

# Cancer surveillance in Mato Grosso, Brazil: methodological and operational aspects of a university extension/research project

## *Vigilância do câncer em Mato Grosso, Brasil: aspectos metodológicos e operacionais de um projeto de extensão/pesquisa*

Noemi Dreyer Galvão<sup>I</sup> , Rita Adriana Gomes de Souza<sup>III</sup> ,  
Bárbara da Silva Nalin de Souza<sup>III</sup> , Francine Nesello Melanda<sup>III</sup> ,  
Amanda Cristina de Souza Andrade<sup>III</sup> , Neuciani Ferreira da Silva Sousa<sup>I</sup> ,  
Márcia Leopoldina Montanari Correa<sup>I</sup> , Ageo Mario Candido da Silva<sup>II,III</sup> ,  
Marco Aurélio Bertúlio das Neves<sup>I,II</sup> , Jânia Cristiane de Souza Oliveira<sup>III,IV</sup> ,  
Juliana Fernandes Cabral<sup>V,VI</sup> , Mariana Rosa Soares<sup>I</sup> , Paulo Cesar Fernandes de Souza<sup>II</sup> ,  
Mário Ribeiro Alves<sup>I</sup> , Jackson Rogerio Barbosa<sup>I</sup> , Wanderlei Antonio Pignati<sup>III</sup> 

**ABSTRACT:** *Objective:* To describe the methodological and operational aspects of the “Project for surveillance of cancer and its associated factors: population-based and hospital-based registry” (VIGICAN), in the state of Mato Grosso (MT), Brazil. *Methods:* VIGICAN was divided into two projects: a university extension one, which updated the data from the Population-based Cancer Registry (PBCR) of MT in the 2008-2016 period; and a research project, which collected primary data, through individual interviews and analysis of medical records of people with a diagnosis of cancer, aged 18 years or older, treated at reference hospitals for oncology. To analyze the factors associated with cancer, the following variables were collected: socioeconomic and demographic, social support, health status and behavior, and environmental exposure. *Results:* In the 2008-2016 period, approximately one hundred thousand cases of cancer (incident and prevalent) were reported in the PBCR Cuiabá and PBCR Interior. After validation procedures, 50 thousand incident cases were elected. The survey interviewed 1,012 patients, 38.2% living in the municipalities of Cuiabá and Várzea Grande, 60.4% in small cities of the state, and 1.4% in other states. Preliminary data showed that the majority were women (55.0%) and younger than 60 years of age (54.3%). Among the interviewees, 7.2% reported smoking tobacco, 15.5% consumed alcoholic beverages (15.5%), and 32.7% lived nearby crops. *Conclusion:* The development of these projects allowed the integration of education with health services and will enable the recognition of specificities and different exposure scenarios and factors associated with cancer in the Mato Grosso territory. *Keywords:* Neoplasms. Information systems. Methodology. Health surveys.

<sup>I</sup>Universidade Federal de Mato Grosso, Public Health Institute – Cuiabá (MT), Brazil.

<sup>II</sup>Secretaria de Estado de Saúde do Mato Grosso – Cuiabá (MT), Brazil.

<sup>III</sup>Universidade Federal de Mato Grosso, Public Health Institute, Graduate Program – Cuiabá (MT), Brazil.

<sup>IV</sup>Universidade Federal de Rondonópolis – Rondonópolis (MT), Brazil.

<sup>V</sup>Universidade do Estado de Mato Grosso, School of Agrarian and Biological Sciences, Engineering and Health – Tangará da Serra (MT), Brazil.

<sup>VI</sup>Universidade Federal de Mato Grosso, Graduate Program in Public Health – Cuiabá (MT), Brazil.

**Corresponding author:** Noemi Dreyer Galvão. Rua Fernando Correa da Costa, 2.367, Boa Esperança, CEP: 78060-900, Cuiabá (MT), Brazil. E-mail: noemidgalvao@gmail.com

**Conflict of interests:** nothing to declare – **Financial support:** Department of Health of Mato Grosso State, with funding for the university extension project *Vigilância de câncer e seus fatores associados: atualização de registro de base populacional e hospitalar* [Surveillance of cancer and its associated factors: update of population-based and hospital-based registry] (contract 088/2016); Ministry of Public Labor Prosecution of the 23<sup>rd</sup> Region, with funding for the research project *Câncer e seus fatores associados: análise de registro de base populacional e hospitalar* [Cancer and its associated factors: analysis of population-based and hospital-based registry] (Technical Cooperation Term 08/2019).

**RESUMO:** *Objetivo:* Descrever os aspectos metodológicos e operacionais do projeto “Vigilância do câncer e seus fatores associados: registro de base populacional e hospitalar” (VIGICAN), em Mato Grosso (MT). *Métodos:* O VIGICAN desdobrou-se em dois projetos: um de extensão, que atualizou os dados dos Registros de Câncer de Base Populacional (RCBP) de Mato Grosso no período de 2008 a 2016; e um de pesquisa, que coletou dados primários por meio de entrevistas individuais e análise de prontuários de pessoas com diagnóstico de câncer, com 18 anos ou mais, atendidas em hospitais de referência para oncologia. Para analisar os fatores associados ao câncer, foram coletadas as seguintes variáveis: socioeconômicas e demográficas, suporte social, situação e comportamentos de saúde e exposição ambiental. *Resultados:* No período de 2008 a 2016, foram notificados nos RCBP Cuiabá e Interior, aproximadamente, 100 mil casos de câncer (incidentes e prevalentes). Após os procedimentos de validação, foram eleitos 50 mil casos incidentes. A pesquisa entrevistou 1.012 pacientes, sendo 38,2% residentes nos municípios de Cuiabá e Várzea Grande, 60,4% no interior do Estado e 1,4% em outros Estados. Os dados preliminares revelaram que a maioria era do sexo feminino (55,0%) e tinha menos de 60 anos (54,3%). Entre os entrevistados, 7,2% relataram fumar tabaco, 15,5% consumiam bebidas alcoólicas (15,5%) e 32,7% moravam próximo a lavouras. *Conclusão:* O desenvolvimento desses projetos permitiu a integração do ensino com os serviços de saúde e possibilitará o reconhecimento das especificidades e dos diferentes cenários de exposição ao câncer, bem como fatores associados a ele, no território mato-grossense.

**Palavras-chave:** Neoplasia. Sistema de informação. Metodologia. Inquéritos epidemiológicos.

## INTRODUCTION

Research with secondary data and population surveys to monitor Noncommunicable Diseases (NCDs) in Brazil have allowed researchers to know the magnitude and transcendence of these diseases and the population's vulnerability to them<sup>1,2</sup>, highlighting cancer as a serious public health issue for being one of the main causes of premature mortality in the world<sup>3-6</sup>. In Brazil, about 235 thousand deaths from cancer were recorded in 2019, making this disease the second leading cause of death (17.4%), with 2,889 deaths in the state of Mato Grosso (MT), Brazil<sup>7</sup>.

