



## Beyond price and income: Preferences and food values in peri-urban Viet Nam

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### ABSTRACT

Sub-optimal diets are one of the most important risk factors contributing to the global burden of disease. Developing a better understanding of the drivers of food choice, including the role of individual preferences, is important to address this issue. The objective of this mixed methods research was to identify the relative importance of preferences for different food quality attributes (e.g. nutrition, food safety, price and convenience) that might influence shopping habits and food choice in the context of a rapidly changing peri-urban food environment in Hanoi Province, Viet Nam. A total of 264 women were randomly selected and interviewed using Best-Worst Scaling to elicit preferences among food quality attributes for different food groups (leafy green vegetables, fruits, instant foods, snack foods). A subset of these respondents (n = 40) participated in focus group discussions in order to explore their preferences and food values in more detail. The food quality attributes considered to be most important varied by food group with nutrition and food safety (both immediate and future health) ranking highest for leafy green vegetables and fruits, convenience for instant foods, and taste for snack foods. Price was considered least important across all food groups. Focus group discussions reinforced these results with additional insights particularly regarding trade-offs between nutrition, food safety, convenience, and price. This research demonstrates the feasibility of identifying important drivers of consumption in a South East Asian context using Best-Worst Scaling. These results could help inform the design of behavior change interventions and guide food system policies that seek to shift consumer choices towards healthier diets.

### 1. Introduction

The global food system has changed rapidly in recent years, with large shifts in the food supply, international trade and food manufacturing, as well as individual consumer behavior and dietary patterns (HLPE 2017; Popkin 2017). The nutrition transition in low- and middle-income countries (LMICs) (Popkin 2015), especially in Asia (Baker & Friel, 2014), involves rising levels of overweight, obesity, and non-communicable disease (Ashfin et al., 2019). Given that six of the top 11 risk factors driving the global burden of disease are related to diet (Forouzanfar 2015), developing a better understanding of the drivers of food choice, including individual preferences, is urgent (Haddad 2020).

Few countries have undergone such rapid development as Viet Nam in recent decades, from one of the poorest countries in the world to an emerging economy with robust economic growth. Accompanying these

economic changes have come changes to the food system and dietary patterns, in turn contributing to the nutrition transition (Harris et al., 2020). Viet Nam has been successful in driving down its stunting rates to 19%, from approximately 50% in the mid-1990s (Keefe, 2015), however in roughly the same period, overweight and obesity increased from 3% to 15% (Nguyen and Hoang, 2016). Furthermore, recent longitudinal data from Hanoi shows that in children and adolescents, overweight and obesity increased from 9% to almost 17% in three years alone (Do et al., 2017). Non-communicable diseases are also on the rise and responsible for an estimated 72% of total deaths in Viet Nam in 2010 (Nguyen and Hoang, 2016). Dietary risk factors in Viet Nam include low consumption of fruit and vegetables (80% of population consumes less than 400 g/day), concomitant with high consumption of salt, instant noodles, sweetened beverages, and other processed foods (Bui et al., 2016; Nguyen and Hoang 2016).

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Food preferences are an important determinant of food choice (Lyerly and Reeve 2015; Steptoe et al., 1995). The economic literature on food choice distinguishes among three mechanisms by which food environments alter dietary intake: income, prices and preferences. Preferences may reflect specific attributes of foods that influence consumer choice at a given level of income and prices (Herforth and Ahmed 2015; Finaret and Masters, 2019). As incomes rise and more diverse foods become available in the food environment, modifiable preferences are likely to play a larger role in food choice in LMICs. In the lowest-income settings, households may have very few options given their budget constraints, while individuals in middle- and higher-income settings with more disposable income, will have access to a wider variety of food choices including more processed and imported foods. Despite the potentially important role of food preferences in determining food choice, individual preferences in LMIC contexts have been largely overlooked and are rarely accounted for by public health nutrition practitioners.

