

Consumption of ultra-processed foods and associated factors in six-year-old children

Nathalia Tomazoni Silva (<https://orcid.org/0000-0002-3074-9050>)¹

Jefferson Traebert (<https://orcid.org/0000-0002-7389-985X>)²

Bianca Pimentel (<https://orcid.org/0000-0002-7927-4631>)²

Eliane Traebert (<https://orcid.org/0000-0001-9667-7216>)^{1,2}

Abstract *This article aims to estimate the prevalence and weekly frequency of ultra-processed food consumption in six-year-old children and associated factors in a municipality in southern Brazil. Cross-sectional study with 956 children. Data were collected through interviews with mothers in the households. The outcomes were the consumption of candies, chewing gum, lollipops and chocolates; stuffed cookies; artificial juices; and soft drinks using the Índice de Alimentação Escolar (School Feeding Index). The independent variables were gender, type of school, education and maternal occupation, breastfeeding, duration of exclusive breastfeeding and the use of bottle. Bivariate analysis was performed using the chi-square test and the multivariate analysis using Poisson regression. In the multivariate analysis, the weekly prevalence of stuffed cookies consumption was 14% higher in students from public schools and 8% higher in children of mothers with less than eight years of schooling. Artificial juice and soft drink consumption was 7% and 8% higher in public school students respectively and 6% higher in bottle-fed children. Most schoolchildren consumed the ultra-processed foods assessed once or twice a week. Consumption was associated with the independent variables assessed.*

Key words *Ultra-processed foods, Child, Diet*

¹ Faculdade de Medicina. Universidade do Sul de Santa Catarina. Palhoça, Santa Catarina, Brasil.

² Programa de Pós-Graduação em Ciências da Saúde. Universidade do Sul de Santa Catarina. Av. Pedra Branca 25, Cidade Universitária Pedra Branca. 88132-270 Palhoça SC Brasil. elisazevedot@gmail.com

Introduction

The profile of eating habits in childhood is a factor that impacts adequate and healthy development, since eating habits early in life are decisive for maintaining health in adult life¹⁻³. Promotion of healthy eating habits in childhood is an emerging priority due to the increasing prevalence of food-related chronic non-communicable diseases in developed and underdeveloped countries, despite the high levels of malnutrition found in the latter countries. The accelerated nutritional transition is driven by the increase in the supply of low cost ultra-processed foods (UPF)⁴.

The ultra-processing of foods aims at convenience, durability and easy consumption, using industry formulations of food and beverages with high palatability, such as soft drinks, stuffed cookies and snacks, which are widely consumed by children⁵. Some types of UPF, especially candies, chewing gum, chocolates, artificial juices and soft drinks can be offered to children early in their life and have low fiber content, high energy density, high glycemic load, high levels of saturated and hydrogenated fats, in addition to synthetic additives such as dyes and flavorings^{6,7} negatively impacting child development^{8,9}.

Different socioeconomic and environmental factors may be related to the selection of these products over fresh food or minimally processed food. Among them, the accelerated pace of life, the purchasing power, children targeting advertising¹⁰, the lack of access to health guidelines in early childhood and low maternal education^{11,12}.

The increase in UPF consumption influences the child's lifestyle and increases the rates of overweight, obesity and alterations in the lipid profile in the pediatric age group, as reported in the literature⁹. Therefore, avoiding UPF consumption is very important for the future adult to maintain the healthy habits that have been adopted in childhood, as a form of primary prevention of morbidity and mortality caused by chronic non-communicable diseases. Understanding the prevalence of UPF consumption is essential for health professionals, parents and educators in order to adopt individual and collective measures with attention to early childhood development. Thus, it becomes necessary to know the situation of UPF consumption in different pediatric populations, since the national literature is still scarce regarding the potential damage caused by the early and inadvertent consumption of these foods, especially in different stages of childhood⁵.

Therefore, the aim of the present study was to estimate the prevalence and weekly frequency of

consumption of certain ultra-processed foods in six-year-old children and associated factors in a municipality in southern Brazil.