The Brazilian National Cancer Institute (INCA) estimated for Brazil, in the triennium from 2020 to 2022, about 630 thousand new cases of cancer, being 49.4% in men and 50.6% in women. The most frequent cancers, excluding nonmelanoma skin cancers, will be female breast, prostate, colon and rectum, lung and stomach cancers, in addition to cervical cancer<sup>8</sup>.

The incidence of cancer can be mostly explained by socioeconomic, environmental, and behavioral changes and by the reduction of infectious and parasitic diseases that, together, contributed to the Brazilian demographic transition<sup>6,9</sup>. In addition, unhealthy lifestyle, infection by some microorganisms – such as human papillomavirus (HPV) and *Helicobacter pylori* (H. Pylori) –, and environmental and occupational exposures to chemical agents (pesticides, heavy metals, benzene, and silica) are also identified as important risk factors for neoplasms<sup>8</sup>.

In order to understand the magnitude and impact of cancer in Brazil, secondary databases, such as Population-based Cancer Registries (PBCR), Hospital-based Cancer Registries (HBCR), Hospital Information System of the Brazilian Unified System (SIH/SUS), and the Mortality Information System (SIM), have been mainly used in Brazil. These data are essential for planning disease prevention and control actions in each location<sup>10</sup>. Furthermore, surveys conducted by public health institutions and/or academic research are essential tools that assist in the surveillance of risk factors for NCDs, including cancer<sup>2</sup>.

In this context, the “Project for surveillance of cancer and its associated factors: population-based and hospital-based registry” (*Vigilância do câncer e seus fatores associados: registro de base populacional e hospitalar – VIGICAN*) was developed in the state of Mato Grosso, with partnerships with public institutions and the cooperation of students from different levels of education. This study aims to describe the methodological and operational aspects of the VIGICAN project.

## METHODS

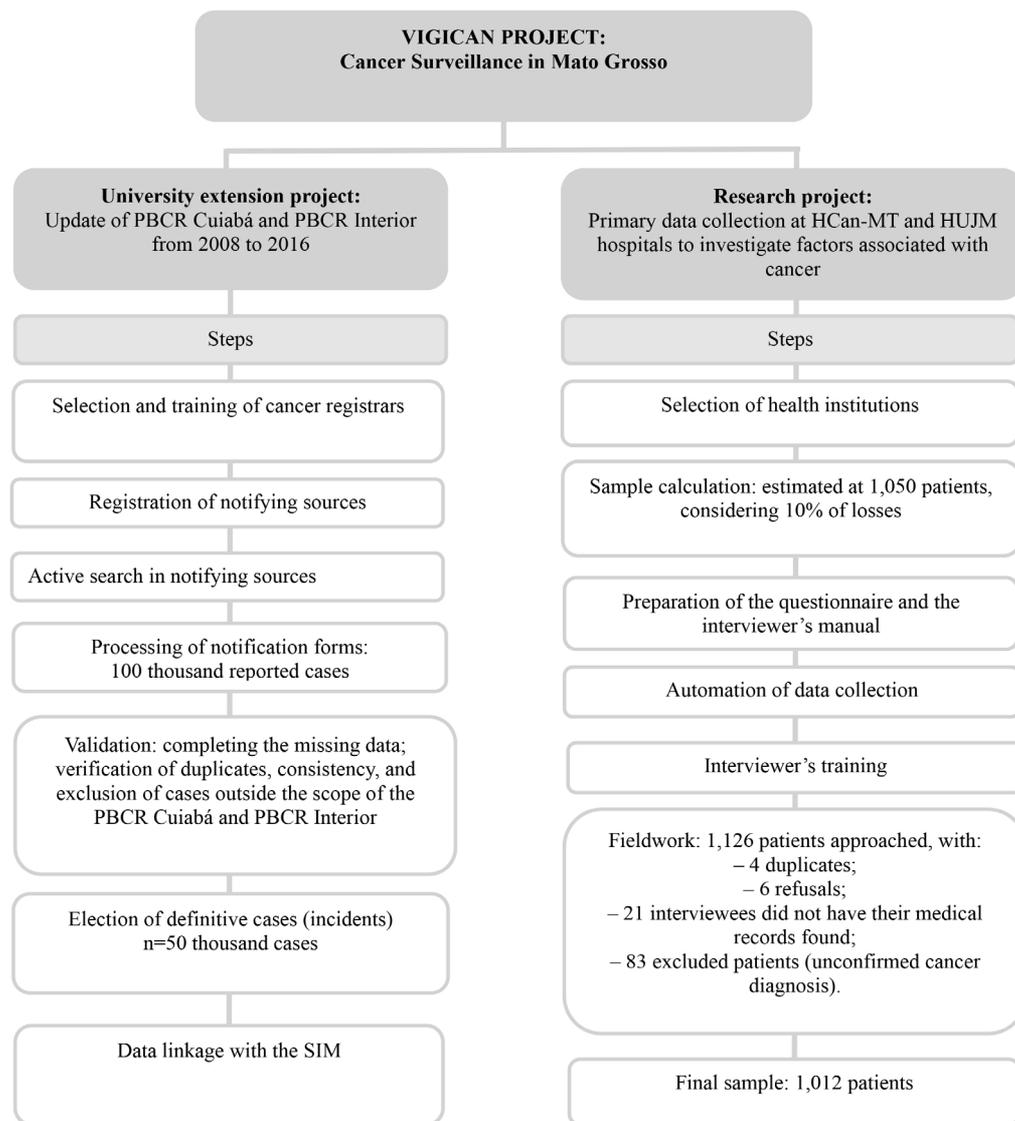
VIGICAN was divided into two projects: a university extension one, which updated the PBCR Cuiabá and PBCR Interior, both in Mato Grosso; and a research project, which interviewed cancer patients in oncology reference services (Figure 1). Considering the differences in operationalization, both projects will be separately presented.

## STUDY LOCATION

The state of Mato Grosso is located in the Midwest region of Brazil. In 2020, its population was estimated at 3,526,220 inhabitants. It is the third largest state in the country, with a population density of 3.90 inhabitants per km<sup>2</sup> and a human development index of 0.725. Mato Grosso is composed of 141 municipalities, spatially distributed in a heterogeneous way, of which only five have a population greater than 100 thousand inhabitants. Cuiabá, capital of the state, is the largest, with 618,124 inhabitants<sup>11</sup>. The state’s economy is based on the production of agricultural commodities for export, such as soybeans, cotton, sugarcane, and corn, by the agribusiness production model<sup>12</sup>, which makes it the largest consumer of pesticides in Brazil in recent years<sup>13</sup>.

As for the cancer care network, Mato Grosso has five services qualified as High-complexity Units in Oncology (*Unidades de Alta Complexidade em Oncologia – UNACON*), three of which are located in the capital and two in small cities within the state (Sinop and Rondonópolis)<sup>14,15</sup>.

The diagnostic network, which provides anatomopathological, immunohistochemistry tests, ultrasound, computed tomography and magnetic resonance imaging tests, is concentrated in municipalities with the highest population density: Cuiabá, Várzea Grande, Rondonópolis, and Sinop<sup>14,15</sup>.