The aim of this study is to better understand the importance of different food attributes for consumers in the context of a rapidly changing peri-urban food environment in the lower middle-income country of Viet Nam. This research contributes to the literature in several ways. Primarily, to our knowledge this is the first study to investigate a wide set of food quality attributes (food values) across different food groups in a LMIC context. Similar research has been conducted in high-income countries but applied to all food as a general category (Bazzani et al., 2018; Lusk and Briggeman 2009; Ellison et al., 2021). Secondly, while standard practice is to carry out either a quantitative or qualitative approach when measuring preferences for different food quality attributes, we use a mixed methods approach in order to triangulate our quantitative results with qualitative insights from focus group discussions. Lastly, this research demonstrates how a method developed in the field of marketing to understand consumer behavior can be leveraged for public health nutrition purposes in LMICs and in doing so fill an important research gap related to food preferences.

## 2. Methods

### 2.1. Study setting

This study took place in Thanh Oai District (population approximately 166,075), a peri-urban area close to Hanoi in northern Viet Nam and was carried out in partnership with the Viet Nam National Institute of Nutrition. Viet Nam is a country in transition with about half its population engaged in agriculture, 18% working in non-farm self-employment, 32% employed through wage work, and with high levels of education (74% secondary school attendance). Compared to the national average, the district of Thanh Oai has a smaller agrarian population (34%), and larger non-farm self-employment (38%), with the remainder engaged in wage work (28%), and slightly higher levels of secondary school attendance (81%) (World Bank).

### 2.2. Data collection

This study was nested within the INDDX Project's validation study of INDDX24, an innovative dietary assessment platform designed to streamline collection of quantitative 24-h dietary recall data. The INDDX24 validation study included two days of data collection for each participant. The first day consisted of an observer weighed food record, followed by a second day in which interviewers conducted a 24-h dietary recall (using either pen and paper or INDDX24). Interviewers administered the food preference module on a tablet, immediately after the dietary recall (Coates et al. In preparation).

All data collection took place in August 2019. Respondents were randomly selected from a sampling frame of women of reproductive age (18–49) living in the Thanh Oai District. This sampling frame was

developed by the Thanh Oai District community health service based on their record of community members. A total of 264 women between the ages of 18–49 were randomly selected for the quantitative portion of the INDDX24 validation study and the food preferences questionnaire. A sub-sample of 40 women were randomly selected from the larger sample to participate in the qualitative focus groups in which preferences and food values were discussed in more detail.

This study was approved by the institutional review boards at Tufts University and the Viet Nam National Institute of Nutrition. All respondents agreed to participate in the study and provided informed consent.

### 2.3. Instruments used

#### 2.3.1. Best-Worst Scaling module

The instrument used for measuring consumer preferences for different food quality attributes was Best Worst Scaling (BWS). BWS was designed to elicit consumer preferences for specific product attributes, including different goods, services, or policies, in which respondents are asked to identify the most and least preferred attribute (Louviere et al., 2015). This approach is based on the critical insight that all goods are a collection of attributes and therefore consumers seek out specific characteristics (attributes), not the goods themselves (Lancaster, 1966).

BWS requires respondents to identify which attribute they consider to be most important (i.e., best) and which they consider least important (i.e., worst). In contrast to other methods that ask respondents the degree to which something is important in a scale-based question (e.g., Likert scales) or asking respondents to rank a set of options, BWS forces an extreme choice, which can be more revealing than a Likert-style rating continuum and less cognitively complex than ranking multiple items (Adamson et al., 2013). Given these considerations, BWS is typically considered to be more accurate and cognitively easier for respondents compared to alternative methods (Louviere et al., 2015).

This research follows existing work by Lusk and Briggeman (2009) and Bazzani et al. (2018), who have used BWS as a way of measuring consumer preferences for different food values. The original research by Lusk and Briggeman (2009) identified common values in the literature from which they selected 11 that could relate to food preferences and referred to them as 'food values'.<sup>1</sup> These food quality attributes were further adapted by Bazzani et al. (2018) in a recent study comparing preferences in the USA and Norway.

