

Ultra-Processed Food Consumption Score among Brazilian Women Who Survived Cancer: National Health Survey, Brazil, 2019

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Escore de Consumo de Alimentos Ultraprocessados entre Mulheres Brasileiras Sobreviventes do Câncer: Pesquisa Nacional de Saúde, Brasil, 2019

Puntuación del Consumo de Alimentos Ultraprocesados entre Mujeres Brasileñas Sobrevivientes de Cáncer: Encuesta Nacional de Salud, Brasil, 2019

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ABSTRACT

Introduction: The intake of ultra-processed foods has increased in the Brazilian population in recent years and is associated with the development and aggravation of chronic diseases as cancer. **Objective:** To evaluate the intake of ultra-processed foods by Brazilian women survivors of breast, ovarian and cervical cancer. **Method:** Cross-sectional study with secondary information from the National Health Survey (2019), a health survey of the Brazilian population in general, investigating socio-demographic, clinical and dietary aspects, from where information of adult women with self-reported diagnosis of breast, ovarian and cervical cancer were collected. Ultra-processed food intake was assessed using the NOVA score, which is based on the frequency of consumption of ultra-processed food types. The association between cancer diagnosis and intake of ultra-processed foods was analyzed by Poisson regression models with robust variance through software Stata/MP 17.0. **Results:** The prevalence of intake of five or more types of ultra-processed foods was 7.8% among women with a history of cancer, and was higher among those with ovarian cancer and under 40 years of age. The association between intake of ultra-processed foods and cancer varied according to body mass index and cancer type, with higher prevalence among women with obesity and cervical cancer (PR=6.37; CI95%:1.46;27.68). **Conclusion:** Cancer patients eat a significant amount of ultra-processed foods, with higher prevalence among women with obesity and cervical cancer.

Key words: Cancer Survivors; Food, Processed; Breast Neoplasms; Uterine Cervical Neoplasms; Ovarian Neoplasms.

RESUMO

Introdução: O consumo de alimentos ultraprocessados tem aumentado na população brasileira nos últimos anos e está associado ao desenvolvimento e agravamento de doenças crônicas como o câncer. **Objetivo:** Avaliar o consumo de alimentos ultraprocessados por mulheres brasileiras sobreviventes dos cânceres de mama, ovário e colo do útero. **Método:** Estudo transversal com informações secundárias da Pesquisa Nacional de Saúde (2019), um inquérito de saúde da população brasileira em geral, que investigou aspectos sociodemográficos, clínicos e alimentares, de onde foram coletadas informações de mulheres adultas com diagnósticos autorreferidos de câncer de mama, ovário e colo do útero. O consumo de alimentos ultraprocessados foi avaliado pelo escore NOVA, baseado na frequência de consumo de tipos de alimentos ultraprocessados. A associação entre o diagnóstico de câncer e o consumo de alimentos ultraprocessados foi explorada usando modelos de regressão de Poisson com variação robusta, software Stata/MP 17.0. **Resultados:** A prevalência de consumo de cinco ou mais tipos de alimentos ultraprocessados foi de 7,8% entre as mulheres com histórico de câncer, sendo mais alta entre as com câncer de ovário e menos de 40 anos. A associação entre consumo de ultraprocessados e câncer variou conforme o índice de massa corporal e o tipo de câncer, com maiores prevalências entre mulheres com obesidade e câncer do colo do útero (RP=6,37; IC_{95%}:1,46;27,68). **Conclusão:** Pacientes com câncer consomem alimentos ultraprocessados em quantidade expressiva, com maiores prevalências de consumo entre mulheres com obesidade e com câncer do colo do útero.

Palavras-chave: Sobreviventes de Câncer; Alimento Processado; Neoplasias da Mama; Neoplasias do Colo do Útero; Neoplasias Ovarianas.

RESUMEN

Introducción: El consumo de alimentos ultraprocesados ha aumentado en la población brasileña en los últimos años y está asociado al desarrollo y agravamiento de enfermedades crónicas como el cáncer. **Objetivo:** Evaluar el consumo de alimentos ultraprocesados en mujeres brasileñas sobrevivientes de cáncer de mama, de ovario y de cuello de útero. **Método:** Estudio transversal con información secundaria de la Encuesta Nacional de Salud (2019), un estudio de salud de la población brasileña en general que investigó aspectos sociodemográficos, clínicos y alimentarios, de donde se obtuvieron datos de mujeres adultas con diagnósticos autoinformados de cáncer de mama, ovario y cuello de útero. El consumo de alimentos ultraprocesados se evaluó mediante el índice NOVA, basado en la frecuencia de consumo de distintos tipos de alimentos ultraprocesados. La asociación entre el diagnóstico de cáncer y el consumo de alimentos ultraprocesados se exploró utilizando modelos de regresión de Poisson con variación robusta con el programa Stata/MP 17.0. **Resultados:** La prevalencia de consumo de cinco o más tipos de alimentos ultraprocesados fue del 7,8 % entre las mujeres con antecedentes de cáncer, siendo más alta entre las que tenían cáncer de ovario y menos de 40 años. La asociación entre el consumo de ultraprocesados y cáncer varió en función del índice de masa corporal y el tipo de cáncer, con mayores prevalencias entre las mujeres con obesidad y cáncer de cuello uterino (RP = 6,37; IC_{95%}: 1,46-27,68). **Conclusión:** Las pacientes con cáncer consumen alimentos ultraprocesados en cantidad significativa, siendo mayor la prevalencia de consumo entre las mujeres con obesidad y con cáncer de cuello uterino.