PBCR: Population-based Cancer Registry; HCan-MT: Hospital de Câncer de Mato Grosso; HUJM: Hospital Universitário Júlio Muller; SIM: Mortality Information System.

Figure 1. Flowchart of research and university extension projects of the "Project for surveillance of cancer and its associated factors: population-based and hospital-based registry," Mato Grosso (MT), Brazil, 2021.

## UNIVERSITY EXTENSION PROJECT: UPDATE OF POPULATION-BASED CANCER REGISTRIES

The coverage area of the PBCR Cuiabá covers the municipalities of Cuiabá and Várzea Grande, namely Grande Cuiabá. PBCR Cuiabá was implemented in 1999 by the Department of Health of Mato Grosso State (*Secretaria de Estado de Saúde de Mato Grosso – SES-MT*).

Currently, it has 38 health institutions as notifying sources, one of which is a federal hospital, four state health services, six philanthropic institutions, ten municipal services, and 17 private health institutions (diagnostic and treatment clinics and anatomic pathology laboratories). The PBCR Interior covers the other 139 municipalities in Mato Grosso.

Faced with the difficulty in keeping registries available, a partnership between SES-MT and the Public Health Institute (*Instituto de Saúde Coletiva* – ISC) of Universidade Federal de Mato Grosso (UFMT) was established in 2016 to develop the VIGICAN university extension project. The overall objective of this project was to implement cancer surveillance by updating population-based registries in Mato Grosso. This project was effective from April 2016 to March 2021.

The team was composed of professors from several Brazilian universities: UFMT, Universidade Federal de Rondonópolis (UFR), Universidade do Estado de Mato Grosso (UNEMAT), Universidade de São Paulo – Ribeirão Preto campus (USP), Faculdade de Sinop (FASIPE), Centro Universitário de Várzea Grande (UNIVAG), Universidade de Cuiabá (UNIC), and Faculdade de Cuiabá (FAUC/AUM); in addition to health professionals from SES-MT and the Municipal Departments of Health, hired consultants, students from the Graduate Program in Public Health and from the undergraduate courses in Public Health, Medicine, Nursing, Psychology, and Statistics at UFMT, who worked as interns, volunteers, or scholarship holders, through public selection and hiring by the UFMT Support Foundation (UNISELVA).

The project participants were trained as cancer case registrars by INCA in April 2017 and July 2018. The methodology adopted by INCA was used<sup>12</sup>. Subsequently, an active search for information on malignant tumors diagnosed in the period from 2008 to 2016 began, carried out with the notifying sources in visits previously scheduled by SES-MT, which took place on weekdays and times with lower flow of patients aiming not to compromise the provision of health care. The data sources in these searches were the patients' medical records, both physical and electronic (diagnostic and treatment services), and the anatomopathological examination reports (anatomic pathology laboratories). The obtained data were transcribed into the tumor notification form standardized by INCA, with mandatory, optional, and essential variables<sup>16</sup> (Chart 1), except for the complementary ones, which are not collected in Mato Grosso (laterality, classification [TNM]/staging, and distant metastasis location).

Data processing was performed in SisBasepopWeb (BPW), developed and made available by INCA for structuring its databases and managing the process of collecting and producing information<sup>16</sup>.

To complete the variables of identification and residence address not found in the medical records and reports, other information systems were consulted, such as: SUS User Registration and Maintenance System (*Sistema de Cadastramento e Manutenção de Informações de Usuários do SUS* – CADSUS), High-complexity / cost Outpatient Procedure Authorization System (*Sistema de Autorização de Procedimento Ambulatorial de Alat complexidade/Custo* – APAC), and SIM.

Seeking to expedite and reduce errors in the data update process, the team was divided into three groups: active search; coding of tumors by the International Classification of Diseases for Oncology — 3<sup>rd</sup> edition (ICD-O/3)<sup>17</sup>; and processing of notification forms in

Chart 1. Variables from the Population-based Cancer Registries and the Mortality Information System, “Project for surveillance of cancer and its associated factors: population-based and hospital-based registry,” Mato Grosso (MT), Brazil, 2021.

Variables in PBCR*	
Mandatory variables <sup>†</sup>	Year of diagnosis; medical record number; patient’s name; patients’ mother name; sex; ethnicity/skin color; date of birth; age; address/provenance (city); topography; morphology; means of diagnosis; date of diagnosis; extent of the disease.
Optional variables <sup>‡</sup>	Examination number; patient document number; birthplace; nationality; marital status; level of education; occupation/profession; date of death; cause of death; vital status; date of last contact with the patient.
Essential variables <sup>§</sup>	Birthplace; nationality; marital status; level of education.
SIM variables <sup>//</sup>	
Block II: identification	Date of death; name of the deceased; name of the deceased’s mother; date of birth; age; sex; ethnicity/skin color; marital status; level of education; occupation.
Block III: residence	Municipality, Federation Unit.
Block VI: conditions and causes of death	Underlying cause of death.

PBCR: Population-based Cancer Registry; SIM: Mortality Information System. \*Variables extracted from the tumor notification form<sup>16</sup>, which composes the PBCR database; <sup>†</sup>Mandatory and standardized collection for integration and comparability; <sup>‡</sup>These are the ones whose completion, once the option to collect them is made, becomes mandatory and standardized; <sup>§</sup>They are part of a group of variables that must be included in all nationally-based systems; <sup>//</sup> Variables selected in the death certificate (DC), composed of nine blocks and 62 variables.

BPW. Weekly rotations of activities were established for each registrar and biweekly meetings with the SES-MT team to clarify doubts in the collection, coding, data processing, and validation of cases.

The reported cases comply with specific criteria to be classified as incidents<sup>16</sup>, such as: verification of duplicity, validation of the variables age, coverage area of the PBCR, extent of the disease, topography, morphology, date of diagnosis, and comparison with the database of collection and the database of incident cases. To ensure correct validation of the cases, a cancer registrar with expertise in this process was hired. Currently, the PBCR Cuiabá and PBCR Interior databases are updated and consolidated for the period from 2001 to 2016.

Several trainings were carried out for health surveillance professionals from the Municipal Department of Health (*Secretaria Municipal de Saúde – SMS*) of Cuiabá-MT and SES-MT and for the VIGICAN project team, with topics related to data linkage, methods for analysis of historical disease trends, survival analysis, and spatial analysis of morbidity and mortality rates, to ensure data publicity.

## CRITERIA FOR INCLUSION AND EXCLUSION OF CASES

For the definition of cancer cases, inclusion and exclusion criteria were established. In the PBCR, the following were selected as inclusion criteria: all incident cases (“true” definitive indicator) of cancer (ICD-O/3<sup>rd</sup> edition<sup>17</sup> — C-00 to C-80) mandatorily diagnosed by anatomopathological, clinical, cytological tests, necropsies and cases with notification by death certificate only (DCO), and residents in the study site<sup>16</sup>. Analysis of duplicate cases was performed by patient’s name, patients’ mother name, sex, date of birth, disease code, and date of diagnosis.

