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Abstract

In recent decades, an increase in consumption of ultra-processed foods (UPF), a type of product frequently associated with diet-related obesity, chronic diseases, decrease of eating traditions and loss of culinary diversity, has been observed in middle-income countries. However, there is lack of information on factors related to choosing UPF. In this study, we aimed to understand the factors promoting UPF choices and consumption among mothers living in an urban context in the Brazilian Amazon, and to present a conceptual model grounded on their experiences that illustrates the dynamics between the observed factors. For this qualitative study, we used a constructive grounded theory approach, with a theoretical sampling of 40 women, to choose mothers with high and low consumption of ultra-processed foods. Data production and the first steps of analysis were performed concomitantly, followed by four steps of coding focused on creating conceptual categories and explaining the interactions between them. Our findings highlighted the importance of context in promoting UPF choice and consumption, particularly the “food environment”, physical and virtual, and the “sociocultural environment”. These contextual aspects interacted with the two main personal aspects influencing participants’ UPF consumption, one concerning practices, “cooking behaviors”, and the other concerning preferences, “food tastes”. Factors such as economic and time constraints were also important and competed to shape eating practices through interactions with participants’ health valorization. Findings are discussed in relation to food choice theories, social roles and the food environment. Implications for public health initiatives include the importance of considering environmental changes, sociocultural and

economic influences, the reliance on UPF, and the role of women in the home, when promoting healthy diets.

Key-words: Eating practices; food choices; ultra-processed foods; mothers; grounded theory; qualitative research; Brazil.

Introduction

Food choices concern the selection of foods for consumption that result from competing, reinforcing and interacting influences of several factors. Such factors range from individual responses (to psychological, physiological and sensory influences) to broader interactions (between social, environmental and economic influences) (Buttriss et al., 2004). Studies have investigated the interactions among environmental, social and psychological factors influencing food choices (Puddephatt et al., 2020; Wertheim-Heck & Raneri, 2019; Buttriss et al., 2004). Nonetheless, Sobal and Bisogni (2009) state that food choices are still not fully understood. In this study, we hope to add to the food choice literature by shedding light on factors related to choosing a specific category of industrialized food – ultra-processed food (UPF) – that has been increasingly consumed in contemporary urban societies due to its convenience, hyper-palatability, marketing and accessibility (Monteiro, Mourabac, Cannon, Ng & Popkin, 2013; Monteiro et al., 2011).

Different reviews on food choices have highlighted important environmental, social and psychological influences affecting them, but with different focuses and approaches. A review of environmental influences on food choices performed by Stroebele and De Castro (2004) highlighted as important factors in the process: physical surroundings (i.e. type of food, presentation and location, food and environment colors, temperatures and smells, and ambient light), time-related characteristics (meal frequency and meal times), and distractions (television and music). This study considered social variables as environmental factors, highlighting the influences of social facilitation and social modeling on food choices (Stroebele & De Castro, 2004).

Deepening understanding on the social influences on food choices, Cruwys, Bevelander and Hermans (2015) corroborated the importance of social modeling and argue that it has significant effects on choosing food, being shaped by social norms as individuals

either seek information about appropriate behavior or to affiliate with others. Köster (2009) also approached the unconsciousness of food choices. For the author, food choices are based on past behavior, therefore, habit and hedonic appreciation seem to be better predictors of food choices than psychological constructs themselves, such as attitudes and intentions. In an effort to combine the several factors that compete to influence food choices, the umbrella literature review performed by Sleddens et al. (2015) with 14 review papers concluded that food choices were mainly influenced by habitual and structural factors, with the habitual factors being the most consistent predictor of food choice. Motivational choices, such as self-efficacy, self-regulation, motivation and goals, were also linked to food choices, but played a smaller role.

The apparent consensus on the relevance of environmental and social influences on food choices reinforces Sobal and Bisogni's (2009) argument that food choices are situational, which means that they are selectively employed in each specific setting, composing a contextualized process. Therefore, it could be relevant to think about specific influences on food choices according to the setting or the type of food studied. The authors used a grounded theory approach to develop a model on the food choice experiences of 29 adults living in New York, named the Food Choice Process Model. They classified three main components affecting their participants' food choices: life course, influences (ideals, personal factors, resources, social frameworks and food contexts) and personal systems (mental processes by which people translated influences to actual food practices). Although offering a broad map for considering influences on food choices, Sobal and Bisogni (2009) highlight that no one specific theory, model or perspective could capture all the complexity of the phenomenon and that new deductive models could be developed.

Ultra-processed foods are a relatively new category of food classification, defined as "formulations of ingredients, mostly of industrial use, that result from a series of industrial

processes" (Monteiro et al., 2019, page 2). They are characterized by two types of ingredients: (1) food substances with no or little culinary use (e.g. varieties of sugars – such as maltodextrin –, modified oils – such as hydrogenated oils –, and protein sources – such as hydrolyzed proteins) and (2) cosmetic additives that make the final product palatable or often hyper-palatable (e.g. flavors, emulsifiers, and thickeners). Some examples of UPF are soft drinks, packaged snacks, candies, mass-produced packaged breads, margarines and other spreads, industrialized cookies and biscuits, cake mixes, pre-prepared dishes, reconstituted meat products, powdered soups, and instant noodles (Monteiro et al., 2019).

UPF's convenience, hyper-palatability, branding and aggressive marketing make them liable to displace all other food groups. Its consumption has been associated in the last decades with a transition in food practices – with less time spent in cooking and eating, change in traditional meal patterns, decline in commensal eating, and an increase in the prevalence of snacking – in middle-income countries (Monteiro et al., 2019; Monteiro, Mourabac, Cannon, Ng & Popkin, 2013; Monteiro et al., 2011). High consumption of UPF has negative nutritional and cultural effects, being associated with an overall deterioration of the diet quality in several countries (Louzada et al., 2018; Cediel et al., 2018; Moubarac et al. 2017) and an increase in chronic diseases (Louzada et al., 2015; dyslipidemia (Rauber, Campagnolo, Hoffman & Vitolo, 2015; Mendonça et al. 2017; Lavigne-Robichaud et al., 2018), in addition to promoting loss of eating traditions, commensality and culinary diversity (Monteiro et al. 2013). In response to the increase in UPF consumption and impact on public health, the Brazilian Dietary Guidelines launched in 2014 emphasize the importance of avoiding UPF and maintaining eating traditions to achieve healthy diets (Brazil, 2014).

