

Food Classifications by Brazilian Amazon Mothers: Interactions With Eating Practices

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ABSTRACT

Objective: To assess how mothers classify foods and how their eating practices interact with these classifications, with special attention to meanings and uses given to ultra-processed foods.

Design: Qualitative research with in-depth interviews and pile sorts.

Setting: Urban Brazilian Amazon.

Participants: A sample of 34 mothers were selected through theoretical sampling.

Analysis: Content analysis for in-depth interviews and multidimensional scaling and cluster analysis for pile sorts.

Phenomenon of Interest: Food classification.

Results: Classifications were based on context (ie, a time or a situation in which the food is eaten) and foods' healthiness. Five food groupings based on mothers' classifications were defined: (1) main meal foods, (2) fruits and fruit juices, (3) convenient foods, (4) leisure foods, and (5) canned sardines. Ultra-processed foods were classified differently from non-ultra-processed foods and considered unhealthy, consumed on special occasions or when there was no time or desire to cook.

Conclusions and Implications: Results highlight the potential of incorporating context-based categories and personal experiences to guide nutrition interventions and the potential of pile sorts to tailor messages to target populations.

Key Words: food classification, eating practices, ultra-processed foods, pile sort, nutrition education (*J Nutr Educ Behav.* 2021;000:1–6.)

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INTRODUCTION

Eating practices can be defined as doings and discourses that remain together and coordinated through meanings. According to Warde,¹ eating practices do not only result from people's deliberation but also social habituation and orchestration. Thus, food interpretation largely escapes conscious decisions, being part of social phenomena. In this sense, how people give meaning and classify foods are important entry points to understand eating practices.

Several authors have discussed the transformations of contemporary eating practices, highlighting new forms of eating (solitary, fast, anytime, and anywhere)^{2,3} and new types of industrialized foods.⁴ According to the NOVA classification, featured in Brazilian Dietary Guidelines, such foods are categorized as ultra-processed foods (UPF) made with ingredients and processes only available to the food industry.⁵ The significant increase of UPF consumption in the last decades is a public health issue, not only affecting

eating practices, but also the nutritional and health status of populations worldwide, with associations with obesity, cardiovascular diseases, cancer, and cavities.⁶

Food is usually cross-classified by consumers.⁷ Assessing the multiple categories that people use to classify foods supports inductive inferences that may help create effective communication to nutrition education. In a scenario in which eating traditions are weakening, this is particularly relevant to approach the cognition of the target audience instead of strictly focusing on the chemical and health-related properties of food.⁸

As the ways people classify foods are influenced by the social and eating context,⁹ the city of Cruzeiro do Sul, in the Brazilian Amazon, is an interesting setting to investigate food classifications, as it has gone through a recent process of urbanization with the opening of the road that connected the city to the state capital

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and other capitals in 2011. This creates a complex scenario, with changes in the city's food environment in the last years marked by an increase of UPF availability at grocery stores and fast-food restaurants, concomitantly with a strong regional food culture—based on rice, beans, cassava flour, fish (or other meats), and Amazonian fruits—that is preserved through generations.¹⁰

However, food categorization schemas are often not readily accessible to individuals. Thus, techniques that encourage the individual to express internal cognitions are necessary for studying food classifications. Pile sorting is a method long used to examine cognitive structures and processes,^{11,12} that assumes that the ways people sort cards into categories represent their underlying mental processes.¹³ Card sorts are used to assess the frequency of food consumption,^{14,15} food preferences,^{16,17} perceptions of healthy eating styles,¹⁸ and food classifications.^{19–21} However, card sorts are not used to explore how mothers classify foods in settings undergoing intense transformations in eating practices and the food environment. The present study aimed to assess how mothers living in an urban setting in the Brazilian Amazon classify foods through pile sorts and explore how their eating practices interact with these classifications. In addition, it focused on the meaning and use given to UPF.