Regarding the SIM, individuals with a record of death from cancer by known topography-site (C00.0 to C77.9) and unknown primary site (C80 and C80.9) were included. Cases in which the name of the deceased was blank or filled in as “unknown,” “ignored,” or “indigent” were excluded.

## VARIABLES AND ORGANIZATION OF DATABASES FOR ANALYSIS

Chart 1 presents the variables from the PBCR database and those selected from the SIM. The variables of identification, occupation, and municipality of residence were common between these two systems. The “occupation” variable was categorized into large groups, according to the Brazilian Classification of Occupations (*Classificação Brasileira de Ocupações* – CBO) and the 2000 Census<sup>18</sup>, and the “municipality of residence” was aggregated into different geographic units (macroregion, health regions, and intermediate geographic regions). The topography and morphology of cancer in the PBCR were coded according to the ICD-O/3<sup>rd</sup> edition<sup>17</sup>. The underlying cause was coded by the International Statistical Classification of Diseases — 10<sup>th</sup> Revision (ICD-10).

For the probabilistic linkage between the PBCR and SIM databases, fields with common data, such as patient’s name, patients’ mother name, date of birth, and sex, were used to estimate the probability of certain records belonging to the same person in the two databases<sup>20</sup>.

The probabilistic linkage between the PBCR and SIM databases was performed following the three steps proposed by Brastulin and Marson<sup>21</sup>: standardization of the common fields to be used in the matching; blocking, by the variable “sex”; and matching by the construction of agreement scores based on the variables “name” (patient’s and deceased’s), “patients’ mother name,” and “date of birth.”

Blocking allows the databases to be divided into mutually exclusive blocks, with comparisons and estimation of scores limited to records belonging to the same block. To find true matches, this step was developed by combining the first name with the “sex” variable.

To define true matches, the matching parameters presented by Coeli and Camargo Jr.<sup>22</sup> were used in each step. All scores with values above 7.0 were manually revised to improve the obtainment of true matches.

## ETHICAL CONSIDERATIONS

Approval by the UFMT Health Research Ethics Committee (Opinion no. 4.858.521, of July 20, 2021).

## RESEARCH PROJECT: FACTORS ASSOCIATED WITH CANCER

In a complementary way, seeking to overcome the limitations of secondary data, in mid-2019 the research project *Câncer e seus fatores associados: análise de registro de base populacional e hospitalar de Cuiabá-MT* [Cancer and its associated factors: analysis of population-based and hospital-based registry in Cuiabá-MT, Brazil] began, which aimed to investigate associations between behavioral and environmental factors in patients from Mato Grosso. The project was funded by the Ministry of Public Labor Prosecution (*Ministério Público do Trabalho – MPT*) of the 23<sup>rd</sup> Region, in force until July 2023.

From the cancer care network in the state, the Hospital de Câncer de Mato Grosso (HCan-MT) and the Hospital Universitário Júlio Muller (HUJM), both located in the state capital, Cuiabá, were selected to carry out the research. The HCan-MT, classified as UNACON<sup>14,15</sup>, is the reference hospital for cancer care in the state, being responsible for almost 70% of oncological care. The HUJM is the teaching hospital of UFMT and is mainly responsible for the surgical treatment of cancer.

## INCLUSION AND EXCLUSION CRITERIA

The research included individuals treated with a cytopathological or histopathological diagnosis of cancer, aged 18 years or older, admitted to the selected hospitals. Patients who were hospitalized and those whose medical records showed incomplete records regarding the diagnosis and staging of cancer were excluded.

## SAMPLE

To calculate the sample of cancer patients treated at both hospitals, the number of hospitalizations in the Hospital-based Cancer Registry (2015) of patients aged 20 years or older was considered (2,146 in the HCan-MT and 245 in the HUJM). There was no information on the number of patients seen at the outpatient clinics; thus, these appointments were not considered in the sampling process. Maximum proportion of  $p=0.50$ , tolerable error of 2.5%, and confidence level of 95% were adopted. The sample was estimated at 1,050 patients, considering 10% of losses and a proportional distribution of patients according to the number of hospitalizations per hospital.

## PREPARATION OF THE QUESTIONNAIRE

The preparation of the questionnaire demanded a broad review of the literature and consultation of manuals, guides on health programs and actions<sup>23-30</sup>, national experiences, such as the Surveillance System for Risk and Protective Factors for Chronic Diseases by Telephone Survey (*Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico – VIGITEL*)<sup>31</sup>, the National Health Survey (*Pesquisa Nacional de Saúde – PNS*)<sup>32</sup>, and studies on socioeconomic data<sup>33</sup>, social support<sup>34-36</sup>, religion<sup>24,37-39</sup>, and functional capacity<sup>40</sup>. Health professionals from SES-MT were also consulted, as well as researchers with expertise in the areas of environmental and occupational exposure and behavioral factors for a better understanding of academic demands and cancer surveillance. It is noteworthy that this exchange of information in the preparation of the questionnaires was essential for all topics of interest to be addressed in the study.

Two data collection instruments were developed: a form for interviewing the patients and another for collecting data from medical records, totaling 14 blocks of questions (Chart 2). Considering this diversity of variables, an overcome challenge was the organization of a questionnaire in an appropriate size and adequate to the specific objectives of the investigation.

## AUTOMATION OF DATA COLLECTION

This study used electronic forms applied with the aid of tablets via the Open Data Kit (ODK) application, which consists of a set of tools that allows browsing, editing, and storing the information collected offline using an Android system device<sup>41</sup>.

Two of the three programs contained in the ODK were employed: XLSForm (form preparation) and ODK Collect (data collection). At first, the mask was created and saved in the Excel program, in .XLSX format. Subsequently, the XLSForm Online v2.x website (<https://getodk.org/xlsform>) was used to convert it to .XML format, which is compatible with the ODK. This new mask in .XML format has been imported into Google Drive.

The ODK application was downloaded and installed on all tablets used for data collection. Finally, the mask available on Google Drive was linked and the data were entered on the tablets using the ODK Collect. At the end of the interviews, the information was sent to an online server (Google Drive), in an e-mail exclusively created for storing research data, and exported to an Excel spreadsheet.

## FIELDWORK

The team in charge of the fieldwork was composed of interviewers chosen by a selection process (undergraduate interns who receive scholarships) and field supervisors (professors

Chart 2. Description of the blocks and variables addressed in the survey data collection instrument on factors associated with cancer of the “Project for surveillance of cancer and its associated factors: population-based and hospital-based registry,” Mato Grosso (MT), Brazil, 2019 and 2021.