Despite the relevance of UPF in contemporary eating practices and their impacts on public health, to the best of our knowledge, only one study investigated UPF choices, but with a strict focus on environmental factors that might work as facilitators or barriers to UPF

consumption. Participants were adults living in São Paulo, Brazil. Most of them perceived their neighborhoods as favorable to UPF consumption and reported more facilitators than barriers to consume UPF, namely appreciation for its taste, children's acceptance, convenience, cost, and feeling addicted to it (Almeida, Scagliusi, Duran & Jaime, 2017). However, to allow a deeper understanding of UPF choices, it is relevant to build a model based on people's broader experience with choosing and eating food, particularly UPF.

One relevant group for understanding UPF choices within families comprises mothers, as they are, in many cultures, most often responsible for determining the foods available at home and how they are prepared (Sato, Ulian, Unsain & Scagliusi, 2018; Larson & Story, 2009; DeVault, 1991). Because of this social role, mothers are often described as central in teaching children how to eat, being responsible for their (1) food familiarization, (2) food choice learning, (3) conditioning learning, and (4) food categorization learning (Paroche et al., 2017). Several studies investigated how mothers' food choices influence their children's eating; however, few studies have focused on how being a mother can affect their own food choices. The studies conducted focus on specific aspects such as identity (Johnson, Sharkey, Dean, McIntosh & Kubena, 2011) or coping strategies (Blake, Devine, Wethington, Jastran, Farrell & Bisogni, 2009; Devine, Jastran, Jabs, Wethington, Farell & Bisogni, 2006).

A study with low-income mothers in the United States of America described the influence of a "healthy identity" on their food choices. The authors observed that mothers that did not identify themselves as being healthy ate more UPF and felt more anxious and guilty about their food choices (Johnson et al., 2011). Another study on parents living in the US described several coping strategies related to food choices. These strategies aimed to manage stress, reduce the time/effort needed for meals, and traded off food needs against other family needs (Devine et al., 2007). Blake et al. (2009) described gender influences on such strategies among the same population, with mothers skipping meals and trading-off

personal nutrition to save time and energy. These observations suggest that a mother's social roles could influence UPF consumption in different ways, discouraging UPF choices for not being healthy or promoting it to cope with the overload of being responsible for feeding the family.

Given that food choices are highly affected by context, it seems relevant to approach the phenomenon from a region going through changes in the food system associated with greater UPF consumption, while still maintaining a strong traditional food culture, as in Amazonian settings. The region has been experiencing a nutrition transition, with increasing rates of obesity (Braz, Duarte & Tauil, 2012) and other nutrition-related non-communicable diseases (Lourenço, Gimeno & Cardoso, 2014), and has gone through an intense process of urbanization in the 1960s and 1970s (Lima, 2014). In this paper we aimed to understand the factors promoting UPF choices and consumption among mothers living in this urban context in the Brazilian Amazon, and to present a conceptual model grounded on their experiences and perceptions that illustrates the relations and dynamics between the observed factors. To achieve these aims, we addressed three research questions: (1) What are the main factors contributing to choosing and consuming UPF among mothers living in Cruzeiro do Sul, Acre?; (2) Which factors prevent mothers from choosing and consuming UPF?; and (3) How do the factors promoting or preventing UPF choice and consumption interact?

Methods

The main study design and setting

This was a qualitative research based on a constructivist grounded theory approach, as proposed by Charmaz (2006). The constructivist grounded theory approach has its philosophical basis in symbolic interactionism, which posits that meanings are negotiated through social interactions in social processes. This approach is consistent with our aim, as it allows us to develop an explanatory model of a contextualized basic social process – such as

158 choosing food (Sobal & Bisogni, 2009; Furst et al., 1996). Creswell (2007) explains that
159 grounded theory intends to move beyond description of the phenomenon, and to generate a
160 model or theory – i.e. an abstract analytical schema of a process.

161 Sobal and Bisogni (2009) discuss that there are several ways to develop models about
162 the food choice process, but highlight grounded theory's inductive approach, whose strength
163 is to create concepts that are important to the study's participants. Inductive approaches elicit
164 information about people's food choices and adopt emergent concepts to create models and
165 theories that are grounded in the consumers' perspectives. This means that the theory should
166 not be created from existing literature but based on empirical data. Thus, rather than focusing
167 on people's language and words (as in a discourse analysis), our study paid special attention
168 to how a social process (UPF choice) happened in a certain context (Brazilian Amazon). To
169 achieve that, special attention was payed to the participants' views, beliefs, feelings,
170 assumptions and ideologies.

171 Additionally, Charmaz's constructionist approach advocates for a perspective that
172 does not assume that researchers are neutral observers. Thus, researchers involved in this
173 study were constantly exercising their reflexivity and relativizing their perspectives, practices
174 and positions throughout every step of the research.

175 This study was part of a prospective cohort study in Cruzeiro do Sul, Acre State,
176 named MINA-Brazil Study (Maternal and Child Health and Nutrition in Acre, Brazil).
177 Cruzeiro do Sul is located in the North region of Brazil, in the Western Brazilian Amazon
178 and has an estimated population of 87,673 inhabitants (IBGE, 2018). The city is located 631
179 km away from Acre's capital, Rio Branco, and has gone through an intensive process of
180 urbanization, with its urban population increasing from 57.8% to 70.5% of the total
181 population between 2000 and 2010 (IBGE 2000, 2010).

Inclusion criteria for participation in the MINA-Brazil Study were (1) giving birth between July 2015 and July 2016, (2) giving birth in the maternity hospital in Cruzeiro do Sul, and (3) living in the urban area of the municipality. The MINA-Study cohort was population-based at baseline, with a 70% retention rate for the 2-year follow up (n=868) (Cardoso et al., 2019). This research took place during the MINA-Brazil Study's 2-year segment and focused on a subsample of the main study. The segment data collection was divided into five waves, conducted every three months from July 2017 to July 2018. Approaches to the subsampling and methods are described below. Further information on the MINA-Study design has been described elsewhere (Neves et al., 2018).

Sampling of informants

Theoretical sampling is used in grounded theory to establish the events to be observed in order to create explanatory categories to build a conceptual model (Dantas, 2009). We started with a broad perspective for the initial sampling, defining as main events high or low consumption of UPF. Data from the MINA-Study helped define a subsample of participants with either high or low frequency of UPF consumption. Based on quantitative data, women were divided into quintiles according to their frequency of UPF consumption, and mothers from the highest and from the lowest quintiles were invited to participate in the study.

