



## **Racial clipping and socioeconomic status as social determinants of health in breast cancer diagnosis**

### **Recorte racial e situação socioeconômica como determinantes sociais de saúde no diagnóstico do câncer de mama**

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#### **ABSTRACT**

The objective of this study was to investigate the possible associations between socioeconomic and race/color as social determinants of health for breast cancer diagnosis. The data of interest were sociodemographic, such as age, education, income, race/color self-reported as black (black and brown) and white, and clinical data, such as family history and diagnosis of breast cancer. Adult women with and without breast cancer participated with no age difference between the groups. And among those in the group of cases we observed lower education and income, higher percentage of self-declared black women, with no difference between groups for marital status. However, it was observed that black women without partners had lower per capita income than those with partners. In addition, black women were almost twice as likely to develop breast cancer compared to non-black women. In addition, black women with a partner were almost 2.1 times more likely when compared to white women with a partner. We conclude that socioeconomic factors and race are indeed important social determinants that relate to the development of breast cancer and endorse the need to strengthen existing public policies for the prevention and early treatment of the disease.

**Keywords:** breast cancer; women of African descent; racial inequality; health disparity, minorities and vulnerable populations

#### **1 INTRODUCTION**

Social Determinants of Health (SDH) are the living and working conditions of people as well as their economic, social, ethnic/racial, cultural, psycho-behavioral factors that exert influence, to a greater or lesser extent, on the health of individuals. The study of SDH makes it possible to glimpse the list of inequalities that the current socioeconomic system produces and maintains (BUSS; PELLEGRINI FILHO, 2007).

Socioeconomic, racial and gender issues significantly influence health inequities. In particular, the Afro-Brazilian population, for being historically exposed to social vulnerability factors, may have a worse prognosis in relation to various diseases, including breast cancer. In addition, women of African descent have a higher genetic risk of developing the disease earlier with a more aggressive and difficult to diagnose type of cancer (MCKENZIE; IVES; JEFFREYS, 2012).

Breast cancer is the most common neoplasm affecting women worldwide. Its etiology involves different environmental, hereditary and genetic factors. In Brazil, the incidence grows progressively after the age of 50, being a little rarer before the age of 35 (ROSA; RADUNZ, 2012).



And besides the high incidence, there are also high mortality rates, being the leading cause of death from cancer in women. The estimates for the year 2022 in Brazil are 66,280 new cases, which represents an adjusted incidence rate of 43.74% of new cases per 100,000 women. The highest rates of this cancer are found in the South and Southeast, however, in the Midwest the numbers draw attention by presenting a crude rate of 45.24% and an estimate of 3,760 new cases, and in Goiás, 1620 new cases with a crude rate of 46.09%, both exceeding the national data (MINISTÉRIO DA SAÚDE, 2021).

For black women, considering that it is the group that represents one of the poorest segments of the Brazilian population, the intersectionality of discriminatory systems such as race/color and gender, combined with class oppression, restricts access to goods and services in health, when compared to white women. Consequently, it is characterized as a factor of exclusion as a subject of right (BATISTA; WERNECK; LOPES, 2012; BORGHI; OLIVEIRA; CEVALHO, 2018).

The standardization for the inclusion of the question race/color in the main health information systems in Brazil, in 1996, increased the number of researchers who have dedicated themselves to studying race relations in the health-disease process in the country. However, studies that address these aspects in the context of risk and disease prognosis are still insufficient (BATISTA; WERNECK; LOPES, 2012; GARBOIS; SODRÉ; DALBELLO-ARAÚJO, 2017).

Given the above, the present study is justified in view of its degree of importance, and also the need to deepen the investigations on the subject to complement and expand the possibilities of health intervention, with emphasis on breast cancer and its relationship with the socioeconomic situation and racial status as important social determinants of health.

## **2 OBJECTIVES**

### **2.1 GENERAL OBJECTIVE**

Investigate the possible associations between socioeconomic and race/color as social determinants of health for breast cancer diagnosis.

### **2.2 SPECIFIC OBJECTIVES**

Characterize the women in the study regarding socioeconomic status and racial status; Understand the relationship between the social determinants of health (income and race/color) and breast cancer.