Palabras clave: Supervivientes de Cáncer; Alimentos Procesados; Neoplasias de la Mama; Neoplasias del Cuello Uterino; Neoplasias Ováricas.

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INTRODUCTION

The last decades have witnessed an increased prevalence of cancer among women worldwide, reaching 27.7 million individuals with the disease, standing out breast and gynecologic cancer; due to early diagnosis and more effective treatment, the number of survivors have increased as well¹. Survivor is anyone who has ever been diagnosed with cancer no matter where they are in the course of their disease²; good feeding habits help to increase global survival³ and intake of ultra-processed food (UPF) is a risk factor for the progression of the disease and death^{4,5}.

The Brazilian population has increased substantially the intake of UPF and more than 27.7% of the calories ingested originate from this type of food⁶. UPF are defined as manufacture of formulations submitted to multiple industrial processes containing many and different substances as emulsifiers, sweeteners, and colors to make the final product palatable⁷, its consumption has been associated with the development of chronic illnesses as obesity, cardiovascular diseases and cancer⁸⁻¹⁰.

The relation between UPF intake and cancer arises from obesity and low intensity chronic inflammation because these are products with high caloric density that favor weight gain and body fat in addition to potentially carcinogenic flavor enhancers and sweeteners⁹⁻¹². A recent meta-analysis indicated that a 10% increment in diet's proportion of UPF was associated with seven different types of cancer, and a 11% increase of the risk of breast cancer³. In despite of these evidences, little is known in Brazil about the intake of UPF by cancer survivors⁶ that can contribute to multi-morbidities (obesity, cardiovascular diseases, hypertension, inflammatory diseases)¹³, reduce the quality of life and global survival⁵.

Poor evaluation and monitoring of UPF intake occurs due to the complexity of the instruments and classification of the processing of the items ingested¹⁴. A simplified new instrument that reflects the proportion of UPF on the consumption – NOVA score – has been recently proposed by Costa et al.¹⁵.

The objective of the present article is to evaluate the relation between breast, ovarian and cervical cancer survivors and UPF intake based on the information of the National Health Survey utilizing the NOVA score.

METHOD

Population-based cross-sectional study with secondary information from PNS-2019 of Brazilian adult women with self-referred diagnosis of breast, ovarian and cervical cancer. PNS is a population-based household survey

conducted in Brazil by the Ministry of Health and “*Instituto Brasileiro de Geografia e Estatística (IBGE)*” to produce information about the current population health scenario and lifestyle. Additional information on the methodology of the survey can be found in official publications¹⁶.

A three-stages sampling was adopted for PNS, aggregating conglomerates, stratified randomized and simple randomized techniques. Primary sampling units (PSUs) consisted of census tract following IBGE's integrated system of household surveys. The conglomerates represented by PSUs were selected by stratified sampling with proportional likelihood to the number of permanent private households. For each PSU, a simple randomized sampling of the domiciles registered at the national registry of addresses for statistical purposes (CNEFE) was performed. At the third stage, an inhabitant aged 15 years or older was selected from each domicile to respond to the interview¹⁶.

Based on the PNS sample (n=293,725), the eligibility criteria for the current study were: 20-59 years old women (n=48,591) diagnosed with breast, ovarian and cervical cancer (n=369) who responded to the individual questionnaire. Cancer diagnoses reported by parents were not included.

Demographic, socioeconomic, anthropometric, food intake and self-reported medical diagnoses of breast, ovarian and cervical cancer variables have been investigated. Demographics and socioeconomic were referred to the geographic region of residence (North, Northeast, Southeast, South and Midwest regions), urban or rural areas, age-range (20-29; 30-39; 40-49; 50-59), skin color [white, brown, black and others (yellow or indigenous)], education (illiterate/incomplete elementary; complete elementary; complete high school; complete college or more) and family income *per capita* in minimum wages.

