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SPATIAL ANALYSIS OF CERVICAL CANCER CASES IN ELDERLY WOMEN IN THE BRAZILIAN NORTHEAST OF 2010 TO 2013

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ABSTRACT

Objective: To identify the spatial distribution of the number of cases of elderly women with cervical cancer in the city of. Using the variables income and schooling of the last census of the Brazilian Institute of Geography and Statistics (IBGE). *Methods*: The population was composed of 238 elderly women, using the Health Information System of the Hospital Registry of Cancer (SIS-RHC) of the Aldenora Bello Cancer Hospital. For spatial distribution of cases of cervical cancer, spatialization of the number of cases by neighborhoods and socioeconomic variables - income and schooling - by the census tract of São Luís through the ArcGis 10.1 software was performed.

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INTRODUCTION

Cervical cancer (CC) is the fourth most common form of cancer in women in the world, 528,000 new cases were estimated in 2012, of which about 80% occurred in less developed regions, accounting for the death of approximately 265 thousand women (IBGE, 2016). In the state of Maranhão and in its capital, CC is the third most prevalent type of cancer, behind prostate and breast cancers. It is the second most prevalent in women. In 2016, there were 970 new cases in the stateand 230 in the capital São Luís in 100 thousand inhabitants. The disease usually begins at age of 30 and increases its risk rapidly until reaching the age of 50 (IBGE, 2016). Cervical cancer is an important public health problem, and although it is a disease that is easy to prevent and cure that through Pap smear be possible its prevention, diagnosis and treatment it still have a high mortality rate in Brazilian society (Campos *et al.* 2015).

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However, the country advanced in its ability to perform early diagnosis.In the 1990s, 70% of the diagnosed cases were of the invasive disease, which is, the most aggressive stage of the disease. Currently 44% of the cases are cancer precursor lesions, called *in situ,* or localized lesions (IBGE, 2016). The highest incidence rates of cervical cancer are between 50 and 60 years of age, and mortality rates tend to increase with increasing age across the country. According to data from the Mortality Information System (SIM), in 2009, of the 5,063 deaths from cervical cancer, 2,124 were in women aged 60 years or more, corresponding to 41.95% of deaths from this tumour. In the northeast region, there was a tendency to increase mortality rates, and the states of Maranhão and Roraima presented the highest trends in rates among all Brazilian states (Wrigth *et al*., 2005; Barbosa *et al*, 2016; BRASIL, 2011). Disease control should be considered a national priority. Among the main actions in this regard, it is highlighted the establishment by the Ministry of Health in 1998 of the National Program to Combat Cervical Cancer and the creation of the Cervical Cancer Information System (Lima *et al*., 2017). In view of the high incidence and mortality of

cervical cancer in Maranhão and São Luís, the present study intends to identify the spatial distribution of the number of cases of elderly women with cervical cancer in the neighbourhoods of São Luís - MA and compare its distribution with the variables income and schooling according to the last census of the Brazilian Institute of Geography and Statistics (IBGE) of 2010.

MATERIALS AND METHODS

This is an ecological descriptive study that used secondary data from the Hospital Registry of Cancer (RHC) of the Hospital of Cancer Aldenora Bello, a philanthropic institution and reference for the oncological treatment, instituted by the Ministry of Health Ordinance No. 741, of 19 of December 2005 as Centre for High Oncological Complexity (CACON), located in São Luís, capital of Maranhão. The Health Information System of the Hospital Registry of Cancer (SIS-RHC) of the institution was used as data source, through the Tumour Registry Records and the medical records for unfilled data. The study population consisted of 238 elderly women diagnosed with malignant neoplasm of the cervix classified in theInternational Classification of Diseases (ICD) C.53 and living in São Luís-MA. This figure corresponds to 100% of cases of cervical cancer in the elderly attended by the institution in the period from 1st January 2010 to 31st December 2013. The inclusion criteria were women diagnosed with cervical cancer, aged 60 years or older, registered and treated at the institution. The exclusion criteria were people that have started the treatment in another institution or that resides in other municipalities of the state of Maranhão or States of the Federation. In order to enable the study of the spatial distribution of cases of cervical cancer it was made a spatialization of the number of cases by neighbourhoods and socioeconomic variables - income and schooling - by the census sectors of São Luís and using the software ArcGis 10.1. The specific period of spatial distribution corresponded to the years 2010 to 2013, as the variables - city and neighbourhoods - were only included in the Tumour Records for SIS-RHC from the year 2010. The data correspond to the last four years in the system. To perform the spatialization of the number of cases per neighbourhoods, the digital information provided by INCID (2014) of urban and rural districts was used. The spatialization of the socioeconomic variables - income and schooling - was distributed by the IBGE census sectors (2014). These variables were chosen because they are considered one of the most important risk factors for the development of cervical cancer and to confer the elderly women of this research as socially vulnerable.