To evaluate the possible associations between the variables studied

## **3 METHODOLOGY**

### **3.1 TYPE OF STUDY**



This is a case-control study. The cohort entitled "Impact of chemotherapy treatment on body composition, lipid profile and glycemic profile of women with breast cancer treated in Goiânia", which has the overall objective "To evaluate the impact of adjuvant and neoadjuvant chemotherapy treatment on body composition, lipid profile and glycemic profile of women with breast cancer treated at the Hospital das Clínicas da Universidade Federal de Goiás (HC/UFG).

### 3.2 STUDY SITE, POPULATION AND SAMPLE

The study population was composed of two groups: cases and controls. The cases were patients recently diagnosed with breast cancer who were seen at the Advanced Breast Diagnostic Center (CORA) of the Clinical Hospital of the Federal University of Goiás (HC/UFG/EBSERH), a reference site for the diagnosis and treatment of breast diseases. Volunteers in the control group were patients who presented with no alteration in the breasts in the last twelve months in relation to the face-to-face interview, confirmed by mammography or clinical examination of the breasts for those over 40 years of age.

The present study used the same pairing as the 1:2 matrix project, in which each case was paired by age (quinquennium), menopausal status (pre- and post-menopausal), and Body Mass Index (BMI - underweight, eutrophic, overweight, and obese), with two controls.

For the present project the sample size calculation was considered: a case-control study, with a case-control ratio of 1:2, a proportion of exposed among controls of 0.060% and 0.010% among cases, two-tailed, 5% alpha, and a power of the test ( $\beta=1-\alpha$ ) of 80%, totaling 202 cases and 404 controls.

### 3.3 INCLUSION AND NON-INCLUSION CRITERIA

Women were included, for the case group:

- With incomplete age from 30 to 80 years, considering the range of higher prevalence of the disease.
- Newly diagnosed with breast cancer, maximum two weeks, according to the anatomopathological report, without initiating chemotherapy and/or hormone therapy treatment;
- Staging between IA and III;
- Do not have and/or have been treated for another neoplasm;
- Have a Single Health System (SUS) card and be seen at CORA.

Women were included for the control group:

- With a minimum age of 30 and a maximum age of 80 incomplete;
- No previous or current diagnosis of breast cancer or any other neoplasm;
- Who have had a mammogram or clinical breast exam (< 40 years old) in the last year and had no changes in the report (up to BIRADS 3);
- Who fit, with the case patients, in the pairing by age (quinquennium), menopausal status, and BMI.



Women were not included in the research for the case and control groups:

- Who have metastasized, relapsed, or been treated for breast cancer and/or other cancers;
- With cognitive impairment and/or psychiatric illness, which makes it impossible to understand the work and collect the information necessary for the research;
- Amputees, with immobilization of upper and lower limbs, paraplegia, orthopedic problems, use of hip prosthesis, which prevented the anthropometric measurements and exams required in the research protocol;
- Pregnant and lactating women.

### 3.4 DATA COLLECTION

Because this study is part of an umbrella project, data were previously collected (August 2014 to September 2017) after written consent, through face-to-face interviews, in a single approach, and by data collection from medical records. For the current study, variables of interest to the study were used, and data were collected by a team of professionals trained for this purpose using the Interviewer's Manual prepared by the researchers responsible for minimizing errors and biases during collection.

The data of interest for the present study were:

- sociodemographic variables: age, education (total years of study), income (per capita in reais and minimum wage). The analytical variable used in this study was race/color, as classified by the Brazilian Institute of Geography and Statistics (IBGE), self-declared as black (black and brown) and white, among others;
- clinical data: family history of breast cancer in first-degree relatives and diagnosis of breast cancer. The instrument used was a questionnaire previously standardized and tested in a pilot study.

The variables race and marital status were recategorized. In race: white (white, indigenous, and yellow) and black (black/pardvas) and marital status in: with partner (married and/or stable union) and without partner (single, separated/divorced, and widowed).

