	0
Total	139,635		28,498		5,213	
Crude Rate		12.88		9.4		10.9
Standard world rate		11.7		9.45		10.7
Standard Brazil rate		12.56		10.16		11.5

Source: IBGE[15]; INCA[13].

from 20-29 years to the age range of 30-39 years. Tripling in the next range and still with another increase for the next one (50-59 years), where there is the great number of persons affected.

The age range of concentration of deaths in Ceará is easily identified when the tendency of the period 2005 to 2015 is analyzed in Table 2. The table shows that the number of deaths increases considerably from 40 years and the greatest occurrences were in the age range from 50 to 59 years and 60 to 69 years.

It was observed that 43.5% of the deaths by breast cancer occurred in persons with age between 50 and 69 years old. These data show that the great majority of the deaths by breast cancer occurs in persons with more than 40 years.

The tendency of the rates of mortality by breast cancer in women in Ceará followed the tendency of Northeast and Brazil, presenting gradual growth in the period investigated.

The tendency of the mortality in Ceará, in Northeast and in Brazil during the period investigated was of increase of the mortality by breast cancer. The analysis of the results had a confidence interval of 95%. It were considered significant the variations of the rate of mortality by breast cancer that presented level of significance $\alpha = 5\%$ in the linear regression as shown in Table 3.

DISCUSSION

In this study, it was observed an increase of the crude rate of mortality in the State of Ceará between 2005 to 2008 and a reduction occurred in 2009. Between 2010 and 2014, these rates presented similar values. In the last year, it occurred the biggest increase (18%).

The epidemiological behavior differs from portions of the world tendency, where, according to the findings of the studies conducted in several countries, although the prevalence of the disease among women continues high, the mortality is pointing out a decrease[16,17].

The growth of these crude rates of mortality in the State of Ceará in the last year investigated can be justified by the improvement of the techniques of information about mortality in this State or reduction of the mortality by unclear causes and, undoubtfully, by the populations growth observed during this period.

The quality and trustworthiness of the death registers encountered in Ceará, in Brazil and other countries are crucial factors to substantiate the mortality information of breast cancer.

In Brazil, INCA, the entity of the Ministry of Health, performs actions of cancer surveillance with information obtained through the Cancer Registries and System of Information of Mortality (SIM), centralized in the Health Vigilance Secretary (SVS). From 1999, through the State Health Secretaries, technical nucleus for cancer registries were created[10].

It is wise to assume that the quality of the death registries of the Brazilian states do not work similarly. The delay of feeding the data in the state nucleus of cancer registries may compromise the veracity of the information.

The increase of the crude rates of mortality in Ceará encountered in this study can be related to the fact that the service of register of breast cancer mortality in this State is one of oldest in Brazil, functioning since 1990, always participating of educational activities to improve the quality of information registered and can be considered one of the most effective in the country, mainly when compared to the other states of the Brazilian Northeast.

Although this system is improving, broadening its coverage and perfecting the quality of the data, there are still death registries for ill-defined causes, which can compromise the analysis of the mortality, especially those by specific causes[18].

A study of 2017 evidenced that, in the period from 2004 to 2014, the rates of mortality by breast cancer in Brazil (standardized per age), the incidence of hospitalization and costs of the public health increased. The authors found still a positive correlation between the disease and the public costs with health, verifying that the implementation of the government strategies is effective against the burden of this cancer in Brazil[19]. These strategies can have direct influence in the reduction of the number of deaths by breast cancer.

It is important to emphasize that the studies of world tendencies indicate a reduction of mortality by breast cancer in the next years. The biggest study ever made in the

Table 3. Regression ratio, confidence intervals, values-p and tendency of the rates of mortality of women per breast cancer, 2005-2015

Region	CI 95%*	Ratio	Value-p	Tendency
Brazil	0.35; 0.41	0.37	<0.001	Increase
Northeast	0.36; 0.48	0.42	<0.001	Increase
Ceará	0.29; 0.57	0.43	<0.001	Increase

Caption: *CI 95%=confidence interval of 95%.

world analyzed the tendency in 20 countries. The result presented favorable tendencies in North America and Oceania, with estimate of additional reduction of 10% in its global rates for 2020, with the finality of reaching values of 11-12/100 thousand women, that is, nearly 50% lower than 1980[20,21]. These results can have relation with the increase of the quality of the registries by breast cancer that justify the creation of possible policies of incentive to the early diagnosis of the disease and, potentially resulting in the reduction of the mortality.