Methods

This is an epidemiological study with a cross-sectional design nested in a longitudinal study called *Coorte Brasil Sul* that has monitored schoolchildren dwelling in the municipality of Palhoça, SC since 2015/2016¹³. This cohort consisted of children who were in the first year of elementary school in their baseline education, therefore aged six, which is why the present population-based study refers to children of this age. The methodological details of the original cohort study have been published before¹³. The parameters used to calculate the sample were: population of 1,756 enrolled students, anticipated prevalence of unknown outcome ($P = 50\%$), relative error of 3% and confidence level of 95%, which generated a sample of 664 children. It was decided to include all six-year-old students registered in the *Coorte Brasil Sul*¹³ database who responded to the information necessary for the study, totaling 956 children.

Data collection was carried out in 2015/2016 by qualified health professionals trained to conduct interviews with mothers or principal caregivers, at home. The dependent variables collected included the weekly consumption of four UPF groups: candies, chewing gum, lollipops or chocolate; stuffed cookies; artificial juices; soft drinks as well as weekly frequency (does not consume/ consumes 1 to 2 times/ consumes 3 to 6 times/ consumes 7 times) based on the *Índice de Alimentação Escolar* (ALES, School Children Feeding Index)¹⁴. The decision in the present study to focus on the consumption of some UPF and categorize them into the four groups mentioned was primarily motivated by the mothers' and teachers' report about the high consumption observed by them of these specific foods being consumed in the population assessed.

The independent variables were gender; type of school (public/private); maternal education (divided into up to 8 years of study completed/ more than 8 years); maternal occupation (with/ without income); whether the child had been breastfed (yes/no); if yes, duration of exclusive breastfeeding (up to 6 months/ more than 6 months) and whether the child had used a bottle (yes/no).

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS)

18.0 program. Bivariate analysis was performed using the chi-square test with $p < 0.05$. Multivariate analysis was performed with all variables that presented $p < 0.20$, using Poisson Regression with a robust estimator, in which Prevalence Ratios were estimated with a relevant 95% confidence intervals. The study was approved by the Research Ethics Committee of the University of Southern Santa Catarina, under CAAE 38240114.0.0000.5369.

Results

A total of 956 students and their mothers or caregivers were included in the study. Most of the sample consisted of boys (51.4%) and public school students (83.1%). As to the mothers, 72.0% had eight or more years of school and 61.5% had paid work and worked outside home.

The proportion of breastfed children was 92.0%, and 54.3% of them had exclusively been breastfed for at least six months. The prevalence of bottle feeding was 75.2%.

As for the consumption of the UPF assessed, it was observed that 42.9% of the children consumed candies, gum, lollipops or chocolates once or twice a week. The consumption of stuffed biscuits was 38.3% and soft drinks 49.9%, with the same weekly frequency. Children's daily consumption of artificial juices was reported by 31.2% of the mothers.

In the bivariate analysis, the weekly frequency of candies, chewing gum, lollipops and chocolates consumption was different according to the type of school ($p = 0.015$) and mother's education ($p = 0.001$). The consumption of stuffed cookies was associated with the type of school ($p < 0.001$), education ($p < 0.001$) and maternal occupation ($p = 0.019$) (Table 1). Weekly consumption of artificial juices was associated with maternal education ($p = 0.017$) and bottle feeding ($p = 0.006$). Weekly soft drink consumption was associated with maternal education ($p = 0.005$) and type of school ($p = 0.011$) (Table 2).

The results of the multivariate analysis showed that the prevalence of stuffed biscuit consumption was independently 14% higher [PR = 1.14 (95%CI 1.07; 1.22)] among students from public schools compared to those from private schools and 8% higher [PR = 1.08 (95%CI 1.02; 1.14)] among children of mothers with less than eight complete years of schooling. The associations observed between the consumption of candies, chewing gum, lollipops or chocolates and

the independent variables in the bivariate analysis lost statistical significance in the multivariate analysis (Table 3).

The prevalence of artificial juices consumption was independently 7% higher [PR = 1.07 (95%CI 1.01; 1.13)] among public school students compared to private school students and 6% higher [PR = 1.06 (95%CI 1.02; 1.11)] in children who had used a bottle compared to those who had not. The consumption of soft drinks was independently 8% higher [RP = 1.08 (95%CI 1.02; 1.15)] in public school students compared to private school students (Table 4).