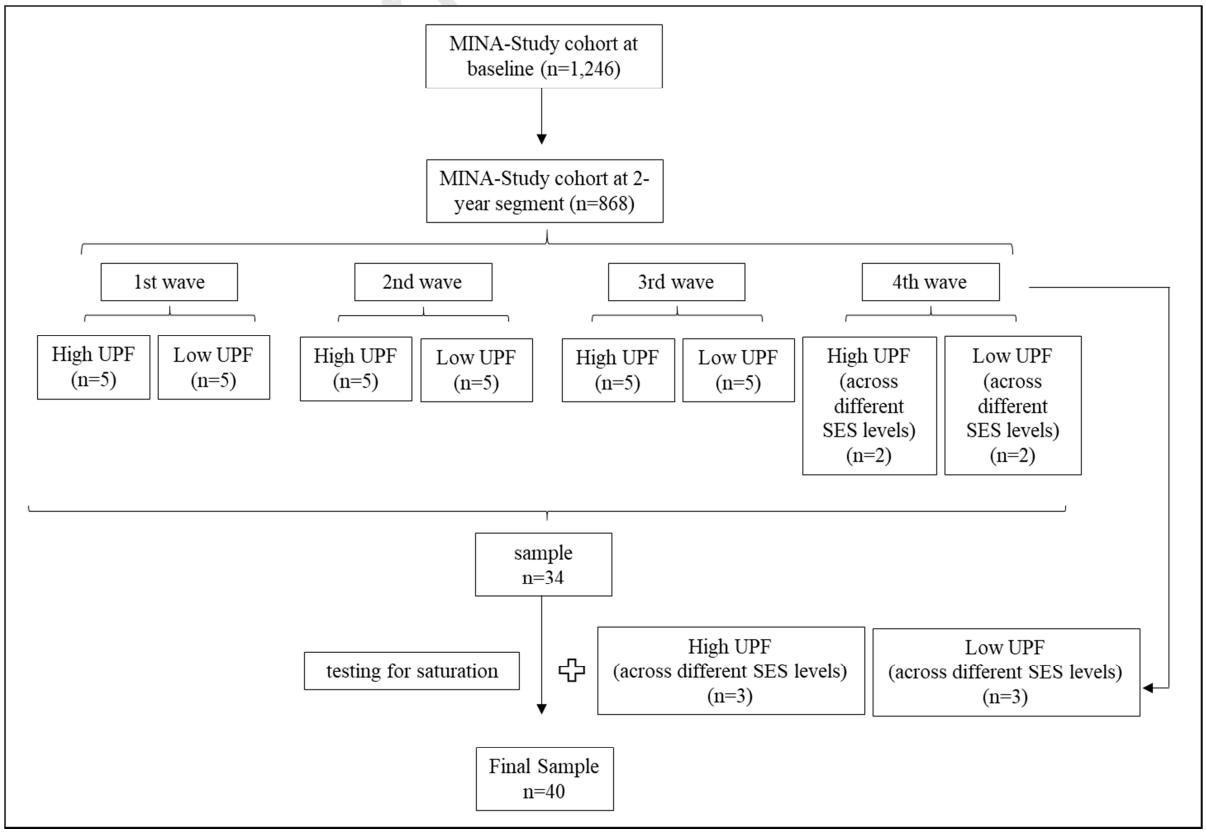
The sample size was defined through theoretical saturation. As analytic work in grounded theory is concomitant to the fieldwork, emerging categories shape data production and allow the researcher to theoretically sample to collect new data in order to check, fill out and extend conceptual categories (Charmaz, 2006). For this reason, in the fourth wave, when key concepts in the data analysis had been defined, instead of choosing participants based only on their UPF consumption, new participants with specific theoretically relevant characteristics were sought. In our case, the interaction among UPF consumption and being

207 employed was still unclear in this step of analysis. Thus, we purposively invited employed
208 women with low or high frequency of UPF consumption taking into consideration their
209 education levels to guarantee participants in all levels.

210 New potential participants were invited to participate in the study until no more
211 relevant information related to UPF consumption emerged from the interviews, and
212 information started to repeat the conceptual categories that were already defined. No new
213 information was being observed by the 34th participant. After that, six new participants were
214 included to test saturation, which was considered reached as the new interviews corroborated
215 the created categories and did not present new emerging themes (Morse, 2015). The final
216 sample consisted of 40 women. All the steps to reach the final sample are presented in Figure
217 1.

218

219 Figure 1. Steps to create a subsample from the MINA-Study cohort according to the
220 frequency of UPF consumption



221

Data production

Quantitative data collection preceded the in-depth interviews and informed the participants' sociodemographic characteristics (age and level of education), frequency of UPF (sugary drinks, chips, crackers and instant noodles) consumption and anthropometry. All data collection and measurements were performed by trained interviewers.

In-depth interviews were performed by a female, non-local researcher who lived in the city for around a month after each quantitative wave. Interviews were performed at the participants' houses according to their availability. The interview guide investigated aspects of the eating practices discussed in the Brazilian Food Guide, namely: (1) regularity of meals, (2) food shopping, (3) learning, practice and sharing cooking abilities, (4) planning food-related activities, (5) eating out, and (6) nutrition and eating information sources. The guide followed a set of initial open-ended questions (e.g. can you tell me about the foods that you eat?), intermediate questions (e.g. can you tell me about how and when you learn new recipes?), and ending questions (e.g. in your opinion, what are the barriers to eat healthy in Cruzeiro do Sul?) (Charmaz, 2006). The whole interview guide is presented as supplementary material.

All interviews were fully audio recorded and subsequently transcribed. The researcher listened to recordings, read transcripts, and noted points to clarify at a subsequent visit, which occurred from two weeks to three months after the first interview. In addition, as data analysis in grounded theory is performed concomitantly to data production, during the fieldwork the researcher initially coded transcripts and created memos that highlighted hypothetical factors promoting UPF consumption that were expanded in the second interview. Field notes with the researcher's descriptions, perceptions and insights were recorded in a notebook after each day of fieldwork.

Ethical considerations

The MINA-Brazil Study and this 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). All the participants were read the contents of the consent forms and given the opportunity to ask questions before giving written consent for participation.

Analytical approach

In-depth, qualitative interviews were analysed through codification. Emerging coding was performed in four phases: initial, focused, axial and theoretical coding, following Charmaz's (2006) recommendations. During field work, one researcher (PdMS) performed initial coding with line-by-line codification to help separate data (interviews and field notes) into categories, see processes, compare data with data, and identify gaps in the data (which were addressed through subsequent interviews). After analytic directions had been identified through the initial coding, categories were discussed with another researcher (MTC), followed by data-to-data comparison to create focused coding. The use of multiple views during coding was described by Jonsen and Jehn (2009) to increase a grounded theory study's validity and reliability.