Blocks	Topic	Variables
		Patient's interview form
I	Identification and demographic and socioeconomic data	Patient's name, patients' mother name, date of birth, age, sex, skin color, municipality of birth and residence, interviewee's and head of household's level of education, marital status, household appliances, income, occupation.
II	Social support	Relationship with family members, friends, and community regarding material, emotional, informational, and affective support.
III	Past health and lifestyle history	Past illnesses, alcohol and tobacco consumption, eating habits.
IV	Women's reproductive health	Detailed history of women's health, both gynecological and obstetric.
V	Men's health	Assessment of men's health (prostate).
VI	Physical activity	Detailed analysis of sports practice or sedentary lifestyle.
VII	Health status	Sex life, body mass index, oral health.
VIII	Functionality	Activities of daily living — Katz Scale — and instrumental activities of daily living — Lawton and Brody Scale.
IX	Family exposure to pesticides	Individual and family exposure.
X	Occupational poisoning	Exposure to pesticides and other chemical and physical contaminants in the workplace.
<b>Form for collecting data from the medical record</b>		
I	Identification	Patient's name and date of birth.
II	Current disease	Disease diagnosis, TNM, staging.
III	Treatment	Prescribed treatment.
IV	Evolutions	Recurrence and metastasis.

TNM: classification of malignant tumors.

and graduate students). The team was trained, and an interviewer's manual was made available with detailed information on each question and the corresponding answer card.

Interviewers were trained to approach participants in interviews and enter data into the ODK, in addition to participating in the pilot test at the locations selected for data collection: Oncology Outpatient Clinic at HCan-MT and Outpatient Clinics I and II at HUIJM.

In the fieldwork, after welcoming the cancer patient awaiting to be seen, an invitation to participate in the research was made. After accepting and signing the Informed Consent Form, the questionnaire was applied. The interviews were conducted between November 11, 2019 and March 20, 2020.

Data collection in medical records was carried out by students and participants of the Academic League of Oncology (*Liga Acadêmica de Oncologia – LION*) of the School of Medicine of UFMT, and ended in June 2021.

## ETHICAL CONSIDERATIONS

The research project was approved by the Research Ethics Committee of the HUJM (Opinion no. 3.048.183).

## RESULTS

In the 2008-2016 period, approximately one hundred thousand cases of cancer (incident and prevalent) were reported in the PBCR Cuiabá and PBCR Interior. After validation procedures, 50 thousand incident cases were elected. The PBCR Cuiabá presented better quality indicators than the PBCR Interior (Table 1).

The most frequent types of cancer were prostate (33.6%) and lung (8.2%) in men, and breast (29.7%) and cervical (13.2%) in women, excluding nonmelanoma skin cancers.

The survey with primary data approached 1,126 patients. Of these, four cases were duplicates, six refused to participate, 21 had their medical records not found, and 83 were

Table 1. Data quality indicators\* from the Cuiabá and Interior Population-based Cancer Registries, according to sex. Mato Grosso (MT), Brazil, 2008 to 2016.

Indicators	Men (%)	Women (%)
<b>PBCR Cuiabá</b>		
Histological, cytological, and hematological tests	84.0	86.7
Death certificate only (DCO)	14.2	11.7
Others	1.8	1.6
<b>PBCR Interior</b>		
Histological, cytological, and hematological tests	61.2	68.3
Death certificate only (DCO)	37.0	29.8
Others	1.8	1.9

PBCR: Population-based Cancer Registries. \*Based on the variable "means of cancer diagnosis."  
Source: Cuiabá and Interior Population-based Cancer Registries of Mato Grosso.

excluded because they did not have a confirmed cancer diagnosis, which resulted in 1,012 interviewed patients, 968 (95.7%) of whom were from the HCan -MT and 44 (4.3%) from HJUM. Of the total, 38.2% resided in the municipalities of Cuiabá and Várzea Grande, 60.4% in small cities, and 1.4% in other states. Figure 2 shows the distribution of interviews per municipality of residence of the respondents.

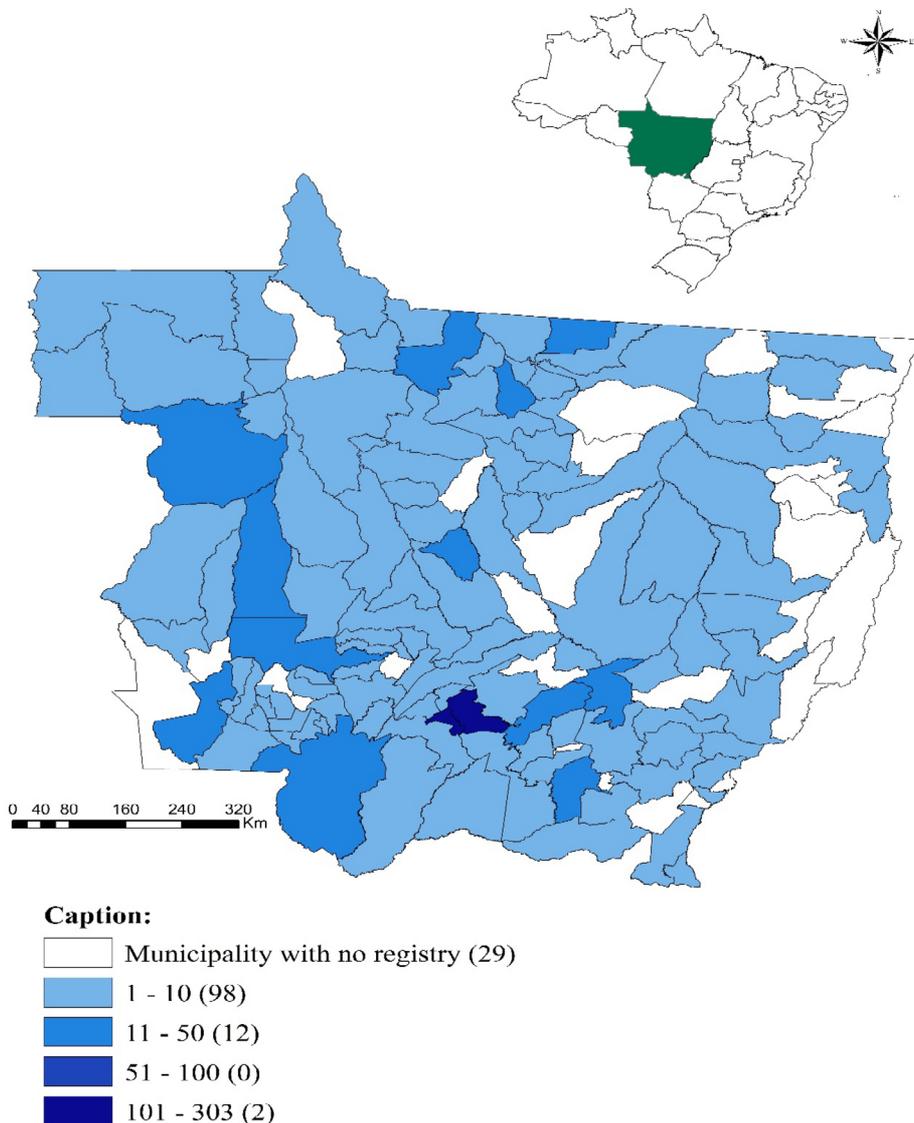


Figure 2. Distribution of interviews per municipality of residence of cancer patients treated at reference hospitals in the state of Mato Grosso, "Project for surveillance of cancer and its associated factors: population-based and hospital-based registry," Mato Grosso (MT), Brazil, 2019 and 2020.