Self-claimed weight and height were collected to calculate the body mass index (BMI-kg/m²) and classification of non-obese (BMI<30 kg/m²) and obese women (BMI≥30 kg/m²)¹⁷.

The research question to evaluate the intake of UPF was: “Did you eat or drink [...] yesterday?” The types of UPF added into brackets were: canned or powdered juice, chocolate-like smoothie or flavored yogurt, snacks or salty crackers, sweet or sandwich cookie or cakes, ice-cream, chocolate, gelatin, flan or other processed dessert, instant noodles, powdered soup, frozen lasagna or other processed frozen dishes. Following the methodology NOVA, a variable to reflect the score of intake of UPF was created with these types of food and assigned one score. The total scores can range from zero to ten, being zero no intake of

UPF the day before the interview and 10, the intake of any of the food groups¹⁵.

The affirmative responses to the question “Has any doctor diagnosed you with [...] cancer?” if breast, ovarian or cervical cancer have been reported. These neoplasms were eligible for being the most common in women due to high incidence, early mortality and impact on their quality of life¹⁸.

The qualitative variables were expressed in absolute and relative frequencies reflecting the sociodemographic characterization related to the intake of UPF the day before the interview. The distribution of UPF score for adult women in general and according to breast, ovarian and cervical cancers investigated and any other cancer was presented. The proportion of individuals who ate five or more types of UPF was estimated according to sociodemographic characteristics.

The association between the diagnosis of cancers and intake of five or more types of UPF was checked by prevalence ratio (PR) and confidence intervals of 95% (CI_{95%}) and by Poisson's five regression models¹⁹ given the complexity of the sample design. Five models have been utilized: sociodemographic adjustments (age, region, skin color, area of residence, education and family income *per capita*) (Model 1); sociodemographic adjustments and other previous cancer diagnoses (Model 2); sociodemographic adjustments, other previous cancer diagnoses, chronic diseases (diabetes, high blood pressure, cardiovascular disease) (Model 3); sociodemographic adjustments, other cancers, chronic diseases and BMI (<30 kg/m² or ≥30 kg/m²) (Model 4); stratified by obesity adjusted by age, region, area of domicile, education, other previous diagnoses of cancer and chronic diseases (Model 5).

The alpha level of significance was 5%. The data were analyzed with Stata/MP 17.0²⁰ and application of module *survey* for PNS sample design.

The National Ethics Committee (CONEP) approved the PNS (report 3,529,376 and CAAE (submission for ethical review): 11713319.7.0000.0008). The approval by the ethics committee was waived because only secondary, deidentified, public data have been utilized for the present study in compliance with Directives 466/2012²¹ and 510/2016²² of the National Health Council.

RESULTS

Of the total of 48,591 adult women, 369 self-reported medical diagnosis of breast, ovarian or cervical cancer with high prevalence of breast cancer (n=189). Among the women with cancer, 44.6% were aged 50-59 years, 45.3% lived in the Southeast Region mostly in the urban

area (91.4%), complete high school or university (52.1%), mean family income of one minimum wage or less (52%), 49.5% self-claimed White and 29.3% presented BMI ≥30 kg/m² (Table 1).

More than 40% of women with cancer ate dressings (margarine, mayo, ketchup or other processed dressings) the day before the interview. Nearly one in three ate bread (sliced bread, hot-dog or hamburger buns), sweets (ice-cream, chocolate, gelatin, flan or other processed dessert) or soda. Approximately 1/5 ate sausages, mortadella or ham, juices (canned, boxed or powdered) or salty snacks or crackers. Other types of UPF were eaten by less than 15% of the women (Table 2).

Among Brazilian adult women, 14.6% ate five or more types of UPF the day before the interview. For those diagnosed with cancer, the prevalence was 7.8% and 24.1% of the women with ovarian cancer ate five or more types of UPF (Table 3).

The highest prevalence of intake of five or more types of UPF the day before the survey (Table 4) was found for women with cancer, aged 40 years or younger (28.0%), living in urban areas (8.3%) living in the North and South regions (23.2%), incomplete high school (25.5%) and earning ≤ two minimum wages (19.6) .

The prevalence of intake of five or more UPF the day before was higher among women with ovarian cancer according to the models adjusted by sociodemographics (PR=2.33, CI_{95%}: 1.23; 4.41), other cancers (PR=4.14, CI_{95%}: 1.89; 9.05), chronic diseases (PR=2.91, CI_{95%}: 1.42; 5.97) and obesity (PR=2.93, CI_{95%}: 1.41; 6.11). When stratified by BMI, the prevalence was bigger for women with ovarian cancer, BMI <30kg/m² (PR=4.65, CI_{95%}: 2.48; 8.73) and lower for women with any of the other neoplasms (PR=0.43, CI_{95%}: 0.26; 0.71). For obese women (BMI≥30kg/m²), the prevalence of intake of five or more types of UPF the day before was bigger for women with cervical cancer (PR=6.37, CI_{95%}: 1.46; 27.68) (Table 5).