Through focused coding, initial codes that made the most analytic sense to categorize the data were selected. Then, data was compared with the codes, helping to refine them. Subsequently, axial coding was performed to bring data together again as a coherent whole. For that, PdMS created subcategories of the main categories and analysed the links between them. These components helped to make sense of the data. Finally, theoretical coding was performed to define the properties and dimensions of each category and subcategory, integrating them into a theory. At the end of theoretical coding, final conceptual categories

and the relation between them were discussed with another researcher (JW). Relations between categories were further analysed and a conceptual model was built. Memos were recorded through all phases and helped organizing insights and refining conceptual categories. All data was produced and analysed in Portuguese, with quotes selected to illustrate categories in the results section being later translated to English.

RESULTS

Participants' characteristics

Our participants comprised 40 mothers, with ages from 17 to 43, being 18 from 17 to 25 years old, 17 from 26 to 34 years old, and 5 from 35 to 43 years old. Ten had nine or less years of formal education, 19 had between 10 to 12 years of formal education, and 11 had 13 or more years of education.

Although participants were initially classified according to their UPF consumption, conceptual categories were similar across both groups, indicating that, despite the different patterns of food consumption, there were broad factors promoting UPF consumption in that population in general. This means that, although one group had low UPF consumption and the other one had high UPF consumption, many of the factors promoting UPF eating were similar to both of them. Thus, what differentiated the final UPF consumption, making it frequent or not, was how important some of the below-mentioned codes (such as caring or role of taste) were to the participant. For this reason, although respondents' UFP group are specified after each code, the groups are not disaggregated in the remainder of the results section.

Food choices, eating practices and environment

Our results point to the importance of the context in promoting UPF choice and consumption, highlighting two main factors, represented by the categories "food environment" – which created the concrete possibilities for food acquisition, and helped build the desires and aspirations for food consumption –, and "sociocultural environment" – which affected practices and values through social norms and shared experiences. Aspects of the context contributed to two main personal factors influencing participants' UPF consumption, one concerning practices, "cooking behaviors", and the other concerning preferences, "food tastes".

Other factors such as economic and time constraints were also important and competed to shape eating practices through interactions with participants' tastes, cooking practices and environments. The main conceptual categories are presented as subheadings of the results section, with subcategories placed in quotation marks and bold letters (Table 1).

Table 1. Categories and subcategories based on food choices of 40 mothers living in Cruzeiro do Sul, Acre

Categories	**Subcategories**
Food environment	changes in the food environment
	restaurant advertisings
	new recipes
Sociocultural environment	daily meals
	special meals
	healthy foods
	unhealthy foods
	Health
	Appearance
Cooking behaviors	Caring
	cooking as an obligation
	cooking skills
	UPF ingredients
Food tastes	role of taste
	preferences for UPF
Interactions	money limitations
	time limitations

Food environment

The food environment concerned all the environmental aspects that affected the participant's acquisition, preparation and consumption of food. It included food availability

and affordability, as well as visual materials about food, such as advertising (Glanz, Sallis, Saelens & Frank, 2005). The participants referred to physical and virtual spaces that complemented each other in the construction of the food environment.

The physical food environment was characterized by a low diversity of food products and places to eat out. Although the number of food options has improved greatly since 2011, with the opening of the road BR-364 that connects the city to the state capital, access to the city is still difficult. For the participants, this lack of access resulted in fresh foods arriving from other regions being of poorer quality and more expensive than the foods produced locally. However, even fresh produce from the region – in particular, red meat, some fruits and some vegetables – was also not always affordable. *"Everything is very expensive, even what is from the region. The meat is from here, the pork is from here, but it is all very expensive" (Participant 40, high UPF).*

Despite comments about the lack of food diversity, during the time that the fieldwork took place, it was possible to observe and to hear about **"changes in the food environment"**, with an increase of UPF types in stores and fast food restaurants around the city. "*Now, in these last years this "x-tudo" (x-tudo or "cheese-everything", if translated literally, is a sandwich composed by burger, lettuce, shoestring fried potatoes, canned corn, bacon, UPF sausage, mayonnaise and ketchup), these burgers have appeared. We didn't have these carts selling these, now every corner has one, earlier it wasn't like this" (Participant 22, high UPF).* Such options seemed to be liked by the participants to break the monotonous meal routine. "*Sometimes we take one, two or four nights a month to eat out, to eat a barbecue, a burger, something different (Participant 3, low UPF).*" Participant observation allowed us to notice that hamburgers and sandwiches often included UPF ingredients such as cooked ham, UPF sausages, bacon, shoestring potatoes, among others, indirectly promoting the consumption of many UPF ingredients. Such meals also promoted UPF through beverages, as

burgers were most often accompanied by sodas. *"Every Friday, Saturday… On weekends I eat a burger and drink a soda" (Participant 3, low UPF).*

The virtual food environment was accessed mainly through social media. While participants felt that there were limited options in CZS's physical food environment, Facebook displayed a range of **"restaurant advertisings"** which were cited by participants as places they desired to go to, even if they couldn't afford it: *"I would like to eat in that bakery on the top of the São José mount… I always see it… I follow it on Facebook... I have passed in front of it, but have never gone inside…" (Participant 12, low UPF).*

The virtual food environment was particularly important in the dissemination of **"new recipes"**. However, those usually included UPF ingredients. *"I like to get recipes from the internet for the weekends, to eat something different […] The last one that I learned was a pasta recipe, very good. It had ham, cheese, meat, canned mixed vegetables, and white sauce" (Participant 21, high UPF).*

Sociocultural environment

The sociocultural environment was an important space for the manifestation and perpetuation of the meanings that the participants gave to food and to their roles as mothers. These meanings and understandings interacted with the participants' eating practices, and therefore to their UPF choice and consumption.

To understand the participants' reasons for UPF choice, it was important to approach how they classified meals and foods. Two main food classifications were observed: daily vs special meals, and healthy vs unhealthy foods.

Foods composing participants' **"daily meals"** were more traditional and based on non-processed foods. The traditional meal was composed of rice and/or manioc flour, (sometimes) beans, a type of meat (non-processed foods – beef, chicken, fish – or UPF –

canned cooked meat, sausage), and occasionally a salad. Juices (non-processed or UPF) usually accompanied the meal. *"Lunch is rice, some pasta, beans and something fried. It is just when we are in a hurry that we eat canned meat, but it's rare here in the house, it's mostly chicken" (Participant 22, high UPF).*

For **"special meals"**, on weekends and special occasions, UPF were more frequent. Participants ate barbecued meat, pasta, pizza, burgers and hot dogs. Those meals were usually accompanied by sodas. *"Yesterday it was my teacher's birthday. We did a little party here. Everyone came at the end of the day… We made a barbecue, everyone brought a piece of meat […] and soda" (Participant 39, high UPF).*

Identifying what participants considered (un)healthy was central to interpreting their UPF consumption, as it would allow us to relate our scientific language to their native categories. **"Healthy foods"** for most participants were vegetables. *"For me, healthy eating is to eat boiled foods, not fried, without oils, and with vegetables… salads…" (Participant 14, low UPF).* However, a few UPF were considered healthy, sometimes healthier than traditional processed foods. Those were the foods that would be used in weight-loss diets (such as light cream-cheese, meal replacement shakes, light toasts and low-fat yogurt).