Preliminary data demonstrate that the majority were women (55.0%), under 60 years of age (54.3%), and had less than five years of formal education (49.7%). The mean age was 56.8 years (standard deviation — SD=14.3). Among the interviewees, 7.2% daily smoked, 15.5% consumed alcoholic beverages, and 52.8% had already lived, in the previous ten years, in municipalities where there were plantations; of these, 32.7% stated that their residence was nearby crops.

## DISCUSSION

The development of projects allowed the integration of teaching, research, and university extension with health services, promoting the insertion of students in the practical field, new ways of organizing the work in SUS services, and a valuable exchange of knowledge between students, professors, health professionals, and users. This integration of the academic community with the health services and other actors in society has fostered important reflections and curricular proposals in some undergraduate and graduate programs in the field of health at UFMT, promoting training and conditions for the production of qualified information for current and future health professionals and managers<sup>42,43</sup> and enabling humanized and quality care to users<sup>44,45</sup>.

The project enabled to update the PBCR Cuiabá and PBCR Interior, which had not been updated for over a decade. Based on this information, together with the SIM death records, it will be possible to know the incidence, survival, and mortality of types of cancer in MT. The survey of primary data on factors associated with cancer, in turn, will enable to recognize and discuss different exposure scenarios seeking to demonstrate specificities of the territory of Mato Grosso, especially related to environmental and occupational factors.

As for the university extension project, its contribution in making the complete historical series of the PBCR Cuiabá and PBCR Interior available, which will contribute to cancer surveillance in Mato Grosso, stands out. However, some limitations of the PBCR data are highlighted in relation to completeness, consistency of explanatory and/or outcome variables, and system coverage in different periods and territories, in addition to selection and information biases and confounding and interaction factors that, due to their multicausality<sup>46</sup>, should also be considered in the analyses. Among the strengths of the research project, the authors highlight the representativeness of the sample, which covers almost 80.0% of the municipalities in Mato Grosso, and the measurement of the exposure of several environmental and occupational factors to the different types of cancers evaluated in reference hospitals from Cuiabá (MT).

The scope of the projects in the field of public health and their results will directly contribute to the decision-making process, the redirection of public policies, and the reorganization of the care network and actions to face cancer in MT. In the academic environment, these analyses will make it possible to strengthen university extension, research, and its interaction with the SUS. Publicizing the results will be an important instrument for promoting the necessary measures to guarantee collective and individual diffuse rights, which is one of the main institutional functions of the MPT.

## ACKNOWLEDGMENTS

The authors would like to thank the Coordination for the Improvement of Higher Education Personnel (CAPES) for the Graduate Program scholarships; the Brazilian National Cancer Institute (INCA) for its contribution to the training of cancer registrars; the Public Health Institute of Universidade Federal de Mato Grosso for the physical space; the Support Foundation of Universidade Federal de Mato Grosso (UNISELVA) for the contribution to the financial execution; and the oncology services for the support in the development of the projects.

## CEP IDENTIFICATION/APPROVAL NUMBER

Research Ethics Committee (CEP) of Hospital Universitário Júlio Muller (Opinion no.: 3.048.183); Research Ethics Committee of the Department of Health of Mato Grosso State (Opinion no.: 3.263.744); and Health Research Ethics Committee of Universidade Federal de Mato Grosso (CEP-SAÚDE/UFMT) (Opinion no.: 4.858.521)

## REFERENCES

1. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Saúde Brasil 2018 uma análise de situação de saúde e das doenças e agravos crônicos: desafios e perspectivas. Brasília: Ministério da Saúde; 2019. Available at: [https://bvsms.saude.gov.br/bvs/publicacoes/saude\\_brasil\\_2018\\_analise\\_situacao\\_saude\\_doencas\\_agravos\\_cronicos\\_desafios\\_perspectivas.pdf](https://bvsms.saude.gov.br/bvs/publicacoes/saude_brasil_2018_analise_situacao_saude_doencas_agravos_cronicos_desafios_perspectivas.pdf)
2. Malta DC, Silva MMA, Moura L, Morais Neto OL. A implantação do sistema de vigilância de doenças crônicas não transmissíveis no Brasil, 2003 a 2015: alcances e desafios. *Rev Bras Epidemiol* 2017; 20(4): 661-75. <https://doi.org/10.1590/1980-5497201700040009>
3. Cardoso LSM, Teixeira RA, Ribeiro ALP, Malta DC. Premature mortality due to non-communicable diseases in Brazilian municipalities estimated for the three-year periods of 2010 to 2012 and 2015 to 2017. *Rev Bras Epidemiol* 2021; 24(Supl 1): E210005. <https://doi.org/10.1590/1980-549720210005.supl.1>
4. World Health Organization. Noncommunicable Diseases Progress Monitor 2020. Genebra: World Health Organization; 2020. [cited on June 17, 2021]. Available at: <https://www.who.int/publications/i/item/ncd-progress-monitor-2020>
5. Malta DC, Andrade SSCA, Oliveira TP, Moura L, Prado RR, Souza MFM. Probabilidade de morte prematura por doenças crônicas não transmissíveis, Brasil e regiões, projeções para 2025. *Rev Bras Epidemiol* 2019; 22: e190030. <https://doi.org/10.1590/1980-549720190030>.
6. Bray F, Ferlay J, Soerjomataram I, Siegel RL, Torre LA, Jemal A. 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. <https://doi.org/10.3322/caac.21492>
7. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Análise da Situação de Saúde. Mortalidade – Brasil – Dados preliminares [Internet]. Brasília. Departamento de Informática do SUS (DATASUS); 2020. [cited on July 15, 2021]. Available at: <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sim/cnv/obt10uf.def>
8. Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2020: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2019. [cited on May 20, 2021]. Available at: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files/media/document/estimativa-2020-incidencia-de-cancer-no-brasil.pdf>

