

Ultra-processed foods consumption among inmates in a women's prison in São Paulo, Brazil

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ABSTRACT

Objective: To assess the consumption of ultra-processed foods among inmates in a women's prison in the State of São Paulo, Brazil.

Methods: We conducted a cross-sectional study in 2012/2013 with 1,013 female inmates. A structured interview questionnaire was used to collect socio-demographic, self-reported morbidity and healthy lifestyles and health-related behaviors data. The inmates' usual diet was assessed with a food frequency questionnaire. Foods were classified as either natural or minimally processed, processed or ultra-processed.

Results: Inmates age ranged from 18 to 65 years, 51.7% were black, 80.3% had children, 69.5% smoked, 47% were overweight/obese and half of them had high blood triglycerides. The prevalence of daily consumption of natural or minimally processed foods (rice, beans and cassava flour) was 87.7%. The prevalence of daily consumption of green leafy and other vegetables was 63.7%. Almost two-thirds reported consuming milk and fried chicken frequently. A high prevalence of daily consumption of ultra-processed foods was observed in this study. Hot dog bread and sweet bread with margarine were consumed by 86.5% of the interviewees on a daily basis; sugar sweetened beverages by 68.4%, and biscuits as well as candies by 77.1%.

Conclusions: The women's diet in the prison is of low quality, and may lead to metabolic alterations, obesity and other comorbidities. It is recommended that the prison's Food Evaluation Committee considers improvements to the quality of the prisoners' diets.

Keywords: women's health; prison; food consumption; cross-sectional studies; population; prisoners.

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INTRODUCTION

The international human rights treaties include two indivisible dimensions of the Human Right to Adequate Food (HRAF): the right to be free from hunger and malnutrition and the right to consume high-quality diets. Human beings dietary needs involve much more than simply meeting energy need as it is important that the diet is also nutritionally balanced and culturally acceptable. In fact, the HRAF should not and cannot be interpreted in a strict sense

and to be simply translated as a set of "minimum recommendations for energy or nutrients"¹.

The human rights perspective clearly establishes that the respect for protection, promotion and provision of the rights of all the inhabitants of a national territory is the State's duty. Therefore, the State must take all the necessary measures for its citizens to fulfill the HRAF task¹. People deprived of their freedom are part of the countries' vulnerable populations as they can do little or nothing on their own to ensure that their right to have access to a healthy, high-quality diet

is respected. In other words, this population depends on the State to supply this basic human need¹.

An adequate diet in terms of quantity, quality, and safety is essential for the organism to obtain the energy and nutrients that are necessary for its organs to function and be able to maintain a good health status. Fulfilling the HRAF is crucial for national development as empirical evidence supports a direct relationship between inadequate food consumption pattern and the occurrence of nutritional deficiencies, overweight/obesity and chronic noncommunicable diseases (NCDs)²⁻⁴.

Unhealthy eating is one of the strongest risk factors for the development of NCDs⁵⁻⁷. Documentation of major changes in dietary habits in the Brazilian population led to the update of the Brazilian Population Food Guide (GAPB), published in 2014⁸. The new GAPB classifies foods in relationship to their degree of industrial processing. The GAPB recommends a healthy diet based on natural or minimally processed foods instead of ultra-processed foods – such as sugar sweetened beverages, pastries, chips, processed meats and ready-to-eat meals - which have been strongly linked the development of NCDs⁸⁻¹⁴.

Dietary intake assessments in highly vulnerable populations are not easy to conduct however it is crucial to do so as without this information it is not possible to improve public health nutrition policies^{9,10}. This study aimed to (a) assess the prevalence of consumption of ultra-processed foods, according to sociodemographic variables, health-related behaviors, time in prison, and health status among female inmates, and (b) describe the the frequency of consumption of foods with different degrees of processing.

MATERIAL AND METHODS

A cross-sectional study was carried out from August 2012 to July 2013 as part of a larger project entitled “Comprehensive healthcare provided to imprisoned women and employees at a women's prison located in the State of São Paulo”. The study involved all 1013 inmates who agreed to participate in the study. The information collected through a structured interview questionnaire included socio-demographic factors, anthropometric measures, self-reported morbidity, health related lifestyles, behaviors and food consumption. Capillary blood was collected for assessing blood cholesterol and triglycerides¹⁵.

