

ASSESSMENT OF FOOD CONSUMPTION OF SOCIALLY VULNERABLE CHILDREN FROM SÃO JOSÉ, SANTA CATARINA, BRAZIL

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Highlights: 1. High consumption of ultra-processed foods, especially sweets. 2. Habit of having meals while watching the television or using the computer and/or mobile phone. 3. Low dietary diversity and low consumption of vegetables.

PRE-PROOF

(as accepted)

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ABSTRACT

Healthy eating is essential throughout all life cycles. However, inadequate nutrition in early childhood can have negative consequences for the child's growth and development. This study aimed to assess the food consumption of children aged 3 to 5 years cared for by a non-governmental organization that welcomes socially vulnerable children in the municipality of São José, Santa Catarina, Brazil. Their dietary diversity was assessed with an online questionnaire based on the "Food Consumption Markers" from the Food and Nutrition Surveillance System and lists of foods from each group. The sample had 229 children, including girls (52.84%) and boys (47.16%), whose mothers mostly worked outside the home and had attended up to high school, with a per capita family income of up to one minimum wage. The research identified a considerable consumption of ultra-processed foods, especially sweets (70%), and the use of electronic devices during meals (63%). Only 43.85% of children consumed all food groups covered in the study, and the vegetable group was the least consumed. In conclusion, intervention strategies must be implemented to promote and improve the dietary and nutritional profile of children and their families. There is a particular need for interventions that go beyond the individual sphere, focusing on the implementation of intersectoral public health policies.

Keywords: Eating; Child Nutrition; Social Vulnerability; Biodiversity.

INTRODUCTION

Healthy eating is essential at all stages of life. However, inadequate nutrition in early childhood can have negative consequences for the child's growth and development, affecting physical aspects and their cognitive and social capacity^{1,2}. Furthermore, eating habits acquired at this stage of life tend to shape eating habits in adulthood³.

A healthy diet must be varied, comprising different food groups, as it increases the potential supply of different nutrients and bioactive compounds³. Dietary diversity can even be seen as an important indicator of food and nutritional security⁴.

On the other hand, adequate nutrition goes beyond the concept of consuming fresh foods (fruits, vegetables, and so forth), as it is necessary to know the foods and make assertive choices to eat well – for instance, avoiding the consumption of foods with low nutritional value, such as ultra-processed foods (rich in sodium and fat) and sugary drinks^{5,6}.

In this regard, the food environment in which children and their families live may not be conducive to healthy eating. Children and their parents/guardians are currently more vulnerable to consuming foods with low nutritional value, due to mass advertisement and varied options for ultra-processed foods, which have high levels of sugar, salt, and saturated and trans fats at an affordable price, widely available and practical to be served to children⁷.

Given the above, knowing children's food consumption is believed to be important, since such a diagnosis can guide actions to improve their food and nutritional profile. However, the nutritional condition of socially vulnerable children in São José, Santa Catarina, Brazil, is unknown. Thus, this study aimed to assess the food consumption of children aged 3 to 5 years cared for by a non-governmental organization (NGO) that welcomes socially vulnerable children in São José, Santa Catarina, Brazil.

METHOD

This is a descriptive quantitative study⁸. Regarding its procedures, it is a case study, through which the phenomenon is investigated while preserving its unitary character, not separating it from its context⁹. It was carried out in an NGO located in São José, Brazil, whose target audience is socially vulnerable children from that city.

It was based on a sample, whose study subjects were children aged 3 to 5 years, enrolled in the said institution. The NGO serves a total of 460 children (241 boys and 219 girls), which was the population of interest (N). Two strata (males and females) were considered, with a simple random distribution of samples in each stratum. The minimum sample number (sample size) and the stratification method were calculated based on the methodology suggested by Barbetta (2019)¹⁰, with a 95% confidence interval ($p < 0.05$). The statistical analysis tolerated a maximum 5% sample error.

Barbetta (2019)¹⁰ suggests two equations, the first one to calculate the approximation value, and the second one to calculate the minimum sample size. Equation 1: $n_0 = 1 / (E)^2$; and Equation 2: $n = N * n_0 / (N + n_0)$ – in which: n_0 is the approximation value for the calculation; n is the minimum sample size; N is the total population of interest; E is the tolerable sample error for the researcher. The methodology considers a nonlinear tolerable sampling error and population representativeness, in which the sample size does not increase proportionally to the increase in the size of the population of interest. The calculated sample was 215 children.