> *"Low-fat cream cheese is something that I really like, but it is much more expensive than a can of butter. I used to eat it a lot. Light cream crackers with low-fat cream cheese, is there anything better than that? There isn't! It's healthy, but you end up not buying because it is too expensive and you have a child to raise…" (Participant 6, low UPF).*

Most of what was considered **"unhealthy foods"** comprised UPF, such as chips, crackers, candies, instant noodles and soups, and sodas. Those "industrialized foods" were considered harmful to health and "fattening". *"Most people don't eat well, they eat those*

industrialized foods. That's why here in Cruzeiro there is a high rate of obesity" (Participant 3, low UPF). Although participants did not mention foods' processing level, their idea of what was healthy somehow reflected in a lower consumption of UPF.

The social group in which participants were located exerted important influences on their eating practices, either because it set social norms that participants incorporated (due to being responsible for the family's health) or because the experiences of those around them affected their thoughts about food. Being women and mothers, two striking food-related concerns were observed among our participants: **"health"** and **"appearance"**.

When concerned about **"health"**, participants usually mentioned a health condition of their own or a family member's, which resulted in them worrying about eating healthily.

> *"Yes… because I don't really like to give him [son] fatty foods, because his grandmother has high triglycerides. So, we think about her [grandmother], him [son] and the two of us [couple], because if we eat too much grease, we will be like her when we get older, having to diet and eating only grilled foods" (Participant 16, low UPF).*

To other participants, worrying about health started after they became mothers and began to be responsible for their children's health.

> *"It was only after the girls were born, you know… Because when they were born I was concerned, so you take them to the paediatrician. The paediatrician starts to tell you about eating healthy... and then you start trying to make healthier foods so your kid has healthier eating" (Participant 4, low UPF).*

When the concern was focused on **"appearance"**, there was sometimes an intersection between what is considered appropriate food to lose weight, and healthy foods. Concern about body weight did not always lead participants to eat less UPF – which can be understood by the participants' idea of UPF designed for slimming diets as being healthy (as presented in the "food classifications" subtopic). *"Now I am on a diet. I have a personal gym instructor and am seeing a nutritionist. Then, in the morning I have a diet shake [for breakfast] … It has all the nutrients… You drink it and you don't feel hungry (participant 8, low UPF)"*.

Cooking behaviors

Cooking was closely related to social norms and the resulting responsibility that the participants had for taking care of their family. Cooking had objective and subjective components that shaped this practice to rely to varying degrees on UPF.

The objective component concerned doing the activity itself; that is to say, cooking at home on a daily basis. Surprisingly, participants that cooked did not necessarily eat less UPF than the ones that did not cook. This happened because the participants that did not cook were often relying on other women, mothers or housekeepers, to prepare their meals. They were of two kinds: (1) women with higher education and SES that worked outside home and paid someone else to cook in their houses, and (2) young women still living with their mothers who did not have responsibility for the family's food. The first group was concerned about health and because of that avoided the foods that they didn't consider healthy, consequently eating few UPF.

"Interviewer: - who cooks in your house? Participant: - The woman that works there. But every day, before I go to work, I tell her if she should make

fish, chicken, beef… I tell her what to cook […] my husband and I are hypertensive, so we try to have a diet without too much fat or salt" (Participant 4, low UPF).

The second group had home-made meals available (made by their mothers), but often ate snacks, as they were not as worried about eating healthy – consequently eating a lot of UPF.

"*Most of the time I eat junk, soda… For lunch it's meat... in my mom's house it's rice, beans, I don't like eating them, but sometimes I do […] I haven't been feeling like cooking lately, so it's been just my mom cooking. I live behind her house, so we [her, husband and daughter] spend most of the time here. We [both nuclear families] eat all together" (Participant 32, high UPF).*

The subjective component was related to the meanings given to cooking and the feelings associated to it. Most participants were the main – and most of the times the only – person responsible for cooking in their houses, whether they liked it or not. Participants that liked to cook attributed a **"caring"** meaning to this activity that outweighed the negative aspects related to cooking every day:

"I like to cook. I like it a little. Sometimes... like, it is a little annoying cooking every day because you come from work and sometimes you are just not inspired. But, [I?] like it… I always cook. I like cooking because then I know what I am giving to my daughters, to my family. When you buy something ready to eat, you don't know how that was made" (Participant 19, low UPF).

The centrality of the caring meaning to the participants' cooking behaviors was highlighted when they talked about the foods they made for themselves when their children and husband were not home. "*I do [cook] because I am always with the boys, but when I am by myself I just eat something quick" (Participant 19, low UPF).*

However, not all participants incorporated the socially expected caring meaning to the activity, seeing **"cooking as an obligation"**. In those cases, mothers did not like to cook and were more likely to use practical UPF foods. "*Participant: - I don't like to cook, but I have to, so I do it with love, but I don't like to. Interviewer: - And what do you cook? Participant: - Rice, hotdog sausages, canned meat, eggs… anything fast" (Participant 33, high UPF).* Being the only person responsible for all the cooking (and household chores) was difficult for all participants, and even those who worried about healthy eating sometimes had to appeal to practical options: "*I think that in the house we need to have the practical and the healthy… Because sometimes we don't have time to make the healthy" (Participant 16, low UPF).*

"Cooking skills" could help participants deal with some of the time constraints, as they developed several strategies to be able to cook fresh foods in less time or have them ready quickly, namely: pre-preparing the night before – "*When I get home [from work] I must season [the meat], otherwise I don't have time in the next day. When I don't do it, I chose fast options, or I don't have time to cook" (Participant 31, high UPF)* –, cooking more in a meal and saving it for later – "*I cook a lot of beans in one go and freeze them in little portions*" (*Participant 22, high UPF*) –, and pre-preparing the food for someone else to complete the meal – "*When I work I always season the food at night and leave it ready to cook, so whoever arrives first just put it on the pan" (Participant 29, high UPF).*

"Cooking skills" were also important to escape from food monotony presented by the food environment, particularly on special occasions. Combined with the recipes available on

social media, cooking **"special meals"** sometimes contributed consumption of UPF within food preparations. *"I made a chicken mayo. You cook the chicken breast, shred it, add the potato, the carrots... it's very easy… the cream and the mayo. And you finish it with chips on top" (Participant 38, high UPF).* In this example, although the chicken used was non-processed, the mayonnaise and the chips were UPF.