Trained and supervised interviewees administered the face-to-face interviews, collected the anthropometric data and performed the capillary blood collection

(fingerstick blood sample collected with Accu-Chek Safe-T-Pro Uno lancets and using the Accutrend® portable device). It was recommended a 12-hours fasting before to collect blood samples.

In this study, the foods were classified as natural or minimally processed, processed and ultra-processed foods as recommended by the Dietary Guidelines for the Brazilian Population⁸. Natural or minimally processed foods are those that do not undergo any alteration or that undergo processes that do not involve addition of substances. These foods usually only undergo cleaning, removal of inedible parts, grinding, pasteurization, and freezing. Processed foods are foods modified by industry with the use of salt, sugar, oil and other substances to preserve them or to make them more palatable. Ultra-processed foods are industrial formulations made mostly or entirely by substances extracted from foods (oils, fats, sugar, starch and proteins), derived from food constituents (hydrogenated fats and modified starch), or synthesized in laboratories from organic materials such as oil and coal (hydrogenated fats and modified starch). The purpose of ultra-processing is to enhance foods' shelf life, practicality, profitability and hyper-palatability⁸.

The remaining variables collected directly from the inmates included:

- Sociodemographic conditions: age group (years), skin color (white or black) and level of schooling (years of formal education completed).
- Self-reported morbidity: presence of arterial hypertension, heart problems, diabetes and migraine (yes or no per morbidity; self-report).
- Biochemical and anthropometric assessment data:

Anthropometric measures: the inmates' weights before admission to the prison were self-reported, and the current weight and height were measured in order to calculate the Body Mass Index (weight in kilograms divided by the square of the height in meters). The cutoff points proposed by the World Health Organization to the adult population were used: overweight (BMI ≥ 25.0 and < 30 kg/m²) and obesity (BMI ≥ 30 kg/m²). Abdominal obesity was also assessed, measured by waist circumference (WC), an interpreted using the recommended risk cutoff point (WC > 88 cm)¹⁶. Biochemical tests: standard risk cutoff points were used for total cholesterol (≥ 200 mg/dl) and triglycerides (≥ 150 mg/dl).

- Lifestyle indicators: physical activity was assessed by the question “Do you practice any kind of physical activity?” and dichotomized as “yes” or “no”. Inmates were also asked to report if they were physically active for 30 minutes or more per day. Based on the question “Do you smoke ciga-

rettes?" the inmates were classified as smokers or non-smokers.

- Individual food consumption: for the assessment of food and food group consumption, a food frequency questionnaire was used. For each food item listed the categories were: "does not consume it", "consumes it 1 to 2 times per month", "consumes it 1 to 2 times per week", "consumes it 3 to 6 times per week" and "consumes it on a daily basis". In this study, we further classified the food items into the following food consumption categories: "does not consume the food or consumes it up to 2 times per month", "consumes it 1 to 2 times per week", "consumes it 3 or more times per week". The food groups assessed were: Milk and dairy products, meats, eggs, cereals, fruits, oils, fats, sugars, candies, fried foods, snacks and drinks.

The number of meals consumed per day was assessed in response to the question "Do you have the following meals?" with response options being breakfast, morning snack, lunch, afternoon snack, dinner and evening snack.

Information on leftovers was obtained through the following questions: "Do you usually leave food on your plate/in your lunchbox?" (yes or no); "If you do, what do you usually leave most:" rice, beans, pasta, meats (beef, poultry, fish and sausage), vegetables, flours, others. The estimated amount of leftovers was verified through the question: "How much food do you usually leave on your plate/in your lunchbox?" The possible answers were: "I don't leave anything", "almost everything", "half", "more than half", "less than half".

Descriptive analyzes were performed using measures of central tendency and dispersion, absolute and relative frequencies. The prevalence of consumption food ultra-processed, according to sociodemographic variables, health-related behaviors, period of imprisonment and health status indicators were estimated. The associations between the consumption food ultra-processed and these variables were assessed using the chi-square test or Fisher's exact test with 5% significance level. All analyses were conducted with SPSS for Windows (v. 21).

Ethical considerations

The research project was submitted to the Research Ethics Committee of the Penitentiary Administration Department (CEP/SAP) on October 27, 2011, and was approved on June 21, 2012 (Opinion no. 045/2011). The study's informed consent form was read to all the study participants. This form

clearly explained the study's objectives, the procedures that were going to be performed, and the voluntary nature of their participation.