Discussion

The results of the present study showed that most of the 956 six-year-old students consumed the foods assessed, once or twice a week for three of the four food groups and daily for the consumption of artificial juices. The increasingly significant caloric contribution of UPF has already been observed in the Brazilian population among individuals over 10 years of age in the 2008-2009 Family Budget Survey⁶. Likewise, based on the Household Budget Surveys carried out in Brazil in 1987-1988, 1995-1996, 2002-2003 and 2008-2009, it was found that in 22 years, the caloric contribution of UPF was 18.7% in 29.6% in Brazilian households¹⁵. The significant increase in UPF consumption worldwide is also pointed out, with a prevalence of 43.7% in consumption¹⁶. In Canada, from 1938 to 2011, there was an important change in dietary patterns, marked by the replacement of unprocessed or minimally processed foods, as well as culinary ingredients used in meal preparation, with ready-to-eat UPF¹⁷. Thus, the growing participation of UPF in food is not a condition restricted to the Brazilian population.

In Brazil, the high prevalence of UPF in children feeding has been reported^{9,18,19} which is information of concern given the harm UPF can cause to health and to child development. UPF consumption at preschool age was a predictor of a greater increase in total cholesterol and LDL cholesterol from preschool to school age⁹. It is associated with the occurrence of infectious diseases, respiratory conditions, dental caries, malnutrition, overweight and specific deficiencies of micronutrients such as iron, zinc and vitamin A, among others, in the first years of life⁸.

A study carried out with children aged 6 to 59 months⁸ showed that 46.3% consumed cook-

Table 1. Weekly consumption frequency of candies, chewing gum, lollipops or chocolates and stuffed cookies in six years old schoolchildren in Palhoça, SC.

Variables	Weekly consumption frequency									
	Candies, chewing, lollipops or chocolates					Stuffed cookies				
	Does not consume (%)	1 to 2 times n (%)	3 to 6 times n (%)	7 times n (%)	p-value	Does not consume (%)	1 to 2 times n (%)	3 to 6 times n (%)	7 times n (%)	p-value
Gender					0.123					0.460
Male	119 (24.2)	201 (40.9)	129 (26.3)	42 (8.6)		162 (33.0)	185 (37.7)	94 (19.1)	50 (10.2)	
Female	87 (18.4)	209 (44.9)	118 (25.4)	51 (11.0)		162 (34.8)	181 (38.9)	88 (18.9)	34 (7.3)	
Type of school					0.015					<0.001
Public	169 (21.3)	327 (41.2)	212 (26.7)	86 (10.8)		237 (29.8)	327 (41.2)	159 (20.0)	71 (8.9)	
Private	37 (22.8)	83 (51.2)	35 (21.6)	7 (4.3)		87 (53.7)	39 (24.1)	23 (14.2)	13 (8.0)	
Mother's education (completed years)					0.001					<0.001
Less than 8	53 (21.0)	93 (36.9)	65 (25.8)	41 (16.3)		62 (24.6)	108 (42.9)	49 (19.4)	33 (13.1)	
8 or more	143 (22.1)	294 (45.4)	161 (24.8)	50 (7.7)		243 (37.5)	239 (36.9)	120 (18.5)	46 (7.1)	
Mother's occupation					0.906					0.019
No income	75 (20.8)	153 (42.4)	95 (26.3)	38 (10.5)		101 (28.0)	157 (43.5)	69 (19.1)	34 (9.4)	
With income	126 (21.9)	250 (43.4)	146 (25.3)	54 (9.4)		215 (37.3)	203 (35.2)	110 (19.1)	48 (8.3)	
Breast-feeding					0.192					0.852
No	21 (27.6)	35 (46.1)	12 (15.8)	8 (10.5)		29 (38.2)	27 (35.5)	13 (17.1)	7 (9.2)	
Yes	185 (21.2)	372 (42.6)	232 (26.5)	85 (9.7)		293 (33.5)	339 (38.8)	166 (19.0)	76 (8.7)	
Exclusive breastfeeding time (months)					0.780					0.108
Less than 6	84 (21.5)	162 (41.4)	104 (26.6)	41 (10.5)		143 (36.6)	136 (34.8)	76 (19.4)	36 (9.2)	
6	100 (21.6)	205 (44.2)	118 (25.4)	41 (8.8)		144 (31.0)	199 (42.9)	84 (18.1)	37 (8.0)	
Bottle use					0.273					0.072
Yes	161 (22.7)	295 (41.6)	184 (26.0)	69 (9.7)		255 (36.0)	254 (35.8)	136 (19.2)	64 (9.0)	
No	41 (17.5)	112 (47.9)	58 (24.8)	23 (9.8)		66 (28.2)	105 (44.9)	43 (18.4)	20 (8.5)	

p-value obtained by the chi-square test.