### 3.5 DATA BANK AND ANALYSIS

To build the database, the Epi-Info™ (version 7.1.5) software was used, with double entry, in order to minimize the chances of errors in the tabulation of collected data. The analysis used descriptive statistics, where categorical variables were expressed in absolute and relative frequencies and continuous variables in mean, median, interquartile range, standard deviation, minimum and maximum.

The "Kolmogorov-smirnov" test was used to verify the normal distribution of continuous variables, considering normal distribution when  $p > 0.05$ . Chi-square tests were used for comparison of categorical variables, mean comparison tests for continuous variables with parametric (paired or unpaired t-Student test) or non-parametric (Mann-Whitney and Wilcoxon) statistics. Pearson (normal distribution) and/or Spearman (non-normal distribution) correlation tests were used. The Odds Ratio (OR) was used to evaluate



the odds ratio of developing breast cancer and the relationship with the social determinants of health evaluated. The results were presented in tables and graphs.

### 3.6 ETHICAL ASPECTS

The matrix project was structured according to the norms of Resolution 466/2012 (BRASIL, 2012) and was previously approved by the Ethics and Research Committee of the Hospital das Clínicas of the Federal University of Goiás (HC/UFG/EBSERH) under Opinion number: 751.387/2014 and amendment that other necessary objectives: 3.642.562/2019.

Patients who met the criteria for inclusion in the sample were previously informed of the research objectives, its potential benefits and risks, as to the reliability and privacy of procedures, image protection and non-stigmatization, ensuring the non-use of information to the detriment of individuals and/or communities, including in terms of self-esteem, prestige and/or economic and financial aspects, being given the right to accept or refuse to participate in the study (BRASIL, 2012). It is noteworthy that the participants had already signed the Informed Consent Form (ICF) when they were inserted in the matrix project.

## 4 RESULTS

A total of 592 women participated in the study, 199 cases (33.61%) and 393 controls (66.39%), according to the proposed pairing, which is equivalent to 98.52% of the sample calculated for cases and 97.28% for controls. We observed a mean age of  $52.24 \pm 11.71$  among cases and  $52.14 \pm 11.40$  among controls, with no difference between groups ( $p=0.96$ ), as expected in the inclusion criteria (Table 1). The range of age between minimum and maximum was 29 to 87 years (cases) and 30 to 83 years (controls).

Regarding education, we found a mean number of years of study of  $7.96 \pm 4.27$  (cases) and  $10.58 \pm 4.69$  (controls), with a statistically significant difference between groups ( $p<0.001$ ), in which cases had less education (Table 1), ranging from zero to 20 (cases) and zero to 25 (controls) years of study.

There is a difference between the monthly family income in Reais between the groups, in which cases also had lower income when compared to controls ( $p<0.001$ ), with a median of 1,500.00 and 2,290.78, for cases and controls, respectively (Table 1). There was a variation in income, between minimum and maximum, from zero to R\$10,000.00 (cases) and from zero to R\$35,000.00 (controls) in monthly family income. The income difference between the groups is also reinforced in minimum wages (MW), in which controls receive almost 1.6 times more than cases (Table 1).

Table 1. Measures of central tendency and dispersion of the sociodemographic variables of the study participants. Advanced Center for Breast Diagnosis - CORA, Goiânia, Brazil, 2014/2017.

Variables	Cases (n)	X ± SD	Controls (n)	X ± SD	p
Age (years)	198	52,24 ±11,71	346	52,14±11,40	0,96



Years Studied	190	7,96±4,27	329	10,58±4,69	<0,001
Monthly family income (reais)*	192	1.500,00**	338	2.290,78**	<0,001
Monthly family income (SM)	190	1,8**	329	2,84**	<0,001
Monthly income per capita (SM)	191	0,57**	337	1,01**	<0,001

\*Minimum wage-SM (2014/2017) = R\$ 724.00 / R\$ 937.00

\*\*Median was used, due to the very discrepant SD

When comparing the races between cases and controls it was observed that those women in the first group represented a higher percentage (around 70.0%; n=136; p = 0.02) in relation to the black race (black/male), when compared to controls and other races (non-black). When comparing marital status between cases and controls, no significant difference was observed between the groups, besides a slightly lower percentage of women without partners in both groups (Table 2).