If the assessed biomedical parameters showed alterations, medical assistance and/or tests were requested for further diagnosis. Faculty from the University of Campinas School of Medicine had been providing antenatal care and overall medical care to inmates for many years prior to the study. Special diets were indicated whenever a health problem that required doing so was identified.

RESULTS

The inmates' average age was 30.8 years (minimum of 18 and maximum of 65 years), 51.4% self-reported that their as black, 35% were married, and 80.3% had children. The majority (61.4%) had up to 4 years of schooling and, at the time the research was conducted, only 4.4% were studying in prison. We found that 47.0% were overweight/obese (28.3% overweight and 18.7% obesity), and 50.5%, 36.9% and of the inmates presented alterations in the levels of blood triglycerides and cholesterol, respectively. About 69.5% were smokers and only 30% practiced 30 minutes or more of physical activity per day (Table 1).

The prevalence of consumption of the ultra-processed food for three or more times per week was very high (98.9%), and almost 100% among white women.

Regarding the three main meals, 66.4%, 66.1% and 59.9% reported daily consumption of breakfast, lunch and dinner, respectively. The morning snack was not consumed by 85.1% of the participants, 58.4% ate something in the afternoon snack and 46.8% had a snack before going to sleep (data not presented on tables).

Foods consumed in the morning and afternoon snacks came from breakfast or lunch leftovers saved by the inmates, were brought by families during weekend visits, or were purchased by the inmates inside the prison. These snacks usually consumed were breads, biscuits and candies (data not presented on tables).

Considering the group of natural or minimally processed foods, we found that 86.7% of the inmates reported consuming rice, beans and cassava flour ≥ 3 times per week. Other foods consumed with the same frequency were: milk which was consumed by 64.4%; vegetables by 50.5%; green leafy vegetables by 63.4%; fruits by 44.1%; and roots and tubers by approximately 32% of the respondents. Although it was not possible to verify the amount of individual

Table 1. Distribution of the sample and the prevalence of consumption food ultra-processed, according to sociodemographic variables, health-related behaviors, period of imprisonment and health status indicators. Inmates of a women's prison located in the State of São Paulo, Brazil, 2012-2013.

	n = 1.013		Ultra-processed foods ≥ 3 times per week		p-Value
Variables	n	%	n	%	
Level of schooling (in years)					
0 to 4	622	61,4	612	98,6	0,161
5 or more	391	38,6	389	99,5	
Race/skin color					
Black	521	51,7	510	98,1	0,012
White	487	48,3	486	99,8	
Period of imprisonment in this institution					
Less than 12 months	616	60,8	612	99,4	0,094
More than 12 months	396	39,2	389	98,9	
Income					
No	646	63,8	641	99,2	0,202
Yes	366	36,2	360	98,4	
Cholesterol (mg/dl)					
< 200	585	63,1	577	98,6	0,755
≥ 200	342	36,9	338	99,1	
Triglycerides (mg/dl)					
< 150	439	49,5	431	98,4	0,219
≥ 150	448	50,5	445	99,3	
Overweight/Obesity					
No	464	49,4	458	98,7	0,449
Yes	476	50,6	472	99,2	
Waist circumference (cm)					
≤ 88	432	46,5	424	98,1	0,126
> 88	497	53,5	493	99,4	
Physical activity (minutes/day)					
< 30	712	70,3	704	99,0	0,741
≥ 30	301	29,7	297	98,7	

Note. Missing: Race/skin color (5); Overweight/Obesity (73); Waist circumference (84); Cholesterol (86); Triglycerides (126).

consumption of vegetables, the inmates reported that they received the equivalent of 12 green leaves (two times per week) per cell, which was inhabited by approximately 30 women. Beef, pork, poultry or fish were consumed 1 or 2 times per week by 91.1% of the women. The most consumed meat was fried chicken (79.2%) and the least consumed was fish (15.1%). Almost all respondents (97.9%) indicated that they did not consume dairy foods such as cheese (Table 2).

A high prevalence of daily consumption of ultra-processed foods was observed in this study. Hot dog

bread and sweet bread with margarine were consumed by 86.5% of the interviewees on a daily basis; soft drinks and sweetened juices by 68.4%, and 77.2% reported consuming biscuits 3 or more times per week, with or without fillings, as well as candies in general (Table 2).