METHODS

Study Design and Setting

The study took place during the 2-year follow-up of a prospective cohort study named Maternal and Child Health and Nutrition in Acre, Brazil (MINA-Brazil) study, which consisted of a larger qualitative, grounded-theory-based investigation that aimed to explore eating practices and UPF consumption among mothers. The study took place in Cruzeiro do Sul, Acre, located in the Western Brazilian Amazon. The municipality had an estimated population of 87,673 inhabitants in 2018.²² Its urban population increased from 57.8% to 70.5% of the total population between 2000 and 2010.²³

Participants

Inclusion criteria for participation in the MINA-Brazil study were (1) having given birth between July, 2015, and July, 2016, (2) having given birth in the maternity hospital in Cruzeiro do Sul, and (3) living in the urban area of the municipality. The MINA-Brazil birth cohort composed 1,246 participants eligible to follow-up, with a 69.9% retention rate after 2 years ($n = 854$). Further information on the MINA-Study design is available elsewhere.²⁴ The subsample of participants for the present analysis was selected on the basis of theoretical sampling, aiming to guarantee diversity concerning economic conditions, presence of paid job, marital situation, and frequency of UPF consumption in the previous 30 days. The frequency of UPF consumption was based on a simplified food frequency questionnaire; participants were ranked in quintiles, and mothers from the lowest and highest quintiles were invited to participate in the study. More information on the subsample definition can be found in Sato et al.¹⁰ Subsample size and composition were defined using saturation criteria, observed when new interviews to new participants did not present new relevant information,²⁵ resulting in 34 participants.

Data Production

The first author, who has experience with in-depth interviews and pile sorts, and had previous experience with the study setting, interviewed all participants about their eating practices in Portuguese at their homes. For the pile sorts, 28 food items were chosen as units of analysis on the basis of previous observations of the local food environment and eating practices.¹⁰ The selection aimed to guarantee a large diversity of food types while keeping the number below 30, as suggested by Pelto.²⁶ The food items represented a diversity of processing levels, prices, culinary complexities, and regionalities. This aimed to explore more deeply how participants classified not only foods that they were used to eating but other foods that participants were exposed to and may desire (or

reject), allowing different cross-classifications. Items were: açaí berry, banana, canned sardines, cupuaçu (Amazonian fruit), brown rice, baixinha (regional meal composed of ground beef, sunny side up egg, cornflour and fresh parsley), chicken nuggets, egg, fast-food combination meal (composed of hamburger, soda, and fries), fish, fresh fruit juice, frozen meal (eg, industrialized, ready-to-eat lasagna and pasta), green salad, hamburger sandwich, hot-dog sausage, instant noodles, juice powder, industrialized farofa (toasted and seasoned manioc flour), manteiguinha beans (regional beans, often used to make salads), pinto beans, pizza, soda, steak, strawberry, sushi and sashimi, traditional Cruzeiro do Sul's manioc flour, water, and white rice.

Two meals were included in the list, as sometimes specific meanings are given to the combination of certain foods. For this reason, some food items, such as soda and cassava flour, could appear as part of the meal by itself. However, the repetition did not mean redundancy. For example, soda was classified (when by itself) differently from the fast-food combination meal they are often part of, as they were more often consumed and cheaper than the whole meal.

Categorization of units of analysis was made through pile sorts, following Pelto's recommendations.²⁶ Each food was represented on a card, with a photograph and name (eg, frozen meals were written on a card with a photograph of industrialized frozen, ready-to-eat meals). All cards were presented to each participant, making sure that they knew all displayed foods and were familiar with photographs. Then, the participant divided all the cards into piles, according to their food classifications, with no limit to the number of piles or the number of cards in a pile. Once the participants were finished sorting the cards, participants were asked to explain the rationale behind each food-card pile. In addition, in-depth interviews approached (1) food shopping, (2) meal composition, (3) food preferences, (4) cooking activities, and (5) eating out and at home. The interview guide was based on the concept of eating practices, aiming to approach them in several

dimensions. The guide was pretested with 3 women participating in the MINA-Brazil study but not included in this research. Piles, explanations, and in-depth interviews were recorded and transcribed verbatim.

The MINA-Brazil study and this qualitative research were approved by the Ethics Committee of the Public Health School from the São Paulo University (protocols 872.613 and 2.454.972, respectively). Written informed consent was obtained from all participants.

Data Analysis

The pile sort analysis included: (1) multidimensional scaling analysis, (2) cluster analysis, (3) cluster labeling, and (4) consensus analysis. The multidimensional scaling analysis created an aggregated matrix with card sorts of all participants, and from that matrix created coordinate estimates and a 2-dimensional map of distances between the statements. The resulting map represented a multidimensional graphic representation of the participants' food classifications. Each food is represented as a dot, with points farther apart on the map being sorted together less often than those closer together.²⁷ Hierarchical agglomerative cluster analysis using Ward's algorithm was used to

determine how the foods clustered together on the basis of participants' classifications.