We extend the existing literature in several ways. First, building off of the list of food quality attributes used by Lusk and Briggeman (2009) and Bazzani et al. (2018), we conducted key informant interviews and pre-survey piloting in Hanoi to test the relevance of the food quality attributes in the context of Viet Nam. Adjustments were made to the attributes based on feedback received. For example, in the case of food safety, eating food that could cause immediate illness from bacteria was thought of differently from food safety concerns that could cause illness later due to chemical exposure. Rather than having a single attribute for "food safety", we divided food safety into two attributes "food safety (immediate)" and "food safety (future)". Similarly, instead of having a single attribute for "nutrition", this was divided into two attributes, one related to the importance of energy (i.e., calories) for immediate daily activity and the other related to foods that confer longer term benefits for future health. Table 1 presents the food quality attributes that were used in the study. In addition, the definitions following each of the food quality attributes was adapted for use in Viet Nam.

While the previous authors included either "novelty" (Bazzani et al.,

<sup>1</sup> While some of the literature uses the term "food values", Bazzani et al. (2018) pointed out that the phrase "food quality attributes" better reflects what is being studied – the consumer's preference for different food attributes rather than a higher-level construct related to values, therefore, we use "food quality attribute" instead of "food values" here.

**Table 1**  
Food quality attributes and description for Best Worst Scaling in Viet Nam.

| Current study  | Lusk and Briggeman (2009)   | Bazzani et al. (2018)   |
|--|---|---|
| <b>Appearance:</b> This type of food looks appealing and appetizing  | <b>Appearance:</b> Extent to which food looks appealing   | <b>Appearance:</b> The food looks appealing and appetizing  |
| <b>Convenience:</b> This type of food is easy to obtain, prepare and consume. (Eating this food is not difficult or time-consuming)  | <b>Convenience:</b> Ease with which food is cooked and/or consumed                                      | <b>Convenience:</b> How easy and fast the food is to cook and eat   |
| <b>Modernity/Novelty:</b> This type of food helps me feel connected to new trends that I value   |   | <b>Novelty:</b> The food is something new that you have not tried before  |
| <b>Naturalness:</b> This type of food is not packaged or processed   | <b>Naturalness:</b> Extent to which food is produced without modern technologies                        | <b>Naturalness:</b> Made without modern food technologies like genetic engineering, hormone treatment, and food irradiation |
| <b>Nutrition*:</b> This type of food contains things (protein, vitamins) that will make me healthier in the future, in the months and years after eating   | <b>Nutrition:</b> Amount and type of fat, protein, vitamins, etc.                                       | <b>Nutrition:</b> Amount and type of fat, protein, etc.   |
| <b>Energy*:</b> This type of food fills my stomach and gives energy (calories)   |   |   |
| <b>Price*:</b> This type of food is the right price for me   | <b>Price:</b> The price that is paid for the food   | <b>Price:</b> Price that is paid for the food   |
| <b>Food safety (immediate)*:</b> This type of food does NOT contain things that could make me sick immediately, in the next week after eating  | <b>Safety:</b> Extent to which consumption of food will not cause illness                               | <b>Safety:</b> Eating the food will not make you sick   |
| <b>Food safety (future)*:</b> This type of food does NOT contain bacteria, toxins, chemicals that could make me sick later in life, in the months and years after eating   |   |   |
| <b>Taste:</b> The extent to which the flavor of the food is appealing to my senses   | <b>Taste:</b> Extent to which consumption of the food is appealing to the senses                        | <b>Taste:</b> The flavor of the food in your mouth  |
| <b>Tradition:</b> This type of food helps me feel connected to my family and community's traditions and culture. (Eating this food is something that my parents and grandparents or friends and neighbors did in the past) | <b>Tradition:</b> Preserving traditional consumption patterns   |   |
|  | <b>Environmental impact:</b> Effect of food production on the environment                               | <b>Environmental impact:</b> Effects of food production on the environment  |
|  | <b>Origin:</b> Where the agricultural commodities were grown  | <b>Origin:</b> Whether the food is produced locally, in USA/Norway or abroad  |
|  | <b>Fairness:</b> The extent to which all parties involved in the production of the food equally benefit | <b>Fairness:</b> Farmers, processors and retailers get a fair share of the price  |
|  |   | <b>Animal welfare:</b> Well-being of farm animals   |

\* These five food quality attributes comprised the BWS short list, in addition to being part of the BWS long list. For four of these attributes, we used slightly different terms (translated into Vietnamese) during data collection, these were: 1) "nutrients for strength in the future", here we use "nutrition", 2) "satiating", here we use "energy", 3) "safety against illness now", here we use "food safety (immediate)", and 4) "safety against illness in the future", here we use "food safety (future)".