9. Parkin DM, Fernández LMG. Use of statistics to assess the global burden of breast cancer. *Breast J* 2006; 12 Suppl 1: S70-80. <https://doi.org/10.1111/j.1075-122X.2006.00205.x>
10. Latorre MRDO, Almeida ABM, Möller BB, Silva TGV, Toporcov TN. A importância do registro de câncer no planejamento em saúde. *Rev USP* 2021; 1(128): 27-44. <https://doi.org/10.11606/issn.2316-9036.i128p27-44>
11. Brasil. Instituto Brasil de Geografia e Estatística. Cidades. Cuiabá [Internet]. 2021 [cited on July 20, 2021]. Available at: <https://cidades.ibge.gov.br/brasil/mt/cuiaba/panorama>
12. Instituto Mato-Grossense de Economia Agropecuária. Mapa das macrorregiões do IMEA; 2017. [cited on July 20, 2021] Available at: <https://www.imea.com.br/imea-site/view/uploads/metodologia/justificativamapa.pdf>
13. Pignati WA, Souza e Lima FAN, Lara SS, Correa MLM, Barbosa JR, Leão LHC, et al. Distribuição espacial do uso de agrotóxicos no Brasil: uma ferramenta para a Vigilância em Saúde. *Ciênc Saúde Colet* 2017; 22(10): 3281-93. <https://doi.org/10.1590/1413-812320172210.17742017>
14. Brasil. Ministério da Saúde. Secretaria de Atenção Especializada à Saúde. Portaria nº 1399, de 17 de dezembro de 2019. Redefine os critérios e parâmetros referenciais para a habilitação de estabelecimentos de saúde na alta complexidade em oncologia no âmbito do SUS. *Diário Oficial da União, Brasília, DF*, 19 de dezembro de 2019. Edição 245, seção 1, página 173. [cited on July 15, 2021]. Available at: <https://www.in.gov.br/web/dou/-/portaria-n-1.399-de-17-de-dezembro-de-2019-234338206>
15. Governo de Mato Grosso. Secretaria de Estado de Saúde. Resolução CIB/MT *Ad referendum* nº 001 de 20 de fevereiro de 2017. Dispõe sobre a Aprovação do Plano de Ação da Atenção Oncológica no Estado de Mato Grosso de 2017 a 2019 [Internet]. 2017 [cited on July 15, 2021]. Available at: [www.saude.mt.gov.br/arquivo/7317](http://www.saude.mt.gov.br/arquivo/7317)
16. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação-Geral de Prevenção e Vigilância. Divisão de Vigilância e Análise da Situação. Manual de rotinas e procedimentos para registros de câncer de base populacional. 2ª ed. rev. atual. Rio de Janeiro: Inca; 2012. [cited on Sept. 05, 2018]. Available at: <https://www.inca.gov.br/sites/ufu.sti.inca.local/files//media/document//manual-de-rotinas-e-procedimentos-para-registros-de-cancer-de-base-populacional.pdf>
17. Organização Mundial da Saúde. CID-O. Classificação internacional de doenças para oncologia. 3ª ed. São Paulo: Fundação Oncocentro de São Paulo; 2013.
18. Instituto Brasileiro de Geografia e Estatística. Classificação de ocupações. Censo demográfico; 2000. [cited on Sept. 05, 2019]. Available at: <https://concla.ibge.gov.br/classificacoes/por-tema/ocupacao/classificacao-brasileira-de-ocupacoes.html>
19. Organização Mundial da Saúde. CID-10. Classificação estatística internacional de doenças e problemas relacionados à saúde. 10ª ed. rev. São Paulo: Edusp; 1997
20. Teixeira CLS, Klein CH, Bloch KV, Coeli CM. Método de relacionamento de bancos de dados do Sistema de Informação sobre Mortalidade (SIM) e das autorizações de internação hospitalar (BDAIH) no Sistema Único de Saúde (SUS), na investigação de óbitos de causa mal-definida no Estado do Rio de Janeiro, Brasil, 1998. *Epidemiol Serv Saúde* 2006; 15(1): 47-57. <http://doi.org/10.5123/S1679-49742006000100004>
21. Brastulin R, Marson PG. Inclusão de etapa de pós-processamento determinístico para o aumento de performance do relacionamento (*linkage*) probabilístico. *Cad Saúde Pública* 2018; 34(6): e00088117. <https://doi.org/10.1590/0102-311X00088117>
22. Coeli CM, Camargo Jr. KR. Avaliação das diferentes estratégias de blocagem no relacionamento probabilístico de registros. *Rev Bras Epidemiol* 2002; 5(2): 185-96. <https://doi.org/10.1590/S1415-790X2002000200006>
23. Abreu GA, Silva TLN, Teixeira LR, Bloch KV. Análise da qualidade da informação autorreferida sobre duração do sono de escolares do Estudo de Riscos Cardiovasculares em Adolescentes (ERICA). *Cad Saúde Pública* 2019; 35(10): e00152918. <https://doi.org/10.1590/0102-311X00152918>
24. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de DST, Aids e Hepatites Virais. Pesquisa de conhecimento, atitudes e práticas na população brasileira. Brasília: Ministério da Saúde; 2011. [cited on Aug. 05, 2019]. Available at: [https://bvsms.saude.gov.br/bvs/publicacoes/pesquisa\\_conhecimentos\\_atitudes\\_praticas\\_populacao\\_brasileira.pdf](https://bvsms.saude.gov.br/bvs/publicacoes/pesquisa_conhecimentos_atitudes_praticas_populacao_brasileira.pdf)
25. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Guia alimentar para a população brasileira. Brasília: Ministério da Saúde; 2014. [cited on Aug. 04, 2019]. Available at: [https://bvsms.saude.gov.br/bvs/publicacoes/guia\\_alimentar\\_populacao\\_brasileira\\_2ed.pdf](https://bvsms.saude.gov.br/bvs/publicacoes/guia_alimentar_populacao_brasileira_2ed.pdf)