The children's parents/guardians were invited to participate in the study through the WhatsApp[®] messaging application, where they also received the research objective and the link

to the online questionnaire, available in an electronic form, to which they had access after agreeing to the informed consent form. The questionnaire had been previously tested by some families and public health professionals and later improved.

The research questionnaire was administered only once. The child's parent/guardian was instructed to answer it based on the child's food consumption on the previous day. Data were collected between July and August 2022, during vacation or a weekend – i.e., when they were not at the institution.

The questionnaire was based on a form named “Food Consumption Markers”, from the Food and Nutrition Surveillance System (SISVAN, in Portuguese)⁶. The first part contained questions on the child's and their family's sociodemographic data (sex, age, maternal education level, family income, number of people living in the house, work situation – whether the mother worked outside the home, employed or unemployed –, whether they received Brazil Assistance welfare or food staples, and their food consumption). The second part had questions on food consumption, with healthy and unhealthy eating markers, and a list of foods from each group (legumes, fresh fruits, vegetables, cereal and tubers, meat and/or eggs, dairy, and oil and fat) to assess their food consumption. The questionnaire included closed-ended and open-ended questions and illustrations to facilitate understanding.

The healthy eating markers were the consumption of fruits, vegetables, and beans, and the unhealthy eating ones were the consumption of ultra-processed foods (such as sausages, sugary drinks, instant noodles, and crackers), the use of electronic equipment during meals, and the consumption of sweets and sandwich cookies⁶.

Regarding sociodemographic data, family income was assessed using the national reference minimum wage, whose value corresponded to 1,212.00 reais. It also verified whether they received Brazil Assistance welfare, a social income transfer program from the Brazilian Ministry of Citizenship for poor and extremely poor families, aiming to overcome their social vulnerability, was also evaluated.

The study included all children aged 3 to 5 enrolled in the NGO's early childhood education center. Children outside this age range and/or whose parents/guardians did not consent to their participation were excluded.

The data were tabulated and statistically treated. To tabulate the data, groupings were used for open questions and quantitative measurement for closed and multiple-choice questions.

The primary data treatment assessed the parameters of central tendency, asymmetry, and dispersion. The analysis of variance (ANOVA) ($p < 0.05$) was used to identify statistically

significant differences between the results of the dependent variables and to identify independent ones with statistically significant influences.

The correlation analysis between study variables initially categorized them into ordinal qualitative (e.g., age, consumption of legumes, fruits, vegetables, etc.) and nominal qualitative variables (e.g., sex, mother's education level, and whether the mother worked outside the home). The Microsoft Excel® program was used for tabulation and ordering, and the Jamovi® program was used for processing. The significance level was set at 95% ($p < 0.05$).

P-values below 0.05 represent a positive or negative statistically significant correlation between study variables. The Spearman correlation was used for statistical evaluation, as most variables analyzed (predictors) were qualitative (either ordinal or nominal).

The research followed the human research norms established by Resolution no. 466/2012 of the National Health Council and the ethical principles of the Declaration of Helsinki. Data collection began only after the Human Research Ethics Committee had approved the project, via the Brasil Platform, under evaluation report number 5.457.898.

RESULTS

Altogether, 249 questionnaires were answered. Incomplete and duplicate ones were subtracted from these, resulting in a sample of 229 participants.

The sociodemographic characteristics of the children and their families are presented in Table 1. Most (82.53%) of the 229 children in the study were 4 to 5 years old. The percentages between the sexes were similar, characterizing a symmetrical sample.

Table 1 – Sociodemographic data of the children aged 3 to 5 years ($n = 229$) cared for by a non-governmental organization that welcomes socially vulnerable children in São José, Brazil, 2022.