2018) or "tradition" (Lusk and Briggman 2009), our study included both "modernity/novelty" and "tradition". Based on pilot testing in Hanoi and the established foodways in Viet Nam, we determined that it was important to include both attributes in order to measure the potential importance of tradition, while also capturing the extent to which novel and modern foods, especially in the form of instant and snack foods, appeal to consumers. In addition, there were four food quality attributes that were included in previous studies but were determined not to be salient based on pilot testing in Hanoi and therefore were excluded in this study. These included "environmental impact" which was not meaningful to the respondent group in Thanh Oai, however younger consumers in Hanoi who participated in the pilot testing indicated that this attribute was important, therefore it could be relevant in future research of urban consumers. In addition, "origin" caused confusion as it was considered too closely associated with food safety and was eliminated on those grounds, while "fairness" and "animal welfare" were determined not to be relevant.

The second important change we introduced was to ask about the most and least important food quality attributes for several food groups rather than for "food" in general. Typically, existing research measuring food quality attributes asks respondents about their diet as a single, homogeneous category (Lusk and Briggman 2009; Bazzani et al., 2018; Lysterly and Reeve 2015; Steptoe et al., 1995). However, diets are heterogeneous and different food groups could be associated with different food quality attributes (i.e., more or less safety, nutrition, taste, convenience etc.). Thus, respondents were asked to evaluate four food groups separately: 1) Dark leafy green vegetables (henceforth 'vegetables'), 2) Fruits, 3) Instant foods/prepared foods (henceforth 'instant foods'), 4) Sweet and savory snack foods (henceforth 'snacks') (Table 2). These food groups were selected because they highlight cases where consumers might be forced to choose between different attributes of importance. Vegetables and fruit represent two food groups that are

regarded as an essential part of a healthy diet rich in fiber and micro-nutrients, but also have high food safety concerns in the context of Viet Nam (Ha et al., 2019; Mergenthaler et al., 2009; World Bank 2017). While instant foods and snack foods tend to be convenient and might be perceived as safer since they are often packaged and, in some cases, produced by international brands.

The enumerator gave the respondent a sheet of paper to review with the various attributes and definitions (first column Table 1) and the food groups (Table 2) in Vietnamese. The enumerator went through each food group in succession and asked the respondent to select the most and least important food quality attribute, first from the short list of five attributes, followed by a similar question where the respondent was asked to select from a long list of all 11 attributes (Figs. 1s and 2s). The same list of attributes was applied across all food groups, with the exception of the "modernity/novelty" attribute. This issue was due to a coding error in the tablet which resulted in the attribute appearing for the instant food group and the snacks food group, but not for the vegetable and fruits food groups.

Prior to answering the BWS questions, respondents were asked about their consumption habits of the four food groups of interest over the past seven days. The objective of these questions was to assess 1) whether

**Table 2**  
Food groups and examples.

|   |
|---|
| <b>Food group 1: DARK LEAFY GREEN VEGETABLES</b> (E.g., Morning glory, bok choy, Ceylon spinach, mustard greens, sweet potato leaves, chrysanthemum, leek onion leaves, pumpkin leaves, chayote leaves, watercress) |
| <b>Food group 2: FRUITS</b> (E.g., Apples, papaya, oranges, guava, pear, peaches, pineapple, banana, melon, watermelon)   |
| <b>Food group 3: INSTANT FOODS/PREPARED FOODS</b> (E.g., Instant noodles, instant porridges, sausages, pork paste, canned meat/fish, pates)   |
| <b>Food group 4: SWEET and SAVORY SNACK FOODS</b> (E.g., Potato chips, crackers, crisps, biscuits, cookies, cakes, candy)   |

respondents had consumed foods from the four food groups in the past seven days; 2) the frequency of consumption in the past seven days; 3) whether the respondents judged the quantity they consumed of each food group to be too much, just right, or not enough; and 4) the reasons respondents may not have consumed the desired amount of a given food group. This final question was open ended and was only asked of those who reported consuming too much or too little.