Table 2. Racial and marital status characterization of the study participants. Advanced Center for Breast Diagnosis - CORA, Goiânia, Brazil, 2014/2017

Variables	Cases (n)		Controls (n)		p
	n	%	n	%	
<b>Race/Color (n=198 cases and n=345 controls)</b>					
White	52	26,26	136	39,42	
Black	24	12,12	36	10,43	
Brown	112	56,57	147	42,62	<b>0,02</b>
Yellow	08	4,04	20	5,79	
Indigenous	02	1,01	06	1,74	
<b>Marital status (n=196 cases and n=345 controls)</b>					
Married and/or with partner	115	58,67	212	61,45	
Single	35	17,86	51	14,78	0,43
Separated/Divorced	19	9,69	49	14,20	
Widow	27	13,78	33	9,57	

There was no difference in per capita income (in SM) by race among cases, even with higher median among whites, but among controls, black women had lower income (p <0.01). As for marital status, it was observed that black women, regardless of being cases and controls, without partners had lower per capita income (in SM) than those accompanied (p <0.01), in both groups (Table 3).

Table 3. Income characterization among breast cancer cases and controls by race and marital status of the study participants. Centro Avançado de Diagnóstico da Mama - CORA, Goiânia, Brazil, 2014/2017.

Variables	Cases (n)						p	Controls (n)						p
	White (n=59)			Blacks (n=131)				White (n=159)			Blacks (n=179)			
	Min	Med	Max	Min	Med	Max		Min	Med	Max	Min	Med	Max	
Per capita income (SM)	0,63	2,00	10,67	0,00	1,66	12,69	0,13	0,16	3,50	44,40	0,00	2,27	38,07	<0,01
	With partner (n=114)			No partner (n=75)				With partner (n=209)			No partner (n=128)			
Per capita income (SM)	0,00	2,00	12,69	0,00	1,00	12,50	<0,01	0,00	3,20	38,07	0,16	2,05	44,40	<0,01

Min=minimum, Med=Median, Max=maximum. The median was used in view of the very discrepant SD

When evaluating the odds ratio of developing breast cancer by the variables that are related as social determinants of health, it was observed (Table 4) that black women were almost twice as likely to develop breast cancer when compared to those who were not black (OR 1.94;  $p < 0.001$ ). When the association between marital status was verified, it was found that women without a partner did not differ from those with a partner (OR 1.14;  $p = 0.52$ ).

When associating race with marital status and the development of breast cancer, it was observed that black women **with a partner** were almost 2.1 times more likely to develop breast cancer when compared with matched white women. In addition, black women **without a partner** did not show different odds ratios when compared with white women of the same marital status (Table 4).

Table 4. Odds Ratio for breast cancer cases according to race and marital status. Centro Avançado de Diagnóstico da Mama - CORA, Goiânia, Brazil, 2014/2017.

Variables	Cases		Controls		OR 95% CI	p
	n	%	n	%		
<b>Race</b>	198	100,00	345	100,00		
White (not black)	62	31,31	162	46,96	1,0	<0,001
Black	136	68,69	183	53,04	1,94 (1,35-2,80)	
<b>Marital status</b>	197	100,00	345	100,00		
With partner	115	58,38	212	61,45	1,0	
No partner	82	41,62	133	38,55	1,14 (0,80-1,62)	0,52

Marital status associated with race



<b>With partner</b>	115	100,00	211	100,00		
White women	37	32,18	105	49,76	1,0	<b>&lt;0,001</b>
Black women	78	67,82	106	50,24	2,08 (1,30-3,36)	
<b>No companion</b>	82	100,00	133	100,00		
White women	25	30,49	56	42,11	1,0	0,11
Black women	57	69,51	77	57,89	1,65 (0,93-2,97)	

## 5 DISCUSSION

This case-control study showed adult women with and without breast cancer with no age difference between groups, according to the eligibility criteria. And among those with breast cancer we observed lower education and income, a higher percentage of self-declared black women (black/male), with no difference between groups for marital status. However, it was observed that black women, regardless of being cases or controls, without partners had lower per capita income than those accompanied.