Sex			
Males	108	47.16%	
Females	121	52.84%	
Age			
3 years	40	17.47%	
4 years	80	34.93%	
5 years	109	47.60%	
Maternal education level			
Middle school incomplete	24	10.48%	
Middle school graduate	15	6.55%	
High school incomplete	33	14.41%	

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High school graduate	99	43.23%
Higher education incomplete	22	9.61%
Bachelor's degree	33	14.41%
Not known	3	1.31%
The mother works outside the home		
Yes	162	70.74%
No	56	24.45%
Not applicable	11	4.80%
Per capita family income in minimum wages *		
≤ 1/4 MW	53	23.14%
> 1/4 - 1/2 MW	80	34.93%
> 1/2 - 1 MW	71	31.00%
More than 1 MW	25	10.92%
Number of people living in the household		
0-2	18	7.86%
3-4	143	62.45%
5-6	61	26.64%
7 or more	7	3.06%
Unemployment		
Yes	13	5.68%
No	216	94.32%
Brazil Assistance welfare beneficiary		
Yes	49	21.40%
No	180	78.60%
Food staples donee		
Yes	13	5.68%
No	216	94.32%

Source: The authors (2022)

As for education level, most mothers were high school graduates (43.23%). It was also found that they played an important role in the job market since the vast majority worked outside the home (70.74%). There was a significant variation in family income, as 89.07% had a per capita income of up to one minimum wage. Moreover, 89.09% of families had 3 to 6 members, and 21.40% of families were Brazil Assistance welfare beneficiaries.

The healthy and unhealthy eating markers are presented in Table 2. Most children consumed all healthy food groups – although, the vegetable group had the lowest consumption. Also, almost all children had at least the three main meals of the day (breakfast, lunch, and dinner).

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Table 2 – Healthy and unhealthy eating markers in the diet of children aged 3 to 5 years cared for by a non-governmental organization that welcomes socially vulnerable children in São José, Brazil, 2022.

Healthy eating markers*	(n)	(%)
Consumption of legumes	198	86.46
Consumption of fresh fruits**	192	83.84
Consumption of vegetables	157	68.56
Habitually has at least three main meals a day	218	95.20
Unhealthy eating markers*	(n)	(%)
Consumption of hamburgers and/or sausages	74	32.17
Consumption of instant noodles, chips, crackers	111	48.26
Consumption of sweets (candies, lollipops, chocolate, bubble gums, etc.)	161	70.00
Consumption of sugary beverages***	109	47.39
Habitually eats watching television and/or the mobile phone	144	62.61

* National Food and Nutrition Surveillance System (2015)

** Not including fruit juice.

*** Including all beverages with added sugar, even fruit juice

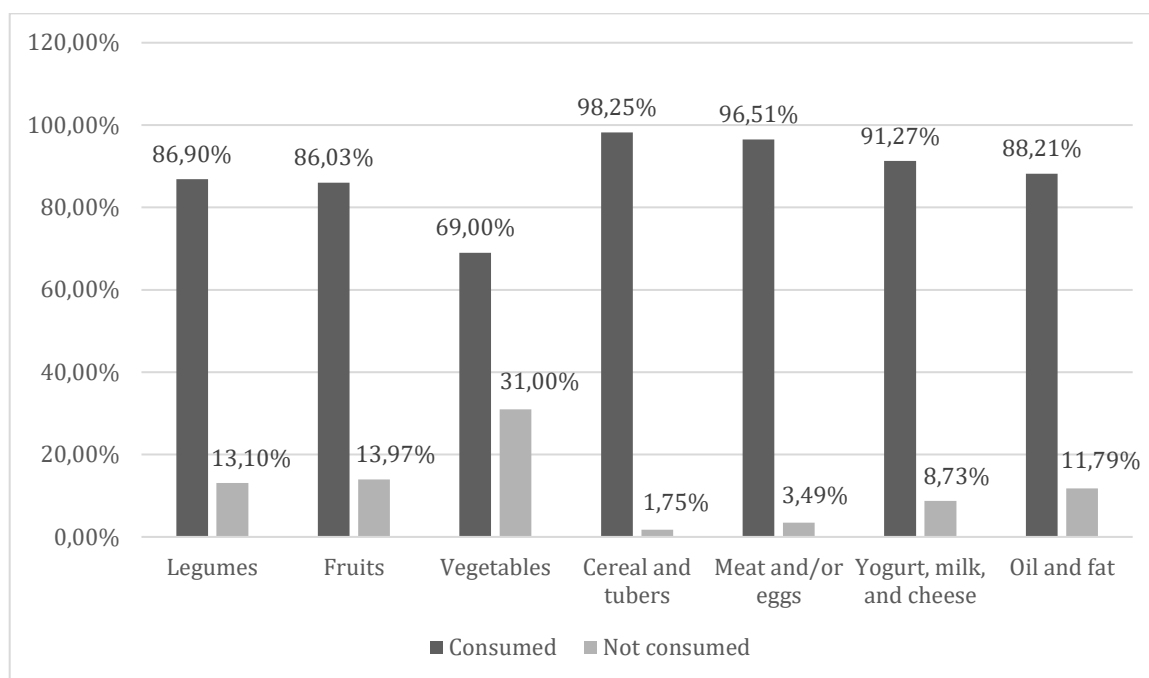
Source: The authors (2022)