DISCUSSION

So far, this is the first national study presenting results about food intake based on NOVA score of consumption of UPF in women with breast, ovary and cervix cancer in a representative sample of the Brazilian population. The findings indicate that even after the diagnosis of cancer, nearly 8% of the women ate five or more UPF the day before the interview. And for women with ovarian cancer, this prevalence exceeded 24%, in addition, the presence of obesity modified the relation between having cancer and intake of UPF.

Post cancer diagnosis life habits and food changes are potentially important behaviors through which



Table 1. Sociodemographic and anthropometric characterization of adult Brazilian women with cancer (20-59 years). PNS, 2019

Characteristic	Cancer Diagnosis							
	Breast (n=189)		Ovary (n=31)		Cervix (n=165)		Breast/ovary/cervix (n=369)	
	n (%) ^a	(CI _{95%})	n (%) ^a	(CI _{95%})	n (%) ^a	(CI _{95%})	n (%) ^a	(CI _{95%})
Age-range								
20-29	1 (2.1)	(1.9; 2.4)	..	..	6 (2.3)	(1.7; 3.2)	7 (2.1)	(1.5; 3.1)
30-39	19 (12.8)	(10.7; 15.3)	5 (29.4)	(29.2; 29.7)	42 (34.1)	(28.5; 40.3)	63 (21.1)	(16.6; 26.4)
40-49	72 (34.0)	(28.1; 40.5)	12 (31.2)	(29.4; 33.1)	54 (26.1)	(21.9; 30.9)	132 (32.1)	(26.7; 38.1)
50-59	97 (51.0)	(43.9; 58)	14 (39.3)	(37.4; 41.3)	63 (37.4)	(33.9; 41.1)	167 (44.6)	(38.7; 50.7)
Region								
North	19 (2.7)	(2.4; 3.1)	7 (3.5)	(3.3; 3.7)	40 (6.9)	(6.3; 7.6)	65 (4.3)	(3.9; 4.8)
Northeast	53 (13.4)	(11.8; 15.2)	6 (20.4)	(20.2; 20.5)	47 (20.7)	(18.9; 22.6)	103 (16.8)	(15.2; 18.4)
Southeast	61 (54.4)	(49.6; 59.1)	6 (39.9)	(39.4; 40.4)	24 (28.6)	(26.4; 30.8)	89 (45.3)	(41.4; 49.3)
South	38 (24.9)	(22.3; 27.7)	9 (22.0)	(21.8; 22.2)	37 (33.6)	(29.4; 38.1)	77 (27.2)	(24.3; 30.3)
Midwest	18 (4.6)	(4.1; 5.2)	3 (14.2)	(14.1; 14.3)	17 (10.2)	(6.7; 15.4)	35 (6.4)	(5.0; 8.2)
Race/color								
White	87 (52.5)	(45.7; 59.2)	11 (43.0)	(39.2; 47)	63 (44.5)	(37.3; 51.9)	155 (49.5)	(43.1; 55.8)
Brown	87 (41.3)	(34.8; 48.1)	16 (30.0)	(26.1; 34.3)	87 (46.7)	(38.9; 54.6)	183 (43.3)	(36.6; 50.3)
Black	13 (6.0)	(4.7; 7.8)	3 (15.8)	(15.6; 15.9)	10 (5.6)	(4.8; 6.5)	24 (5.9)	(4.0; 8.8)
Other	2 (0.2)	(0; 0.9)	1 (11.2)	(11.1; 11.3)	5 (3.3)	(0.7; 14.7)	7 (1.3)	(0.3; 5.2)
Domicile								
Urban	168 (93.3)	(92.5; 93.9)	26 (86.5)	(85.8; 87.2)	136 (90.3)	(89.5; 91.1)	316 (91.4)	(90.5; 92.2)
Rural	21 (6.7)	(6.1; 7.5)	5 (13.5)	(12.8; 14.2)	29 (9.7)	(8.9; 10.5)	53 (8.6)	(7.8; 9.5)
Education								
III/IE	47 (22.1)	(18.2; 26.5)	10 (33.6)	(29.2; 38.2)	73 (51.2)	(42.9; 59.4)	123 (32.3)	(27.4; 37.7)
CE	26 (20.8)	(16.9; 25.2)	6 (14.7)	(11.3; 18.7)	17 (9.4)	(8.3; 10.7)	46 (15.6)	(11.6; 20.5)
CHS	68 (26.0)	(20.9; 31.8)	11 (47.9)	(47.5; 48.3)	57 (31.8)	(26.3; 37.9)	131 (29.8)	(24.5; 35.8)
CC or higher	48 (31.2)	(24.3; 39)	4 (3.8)	(2.4; 6)	18 (7.6)	(4; 14.1)	69 (22.3)	(16.5; 29.4)
House income per capita								
≤ 1 MW	89 (44.3)	(39.0; 49.7)	16 (63.2)	(58.9; 67.4)	108 (63.9)	(56.1; 71.1)	204 (52.0)	(45.9; 57.9)
> 1 and ≤ 2 MW	47 (25.3)	(20.7; 30.5)	9 (32.0)	(31.7; 32.3)	39 (25.2)	(19.0; 32.8)	91 (25.2)	(20.8; 30.1)
> 2 MW	53 (30.4)	(23.4; 38.5)	6 (4.8)	(2.0; 10.8)	18 (10.8)	(8.9; 13.1)	74 (22.9)	(17.6; 29.2)
Obesity per BMI								
No (< 30 kg/m ²)	136 (70.5)	(64.3; 76.1)	18 (54.1)	(58.0; 18.0)	117 (69.3)	(61.3; 76.4)	263 (70.7)	(64.8; 75.9)
Yes (≥ 30 kg/m ²)	53 (29.5)	(23.9; 35.7)	13 (45.9)	(49.9; 13.0)	47 (30.7)	(23.6; 38.7)	105 (29.3)	(24.1; 35.2)