26. Paraná. Secretaria de Estado da Saúde. Superintendência de Vigilância em Saúde. Centro Estadual de Saúde do Trabalhador. Protocolo de avaliação das intoxicações crônicas por agrotóxicos. Curitiba: Secretaria de Estado da Saúde do Paraná; 2013. [cited on Aug. 04, 2019]. Available at: <http://www.abrasco.org.br/UserFiles/Image/PDF%20protocolo%20avaliacao%20intoxicacao%20agrototoxic.pdf>
27. Andrade LMS, Bertoldi MC. Atitudes e motivações em relação ao consumo de alimentos orgânicos em Belo Horizonte - MG. *Braz J Food Technol* 2012; 15(spe): 31-40. <https://doi.org/10.1590/S1981-67232012005000034>
28. Instituto Nacional de Câncer José Alencar Gomes da Silva. Coordenação Geral de Ações Estratégicas. Coordenação de Prevenção e Vigilância. Área de Vigilância do Câncer relacionado ao Trabalho e ao Ambiente. Diretrizes para a vigilância do câncer relacionado ao trabalho. Rio de Janeiro: Inca; 2012. [cited on Aug. 20, 2019]. Available at: [https://bvsm.sau.gov.br/bvs/publicacoes/inca/diretrizes\\_vigilancia\\_cancer\\_trabalho.pdf](https://bvsm.sau.gov.br/bvs/publicacoes/inca/diretrizes_vigilancia_cancer_trabalho.pdf)
29. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Atenção Básica. Controle dos cânceres do colo de útero e de mama. Brasília: Editora do Ministério da Saúde; 2013. [cited on Aug. 15, 2019]. Available at: [https://bvsm.sau.gov.br/bvs/publicacoes/controle\\_canceres\\_colo\\_uterio\\_2013.pdf](https://bvsm.sau.gov.br/bvs/publicacoes/controle_canceres_colo_uterio_2013.pdf)
30. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas Estratégicas. Política nacional de atenção à saúde do homem. Brasília: Ministério da Saúde; 2008. [cited on Aug. 15, 2019]. Available at: [https://bvsm.sau.gov.br/bvs/publicacoes/politica\\_nacional\\_atencao\\_saude\\_homem.pdf](https://bvsm.sau.gov.br/bvs/publicacoes/politica_nacional_atencao_saude_homem.pdf)
31. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância de Doenças e Agravos não Transmissíveis e Promoção da Saúde. *Vigitel Brasil 2017: vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2017*. Brasília: Ministério da Saúde; 2018. [cited on Aug. 25, 2019]. Available at: [https://bvsm.sau.gov.br/bvs/publicacoes/vigitel\\_brasil\\_2017\\_vigilancia\\_fatores\\_riscos.pdf](https://bvsm.sau.gov.br/bvs/publicacoes/vigitel_brasil_2017_vigilancia_fatores_riscos.pdf)
32. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de saúde 2013: ciclos de vida: Brasil e grandes regiões. Rio de Janeiro: IBGE; 2014. [cited on Aug. 23, 2019]. Available at: <https://biblioteca.ibge.gov.br/visualizacao/livros/liv94522.pdf>
33. Friche AAL, Xavier CC, Proietti FA, Caiaffa WT, orgs. Saúde urbana em Belo Horizonte. Belo Horizonte: Editora UFMG; 2015.
34. Chor D, Griep RH, Lopes CS, Farstein E. Medidas de rede e apoio social no Estudo Pró-Saúde: pré-testes e estudo piloto. *Cad Saúde Pública* 2001; 17(4): 887-96. <https://doi.org/10.1590/S0102-311X2001000400022>
35. Griep RH, Chor D, Faerstein E, Lopes C. Apoio social: confiabilidade teste-reteste de escala no Estudo Pró-Saúde. *Cad Saúde Pública* 2003; 19(2): 625-34. <https://doi.org/10.1590/S0102-311X2003000200029>
36. Griep RH, Chor D, Faerstein E, Werneck GL, Lopes CS. Validade de construto de escala de apoio social do Medical Outcomes Study adaptada para o português do Estudo Pró-Saúde. *Cad Saúde Pública* 2021; 21(3): 703-14. <https://doi.org/10.1590/S0102-311X2005000300004>
37. Lucchetti G, Lucchetti ALG, Peres MF, Leão FC, Moreira-Almeida A, Koenig HG. Validation of the Duke religion index: DUREL (portuguese version). *J Relig Health* 2012; 51(2): 579-86. <https://doi.org/10.1007/s10943-010-9429-5>
38. Moreira-Almeida A, Peres MF, Aloe F, Lotufo Neto F, Koenig HG. Versão em português da Escala de Religiosidade da Duke: DUREL. *Rev Psiq Clín* 2008; 35(1): 31-2. <https://doi.org/10.1590/S0101-60832008000100006>
39. Instituto Brasileiro de Geografia e Estatística. Manual do recenseador CD 1.09. Rio de Janeiro: IBGE; 2010. [cited on Aug. 15, 2019]. Available at: [https://biblioteca.ibge.gov.br/visualizacao/instrumentos\\_de\\_coleta/doc2601.pdf](https://biblioteca.ibge.gov.br/visualizacao/instrumentos_de_coleta/doc2601.pdf)
40. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. *Gerontologist* 1969; 9(3): 179-86. PMID: 5349366
41. Detoni MB, Lima DM, Silva TP, Machado LF, Tomiotto-Pellissier F, Costa IN, et al. Temporal and spatial distribution of American tegumentary leishmaniasis in north Paraná: 2010-2015. *Rev Soc Bras Med Trop* 2019; 52: e20180119. <https://doi.org/10.1590/0037-8682-0119-2018>
42. Brasil. Presidência da República. Casa Civil, Subchefia para Assuntos Jurídicos. Lei nº 9.394, de 20 de dezembro de 1996. Estabelece as diretrizes e bases da educação nacional. *Diário Oficial da República Federativa do Brasil*. Brasília, 20 de dezembro de 1996. [cited on July 10, 2021]. Available at: [http://www.planalto.gov.br/ccivil\\_03/leis/l9394.htm](http://www.planalto.gov.br/ccivil_03/leis/l9394.htm)
43. Brasil. Ministério da Saúde. Gabinete do Ministro. Portaria nº 1.996, de 20 de agosto de 2007. Dispõe sobre as diretrizes para a implementação da Política Nacional de Educação Permanente em Saúde. Brasília, 20 de agosto de 2007. [cited on July 10, 2021]. Available at: [https://bvsm.sau.gov.br/bvs/sau delegis/gm/2007/prt1996\\_20\\_08\\_2007.html](https://bvsm.sau.gov.br/bvs/sau delegis/gm/2007/prt1996_20_08_2007.html)

44. Albuquerque VS, Gomes AP, Rezende CHA, Sampaio MX, Dias OV, Lugarinho RM. A integração ensino-serviço no contexto dos processos de mudança na formação superior dos profissionais da saúde. *Rev Bras Educ Méd* 2008; 32(3): 356-62. <https://doi.org/10.1590/S0100-55022008000300010>
45. Costa MV, Patricio KP, Câmara AMCS, Azevedo GD, Batista SHSS. Pró-Saúde e PET-Saúde como espaços de educação interprofissional. *Interface* 2015; 19 Supl 1: 709-20. <https://doi.org/10.1590/1807-57622014.0994>
46. Afshar N, English DR, Milne RL. Factors explaining socio-economic inequalities in cancer survival: a systematic review. *Cancer Control* 2021; 28: 10732748211011956. <https://doi.org/10.1177/10732748211011956>

Received on: 08/27/2021

Reviewed on: 03/03/2022

Accepted on: 03/04/2022

Preprint: 04/25/2022

<https://preprints.scielo.org/index.php/scielo/preprint/view/4016>

Authors' contributions: Galvão, N.D.: Project administration, Data curation, Writing – original

draft, Writing – review & editing, Methodology, Supervision, Funding acquisition, Resources, Validation, Visualization. Souza, R.A.G.: Writing – review & editing, Validation, Visualization. Souza, B.S.N.: Writing – review & editing, Validation, Visualization. Melanda, F.N.: Writing – review & editing, Validation, Visualization. Andrade, A.C.S.: Writing – review & editing, Validation, Visualization. Sousa, N.F.S.: Writing – review & editing, Validation, Visualization. Correa, M.L.M.: Writing – review & editing, Validation, Visualization. Silva, A.M.C.: Writing – review & editing, Validation, Visualization. Neves, M.A.B.: Writing – review & editing, Validation, Visualization. Oliveira, J.C.S.: Writing – original draft, Writing – review & editing, Validation, Visualization. Cabral, J.F.: Writing – original draft, Writing – review & editing, Validation, Visualization. Soares, M.R.: Writing – review & editing, Validation, Visualization. Souza, P.C.F.: Writing – review & editing, Validation, Visualization. Alves, M.R.: Writing – review & editing, Validation, Visualization. Barbosa, JR.: Funding acquisition, Validation, Visualization. Pignati, W.A.: Funding acquisition, Validation, Visualization.