RESULTS

Regarding the sociodemographic variables of the elderly women studied in the city of São Luís, those with an average age of 70.86 years, brown race (45.4%), with incomplete primary education (39.4%), married (44.2%) and peasants (21.1%) were the most prevalent, as can be seen in Table 1. Based on the data base, it can be stated that the neighbourhoods of São Luís, where the largest number of elderly women with cases of cancer of the uterine cervix reside, were the São Francisco, Anjo da Guarda and CidadeOperária with approximately 8 to 12 cases as represented in (Figure 1). It is important to mention that the 2010 census registered the increase of the population of the

municipality of 870,028, in 2000; to 1.014. 837 inhabitants. In this sense the population density presented was approximately 1215.69 inhabitants / km2, and 94.45% of the population is urban. Thus, it should be noted that the three identified districts, São Francisco, Anjo da Guarda and CidadeOperária, are in densely populated areas; as shown in Figure 2. In regarding to the per capita income, calculated through the 2010 census, the districts of São Luís that obtained average wages up to a minimum wage are well distributed; with the lowest income concentrated in the areas that comprise the Itaqui-Bacanga region, CidadeOperária and surrounding area; and the rural area of the capital of Maranhão. The three neighbourhoods identified as residences for the elderly women with CC are inserted in areas with low income (Figure 3). Income and schooling are related variables because there is a reciprocal relationship. Thus, the spatial distribution of schooling, by neighbourhoods in São Luís, is similar to income distribution. The majority of the elderly with UCC have only incomplete primary education (39.4%) or have no schooling (16.7%); in several districts of the city they are elderly with this profile; among them, the three neighbourhoods already identified with the largest number of cases, as shown in (Figure 4).

Table 1. Sociodemographic variables of elderly women with cervical cancer in São Luís from 2010 to 2013

Variables		Results
Age (Average ± Standard deviation)		70,86 ± 7,79
Race n(%)	White	42 (16,7)
	Black	15 (6,0)
	Yellow	49 (19,5)
	Brown	114 (45,4)
	Indigenous	0 (0,0)
	No information	31 (12,4)
Education n (%)	None	42 (16,7)
	Incomplete Primary School	99 (39,4)
	Complete Primary School	29 (11,6)
	Secondary school	36 (14,3)
	Third-level	5 (100,0)
	No information	40 (15,9)
Marital status n (%)	Single	55 (21,9)
	Married	111 (44,2)
	Widowed	71 (28,3)
	Divorced	10 (4,0)
	Partnership	1 (0,4)
	No information	3 (1,2)
Occupation n (%)	Doctor (61)	2 (0,8)
	Teacher Third-level (139)	1 (0,4)
	Teacher pre-school (143)	0 (0,0)
	Teacher (149)	3 (1,2)
	Administrative agent. (319)	4 (1,6)
	Sellers (451)	1 (0,4)
	housewife (540)	11 (4,4)
	Caretaker / Concierge / Gari / Servant of Conservation / Cleaning (552)	4 (1,6)
	washerwoman (560)	1 (0,4)
	peasant (621)	53 (21,1)
	Farmer (639)	0 (0,0)
	extractivists (654)	0 (0,0)
	fisher (669)	0 (0,0)
	Seamstress (795)	3 (1,2)
	factory worker (969)	1 (0,4)
	No classification (999)	64 (25,5)
	Not applicable (888)	50 (19,9)
	No information (9999)	53 (21,1)