However, some **"UPF ingredients"** were not restricted to weekends and special occasions. UPF seasonings, such as stock cubes and industrialized seasoning powders, were used almost every day in meats and soups. They did not substitute non-processed herbs and spices, but were added to them to *"give an extra taste" (Participant 15, low UPF).* Sometimes UPF that could be considered meals by themselves were used as ingredients, in particular instant noodles and canned cooked meat. Interestingly, the use of such foods was not always related to practicality. While canned cook meat was used to provide a fast meal (especially among those that ate substantial UPF), instant noodles were used to make time-consuming soups (especially among those that did not eat substantial UPF).

Food tastes

At the beginning of the interview, many participants that had high UPF consumption, in particular the younger ones, presented themselves as *"unhealthy eaters" (Participant 36, high UPF).* In those cases, the **"role of taste"** was the main aspect for the food choices, as these were not based on money limitations, time constraints, or health. *"I have gastritis. The doctor told me that I shouldn't eat too much candy, that I should have something savory sometimes… But I only eat candy and sweets" (Participant 39, high UPF).* Often these participants also rejected many homemade and fresh foods. *"I just eat snacks. For example, today I cooked lunch for them [family], but didn't eat it, lately I don't feel like it" (Participant 37, high UPF).*

Our results point to some of the factors that may help build **"preferences for UPF"**, highlighting the increase of UPF options as well as social media incentives to eat them through recipes and advertising (presented in the virtual food environment). The taste for UPF seemed to exert a weaker influence on participants' food choices when they had incorporated health discourses. *"I started going to the gym, to work out, and to only eat healthy foods. Then I completely cut sodas out of my life. I don't eat canned foods, none of that stuff" (Participant 15, low UPF).* In those cases, foods considered healthy sometimes occupied the status of a favourite food. *"Girl, what I really like to eat is lots of fruits. I really eat a lot of fruits" (Participant 15, low UPF).*

Interactions with money and time limitations

Although financial constraints prevented many participants from eating more fruits and vegetables, meat was highly valued and therefore was rarely missing in meals. Because of that, **"money limitations"** promoted some UPF consumption, as fresh meats were substituted with cheaper UPF options. *"[We buy sausage] because it's cheaper… Just because the meat is expensive now. If you buy the sausage, one sausage feeds two people" (Participant 9, low UPF).* Our results show an important interaction between the participants' financial situation and what they valued in food, e.g. food's taste or its effects on health. Valuing health sometimes resulted in mothers circumventing financial problems to commit to healthy eating at the expense of other needs. *"If I was going to buy four soap packs, I buy only three… or two, and use the money to buy some meat, some chicken, you know?" (Participant 1, low UPF).*

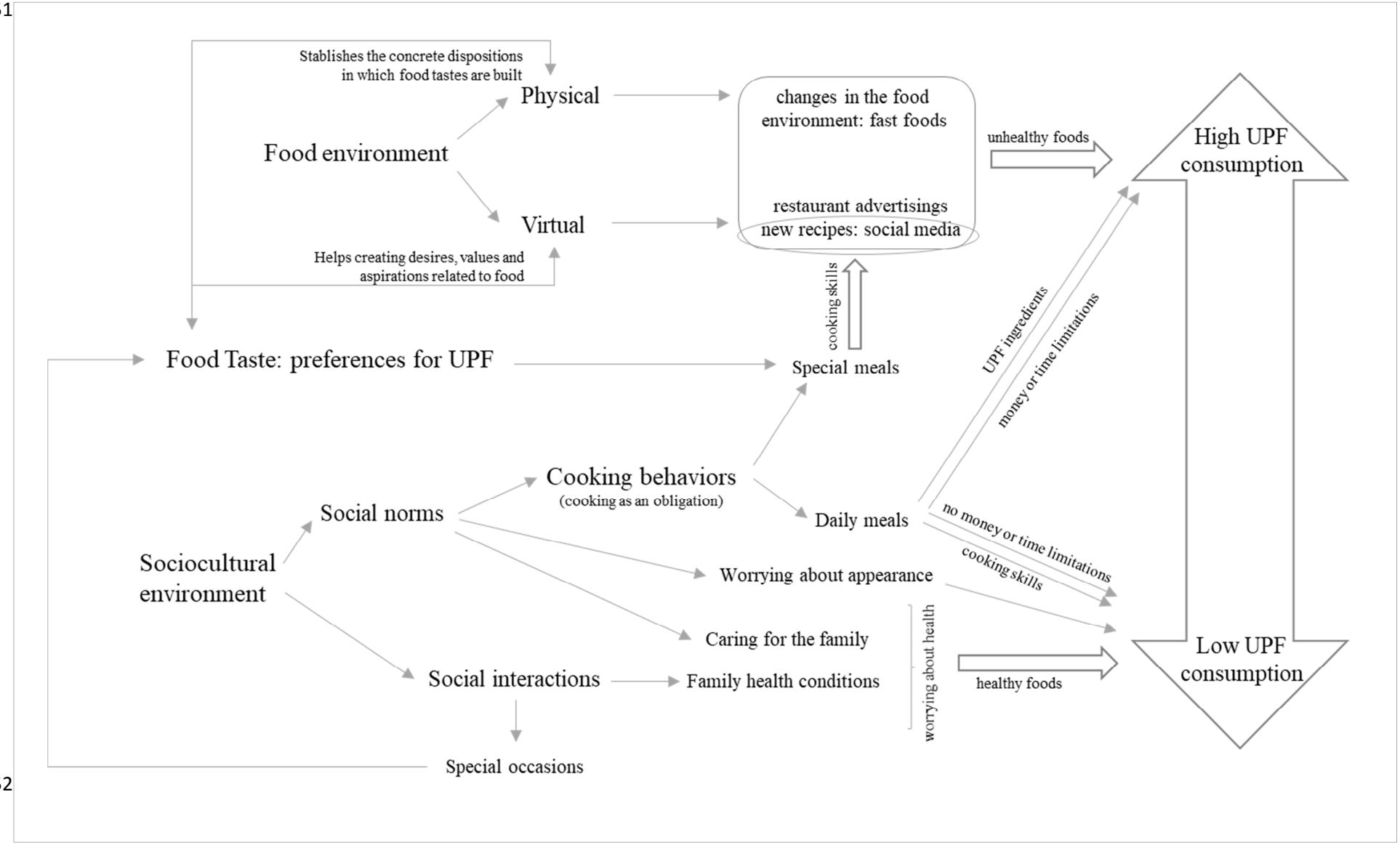
Values given to food emerged through a combination of many factors. As presented in the sociocultural environment section, motherhood and health problems promoted awareness about healthy eating to some participants. However, our data suggest that there are additional

interactions that contributed to food choices, with **"time limitations"** highlighting the role of convenience and showing that not all healthy foods that participants were willing and able to afford were consumed because of time-scarcity. *"When I started to feed my son instant soups, I was worried because it is transgenic, we have studied about this [at the university]. I don't like giving those [instant soups] to him. But sometimes we are obligated to eat it, because it is the only way" (Participant 16, low UPF).* In this matter, participants with particularly higher economic status guaranteed the lowest consumption of UPF, as they could afford someone to cook for them.