When evaluating the odds ratio of developing breast cancer and its relationship with the variables of race and income, it was observed that black women presented almost twice the odds, when compared to those who were not black. In addition, black women with a partner were almost 2.1 times more likely, when compared to matched white women.

In the literature it is observed that the chances of developing breast cancer are progressive from the age of 40, conditions that corroborate with the median age of the study participants, as well as endorse the main risk factors, among them the age related to reproductive characteristics, for being an estrogen-dependent disease (SILVA; RUIL, 2011).

As observed, women with breast cancer, mostly black, had lower income and less education than those without the disease. In a study that evaluated the 10-year survival associated with race, the authors observed that those with the disease were proportionally greater from the black race and had lower income, in addition to starting treatment late, with diagnosis in more advanced stages and lower survival (NOGUEIRA et al., 2018).

When portraying the racial issue, the literature on the educational and professional situation of the black population of Goiania shows that most (54.0%) of those enrolled in CADÚNICO had reduced schooling, and one of the main reasons for dropping out of school is the need to work in order to contribute to the family income, as well as when compared to women with higher levels of education who are white, have more information on preventive factors for breast cancer, such as the higher prevalence of exclusive breastfeeding, among others (IMB, 2021; SILVA, VIANNA; BARJA, 2016).





Still with regard to socioeconomic and racial factors as social determinants of health, when considering that the cases have lower incomes and education, it is observed that the state of Goiás, where this study was conducted, was considered the 5th state with the greatest increase in poverty and with reduced average monthly income from 2014 to 2021, with this, it can be inferred a direct influence on the findings presented (IPEA, 2021).

The association between breast cancer, race and socioeconomic status is validated in different studies. Black women, in the age range of 50 to 70 years, with low income are directly associated with advanced staging at diagnosis, lower prognosis and survival, as well as difficulties in treatment. Such more specific conditions were not evaluated, however, mainly by observing, in the present study, the fact that black women are almost twice as likely to develop breast cancer, when compared to non-blacks, reinforces the need for careful evaluation of this group, especially regarding the prevention of disease-related aggravations and a more in-depth discussion of the theme involving the DSS (NOGUEIRA et al., 2018; JACK; DAVIES; MOLLER, 2009; COUGHLIN, 2019).

With regard to marital status, no difference was observed between cases and controls, but black women without partners, regardless of the group, had lower per capita income than those accompanied. On the other hand, black women with a partner were almost 2.1 times more likely to develop breast cancer when compared to white women of the same marital status. A study conducted in Recife, Pernambuco, observed that women without a partner had a higher mortality rate, especially black women (SANTOS; GUIMARÃES; ARAÚJO, 2007). In addition, there are cases of domestic violence in women accompanied as predictors of symptoms of depression and anxiety, which are common symptoms in cancer patients, regardless of the type (COKER et al., 2012). Another study that evaluated the profile of breast cancer and the relationship between risk factors and clinical stage did not identify a relationship between the stage of cancer and marital status (DUGNO, 2013).

All health disparities observed become important challenges in public health and the impacts of inequality in access to health, especially, with regard to racial and socioeconomic issues (CABRAL et al., 2019), highlighting disadvantages and lack of equity, as social determinants of health that need to be valued in the design, development and implementation of public policies, especially that address this issue.

## 6 CONCLUSIONS



The present study followed mostly young adult women, with no difference between age and marital status for cases and controls. Among those in the control group, we identified black women, with low education and income, the latter being more significant in the group without a companion.

When assessing the possible associations between the variables, with regard to the odds ratio of developing breast cancer, it was observed that black women had almost twice the odds compared to non-black women, and black women with a partner had almost 2.1 times the odds compared to matched white women.

## **7 FINAL CONSIDERATIONS**

It is noteworthy, from the findings of this study, that the black female population is in a situation of vulnerability, with an important degree of school dropout, precarious income and with greater chances of developing breast cancer, including those with partners. Thus, it is suggested that further studies with different designs are conducted to support the information raised and assist in the process of health communication of so many disparities in the social determinants of health that are related to the development of this disease so prevalent and with the incidence in progression, as breast cancer.

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