Captions: ^aabsolute and percent for each category; CI_{95%} = confidence interval 95%; II = illiterate; IE = incomplete elementary; CE = complete elementary; CHS = complete high-school; CC = complete college or higher; MW = minimum wage; BMI = body mass index; any = one of the three types of cancer (breast, ovary, cervix); other races = Yellow and Indigenous.

survivors can protect and promote their well-being and longevity²³. However, most of the survivors are used to inappropriate consumption of certain food groups or nutrients and present low intake of whole grains and healthy fatty acids, further to unwanted food gain²⁴. UPF intake is quite concerning in regard to its health impact and development of non-communicable chronic diseases (NCD) as neoplasms¹³, because a 10% increment of

UPF-originated calories increases 11% the risk of breast cancer and 13% of cancer in general³. Studies indicate that regular consumption of UPF is associated with cancer relapse and increased mortality by these neoplasms^{5,25}.

Furthermore, high consumption of UPF is also connected to worst quality of life of breast cancer women survivors and shows association with fatigue, a 5% increment of UPF-originated calories augments total, subjective fatigue

Table 2. Frequency of intake of UPF by Brazilian adult women (20-59 years). PNS, 2019

Types of UPF	Population (n=48,591)		Cancer Diagnosis							
			Breast (n=189)		Ovary (n=31)		Cervix (n=165)		Breast/ovary/cervix (n=369)	
	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})
Soda	31.4	(30.5; 32.3)	26.0	(22.8; 29.5)	36.7	(32.4; 41.3)	30.8	(24.4; 38.1)	28.3	(23.6; 33.5)
Canned/boxed or powdered fruit juice	24.2	(23.3; 25.2)	20.0	(16.2; 24.3)	24.2	(24.0; 24.4)	25.1	(21.9; 28.6)	19.9	(16.3; 24.0)
Chocolate smoothie or flavored yogurt	16.7	(15.9; 17.4)	13.3	(9.4; 18.6)	15.2	(15.1; 15.4)	13.0	(11.1; 15.2)	11.3	(7.5; 16.6)
Snacks or cookie package/salty cracker	24.9	(24.0; 25.7)	19.6	(15.1; 25.1)	2.5	(2.5; 2.6)	19.8	(14.6; 26.2)	18.3	(13.9; 23.7)
Sweet cookie or sandwich cookie or cake	23.6	(22.7; 24.5)	13.6	(9.2; 19.8)	2.4	(2.4; 2.5)	13.9	(10.8; 17.6)	13.5	(9.7; 18.5)
Ice-cream, chocolate, gelatin, flan or other processed dessert	23.0	(22.1; 23.9)	36.2	(28.0; 45.3)	27.8	(27.6; 28.1)	16.2	(13.0; 20.0)	28.5	(22.0; 35.9)
Sausages, mortadella or ham	25.4	(24.5; 26.2)	20.6	(17.9; 23.5)	16.0	(14.1; 18)	21.3	(14.1; 30.9)	21.3	(16.0; 27.8)
Sliced bread, hot-dog or hamburger buns	30.4	(29.5; 31.4)	27.2	(21.1; 34.2)	33.9	(32.0; 35.8)	26.5	(18.5; 36.4)	28.6	(22.4; 35.8)
Margarine, mayonnaise, ketchup or other processed dressings	48.5	(47.5; 49.5)	44.5	(37.1; 52.2)	55.6	(55.1; 56.0)	36	(31.1; 41.1)	42.9	(36.6; 49.4)
Instant noodles, boxed soup, frozen lasagna or other frozen processed dishes	6.4	(5.9; 6.8)	5.0	(2.4; 10.2)	26.6	(26.3; 26.8)	17.7	(10.7; 27.8)	9.6	(5.6; 15.9)