Figure 2 illustrates the main interactions between environmental factors and eating practices promoting UPF consumption.

550 Figure 2. Interactions between factors (categories and subcategories) promoting high and low UPF consumption.

551



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Discussion

Our study was the first to qualitatively investigate factors promoting UPF choice and consumption through an inductive perspective on mothers' experiences, in the context of recent urbanization and nutrition transition. The grounded method constructionist approach was important for understanding the most relevant aspects in mothers' lives contributing to UPF-related eating practices, and the interaction of such forces.

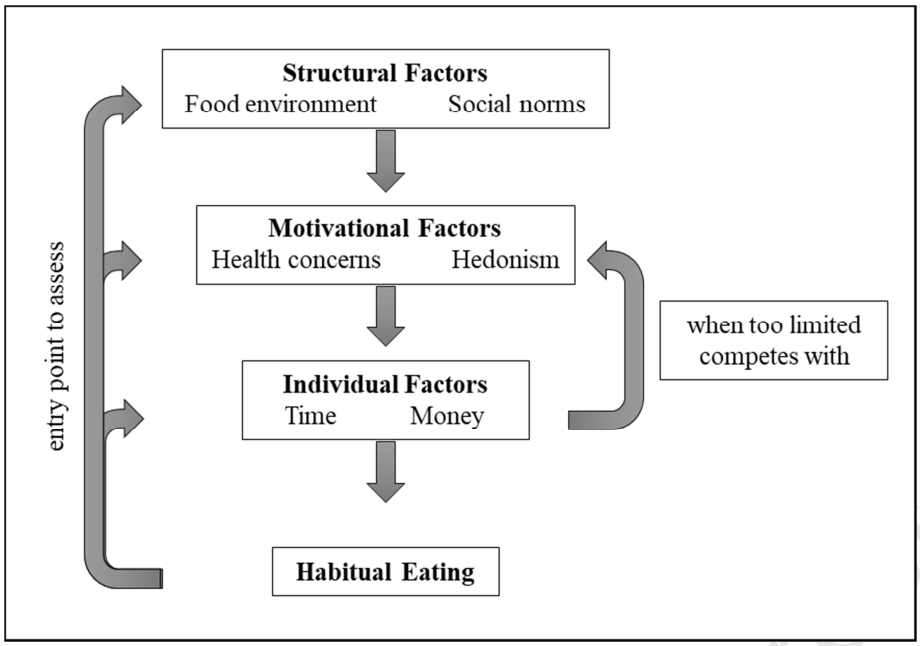
In our model, we identified structural (food and sociocultural environments), motivational (healthy or hedonic inclinations) and individual (money and time available) factors affecting UPF choices among mothers living in Cruzeiro do Sul, Acre (Figure 3). In contrast to Sleddens et al.'s (2015) review, in our study structural – and not habitual – factors were the main influences on food choices. Habitual factors, on the other hand, were the result of structural, motivational and individual factors. This means that, although habitual food choices were a good entry point to understand what and how much UPF participants were choosing, and how it interacted to every day negotiations with time and money constraints, they were not enough to understand the material and symbolic conditions in which habits were developed or changes in UPF choices.

In our study, structural factors were the main influence on UPF choices, as they were important parts of the participants' context, creating the material and symbolic conditions for choosing UPF. This means that food environment and social norms delimited the options of food and food-related practices that participants could choose from. Thus, our model highlights the importance of the food and social environments when studying UPF choices. Sleddens et al. (2015) also acknowledged the importance of structural factors, which was highlighted in their review by the large number of studies with a social-ecological perspective, suggesting that the approach has been gaining influence.

A second level of influence on UPF choices was related to motivational aspects (Sleddens et al., 2015), personal systems (Sobal & Bisogni, 2008), and psychological factors (Köster, 2009) – in other words, it concerned personal meanings, values and beliefs that translated structural factors into attitudes and motivations. Köster (2009) divides psychological factors into unconscious and conscious, indicating that the first would be more relevant in influencing food choices. However, in our study, while unconscious psychological factors (hedonic appreciation and past behavior) were important influences in UPF choices, they only prevailed if the participant did not have a conscious healthy eating motivation (commonly linked to a health problem in the family). Thus, prioritizing foods' tastes competed with valuing health. This dynamic influenced UPF choices, as the more health was valued, the less UPF was eaten.

The third level concerned individual conditions that comprise everyday negotiations, particularly the ones related to time and money. This means that, in concretizing motivational aspects into practices, participants food choices were under the influence of money and time conditions. We considered that money and time shaped the influence of motivational aspects – health valorization and taste valorization – instead of competing with them at the same level, as sometimes people with restricted money or time created strategies and negotiations to afford and prepare healthy meals, as well as people that had both resources could also like and eat a lot UPF. Nevertheless, it is important to note that when money and time were too limited, they could compete with motivational aspects, promoting fast and cheap UPF.

Figure 3. Ultra-processed Food Choice Model based on interviews with 40 women living in an urban setting in the Brazilian Amazon



Our results provide evidence of the web of food environmental factors interacting with UPF consumption that go beyond local physical barriers and reflect a globalized virtual food environment. To date, however, studies about eating and social media have mainly focused on disordered eating (Tan, Kuek, Goh, Lee & Kwon, 2016; Walker et al. 2015; Hummel & Smith, 2014). In this study, social media had an important role in the food culture through influencing cooking practices and knowledge of culinary preparations. Thus, we emphasize the importance of incorporating the food environment's virtual dimension in further food environment studies.

Corroborating the importance of life trajectories for the food choice process, as presented by Sobal and Bisogni (2009), our results highlight two important turning points in some participants' lives associated with decreased UPF consumption: becoming a mother, and experiencing health problems (or having someone in the family experiencing them). Our observations add to other work on motherhood and disease as important influences on healthy eating (Maher & Lowe, 2015; Wethington, Cooper & Holmes, 1997). However, in contrast to the life trajectory study performed by Wethington et al. (1997) among middle-aged and older women in the United States of America, where women's food choices changed after life-

changing events, such as a life-threating disease diagnosis, among our participants diseases that required dietary changes, such as diabetes or high blood pressure, were enough to raise aware for healthier eating.