The unhealthy eating markers included the consumption of ultra-processed foods in general, particularly those of the sweets group – in which, candies (34%), sandwich cookies (34%), and chocolate (33%) were the most recurrent. The group with instant noodles, chips, and crackers had the respective percentages: 18%, 29%, and 32%. In the group of sugary drinks, the following were mentioned most often: soda (24%), processed fruit juice (22%), and juice powder (22%). The habit of eating meals while watching television or using a computer and/or mobile phone had a high percentage (62.61%).

Figure 1 presents data on the children's consumption from different food groups in one day. The groups consumed most often were the cereal and tubers group, followed by the meat and/or eggs group. As previously pointed out, the vegetable group had the highest number of “Not consumed” responses, as almost 1/3 of the children had not consumed foods from this group. Only 105 children (45.85%) consumed the seven food groups (legumes; fruits; vegetables; cereal and tubers; meat and/or eggs; yogurt, milky and cheese; and oil and fat).

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Figure 1 – One-day food group consumption frequency of children aged 3 to 5 years cared for by a non-governmental organization that welcomes socially vulnerable children in São José, Brazil, 2022.



Source: The authors (2022)

Table 3 presents the statistical p-values ($p < 0.05$) of the correlation analyses (Spearman test) between family characteristics, food groups, and unhealthy eating indicators.

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Table 3 – Correlation analysis data between independent variables and dependent variables (p-values).

	Consumption of legumes	Consumption of fruits	Consumption of vegetables	Consumption of cereal and tubers	Consumption of meat and eggs	Consumption of yogurt, milk, and cheese	Consumption of oil and fat	Consumption of hamburgers and sausages	Consumption of instant noodles, chips, and crackers	Consumption of sweets	Consumption of sugary beverages	Habitually eats watching television or the mobile phone
Child's age	0.119	0.089	0.897	0.387	0.450	0.135	0.604	0.077	0.131	0.735	0.019(-)	0.991
Maternal education level	0.610	0.597	0.106	0.860	0.026 (+)	0.953	0.107	0.654	0.001(+)	0.134	0.629	0.762
Child's sex	0.542	0.043(+)	0.148	0.625	0.672	0.282	0.349	0.076	0.289	0.447	0.643	0.837
Brazil Assistance welfare beneficiary	0.187	0.239	0.235	0.320	0.092	0.982	0.154	0.469	0.102	0.582	0.686	0.010(-)
Mother works outside the home	0.910	0.968	0.628	0.980	0.160	0.866	0.988	0.150	0.477	0.948	0.729	0.028(+)
Unemployed person at home	0.504	0.505	0.211	0.416	0.038(+)	0.902	0.161	0.017(+)	0.192	0.817	0.281	0.217
Family income	0.836	0.235	0.093	0.512	0.189	0.790	0.076	0.388	0.022 (+)	0.619	0.914	0.618

*Values in bold have a statistical significance ($p < 0.05$)

Source: The authors (2022)

The significant correlations shown in Table 4 can be translated as follows: (a) the consumption of sugary drinks increases with the child's age; (b) the higher the maternal education level, the greater the consumption of the groups with meat and eggs and instant noodles and similar foods; (c) boys tend to consume less fruit; (d) families that receive Brazil Assistance welfare tend not to watch television or use the computer or mobile phone during meals; (e) when the mother works outside the home, the child tends to eat while watching television or using the computer and/or mobile phone; (f) the higher the unemployment at home, the more frequent the consumption of meat and eggs, and hamburgers and/or sausages; (g) the higher the family income, the lower the consumption of instant noodles, chips, and crackers.