Caption: CI_{95%} = confidence interval 95%.**Table 3.** Distribution of UPF score in Brazilian adult women (20-59 years). PNS, 2019

Types of food	Population (n=48,591)		Early diagnosis of cancer							
			Breast (n=189)		Ovary (n=31)		Cervix (n=165)		Breast/ovary/cervix (n=369)	
	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})
Count										
0	13.7	(13.1; 14.3)	15.7	(12.2; 20.1)	27.9	(23.9; 32.3)	18.9	(14.6; 24)	17.0	(14.0; 20.5)
1	19.5	(18.8; 20.2)	23.1	(15.2; 33.5)	12.8	(9.1; 17.7)	17.5	(14.4; 21.1)	21.4	(15.5; 28.7)
2	21.4	(20.6; 22.2)	18.1	(15.8; 20.6)	12.8	(12.7; 12.9)	26.1	(20; 33.3)	21.2	(17.5; 25.5)
3	17.9	(17.2; 18.7)	20.5	(16.6; 24.9)	19.4	(17.5; 21.4)	21.3	(13.9; 31.3)	21.2	(17.1; 26.0)
4	12.8	(12.2; 13.5)	15.5	(10.8; 21.7)	3.1	(3.1; 3.1)	6.7	(6.0; 7.5)	11.3	(7.8; 16.0)
5	7.6	(7.1; 8.1)	4.2	(1.8; 9.4)	12.2	(12.1; 12.3)	5.7	(3.3; 9.5)	3.7	(1.8; 7.7)
6	3.4	(3.1; 3.8)	0.4	(0.1; 1.6)	11.9	(11.8; 12)	0.6	(0.2; 1.5)	1.4	(1.1; 1.9)
7	1.9	(1.7; 2.3)	0.2	(0.2; 0.2)	..	..	0.7	(0.6; 0.7)	0.3	(0.2; 0.6)
8	0.9	(0.7; 1.1)	2.4	(1.5; 3.7)	..	..	<0.1	(0.0; 0.2)	1.5	(0.3; 7.0)
9	0.5	(0.4; 0.7)	..	..	..	..	2.5	(2.4; 2.8)	0.9	(0.1; 6.3)
10	0.3	(0.2; 0.4)	..	..	..	..	..	..	..	..

Caption: CI_{95%} = confidence interval 95%.

Table 4. Intake of five or more types of UPF according to sociodemographic characteristics of Brazilian adult women (20-59 years). PNS, 2019