DISCUSSIONS

The National Cancer Institute (INCA) recommends starting the cytopathology exam at age of 25 years old, and should be performed until age of 64 years old and, after that periodit could be interrupted when they have had two consecutive negative tests in the last five years. Although the age group is not exactly the same, the average age of the elderly women presented in this study is much higher than the maximum
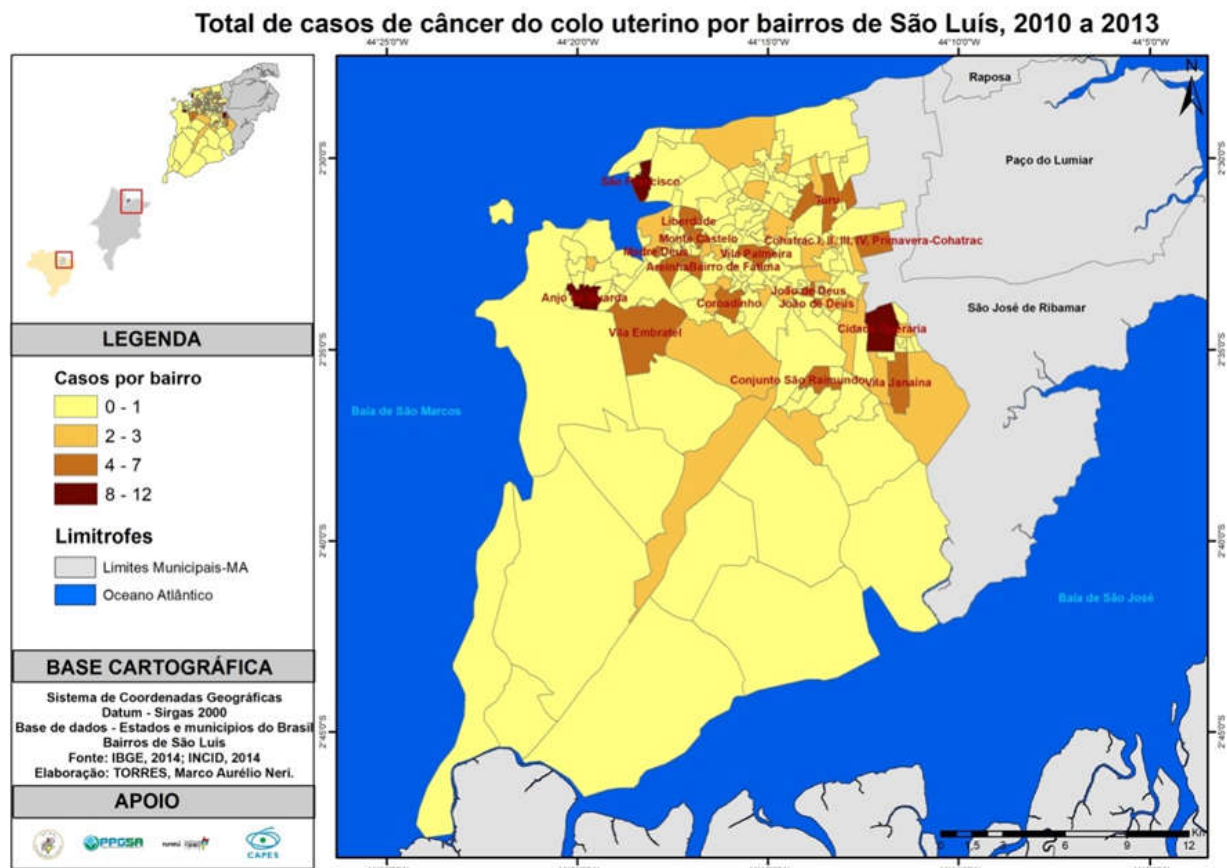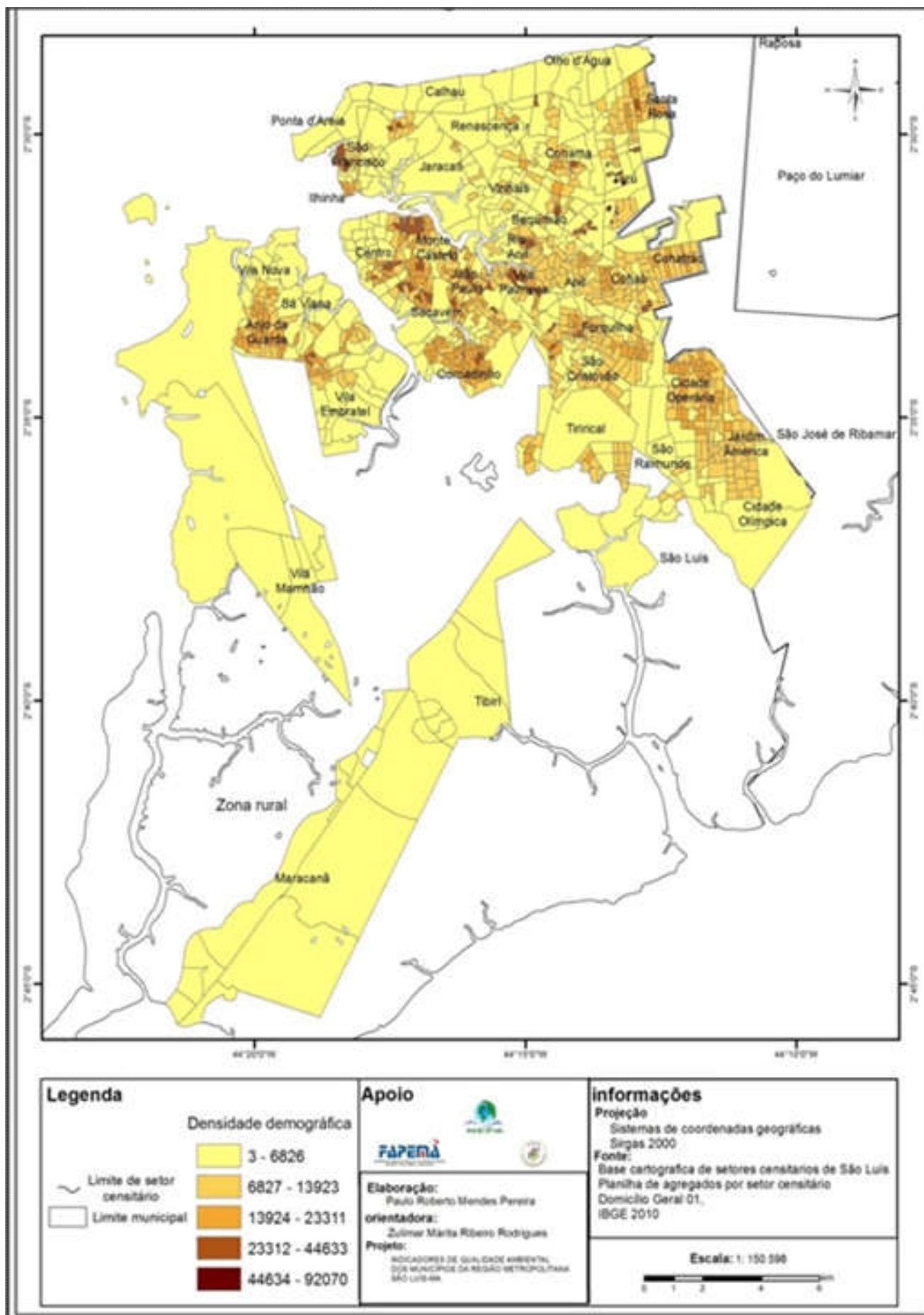
Total de casos de câncer do colo uterino por bairros de São Luís, 2010 a 2013

Source: ArcGis 10.1.