Several solutions, with a different number of clusters, were tested, and the final solution was defined on the basis of consistency with explanations given by participants. Food groupings were named inductively, reflecting explanations given by participants and the foods' characteristics. Finally, a consensus analysis was used to assess the level of agreement among the participants. This was based on the premise that people familiar with the cultural meanings of a certain cultural domain tend to agree with one another. A high agreement level suggests that participants share knowledge in the studied domain and that pile sorts represent this knowledge²⁷ observed in this research. All pile sort analyses were made using Anthropac (version 4.0, Analytic Technologies).

Pile sort explanations and in-depth interviews helped with understanding the relationships between food classifications and eating practices. Participants' speeches were analyzed through content analysis.²⁷ For preanalysis, the material was read exhaustively to extract data about the rationale behind food groupings and opinions about the foods presented in the cards. During material

exploration and data treatment, terms were divided into categories according to the food grouping to which they referred. Finally, categories were interpreted considering their core and peripheral aspects.

RESULTS

Thirty-four participants (Table 1) categorized foods into piles, with the number of food groupings ranging from 2 to 12, with an average of 4.79 (SD, 1.41).

Five food groupings were defined: (1) main meal foods, (2) fruits and fruit juices, (3) convenient foods, (4) hedonic foods, and (5) canned sardines (Figure). Food classifications reflected the NOVA categorization, with 2 food groupings concentrating all UPF. However, they also revealed other elements that participants used to categorize foods, such as the context in which the food is eaten and their perceived healthiness (Table 2). Frequency of consumption and food preferences were also mentioned but did not differ among food groupings.

Foods included in the main meal foods were savory, local, non-ultra-processed, staple foods. They were considered adequate for consumption during the week, especially for lunch. These foods were often consumed and considered healthy.

"Meat, strawberries, juice, man-teiguiinha beans, eggs, water, white rice, cupuaçu, fish, brown rice, banana and açaí berry. These are all the things that are good for you, that make you healthy" (Participant 19, low UPF).

Fruits and fruit juices were also composed of nonprocessed foods and considered healthy. However, they were sweet and not part of a specific meal, being eaten/drunk during/after the meals or throughout the day. Unlike foods in other groupings, most of the participants or their relatives had fruit trees near their houses. "Look, here we have a star fruit tree, I always get some" (Participant 29, high UPF). The exception was strawberries, which were expensive and rarely available in the region.

The convenient foods grouping was mainly composed of UPF, except for sushi and sashimi. The inclusion

Table 1. Characteristics of 34 Mothers Living in Cruzeiro do Sul, Brazil

Characteristics	UPF Consumption		Total
	Low (n = 16)	High (n = 18)	
Age groups, y			
17–25	8	8	16
26–34	7	8	15
35–43	1	2	3
Education, y			
≤ 9	1	7	8
10–12	10	8	18
≥ 13	6	3	9
Wealth index terciles			
First	2	7	9
Second	5	6	11
Third	9	5	14
Nutritional status ^a			
Normal weight	11	7	18
Excess weight ^b	5	11	16

UPF, ultra-processed foods.

^aFollowing World Health Organization recommendations (World Health Organization, 2021)²⁸; ^bPreobesity and obesity.