Characteristics	Population (n=48,591)		Intake of five or more types of UPF							
			Breast (n=189)		Ovary (n=31)		Cervix (n=165)		Breast/ovary/cervix (n=369)	
	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})	%	(CI _{95%})
Age range										
20-29	20.9	(19.2; 22.7)	..	..	..	..	30.1	(21.3; 40.5)	11.3	(7.9; 16.0)
30-39	16.4	(15.0; 17.8)	18.5	(12.5; 26.5)	..	..	3.2	(2.4; 4.2)	8.8	(2.5; 26.4)
40-49	12.4	(11.0; 13.9)	4.3	(1.4; 12.5)	38.1	(36.0; 40.2)	7.2	(1.4; 29.1)	7.9	(4.4; 13.8)
50-59	8.8	(7.8; 10.0)	6.4	(2.6; 15.1)	30.9	(29.2; 32.6)	15.6	(15.0; 16.3)	7.2	(2.8; 17.3)
Region										
North	12.0	(10.8; 13.3)	6.4	(6.0; 6.9)	..	..	16.0	(9.7; 25.3)	11.5	(6.5; 19.6)
Northeast	9.0	(8.2; 9.9)	6.8	(1.4; 27.3)	3.8	(3.8; 3.8)	4.5	(4.2; 4.7)	5.7	(2.0; 14.9)
Southeast	17.1	(15.7; 18.7)	3.8	(0.8; 16.4)	58.3	(57.2; 59.5)	18.4	(18.4; 18.5)	7.0	(2.9; 16.1)
South	20.7	(19.0; 22.5)	15.9	(12.2; 20.4)	..	..	6.1	(1.4; 23.1)	11.7	(4.8; 25.6)
Midwest	12.7	(11.3; 14.2)	..	..	..	..	1.7	(1.1; 2.7)	1.0	(0.7; 1.2)
Race/color										
White	15.7	(14.5; 16.9)	6.6	(2.8; 14.9)	54.1	(49.6; 58.6)	12.3	(7.2; 20.2)	8.3	(4.5; 14.9)
Brown	13.8	(12.8; 14.9)	7.2	(4.6; 11.0)	2.6	(2.2; 3.0)	8.7	(6.8; 11.1)	7.7	(3.2; 17.4)
Black	14.4	(12.6; 16.3)	11.3	(1.7; 48.8)	..	..	..	..	7.1	(1.0; 36.5)
Other	17.2	(12.1; 23.8)	..	..	..	..	..	..	..	..
Domicile										
Urban	15.6	(14.8; 16.5)	7.6	(4.5; 12.7)	27.8	(27.7; 27.9)	9.7	(6.8; 13.5)	8.3	(4.8; 14.0)
Rural	7.7	(6.7; 8.8)	..	..	..	..	8.1	(8.0; 8.3)	3.2	(3.0; 3.4)
Education										
III/IE	11.3	(9.9; 12.8)	5.7	(1.5; 19.2)	..	..	2.9	(1.9; 4.3)	4.0	(1.7; 9.2)
CE	15.6	(13.9; 17.4)	11.4	(3.2; 33.1)	77.7	(53.9; 91.2)	31.2	(28.3; 34.2)	10.1	(3.0; 28.8)
CHS	17.5	(16.2; 18.8)	5.4	(3.8; 7.5)	24.8	(24.8; 24.8)	14.2	(7.3; 25.8)	11.4	(5.7; 21.7)
CC or higher	12.9	(11.5; 14.5)	6.7	(4.8; 9.3)	20.1	(12.5; 30.8)	7.7	(4.1; 14.2)	7.1	(1.7; 25.5)
House income per capita										
≤ 1 MW	14.4	(13.5; 15.4)	9.7	(7.1; 13.2)	..	..	3.5	(2.6; 4.7)	6.7	(3.1; 14.0)
> 1 and ≤ 2 MW	16.3	(14.8; 17.9)	9.9	(2.4; 33.1)	72.8	(72.8; 72.8)	18.6	(9.9; 32.1)	12.9	(6.1; 25.3)
> 2 MW	13.3	(11.8; 15.0)	1.0	(0.6; 1.8)	16.1	(6.7; 34.2)	24	(19.8; 28.7)	5.1	(0.9; 23.0)

Captions: UPF = ultra-processed food; CI_{95%} = confidence interval 95%; ILL = illiterate; IE = incomplete elementary; CE = complete elementary; CHS = complete high school; CC = complete college or higher; MW = minimum wage; any = one of the three types of cancer (breast, ovary, cervix); other races = Yellow and Indigenous.

and related to physical activity²⁶. The present study did not investigate the relation between consumption of UPF and quality of life of women, but future studies may address this issue and allow multimodal interventions not only for food but also physical activities and mental health to improve the quality of life of these women²⁷.

In the last five years, the relation between intake of UPF and cancer is being expanded with more than 160 publications but still with contradictory results. A meta-analysis with more than 104,980 participants indicates that a 10% increment of consumption of UPF augments 10% the risk of cancer in general and 11% the risk of

breast cancer²⁸. A prospective European study with more than one million 40-69 years old participants revealed that a 10% increment of UPF consumption was associated with increased mortality by breast and ovarian cancer of 16% and 30%, respectively²⁹.

UPF are intentionally manufactured to achieve high palatability, practicality and acceptance and, therefore, are rich in calories, added sugars, refined grains, non-healthy fats, sodium and poor nutrients³⁰. The intake of UPF stimulates metabolic modifications that can impact homeostatic mechanisms of regulation of body weight and create an intestinal microbiota prone to proliferation

Table 5. Adjusted association between previous cancer diagnosis and intake of five or more UPF the day before. PNS, 2019

Cancer	Model 1		Model 2		Model 3		Model 4		Model 5			
									BMI < 30 kg/m ²		BMI ≥ 30 kg/m ²	
	PR	(CI _{95%})	PR	(CI _{95%})	PR	(CI _{95%})	PR	(CI _{95%})	PR	(CI _{95%})	PR	(CI _{95%})
			0.63	(0.21; 1.84)	0.61	(0.21; 1.76)	0.61	(0.21; 1.73)	0.77	(0.32; 1.83)	0.50	(0.18; 1.38)
Ovary	2.33	(1.23; 4.41)	4.14	(1.89; 9.05)	2.91	(1.42; 5.97)	2.93	(1.41; 6.11)	4.65	(2.48; 8.73)	2.97	(0.78; 11.29)
Cervix	0.92	(0.37; 2.30)	1.68	(0.58; 4.88)	1.49	(0.49; 4.52)	1.49	(0.51; 4.40)	0.55	(0.20; 1.54)	6.37	(1.46; 27.68)
Breast/ ovary/cervix	0.42	(0.23; 0.78)	0.42	(0.23; 0.78)	0.40	(0.22; 0.72)	0.40	(0.22; 0.72)	0.43	(0.26; 0.71)	0.37	(0.22; 0.62)

Captions: PR = prevalence ratio; CI^{95%} = confidence interval 95%.