Figure 1. Total cases of cervical cancer by neighbourhoods of São Luís, 2010 to 2013

recommended age forcytopathological examination (INCA, 2016). Through this data we can question whether the lack of the active search of the cases by the government and the lack of public policies aimed at the screening specifically for the elderly are contributing to the late diagnosis and in the advanced stages of the disease. It should be noted that population aging is a global phenomenon and the city of São Luís follows this trend. According to the IBGE in 2000, the elderly population was 49,517 and in 2010 it reached 78,060; of this total, 45,640 are women (IBGE, 2017). Thus, the increase in the number of the elderly may reflect on the type of more specific aggravations of this age group or explain the number of elderly women with CC found in this study. They analysed in São Luís how the elderly, enrolled in the Family Health Strategy are distributed among the seven Health Districts (DS), a registry unit of the Municipal Health Department and used data from the Primary Care System (SIAB) and the IBGE (Martins, 2016). According to the SIAB, in 2014, the DS with the longest register of seniors was COHAB, followed by Tirirical, Centro, Vila Esperança, Itaqui-Bacanga, Coroadinho and Bequimão. For the IBGE, in descending order, it was the Center, COHAB, Bequimão, Tirirical, Coroadinho, Itaqui-Bacanga and Vila Esperança. Although the two databases do not record cancer cases, this is a sample of how the elderly population is spatially concentrated in São Luís. Regarding the spatial distribution of the elderly with CC, it was observed that in many neighbourhoods there was at least one case diagnosed, with a higher concentration in São Francisco, Anjo da Guarda and CidadeOperária. Parallel with the IBGE data, in the DS Centro is concentrated the largest number of elderly people and São Francisco is part of this DS; which partly explains the concentration of CC cases. The others, CidadeOperária and

Anjo da Guarda, are inserted, respectively, in the DS Itaqui-Bacanga and Tirirical. For SIAB, DS Tirirical is in second place and Itaqui-Bacanga in fifth place. Demographic density explains the higher concentration of elderly women with CC in the neighbourhoods of São Francisco, Anjo da Guarda and CidadeOperária. These neighbourhoods are densely populated areas of older occupation. São Francisco merges areas of occupation with a middle and high income pattern; however, it has families of low and very low income. Of the three neighbourhoods, it is the one that is more centralized and nearer geographically, of the Hospital of the Cancer Aldenora Bello. The neighbourhoods of the Anjo da Guarda and CidadeOperária are more peripheral areas of São Luís. Specifically, the first one was expanded due to the implementation of large economic projects such as ALUMAR and Vale in the 1980s in São Luís. In general it was occupied without prior planning and with a low income population. Regarding to the socio-demographic dimension, it is known that variables such as schooling and low income are considered as risk factors associated with the inadequacy of screening, especially in the age groups above fifty years of age and in women with less than eight years of schooling. Low schooling can affect the access and understandings of information related to health prevention actions, and make the safer decisions regarding the body itself more difficult, becoming more and more an important point to be considered (Castro *et al*, 2014). Low educational level was an associated factor also discussed by authors where it was observed that the majority of the women surveyed in Teresina-PI (74%) are illiterate or with only incomplete primary education. In the same research, another aspect that draws attention was the race / colour question, since the majority, with approximately (87.5%) are brown or black (Araújo, 2013).