Source: Authors.

ies daily and 22.2% consumed soft drinks. In the southern region, the daily consumption of sweets and soft drinks in that study stood out, in an even greater proportion than that found in this study. These data in an age group smaller than that of the population addressed in our investigation are more worrisome in view of the trend towards increased consumption of UPF with age. A survey⁵ evaluated food consumption according to the degree of food processing in children under six years of age and found a high contribution of UPF to the total daily energy, which increased with age. Another study found that in the twenty past years, the intake of foods rich in sugars, solid fats and sodium increased in children aged two to six years¹⁹.

The origin of unhealthy eating patterns is multivariate and complex, driven by the food system and socioeconomic and cultural factors¹⁷. In

the present study, it was observed that socioeconomic characteristics were associated with high UPF consumption and no protective effect of breastfeeding. In this connection, lower maternal education was associated with studying in a public school, in three of the four UPF groups assessed. Other studies have also shown socioeconomic factors such as mothers' education^{11,12,20-23} and socioeconomic position^{12,21,24} influencing UPF consumption by children, including those in the six years range²¹.

In this study, it can be hypothesized that studying in public schools as well as lower maternal education could indicate children belonging to less privileged economic classes. Since mothers are mostly responsible for buying and preparing food and are behavioral examples for their children, the unfavorable economic context can lead to prioritization of UPF consumption. The results found on

Table 2. Weekly frequency of artificial juices and soft drinks consumption by six-year-old schoolchildren in Palhoça, SC.

Variables	Weekly consumption frequency									
	Artificial juices					Soft drinks				
	Does not consume (%)	1 to 2 times n (%)	3 to 6 times n (%)	7 times n (%)	p-value	Does not consume (%)	1 to 2 times n (%)	3 to 6 times n (%)	7 times n (%)	p-value
Gender					0.925					0.582
Male	83 (16.9)	103 (21.0)	149 (30.3)	156 (31.8)		143 (29.1)	252 (51.3)	76 (15.5)	20 (4.1)	
Female	85 (18.3)	94 (20.2)	144 (31.0)	142 (30.5)		151 (32.5)	225 (48.4)	66 (14.2)	23 (4.9)	
Type of school					0.124					0.011
Public	129 (16.2)	167 (21.0)	246 (31.0)	252 (31.7)		230 (29.0)	399 (50.3)	129 (16.2)	36 (4.5)	
Private	39 (24.1)	30 (18.5)	47 (29.0)	46 (28.4)		64 (39.5)	78 (48.1)	13 (8.0)	7 (4.3)	
Mother's education(completed years)					0.017					0.005
Less than 8	37 (14.7)	40 (15.9)	79 (31.3)	96 (38.1)		74 (29.4)	110 (43.4)	52 (20.6)	16 (6.3)	
8 or more	118 (18.2)	147 (22.7)	195 (30.1)	188 (29.0)		201 (31.0)	339 (52.3)	81 (12.5)	27 (4.2)	
Mother's occupation					0.754					0.555
No income	64 (17.7)	74 (20.5)	117 (32.4)	106 (29.4)		120 (33.2)	173 (47.9)	54 (15.0)	14 (3.9)	
With income	99 (17.2)	120 (20.8)	171 (29.7)	186 (32.2)		169 (29.3)	292 (50.7)	86 (14.9)	29 (5.0)	
Breast-feeding					0.483					0.529
No	11 (14.5)	19 (25.0)	19 (25.0)	27 (35.5)		25 (32.9)	33 (43.4)	15 (19.7)	3 (3.9)	
Yes	157 (18.0)	178 (20.4)	269 (30.8)	270 (30.9)		267 (30.5)	441 (50.5)	126 (14.4)	40 (4.6)	
Exclusive breastfeeding time (months)					0.900					0.962
Less than 6	70 (17.9)	77 (19.7)	120 (30.7)	124 (31.7)		123 (31.5)	194 (49.6)	56 (14.3)	18 (4.6)	
6	83 (17.9)	98 (21.1)	146 (31.5)	137 (29.5)		143 (30.8)	238 (51.3)	62 (13.4)	21 (4.5)	
Bottle use					0.006					0.320
Yes	136 (19.2)	141 (19.9)	200 (28.2)	232 (32.7)		228 (32.2)	344 (48.5)	103 (14.5)	34 (4.8)	
No	28 (12.0)	56 (23.9)	86 (36.8)	64 (27.4)		63 (26.9)	126 (53.8)	37 (15.8)	8 (3.4)	