Note: Model 1 = adjusted by sociodemographics; Model 2 = adjusted by sociodemographics and other cancers. Model 3 = adjusted by sociodemographics, other cancers and chronic diseases (diabetes, hypertension and cardiovascular diseases); Model 4 = adjusted by sociodemographics, other cancers, chronic diseases and obesity; Model 5 = stratified by the presence of obesity and adjusted by sociodemographics, other cancers and chronic diseases.

of micro-organisms to promote inflammatory diseases through modifications of the intestinal barrier function³¹, increasing the risk of cardiovascular diseases, obesity, insulin-resistance, type 2 diabetes and cancer³².

The consumption of UPF was investigated herein with the NOVA score already addressed in some Brazilian studies, but none of them with individuals with cancer. Studies based on NOVA score show that between 15% and 17.7% of the populations investigated eat more than five ultra-processed food^{14,15}, corroborating the findings for Brazilian adult women (14.6%). For women with ovarian cancer, the prevalence was more expressive, 24.1%. In addition, the prevalence of UPF consumption for aggregate neoplasms can lead to perceptions hardly valid for each one of them separately. These findings guide future studies about the consumption of UPF by patients with cancer per specific sites.

Care to cancer survivors should meet the guidelines of the Brazilian population food guidance³⁰ to prevent relapse, involving recommendations for healthier nourishment and food, social and cultural context, contributing for sustainable feeding practices. In addition, the recommendations of the Third Expert Report of the World Cancer Research Fund³³, which indicate the importance of a healthy lifestyle for disease prevention and healthier feeding habits, weight maintenance and regular practice of physical exercises.

The results of the present study recommend specific nutritional strategies for cancer survivors, which depend on the creation and effective implementation of public policies focused to integral women's health. In this context, the Strategic Action Plan for Non-Communicable Diseases (DANT)³⁴ presents key goals to reduce the morbimortality by neoplasms in Brazil, among them, "reduce 10% of breast cancer premature mortality (30-

69 years)", "reduce 20% of cervical cancer premature mortality (30-69 years)", "reduce the consumption of ultra-processed food", "reduce 30% of regular intake of sweet beverages", among others.

The secondary data collected were not specifically structured for the present study, which is one of the limitations of the investigation. In addition, previous diagnoses of the cancers investigated may potentially present detection bias due to the participation of women with more possibilities of obtaining a diagnosis or in different phases of survival or severer symptoms or better access to health services, depending on the sociodemographic reality. Considering these possibilities, adjustments of multiple regression by demographic and socioeconomic aspects were made, specifically income and education. Early diagnoses were utilized to check differences of consumption of the individuals diagnosed and causal inferences linking food consumption to cancers were not made.

Some memory bias may have occurred regarding the information about women's food consumption. To minimize this bias, questions related to the day before the interview were chosen to reduce the possibility of forgetfulness due to time proximity between consumption and interview. One of the study strongest points is the utilization of NOVA score for women cancer survivors because is the first national study presenting these results and may guide future studies and interventions for this population to encourage the selection of food that positively impact the global survival of these women.

CONCLUSION

The analysis of PNS-2019 reveals that 7.8% of the patients with cancer ate five or more types of UPF with higher prevalence of women with ovarian cancer



younger than 40 years of age. In addition, the study has also concluded that the relation of consumption of UPF with cancer varies according to BMI and type of cancer, emphasizing higher prevalence for obese women diagnosed with cervical cancer. These findings underpin the importance of monitoring the diet of cancer survivors and suggest the necessity of dietary interventions to improve the health of these patients.

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Sara Maria Moreira Lima Verde, Soraia Pinheiro Machado and Ilana Nogueira Bezerra contributed to the study design, interpretation of the data, wording and critical review. Larissa Fortunato Araújo contributed to the study design, analysis and interpretation of the data and critical review. Italo Wesley Oliveira Aguiar contributed to the acquisition, analysis and interpretation of the data, wording and critical review. Fernando Natalense da Costa contributed to the wording and critical review. Priscilla de Lima Carneiro contributed to the study design, wording and critical review. All the authors approved the final version to be published.

DECLARATION OF CONFLICT OF INTERESTS

There is no conflict of interests to declare.

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