Source: Pereira (2014)

Figure 2. Demographic density in São Luís – 2010

Renda de até 1 salário mínimo e casos de câncer do colo uterino em São Luís, 2010 a 2013
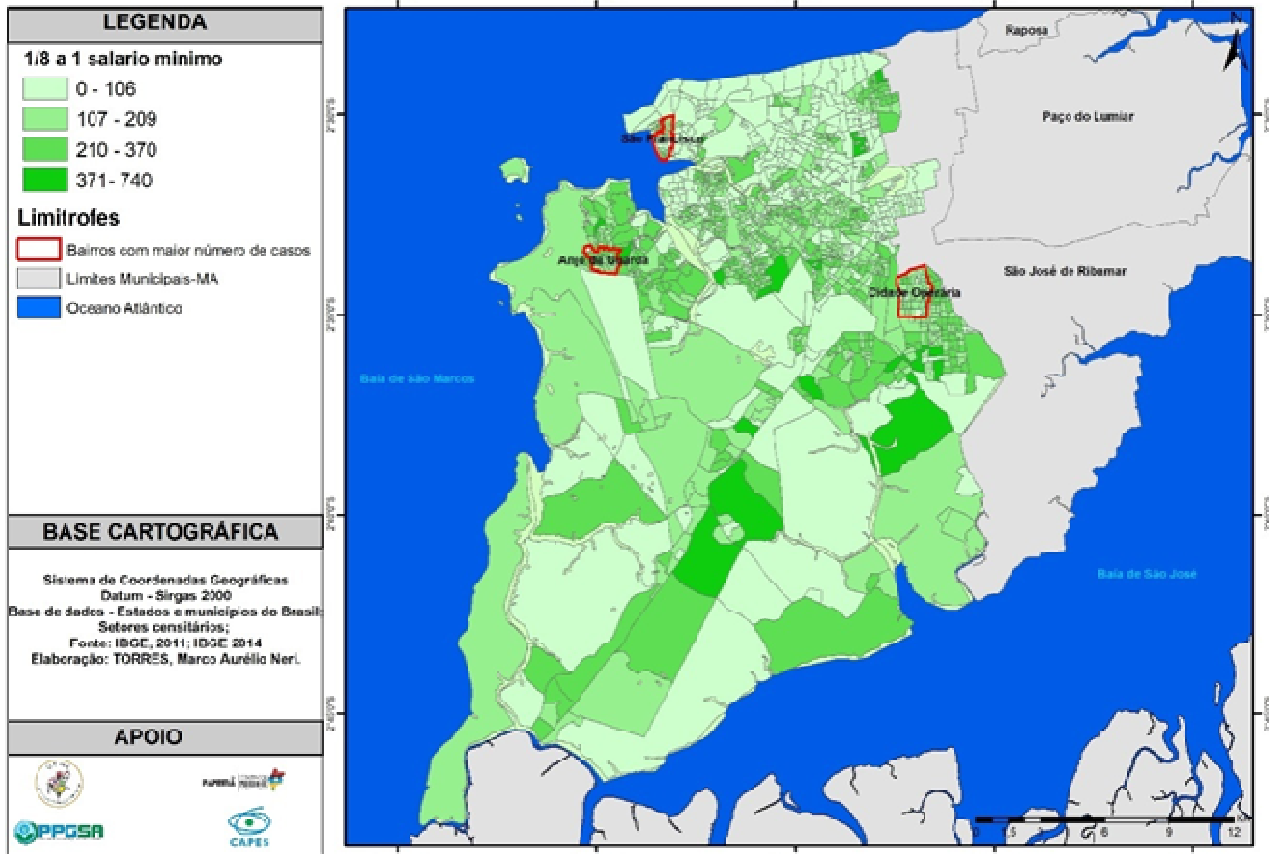
Source: ArcGis 10.1.