Latin America, Brazil, Mexico, Chile and Colombia presented stable rates, below or around 10/100 thousand. The mortality was bigger in Argentine, Cuba and Venezuela, however, in Argentine, the tendencies were favorable in the last years with estimates for 2020 around 16/100 thousand[20,21].

Countries like Hong Kong, Japan and Korea presented low rates of mortality, but with stable or raising tendencies, the rates always remaining below 10/100 thousand. While in Israel, New Zealand and Philippines, the rates of mortality were around 16/100 thousand inhabitants in 2012. Among the countries analyzed, the Philippines presented tendencies always increasing[21].

It is important to emphasize, that, even after the diagnosis, the delay in initiating the treatment reduces the chances of cure. The majority of the women (57%) waits from eight to 12 months to initiate the treatment[16,22]. There is a bigger percentage of women in stages III and IV. Stage III occurs in one third of the Brazilians admitted in oncology services with breast cancer[19,23,24].

A study showed strong association between the time interval and the suspicion and the diagnostic conformation with staging at the diagnosis of cancer (RP adjusted = 2.97 and 3.04). This interval was greater than six months in nearly half of the women (42.7%), indicating, in the period investigated, the morosity of the health system[21,25-27]. The effectiveness and efficacy of the health services determine the success of the cure and reduction of mortality in Brazil.

The environmental and socioeconomic factors also influence directly the problematic. According to the Ministry of Health, the most effective forms of early detection are the clinical exam of the breast and mammography[10]. Ultrasound can also be performed as diagnostic support, which, most of the times, estimate enough data for the clinical staging of the tumor and definition of the treatment.

Nevertheless, many women with profile of risk do not have access to these exams, because this access to health services in some cities in Brazil, including Ceará, is still limited. Not to mention that mammography in the public service is performed only for the age-range considered at risk, between 50 and 59 years old[12,16,26]. In this study, more than 90% of the deaths occurred in women older than 40 years. Corroborating the findings of this study, in 2017, one study showed that more than 85% of the cases occur after 49 years old, reaching its peak from 65 to 70 years[16].

There was increase of the rates of breast cancer rates in younger women in Brazil, however, the age range between 40 and 50 years represents 74% of the cases[12]. Considering this reality, the Brazilian Society of Mastology[28] recommends mammography annually from 40 years old on. The Ministry of Health is contrary to this conduct, indicating that this exam must be done at every two years for women with 50 years or older (group considered priority)[10].

The results encountered in this study should be analyzed cautiously, since they can be influenced by the quality of the diagnosis, the information about deaths and access to oncology services, factors inherent to each State, Region or country.

The rates of mortality in Ceará will be reduced contingent upon the increase of the State investment in public policies targeted to prevention and control of the disease, through structuring of the healthcare network including strategies of promotion of health and prevention of diseases.

World-base studies indicate a tendency of reduction of the mortality rate by breast cancer in Brazil in 2020. However, for this to be materialized, it is necessary investment in public policies aimed for the female health that prioritize the identification of risk factors associated to the disease and the establishment of strategies that include the active search of cases and early diagnosis and then, reduce the number of deaths by breast cancer.

CONCLUSION

The analysis of this study evidenced an increasing tendency of the number of deaths in Ceará, in Northeast and in Brazil, although, during the period, expressive reductions were observed.

It is imperative the elaboration of strategies that prioritize actions that reduce the delay in managing breast cancer cases in public services for early detection and, consequently, the cure become concrete realities in the country, in the Northeast Region and more specifically in the State of Ceará.