In our study, aspects of gender construction were the main bridge between sociocultural and personal factors. That is to say that participants had incorporated social rules that contributed to creating the meanings and circumstances that shaped their personal experience of cooking and eating. Our observations reinforce the centrality of social roles in mothers' eating practices, as discussed by DeVault (1991). Corroborating DeVault's assumptions in the 1990s and other more recent studies in Brazil (Sato et al., 2014; Assunção, 2008), our results show that women are still primarily or solely responsible for feeding the family. Even when the participant did not actually cook, she still chose what was going to be prepared, while delegating cooking to another woman. However, this role and the responsibilities that came with it presented a dual relationship with UPF choice and consumption. Although the commitment to offering healthy food to the family helped participants and their families eat less UPF, the unequal domestic labour distribution also stimulated the use of convenient UPF.

The burden of taking care of the family and the unhealthy food strategies that might result from this task raise the issue of the importance of sharing food-related responsibilities among men and women. This means not only sharing the purchase and preparation of food, but also the mental work that comes with it, such as caring for the family's health. Recognizing the interaction between the activity of cooking for the family and the meanings given to it is important for programs promoting cooking and healthy eating, as the focus on only sharing cooking activities without sharing responsibility for the family's health could increase the consumption of UPF. For example, if fathers start cooking more often without incorporating the idea of taking care of the family's health, they could reach for convenient,

high palatable UPF, as did our participants that were not preoccupied with health but cooked daily as an obligation. This idea is also supported by Lora, Cheney and Branscum's (2017) qualitative study with Hispanic mothers that described that women felt a lack of support for creating a healthy home food environment from their partners, who brought home high-calorie foods and sugary drinks and displayed an indulgent parental feeding style.

Gender constructions could also have influenced the participants' concerns about appearance, which sometimes promoted UPF consumption. Our results add to the discussion of unhealthy practices linked to the desire for lean bodies. Unlike other studies discussing this issue, we did not observe very restricted eating (Wellman, Araiza, Newell & McCoy, 2018) or compensatory practices in our sample (Rohde, Stice & Gau, 2016). Instead, our results indicate that not all foods considered healthy met this criterion, especially those aimed at weight-loss diets. Our participants' misperceptions reflected the intersection of health and beauty discourses perpetuated by the media (Paquette, 2005). Characteristics of the setting, such as the important virtual environment and recent urbanization, could have promoted confused understandings of healthy foods through promoting non-linear health discourses embedded with the contradictions inherent to being mediatized through different vehicles. Thus, further research will be important for understanding the role of the media discourse (including the social media) on the healthy eating perceptions in different contexts.

Even though Cruzeiro do Sul's food environment was very different from those of more urbanized settings, our results point to a better understanding of the relation between the search for food diversity – which is also present in many other urban settings – and the role of UPF in this dynamic. Our results highlight the paradoxical role that UPF foods and ingredients play in relation to food diversity. While UPF may represent to consumers a "change from the routine" or a "new, different food", they contribute to loss of culinary and taste diversity, as their technological production favours products with uniform, pasteurized

667 tastes, designed purposely to please many people without challenging palates (Fischler,
668 1998). Furthermore, accessibility issues facilitated the entrance of long-life shelf foods, so
669 new accessible foods were often UPF. Thus, our study highlights complex relationship
670 between UPF and food diversity, and the need for more studies investigating this interaction
671 in other settings, such as more urbanized ones.

672 It is also important to take into consideration, when discussing the construction of the
673 taste for UPF, the incorporation of such products as ingredients in culinary preparations. In
674 our study many participants liked UPF seasonings, reinforcing the hyper-palatability of UPF
675 and demonstrating their appeal. This observation suggests that studies on UPF-related eating
676 practices should approach UPF not only as a convenient ready-to-eat option, but also as a
677 very high-palate ingredient that reflects and reinforces the taste for UPF. This sheds light on
678 the importance of considering types of ingredients when studying cooking and indicates the
679 need to encourage the use of non-processed or minimally processed ingredients instead of
680 UPF ones when promoting healthy eating through cooking practices.

681 Finally, our study has some limitations. One inherent aspect of eating practice
682 interviews is the fluidity of eating discourses and behaviors, meaning that a participant could
683 give very distinct responses to the questions on different days, either because they started to
684 behave differently or because their opinions changed. However, we believe that interviewing
685 participants more than once helped to recognize content that was not very coherent, leading
686 us to concentrate on robust, repeated responses while also reflecting on any inconsistencies
687 observed. Additionally, our decision to focus on only mothers could be considered a
688 limitation, as it leaves out important practices performed by the other family members. It is
689 important to recognize that fathers and other caregivers may also play crucial roles within the
690 families' meals, and that if studies do not include them, the nature of those roles are never
691 going to be acknowledged in the scientific literature. However, in our study, the decision to

select mothers was supported by specific reasons particular to the cultural context in which the study took place, which still keeps a very traditional gender division of labor where women are solely responsible for domestic work and family care (Pessoa, 2004). Therefore, it is important to highlight that the specificity of the study setting may make some of our observations unsuitable to other groups.

Conclusion

In this study we observed environmental and personal factors influencing UPF choices and consumption among mothers living in the Brazilian Amazon. The food environment had physical and virtual components that contributed to liking UPF and cooking with it, respectively. The sociocultural environment helped to define food classifications. What people considered “food for special occasions” had a big intersection with UPF, and what was considered “healthy foods” were mostly non-processed or minimally processed foods. The sociocultural environment also had a great influence on participant’s social roles as mothers. The main personal factors were cooking practices and taste. While taking care of the family’s health (which was related to social roles) prevented women from choosing UPF, the role of UPF in making foods tasty was valued more highly among those who ate more UPF. Money and time were important for enabling healthy eating among people that valued it, but having them was not synonymous with healthy eating, as participants health values were also based on other personal factors. On the other hand, when money and time were very restricted, UPF were more frequently chosen and eaten, even if the participant wanted to eat healthily. Our results point to the complexity of UFP choices and suggest that further studies incorporate the virtual food environment and gender roles to improve understanding of contemporary eating practices. Among the implications for public health initiatives are the importance of promoting trustful information on issues such as weight-loss, traditional

717 culinary preparations as palatable options, division of food-related responsibilities among
718 family members, and access to healthy affordable foods.

719

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