DISCUSSION

Only 11% of the families interviewed had a per capita income above one minimum wage. According to research carried out by the Brazilian Research Network on Sovereignty and Food and Nutritional Security (PENSSAN Network, in Portuguese) – National Survey on Food Insecurity in the Context of the COVID-19 Pandemic in Brazil¹¹, situations of hunger and some degree of food insecurity are much less frequent in homes with an income above one minimum wage per person.

The consumption of vegetables is an important healthy eating marker, as these foods have low caloric value and are rich in nutrients and bioactive compounds, particularly supplying fiber, vitamins, and minerals^{6,12}. A study assessed the food consumption of same-age children in institutional care in Fortaleza, Ceará, and found slightly better results regarding the

consumption of vegetables (85.36%) and fruits (97.61%) than in the present study (68.56% and 83.84%, respectively)¹³. However, the data analyzed here do not include the children's consumption in daycare centers. The study by Santos et al. (2021)¹⁴ on food and nutrition (in)security of preschoolers and schoolchildren covered by the Family Allowance welfare program in Lavras, Minas Gerais, found an even more critical consumption of vegetables (23.3%) and fruits (47.9%).

The high consumption of ultra-processed foods can be explained by their high palatability, readiness or little preparation needed for consumption, easy access, and so forth¹². Such foods are unhealthy because they tend to contain much sodium, sugar, and/or saturated or trans fats and their frequent consumption is associated with chronic noncommunicable diseases, such as cardiovascular diseases, cancer, diabetes, and obesity¹². Moreover, their production is unsustainable and potentially harmful to the environment and poses a risk to food biodiversity. Their packaging is often discarded in the environment; they encourage monocultures dependent on pesticides and the intense use of chemical fertilizers and water; they disrespect local food culture; they tend to negatively affect the social life of families, as they can be consumed at any time and place, hindering the sharing of meals; and they tend to be socially unfair for those who produce them^{12,15}. On the other hand, the media is known to greatly influence food choices, and children are a more fragile audience due to their insufficient maturity in understanding healthy and unhealthy foods. Thus, they make erroneous choices, preferring ultra-processed foods rather than fruits and vegetables¹⁶. The high exposure to ultra-processed foods was observed in the study by Leite, Damaceno, and Lopes (2022)¹⁷, whose target audience was children aged 2 to 9 years living in a region of high social vulnerability in São Paulo, Brazil.

The high consumption of ultra-processed foods among children in this age group was also found in research by Silveira et al. (2021)¹³ and Santos et al. (2022)¹⁸. However, unlike the present study, in which the sweets group (70.0%) was the most consumed, the sugary drinks group stood out in the other ones (92.7% and 80.4%, respectively, against 47.39% in the present study). Both sweets (candies, sandwich cookies, and chocolate) and sugary drinks are rich in sugar, and their consumption is associated with tooth decay and obesity, whose numbers have been growing alarmingly among children of different age groups^{17,18}. Still in the case of ultra-processed foods, a study with children aged 2 to 12 years at a municipal school in Rio Grande do Sul demonstrated a higher consumption of sweets than the present study (98%)¹⁹.

The data in the present research on the habit of eating meals using electronic devices, such as television, computers, and/or mobile phones (64.71%) corroborate other studies. Marcondes, Masquio, and Castro (2022)²⁰ and Santos et al.¹⁸ respectively found frequencies of

62.61% and 80.40%. Marcondes, Masquio, and Castro²⁰ worked with children aged 2 to 6 years from private schools in Greater São Paulo, while Santos et al.¹⁸ studied preschoolers and schoolchildren from Lavras, Minas Gerais. This fact is problematic, as eating meals without tranquility and focus can compromise the biological mechanisms of satiety⁶.