The knowledge about risk factors, prevention and early diagnosis become vital for the cure and rehabilitation of women in order to reduce mortality by breast cancer.

In this perspective, the continuous education of the professionals of the National Health System (SUS) is essential to control the disease, being necessary the

development of competencies that strengthen the education in health and capacity of problems solving, including the active search of women with determinant risk factors and the improvement of the quality of information about mortality provided by the states.

Therefore, it is important to know the socioeconomic and demographic profile of the women affected by breast tumors, in order to define assertive actions that consider the individual and collective necessities since beliefs, religious and cultural values can influence directly the detection and treatment of these women.

CONTRIBUTIONS

All the authors contributed substantially for the study conception and planning, analysis and/or interpretation of the data, wording and/or critical review and approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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REFERENCES

1. Bray F, Ferlay J, Soerjomaram I, et al. Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. CA Cancer J Clin. 2018;68(6):394-424. doi: https://doi.org/10.3322/caac.21492
2. Ghoncheh M, Pournamdar Z, Salehiniya H. Incidence and mortality and epidemiology of breast cancer in the world. Asian Pac J Cancer Prev. 2016;17(S3):43-6. doi: https://doi.org/10.7314/apjcp.2016.17.s3.43
3. Ghoncheh M, Mahdavifar N, Darvishi F, et al. Epidemiology, incidence and mortality of breast cancer in Asia. Asian Pac J Cancer Prev. 2016;17(S3):47-52. doi: https://doi.org/10.7314/APJCP.2016.17.S3.47
4. Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2020: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2019.
5. Gonçalves LLC, Travassos GL, Almeida AM, et al. Barreiras na atenção em saúde ao câncer de mama: percepção de mulheres. Rev Esc Enferm USP. 2014;48(3):394-400. doi: https://doi.org/10.1590/S0080-623420140000300002
6. Hofelmann DA, Anjos JC, Ayala AL. Sobrevida em dez anos e fatores prognósticos em mulheres com câncer de mama em Joinville, Santa Catarina, Brasil. Cien Saude Coletiva. 2014;19(6):1813-24. doi: https://doi.org/10.1590/1413-81232014196.03062013.
7. Coughlin SS, Ekwueme DU. Breast cancer as a global health concern. Cancer Epidemiol. 2009;33(5):315-18. doi: https://doi.org/10.1016/j.canep.2009.10.003
8. Cuzick J, DeCensi A, Arun B, et al. Preventive therapy for breast cancer: a consensus statement. Lancet Oncol. 2011;12(5):496-503. doi: https://doi.org/10.1016/S1470-2045(11)70030-4
9. Rosato V, Bosetti C, Negri E, et al. Reproductive and hormonal factors, family history, and breast cancer according to the hormonal receptor status. Eur J Cancer Prev. 2014;23(5):412-7. doi: https://doi.org/10.1097/CEJ.0b013e3283639f7a
10. Instituto Nacional de Câncer José Alencar Gomes da Silva. Diretrizes para a detecção precoce do câncer de mama no Brasil. Rio de Janeiro: INCA; 2015.
11. Wild CP, Weiderpass E, Stewart BW, editors. World Cancer Report: cancer research for cancer prevention. Lyon: IARC Press; 2018.
12. Dibaba DT, Ogunsina K, Braithwaite D, et al. Metabolic syndrome and risk of breast cancer mortality by menopause, obesity, and subtype. Breast Cancer Res Treat. 2018;174(1):209-18. doi: https://doi.org/10.1007/s10549-018-5056-8
13. Instituto Nacional de Câncer José Alencar Gomes da Silva. Atlas on-line de mortalidade [Internet]. Rio de Janeiro: INCA; c1996-2014. [acesso 2018 jul. 10]. Disponível em: https://www.inca.gov.br/app/mortalidade
14. Baiocchi G, Distaso W. GRETL: econometric software for the GNU generation. J Appl Econ. 2003;18(1):105-110. doi: https://doi.org/10.1002/jae.704
15. Instituto Brasileiro de Geografia e Estatística [Internet]. Rio de Janeiro: IBGE; [acesso 2018 jul. 11]. Estimativas da população [1 tela]. Disponível em: https://www.ibge.gov.br/estatisticas/sociais/populacao/9103-estimativas-de-populacao.html?edicao=17283
16. Souza NHA, Falcão LMN, Nour GFA, et al. Câncer de mama em mulheres jovens: estudo epidemiológico no nordeste brasileiro. SANARE. 2017;16(2):60-67. doi: https://doi.org/10.36925/sanare.v16i2.1179
17. EBCTCG (Early Breast Cancer Trialists' Collaborative Group), McGale P, Taylor C, et al. Effect of radiotherapy after mastectomy and axillary surgery on 10-year recurrence and 20-year breast cancer mortality: meta-analysis of individual patient data for 8135 women in 22 randomised trials. Lancet. 2014;383(9935):2127-35. doi: https://doi.org/10.1016/S0140-6736(14)60488-8
18. França E, Teixeira R, Ishitani L, et al. Causas mal definidas de óbito no Brasil: método de redistribuição baseado na investigação do óbito. Rev Saúde Pública. 2014;48(4):671-681. doi: https://doi.org/10.1590/S0034-8910.2014048005146