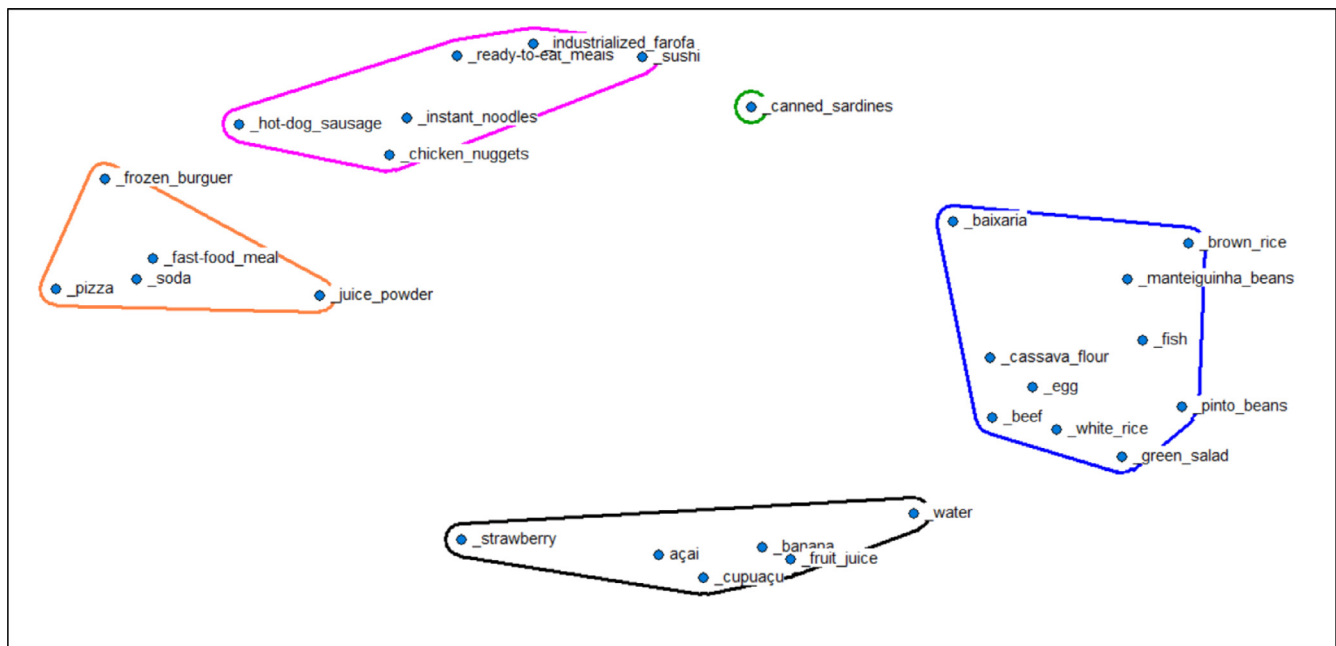


Figure. Final cluster solution of 34 pile sorts from mothers living in Cruzeiro do Sul, Brazil.

Note: Blue, main meals; black, fruits and fruit juices; pink, convenient foods; orange, leisure foods; green, canned sardines.

Table 2. Examples of Quotes From 34 Mothers Living in Cruzeiro do Sul, Brazil, For Each Food Grouping, According to Main Elements Used to Classify Foods

Food Grouping	Context of Consumption	Perceived Healthiness
Main meal foods	<p>"In a plate, we will always have one of these, you know? If not the beef, the eggs. If not the fish, the baixaria. You got to have some of these."</p> <p>"If I am going to make a nice lunch, I will cook rice, beans, roasted beef, some salad, homemade farofa, fresh juice. . ."</p>	<p>"These are the healthier [foods], the most appropriate for your nutrition."</p> <p>"I think these are the foods that give you. . . strength. Because one will eat it for lunch or dinner."</p>
Fruits and fruit juices	<p>"[I would eat] Açai is for a snack, just like the banana and the strawberry."</p> <p>"If I don't drink a juice with my lunch, I will eat one fruit afterwards."</p> <p>"The fruits... I am not sure when I would eat them... I mean, I would eat it whenever I felt like it!"</p>	<p>"This is great for vitamins. It is good for you when you have the flu. . . The strawberry we don't eat that much, but the banana always every day. The banana is very important, people say it's full of vitamins."</p>
Convenience foods	<p>"For a quick dinner, without much time, [I would cook] the frozen meal, rice, instant noodles, canned sardines, fish or egg."</p>	<p>"They are industrialized and have many conservatives that might be bad for your health."</p>
Hedonic foods	<p>"When I graduated from college, we all when to a pizzeria to celebrate it eating pizza."</p> <p>"These foods I could eat when I go out. If I went to a restaurant or a dinner. . ."</p> <p>"Hum... these are good! These are the foods that I like!"</p>	<p>"[These foods are high in] Fat. . . and. . . Let me think... they are full of additives as well, and have a lot of sugar."</p> <p>"Sometimes I buy these foods because my daughter loves them."</p>
Canned sardines	<p>"We hardly buy them [sardines]."</p> <p>"I always buy canned sardines [. . .] I eat them for lunch, when I am in a hurry."</p>	<p>"It is industrialized, and because of that it has more conservatives that may be bad for your health."</p>

of sushi and sashimi in this grouping reflects the unfamiliarity with the Japanese dish—“actually, I never tried Japanese food, so I don’t know how it tastes” (Participant 11, high UPF)—and how far away from the regional identity UPF were considered. Foods in this grouping, often referred to as industrialized, were cross-classified as unhealthy because they “have too many preservatives” (Participant 16, low UPF) and “are full of sugar and fat” (Participant 16, low UPF), although consumed when there was no time or desire to cook.