p-value obtained by the chi-square test.

Source: Authors.

the influence of maternal education corroborate a study¹¹ with more than 34,000 infants in all Brazilian capitals and in the Federal District. Although they analyzed the consumption of ultra-processed juices, soft drinks, cookies and snacks in children under one year of age, the results showed that consumption was higher among children of mothers with lower levels of education.

In our investigation, the prevalence of stuffed biscuit consumption was 8% higher in children whose mothers had less education. Education and maternal life conditions are essential in the process of responsive and attentive care²⁵. Mothers with less education may have less access to regular pediatric and nutritional visits, impairing awareness about adequate food introduction, which is important for the success of healthy eating patterns¹⁵. Access to health information and consequently to healthy food choices associated with mothers' purchasing power may be unfavorable in this situation²².

In a low-income neighborhood nutritional guidance given to mothers when their children were in their first year of life has been shown to be associated with better dietary quality provided to children aged three to four years²⁶. In developed countries, the association of type of consumption with socioeconomic level has also been demonstrated²⁵. Results showed that most parents were informed about nutrition through the media, such as television and magazines²⁵. Therefore, a greater influence of the media and large food industries advertisements that are promoted in parents with less schooling should be considered.

On the other hand, a multicenter study reviewed the eating patterns of children aged one to six years and showed a higher prevalence of eating patterns featuring "snacks" among children from high-income families in private day care centers²⁷. They proposed that the National School Meals Program would have a protective role for

Table 3. Crude and adjusted prevalence ratios for the consumption of candies, chewing gum, lollipops or chocolates and stuffed cookies according to the independent variables studied in six-year-old schoolchildren in Palhoça, SC.

Variables	Prevalence of consumption											
	Candies, chewing gum, lollipops or chocolates						Stuffed cookies					
	PR ^c	CI (95%)	P-value	PR ^a	CI (95%)	P-value	PR ^c	CI (95%)	P-value	PR ^a	CI (95%)	P-value
Gender			0.071	#					0.255	#		
Male	0.96	0.92; 1.01					1.02	0.98; 1.07				
Female	1.00						1.00					
Type of school			0.518	#					<0.001			<0.001
Public	1.02	0.96; 1.08					1.19	1.12; 1.25		1.14	1.07; 1.22	
Private	1.00						1.00			1.00		
Mother's education (completed years)			0.556	#					<0.001			0.007
Less than 8	1.01	0.98; 1.06					1.12	1.06; 1.18		1.08	1.02; 1.14	
8 or more	1.00						1.00			1.00		
Mother's occupation			0.852	#					0.006			0.174
No income	1.01	0.96; 1.05					1.07	1.02; 1.12		1.04	0.98; 1.09	
With income	1.00						1.00			1.00		
Breast-feeding			0.388	#					0.959	#		
No	1.00	0.89; 1.05					1.00	0.92; 1.08				
Yes	0.97						0.99					
Exclusive breastfeeding time (months)			0.958	#					0.082			0.420
Less than 6	1.01	0.96; 1.05					0.96	0.91; 1.01		0.98	0.93; 1.03	
6	1.00						1.00			1.00		
Bottle use			0.095	#					0.061			0.469
Yes	0.96	0.92; 1.01					0.95	0.90; 1.01		0.98	0.93; 1.04	
No	1.00						1.00			1.00		

Removed from the final model due to loss of statistical significance. p-value obtained by Poisson Regression with robust estimator. PR^c = Crude prevalence ratio. PR^a = Adjusted Prevalence Ratio. 95%CI = 95% confidence interval. Final model consumption of stuffed biscuits Omnibus test p = 0.263.