19. Figueiredo FWS, Almeida TCC, Cardial DT, et al. The role of health policy in the burden of breast cancer in Brazil. BMC Womens Health. 2017;17:121. doi: https://doi.org/10.1186/s12905-017-0477-9
20. Carioli G, Malvezzi M, Rodriguez T, et al. Trends and predictions to 2020 in breast cancer mortality in Europe. Breast. 2017;36:89-95. doi: https://doi.org/10.1016/j.breast.2017.06.003
21. Carioli G, Malvezzi M, Rodriguez T, et al. Trends and predictions to 2020 in breast cancer mortality: Americas and Australasia. Breast. 2018;37:163-9. doi: https://doi.org/10.1016/j.breast.2017.12.004
22. Gonçalves PHB, Gaui MF, Martins RG, Bines J. Padrão de tratamento cirúrgico do câncer de mama de acordo com a idade - Análise de 5 anos do Instituto Nacional do Câncer (INCA). Trabalho apresentado no XVI Congresso Brasileiro de Cancerologia e XIII Congresso Brasileiro de Oncologia Clínica, São Paulo, 26 a 30 de novembro de 2003.
23. Coleman MP, Quaresma M, Berrino F, et al. Cancer survival in five continents: a worldwide population-based study (CONCORD). Lancet Oncol. 2008;9(8):730-56. doi: https://doi.org/10.1016/S1470-2045(08)70179-7
24. Cuzick J. Preventive therapy for cancer. Lancet Oncol. 2017;18(8):PE472-PE482. doi: https://doi.org/10.1016/S1470-2045(17)30536-3
25. Tarone RE. Birth cohort trends for breast cancer among women in Europe and North America. Epidemiol Biostat Public Health. 2017;14(1). doi: https://doi.org/10.2427/12306
26. Sant M, Allemani C, Capocacia R. Stage at diagnosis is a key explanation of differences in breast cancer survival across Europe. Int J Cancer. 2003;106(3):416-22. doi: https://doi.org/10.1002/ijc.11226
27. Soares PBM, Quirino Filho s, Souza WP, et al. Características das mulheres com câncer de mama assistidas em serviços de referência do Norte de Minas Gerais. Rev Bras Epidemiol. 2012;15(3):595-604. doi: https://doi.org/10.1590/S1415-790X2012000300013
28. Sociedade Brasileira de Mastologia. Saiba tudo sobre o câncer de mama [Internet]. Rio de Janeiro: Sociedade Brasileira de Mastologia; [2016]. [acesso 2018 jul 10]. Disponível em: https://www.sbmastologia.com.br/wp-content/uploads/2017/09/Cartilha-Saiba-Tudo-Sobre-o-CM.pdf

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