Among the interviewed inmates, 86.2% reported leaving food in lunchboxes; of these, 73.9% used to leave food every day and 41.6% reported they consumed less than half of the foods they received. In addition, 26.3% said they left all types of foods and 33%

Table 2. Frequencies of food consumption according to the processing technique. Inmates of a women's prison located in the State of São Paulo, Brazil, 2012-2013.

Foods	Types	Never / ≤ 2 times per month		1 to 2 times per week		≥ 3 times per week	
		<u>n</u>	%	<u>n</u>	%	<u>n</u>	%
Natural or minimally processed*							
	Milk (whole or skim)	213	21.0	147	14.5	653	64.5
	Beef, pork, poultry and fish	63	6.3	924	91.1	26	2.6
	Eggs	437	43.2	555	54.7	21	2.1
	Rice. Pasta. Cereals. Beans and other legumes (lentil, pea, soybean, chickpea)	66	6.5	69	6.8	878	86.7
	Vegetables (lettuce, kale, chard, watercress, arugula)	152	15.0	216	21.6	645	63.4
	Roots and tubers (potato, cassava, yam)	152	15.0	541	53.4	320	31.6
	Vegetables (carrot, chayote, beetroot, eggplant or zucchini)	334	33.0	167	16.5	512	50.5
	Fruits or unsweetened fruit juices	93	9.2	474	46.7	446	44.1
Processed**							
	Lard (bacon, pork rinds). Cheese (white or yellow)	877	86.5	115	11.4	21	2.1
Ultra-processed***							
	Processed meat, instant noodles	274	27.0	522	51.6	217	21.4
	Biscuits with or without fillings. Yogurt or candies (confectionery in general). Ice cream, sweet or salted popcorn	78	7.7	153	15.1	782	77.2
	Snack (hot dog, hot ham and cheese sandwich or burgers) or deep-fried foods	454	42.8	533	54.6	26	2.6
	Hot dog bread, sweet bread, margarine or mayonnaise	69	6.8	67	6.7	877	86.5
	Soft drinks, sweetened juices or chocolate milk	52	5.1	268	26.5	693	68.4

Note. *Foods that did not undergo any alteration or that underwent processes that do not involve addition of substances, like cleaning, removal of inedible parts, grinding, pasteurization, freezing.

**Foods modified by industry with the use of salt, sugar, oil and other substances. The objective is to preserve or to make them more palatable.

***Industrial formulations made entirely or mostly from substances extracted from foods, derived from food constituents or synthesized in laboratories. The purposes are durability, practicality, profitability and hyper-palatability.

Source: Dietary Guidelines for the Brazilian Population (Ministry of Health, 2014).

frequently left more than 3 types of foods (data not presented on tables).

DISCUSSION

The findings of the study revealed high prevalence of consumption food ultra-processed in the population investigated, independent of the characteristics

sociodemographic, health-related behaviors, period of imprisonment and health status indicators. There was statistically significant differences observed for skin color/race, however the prevalence for both categories are extremely high, revealing a homogeneous exposure to poor and low quality of the diet that was imposed on the inmates.

Consistent with the high prevalence of obesity and dyslipidemia observed the inmates' diets were

of very poor nutritional value. Regarding ultra-processed foods we found that the daily consumption of bread, biscuits/crackers and soft drinks/sweetened juices was experienced by more than two thirds of the inmates, a result that is twice as high as what was found in the National Health Survey¹⁷.

This strongly suggests that the context of eating in the prison explains at least part of the high frequency of consumption of ultra-processed foods, which are harmful to health.

While the contribution of table sugar in the Brazilian diet has decreased in the last 15 years, the contribution of sugar added to processed foods has doubled, especially through the consumption of soft drinks and biscuits¹⁷.

It is recognized in the literature that the intake of sugar sweetened beverages and the frequent consumption of foods containing a high proportion of saturated fat, together with physical inactivity, contribute to the epidemics of chronic diseases, such as obesity, diabetes, hypertension, stroke, hyperlipidemia, coronary disease and cancer^{14,18-21}. These foods are indeed independent predictors of body mass^{14,21}.