Source: Authors.

a better eating pattern in public school students, since its fundamental principle is the provision of healthy foods. These data are in contrast with the evidence found in this study, as the type of public school showed a significant association with three of the four UPF groups assessed and with a higher prevalence (14% for stuffed cookies, 7% for artificial juices and 8% for soft drinks), when compared to students from private schools. Conflicting data can be partially explained by methodological differences between studies²⁷.

In our study, we observed that the use of soft drinks was significant: a total of 49.9% of the sample consumed soft drinks at least 1-2 times a week. This consumption, as well as artificial juices, was associated with lower maternal education and attending a public school. High prevalence of consumption of soft drinks and more frequently artificial juices, corroborate with worldwide

data^{9,26}. Sweetened drinks are associated with increased caloric intake, indicating an association with excessive weight gain and childhood obesity, and therefore, dietary guidelines recommend reduction of their daily consumption²⁶.

The high prevalence found may be related to early, usual and ascending exposure to these products over the years, with possible acquisition of such consumption practice when infants. Results of a study carried out in the city of São Paulo²⁸ enhance that the age of introduction of soft drinks and artificial juices among infants in public day care centers occurred at an early age, and for more than half of the children these drinks were offered as early as the end of the first year of life. The authors enhanced their concern about these data, considering the tendency for consumption to increase with advancing years and the entrance of children in schools²⁸.

Table 4. Crude and adjusted prevalence ratios of industrialized juices and soft drinks consumption according to the independent variables assessed. Six-year-old schoolchildren. Palhoça, SC.

Variables	Consumption prevalence											
	Industrialized juices						Soft drinks					
	RP _b	IC (95%)	P-valor	RP _a	IC (95%)	P-valor	RP _b	IC (95%)	P-valor	RP _a	IC (95%)	P-valor
Gender			0.588	#					0.122			0.124
Male	1.01	0.97; 1.05					1.04	0.99; 1.08		1.04	0.99; 1.08	
Female	1.00						1.00			1.00		
Type of school			0.022			0.031			0.008			0.010
Public	1.07	1.01; 1.13		1.07	1.01; 1.13		1.08	1.02; 1.13		1.08	1.02; 1.15	
Private	1.00			1.00			1.00			1.00		
Mother's education(completed years)			0.168			0.577			0.408	#		
Less than 8	1.03	0.99; 1.08		1.01	0.97; 1.06		1.02	0.97; 1.08				
8 or more	1.00			1.00			1.00					
Mother's occupation			0.927	#					0.188			0.076
No income	0.99	0.96; 1.04					0.97	0.92; 1.01		0.96	0.91; 1.01	
With income	1.00						1.00			1.00		
Breast-feeding			0.444	#					0.735	#		
No	1.00	0.96; 1.10					1.00	0.91; 1.07				
Yes	1.03						0.99					
Exclusive breastfeeding time (months)			0.876	#					0.709	#		
Less than 6	1.00	0.95; 1.04					1.01	0.96; 1.06				
6	1.00						1.00					
Bottle use			0.004			0.006			0.308	#		
Yes	1.07	1.02; 1.11		1.06	1.02; 1.11		1.03	0.97; 1.08				
No	1.00			1.00			1.00					

Removed from the final model due to loss of statistical significance. p-value obtained by Poisson Regression with robust estimator. PRC = Crude prevalence ratio. PRA = Adjusted Prevalence Ratio. CI95% = Confidence interval at 95%. Final model consumption of artificial juices: Omnibus test p = 0.647. Final model soft drink consumption: Omnibus test p = 0.615.

Source: Authors.

In our study, no question was asked about the intake of these sweetened drinks when infants, but it could be a determining factor for the high prevalence encountered. In this connection, in a longitudinal study carried out in the United States of America²⁹, it was found that the probability of sweetened beverages intake at six years of age was more than twice as high among children who consumed any of such beverages when infants, compared to non-consumers²⁹. The above investigation data corroborate the high consumption found in our study, showing that 81% of six-year-old children had consumed sweetened beverages at least once a day during the last month, and the proportion was higher in children of mothers with less schooling and children breastfed for less than six months²⁹.