Eating habits based on adequate and healthy eating are recommended for the age group approached in this study, with a variety of foods covering all groups, based on the consumption of fresh or minimally processed foods¹². In the present study, less than half of the children consumed foods from the seven groups, and the vegetable one was the least consumed. Bezerra et al. (2022)²¹ verified the dietary pattern of children aged 5 to 10 years and found low consumption of fruits and vegetables. A study conducted by UNICEF (2021)⁵ with Brazil Assistance welfare beneficiaries also verified low dietary diversity among children aged 0 to 5 years and 11 months.

A positive aspect observed was the high consumption of legumes (86.9%), especially beans. Its consumption is extremely important for adequate child development, as its composition includes various nutrients and bioactive compounds, especially protein, dietary fiber, B vitamins, iron, zinc, and calcium⁶.

Yogurt (57.64%) and margarine (44.54%) had high consumption. This research could not identify whether the yogurt consumed was in its natural form, without the addition of other ingredients or food additives. However, they were quite likely ultra-processed, with artificial colors and flavorings. Margarine belongs to the category of ultra-processed foods, generally rich in trans fatty acids, which the scientific literature has demonstrated to be unhealthy food²².

Higher maternal education levels in this study were associated with greater consumption of meat, eggs, instant noodles, and similar foods. On the other hand, the study by Wahlbrinck, Adami, and Conde (2022)²³ – which assessed the influence of eating behaviors of parents living in Vale do Taquari (Rio Grande do Sul) on child overweight –, associated mothers with a bachelor's degree with greater availability of fruits and vegetables, in contrast with those that were high school graduates.

As pointed out, boys tended to eat less fruit. This was also found among adults in the 2019 Brazil VIGITEL Survey (Surveillance on risk and protection factors for chronic diseases via telephone survey)²⁴, in which 27.9% of men and 39.8% of women reported consuming fruits and vegetables on five or more days of the week.

The present study found that families who receive Brazil Assistance welfare tend not to watch television or use the computer or mobile phone during meals, which is a healthy practice. However, it also found that when the mother works outside the home, the child is more likely

to use electronic devices during meals. Nowadays, women play different roles (mother, housewife, wage earner, and wife). Women are often included in the labor market in today's Brazilian society; thus, both spouses often have their occupations, and the women's income is essential in supporting the family²⁵. Family income was only correlated with lower consumption of instant noodles, chips, and similar products. However, in another study, family income was associated with the consumption of healthy foods²⁶.

The limitations of this study include the need for literacy and access to the Internet and messaging applications to participate in the research. The relevant topic and the comprehensive characterization of the target audience (including sociodemographic data and dietary profile) stand out as strengths, providing knowledge about children and their families in greater depth.

CONCLUSION

The study sample mainly comprised families with three to six members, whose mothers worked outside the home and partially or fully attended high school. The majority had a per capita income of up to one minimum wage, and just over 20% were beneficiaries of the Brazil Assistance welfare income transfer program.

Most children had high levels of unhealthy eating markers, with considerable consumption of ultra-processed foods, especially in the sweets group (candies, sandwich cookies, and chocolate). They also habitually had meals while watching television or using a computer and/or mobile phone.

Most children consumed the three healthy food groups (legumes, fresh fruits, and vegetables). However, there was low dietary diversity, since fewer than half of the children consumed all seven groups studied here (legumes, fresh fruits, vegetables, cereal and tubers, meat and/or eggs, dairy, and oil and fat). The least consumed group was that of vegetables.

Timely intervention strategies are necessary to help promote and improve the dietary and nutritional profile of children and their families, such as strengthening food and nutritional education activities in preschool and kindergarten. Empowering parents/guardians is also greatly important to improve food choices. However, the need for interventions that go beyond the individual sphere stands out. Intersectoral public health policies are necessary to promote healthy and adequate eating, such as the practical application of the recommendations of the Food Guide for the Brazilian Population.

Further studies with this population are needed, including a validation study of the questionnaire used in this research. They should also use the Brazilian Scale for Direct

Measurement of Food Security/Insecurity (EBIA, in Portuguese) – an instrument adapted and validated for Brazil that identifies people with food and nutritional insecurity at home. Adequately identifying people who have difficulty accessing adequate, sufficient, and healthy food is the first step towards timely and necessary addressing the issue.

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