A high frequency of daily consumption of natural or minimally processed foods such as rice, beans and cassava flour was found. These foods are part of the staple Brazilian diet²³. Among meats, the most consumed was fried chicken. Regarding green leafy and other vegetables, fruits and tubers, consumption was substantially below what is recommended by the World Health Organization. Low consumption of fruits, greens and vegetables is one of the ten main risk factors responsible for deaths caused by non-communicable diseases^{13,18}.

In agreement with the National Health Survey¹⁷ two thirds of the women reported consuming milk three or more times per week. Milk has a high content of calcium, a nutrient that is essential to the maintenance of bone health. Thus the low frequency of consumption by a third of the inmates can be compounded by the low intake of dark green vegetables, oilseeds and some types of fish, which are also important sources of calcium^{3,12}.

No security-related fact or condition should prevent people deprived of freedom from having access to an adequate and healthy diet. The resolution of problems related to food deprivation must be approached from the perspective of the Human Right to Adequate Food, grounded on the principles of human dignity, equality and participation, which highlight that people need to define the actions that are necessary to their wellbeing. These rights must

be guaranteed without discrimination, be it cultural, economic, social, ethnic, related to gender, language, religion, political option or any other kind of discrimination^{1,24}. Nevertheless, this does not exclude the need of affirmative actions targeted at vulnerable groups, particularly women²⁴ and, even more specifically, those living in prisons under the tutelage of the State that is required to promote and protect the Human Rights of its citizens.

Among the limitations of this study, we must bear in mind that it is a cross-sectional study, which prevents us from evaluating whether there were changes in the quality of food in the prison, compared to the food consumption before admittance to the prison system. Another limitation is that we did not assess in detail the foods brought by the families on weekends, although, according to the inmates' reports, they were similar to that of the foods supplied in the institution. It is important to mention that the inmates' spontaneous comments during the interviews emphasized the low quality of the diets they had access to. They referred to the refreshment that was offered as "poison", the meatballs as "little killer balls", and the fried chicken as "shoe sole". They complained about the insignificant amount of green leafy and other vegetables, and fruits and about the rice being "hard" or its grains sticking together. They also reported that the amount of beans are small – "sometimes there is only broth". All this was mentioned when explaining why they often had leftovers after each meal. Furthermore, the inmates did not have an eating area in the institution and they ate inside their cells. It is known that the characteristics of the environment where we eat influence the amount of food we consume and the pleasure we may have. Smells, sounds, lighting, comfort, cleaning conditions and other characteristics of the place are important⁶.

Adopting a healthy diet is not merely a question of individual choice, even less so in an imprisonment situation, in which the supply translates into compulsory consumption. Inside a prison, factors like physical and psychological environment, as well as the quality of the supplied food, and restrictive healthy eating could be easily modified if these women's rights were respected²⁴.

We would like to emphasize that, independently of the segment of the population defined by social class, economic condition, legal situation and others, the State's agents and health authorities must use all possible means, including legislation and legal regulation, to stop and reduce the tendency of replacing minimally processed foods and culinary ingredients by ultra-processed products²⁵⁻²⁷.

A study carried out in the United Kingdom¹⁹ showed that reduction the consumption of processed and ultra-processed foods may lead to a 10-13% decrease in the number of deaths caused by cardiovascular diseases. However, the responsibility to translate this knowledge into policies that facilitate healthy behavior change has been neglected in the general population, and even more so in the case of people whose freedom has been restricted by a court order. The supply of healthy foods as one of the fundamental rights of inmates needs to be acknowledged as a duty of the State. Unfortunately our findings suggest that the State seems to continue to believe that its only duty is to ensure that inmates meet their minimal nutritional needs in the context of a large supply of hypercaloric ultra-processed foods²².

CONCLUSIONS

In view of the fact that the food is not prepared in the prison and that an outsourced company provides the meals, the prison's Food Evaluation Committee has in its hands the ability to change this dire situation. As a start menu planning should be improved in consultation with the inmates with the aim of offering healthier foods, which would contribute to reduce the incidence of non-communicable diseases in this specific sub-group of the Brazilian population.

As a medium- and long-run measure, we propose that the inmates should have a space inside the prison to prepare the food. The women's involvement in the acquisition of foods, in the planning of the menu and in the work related to the preparation of the meals could become an educational and professional development opportunity for them, as well as a sound public health practice within the prison system.

Finally, we recommend that, when the research institutes carry out national health, nutrition and food security surveys, they consider inmates as part of the population surveyed, so that they cease to be an "invisible population".

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