Our investigation showed no association between breastfeeding and UPF consumption. The

ingestion of artificial juices was the only UPF in which a variable associated with feeding practices when infants showed a statistically significant association, being 6% higher in students who had used a bottle. However, some studies^{1,21,30} have shown better eating habits in breastfed children, including greater consumption of fruits, vegetables and meat at school age, besides a greater food variety, since there is greater exposure to different flavors due to the variation in the taste of breast milk, according to the nursing mother's diet.

In another investigation, the association between early feeding practices and the consumption of UPF was tested, based on the proportion of the total daily energy intake that was provided by these foods¹⁸. In this population, 40.3% of total daily energy consumption on average came from UPF, and it was higher in children from families

with lower income and children of mothers with less education. Although the magnitude of the observed effects was small, the duration of exclusive breastfeeding and the age when solid foods were introduced were negatively associated with UPF consumption, suggesting the hypothesis that parents with greater adherence to healthy feeding guidelines in the first year of life would be more likely to maintain healthy habits as children grow, limiting UPF consumption when aged six.

The relationship between breastfeeding and its time duration with the frequency of some foods consumption in American children, also at six years of age, was reviewed in another study³⁰. The results showed that long breastfeeding durations and exclusivity reflected in healthier eating pattern, with a lower frequency of sweetened beverages consumption. The authors highlighted the limitation of the literature regarding this relationship, with the hypothesis that mothers who manage to breastfeed for a longer time may be more likely to support healthy eating habits in the child's development. As in the data of our study, no association was observed between duration of breastfeeding and sweets consumption frequency. In our sample, despite the high proportion of breastfed children, only 54.3% had been exclusively breastfed for at least six months and the majority had used a bottle (75.2%). Therefore, there is a possibility that the prevalence of artificial juice consumption be associated with the introduction of the use of bottles in families with mothers with less education, or who have to return to work in a hurry.

In a literature review³¹, different studies highlighted the high frequency of sugar and sweets consumption in the Brazilian children population. Some studies have shown an association between the consumption of sweets and lower parental education and lower family income, just like the results of our investigation. On the other hand, results from another investigation⁵, when analyzing the participation of sweets and artificial juices separately, showed that these products consumption was associated with higher family income, but no statistical significance was ob-

served between the UPF group and the income quintiles. On the other hand, contribution of sweets to total daily energy was 5.4%. The study, however, did not assess the weekly frequency and reviewed a wide age range. Therefore, regarding the consumption of sweets, income alone may not be a good variable for analysis, with conflicting patterns observed in the literature. Other social factors may have a greater influence, such as the consumption of the same sweets by parents, access to purchase, exposure to advertisements or the cultural practice of rewarding children for their good behavior by offering candies, chewing gum, lollipops or chocolates.

Among the strengths of this study, we highlight the large sample size, a population with a specific age, in addition to the use of validated and easy-to-fill instruments. In addition, a careful capture of data by trained professionals, minimizing possible memory biases because some variables are retrospective. The data found are reproducible for comparison when assessing the frequency based on well-validated food indices and the use of well-established groups such as UPF, investigated in most studies. The results also support the evaluation or implementation of health promotion policies or prevention measures to decrease UPF consumption among children at the local level. However, certain limitations impose caution in interpreting the results. Information such as exposure to children-targeting advertising, parents' dietary patterns and time of introduction of UPF were not collected, as well as data on portion sizes and concomitant consumption of other foods, in order to better establish a dietary profile.

It is concluded that the prevalence and frequency of UPF consumption found among six-year-old schoolchildren in Palhoça/SC were high and warn us about the different socioeconomic and environmental factors that may be involved in the selection of those foods over fresh or minimally processed foods. Therefore, knowing the type of food prevalence is essential to focus on the child development, since eating habits developed in this phase can form the basis of adult eating patterns.

Collaborations

NT Silva, J Traebert and E Traebert: study design, methodological design, data collection, data analysis, manuscript writing, approval of the final version. B Pimentel: writing of the manuscript, approval of the final version.

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