Figure 3. Cervical cancer and per capita income of up to 1 minimum wage

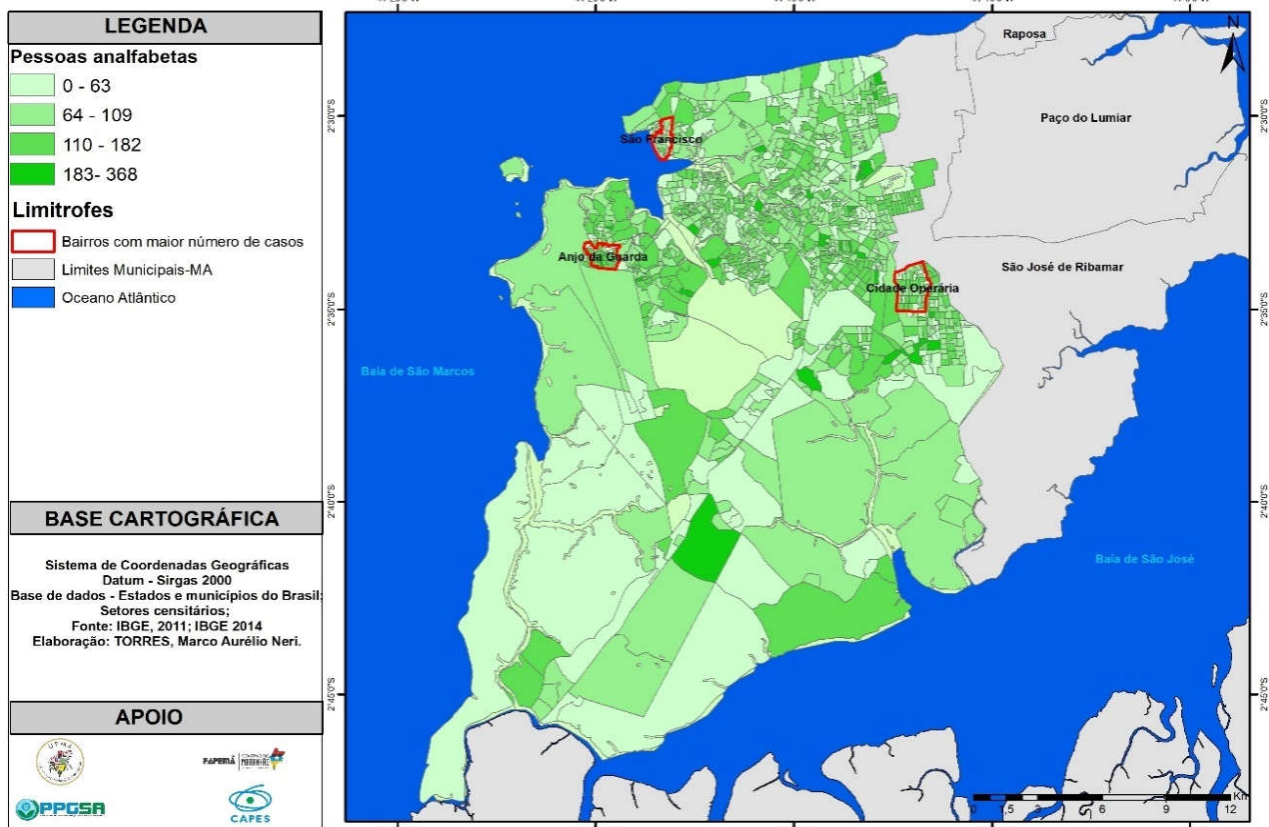## Alfabetização e casos de câncer do colo uterino em São Luís, 2010 a 2013

Figure 4.Cervical cancer and literacy by districts of São Luís, 2010 to 2013

In our research the total of brown and black was (51.4%). About the residents of São Luís with low income, the IBGE identified in 2010, among the nominal household income class; that of the total of 276,830 households, 15,805 had no income, 8,423 had up to ½ minimum wage and 29,479 had more than ½ to 1 salary. This scenario of the monthly income of the families gives a sample about the low income among the elderly with CC researched. While breast, lung and colorectal cancer are more common in countries with high incomes, in low-income countries CC is higher than other cancers (Reis, 2014). Still for the same authors, the great challenge to reduce the incidence of cancer in middle- and low-income countries is still the early diagnosis. This assertion can be attributed to the reality of São Luís, most likely early diagnosis could greatly minimize the sequelae or deaths caused by CC not only among the elderly, but among women in general.