Differently from the other food groupings, consumed on an everyday basis, hedonic foods were considered adequate to special occasions, often consumed on weekends and birthdays “...chicken nuggets, fast food meal, soda and hamburger... that’s what I eat on weekends” (Participant 22, high UPF). Although as convenience foods, they represented a “break from cooking” (Participant 6, high UPF), the main reason to consume them was related to pleasure. They were mostly enjoyed, particularly by the participants’ children, although considered unhealthy. “Sometimes I buy these foods because my daughter loves them” (Participant 17, high UPF).

One food was grouped by itself, canned sardines. This can be explained by different opinions about the food, which was disliked, considered unhealthy and hardly bought by some participants, and liked and frequently eaten by others, especially when they wanted quick and easy meals.

DISCUSSION

The present study investigated how mothers living in the Brazilian Amazon classify foods and how those classifications interacted with eating practices. Different categorizations were observed, highlighting the use of cross-classification in foods and the multiple categories attributed to the food domain at once. However, differently from Blake et al,⁸ who described that food-based taxonomic categories (ie, structured around foods’ intrinsic properties) were most frequent among their participants when no specific situation was defined, in this study, participants based their classifications on context (ie, a time or situation in

which the food is eaten) and (expectations of) personal experiences (eg, healthiness).

The importance of context and healthiness to the participants’ classifications reflects eating practices embedded in their social roles, as context-based classifications of foods are particularly helpful in generating plans for deciding about what foods to prepare/eat⁷ and mothers are widely reported to be the main responsible for planning and preparing family meals and to worry about the family’s healthy eating.²⁹ Other studies with mothers have also observed food healthiness and type of meal to be important factors in classifying and choosing foods.^{21,30}

The present findings corroborate studies suggesting that incorporating context-based classifications and personal experiences might help to guide nutrition interventions more compatible with real life.^{13,21} This reinforces the potential of pile sorts to tailor messages to target populations through assessing foods’ uses and meanings. In addition, pile sorts may help identify items that cause confusion about their properties (eg, healthiness) or will not be well accepted if promoted because of divided opinions about it, as the canned sardines were in this research. The classification of foods based on social dimensions rather than nutritional dimensions highlights the importance of dietary guidelines with holistic approaches that consider nutrients, foods, culinary skills, modes of eating, food systems, such as the Brazilian and the Canadian guidelines.^{5,31}

The present study’s results unveiled 2 main uses of UPF in the context of recent urbanization, pleasure, and convenience. Meanings of modernity and fun attributed to fast foods in Cruzeiro do Sul, in addition to the higher prices of such foods compared with homemade meals, created conditions to a special meal, with family commensality, differently from the convenient, quick consumption of fast foods described in the US³² and Australia.³³ A similar social role of fast-food meals is described among low-income mothers in southeast Brazil. Such meals allowed social aspiration and satisfying all family members’ food tastes.³⁴ Finally, the use of

convenient foods highlighted UPF as cooking ingredients (in opposition to ready-to-eat meals), portraying an important entry point to UPF in homemade meals.

The present study has some limitations. Extrapolation of the study findings must be made with caution, as food classifications will differ across cultural settings; however, the results might shed light on how mothers in other urban settings think about food. In addition, the foods selected to the pile sorts may have limited the types of food classifications used by the participants, but, as the foods included in the present study were based on empirical observations and guided by literature on eating practices, this does not mitigate the importance of the presented results.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Mothers living in the Brazilian Amazon cross-classified foods, with context and healthiness classifications being the most used. The study revealed that the way that participants thought about food was intimately related to their eating practices, reflecting how foods were cooked and eaten and their expected health consequences. Ultra-processed foods were consumed either for pleasure or convenience. The presented results are relevant to professionals and researchers working with nutrition interventions, as education messages are typically based on food groups or other taxonomic categories, even though people use several other food classifications. In addition, nutrition education actions aiming to reduce the consumption of UPF could promote traditional meals as a source of pleasure and include all family members in food preparation practices to reduce the need for convenient foods.

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