The agricultural activities involve different types of risks to the health of the worker, in the present research it was identified that among the elderly of the CC, (21.1%) were peasants. The work environment and occupation account for (4%) of cancers; "At least 19 types of tumour - among them lung, skin, liver, larynx, bladder and leukaemia - are related to occupation and work environment" (INCA, 2018). Some agents associated with these cancers: asbestos, polycyclic aromatic hydrocarbons, arsenic, beryllium, ionizing radiation, nickel, chromium and colleters. Working activities under sun exposure, especially among fishermen and farmers, increase the risk of skin cancer among these workers (INCA, 2018). Rural workers are exposed to at least two toxic agents: agrochemicals and solar UV radiation (Lima, 2013). Other authors point out, in a systematic review, the researches that associate the expositions of workers in general, among them farmers, to chemical substances or mixtures with carcinogenic potential (Chagas, *et al*, 2013). The INCA launched the study "Guidelines for Workplace Cancer Surveillance" (2012), with the aim of drawing protection programs in the work environment and health surveillance and affirms that toxicologists carry out the process of occupational risk assessment.

In this research, among several carcinogenic substances, it refers to the solvents used in agrochemicals and pesticides, with association to CC. It is known that cancer is analysed as multifactorial, therefore, the fact that the elderly women with CC are in the majority peasants, cannot be discard one of the factors associated with the probable use of pesticides in their work activities. It is noteworthy that in the database used, there were failures or underreporting, in the "occupation" category, in the percentages records of "Unclassified", with (25.5%); "Not applicable", with (19.9%); and "No information", with (21.1%). It is understood that the complete fulfilment of this question, would better describe the occupational profile of the surveyed women. The doctor hardly ever asks a patient with cancer what his occupation is. It is imperative that health professionals record the occupation that the patient has worked for the longest period of time and the economic sector in which he / she has acted, so that cases of cancer related to work and the environment are identified and reported in the National System of Notification Diseases (SINAN) (INCA, 2018). There is still an "invisibility" of cancer cases related to the profession and can be evidenced by the low percentage of aid - illness granted by Social Security, which was 0.23% in 2009 (INCA, 2018).

Conclusion

By identifying the spatial distribution of the number of CC cases by neighbourhoods of São Luís – MA and comparing the distribution by neighbourhoods of São Luís - MA with the income and schooling variables of the last IBGE census of 2010, it was observed that the average age was 70, 86 years old, brown race (45,4%), with incomplete primary education (39,4%), married (44.2%) and peasants (21.1%). Demographic density explains the greater concentration of elderly women with CC in the neighbourhoods of São Francisco, Anjo da Guarda and CidadeOperária or also reflects along with several factors of the urban environment that can be conditioning for cases of cancers. For this reason, it has been observed, that in general, there is at least one case of CC scattered among the neighbourhoods of the city. Risk factors associated with cancer can be analysed as external (urban, work, housing, among others) or as endogenous (hereditary factors, age, gender or race, among others); the factors are associated and interrelated, hence the multi-causality of cancer. It is worth noting that the Hospital of the Cancer Aldenora Bello is a philanthropic institution and a reference for cancer treatment, which explains the number of elderly women being treated; especially low-income people. In terms of accessibility, this hospital is well centralized and with several public transport lines that facilitate access to treatment. Recalling that for the elderly using the public transports in the municipality is free of charge. The data on the underreporting of the "occupation" issue reinforce the need for more attention in filling out this aspect to better monitor the factors associated with work. Another important information is regarding to the variables - city and neighbourhoods -that only started to be included in the Tumour Card and included in the SIS-RHC from the year 2010. It is important to remember that the place of residence is a factor to be considered in the causality of aggravation. It is understood that multi-causality for all types of cancers should be put, therefore, not just the individual or endogenous factors of the patients should be reported, but also the exogenous factors, understanding that both factors should always interact and interrelate to a greater or lesser extent.

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