### 2.3.2. Measuring the food environment (personal domain)

The food environment consists of an external domain including dimensions of availability, prices, vendor and product properties, and marketing and regulation, while the personal domain includes dimensions of accessibility, affordability, convenience, and desirability (including preferences) (Turner et al., 2018). Since the majority of this study related to the desirability dimension by measuring preferences, we asked additional questions about the accessibility and convenience aspects of the personal domain of the food environment so as to further round out the preference data. Beyond asking about the importance of food prices in the BWS module, we did not ask about the affordability dimension. In addition, we did not measure the external domain of the food environment which typically relies on different instruments and was out of scope for this study.

In order to measure the accessibility dimension – defined as “physical distance, time, space and place, individual activity spaces, daily mobility, mode of transport” (Turner et al., 2018), a series of questions about source and frequency with which they acquired food from traditional wet markets, informal street markets, mom and pop shops (i.e., small locally owned shops), convenience stores, supermarkets, specialty shops, online, and own production. They were also asked about the main mode of transportation used for grocery shopping. In order to measure the convenience dimension – defined as “relative time and effort of preparing, cooking, and consuming food products, time allocation” (Turner et al., 2018), respondents were asked whether they prepared food for other people in the household and the amount of time spent cooking food per meal. These data were included as part of the descriptive characteristics of the study participants, alongside other sociodemographic data, and are relevant in so far as food preferences are shaped by the food environment.

### 2.3.3. Focus group discussion on preferences with participatory social mapping

To obtain unstructured, qualitative insights about participants' preferences and food choice, focus groups with participatory social mapping were carried out in Thanh Oai District. The primary objective of these focus groups was to further understand which food characteristics were most and least important, and to explore how these preferences varied across food groups. A secondary objective of the focus groups was to learn more about the respondents' food environments and to identify the food purchasing options and food availability. Participants in the focus groups were selected if they had already responded to the dietary assessment components (i.e., weighed food record and 24-h recall) of the INDDX24 validation study.

A semi-structured focus group guide was developed to lead the conversation following the approach taken by Downs et al. (2018), which was combined with a participatory social mapping exercise in which participants draw community maps (Pelto, 2013). Participants were asked about which food quality attributes were of most importance and the reasons why, with in-depth discussion on the relative importance of each attribute. In addition, the participants were given a large piece of paper and different colored markers and asked to draw their food environment, noting all of the places where they could buy or consume food. This exercise was used as an entry point to learn more about the food environment, food sources, and purchasing preferences.

A total of four focus groups were conducted, each with 10 women with mean age of 36.0 years (SD 7.8 years). All four focus groups were facilitated by a native Vietnamese speaker, the study principal

investigator, and a research assistant/translator. Each focus group lasted approximately 1.5 h and was audio recorded. Respondents were offered refreshments while in attendance.

### 2.4. Analytical approach

Descriptive statistics were used to depict consumer preferences for specific food attributes, food habits and patterns, shopping habits, and the food environment. Analysis of the BWS attributes was primarily conducted using the count method. The attributes of interest were appearance, convenience, modernity/novelty, naturalness, nutrition, energy, price, food safety (immediate), food safety (future), taste, and tradition. This method scales the values of the most important attributes less the least important attributes (Louvriere et al., 2015). Following the count method used in recent research (e.g. Ochieng and Hobbs, 2016; Ola and Menapace, 2020) we calculated (i) the total number of times each attribute was selected as the “most important” and as the “least important”; (ii) the difference between the most important total and least important total for each attribute and then divide this by the total sample size; (iii) the square root of the ratio of the most important total to the least important total for each attribute; and (iv) a standardized relative score in which the result of the previous step is scaled according to the attribute with the largest value, resulting in an interval scale of 100. This is used to rank the relative importance of each of the attributes and provides different insight from the basic ranking of attributes calculated in step (ii). All quantitative data were analyzed using Microsoft Excel and Stata 15.

The focus group discussions were transcribed verbatim from the audio-recording in Vietnamese and the transcription was then translated to English by a professional translator. The food environment maps (n = 4) that were drawn during social mapping were not analyzed directly but used as a catalyst during the focus group discussion to stimulate further insights. The focus group discussion data were coded using a mixture of deductive and inductive thematic analysis to identify themes related to consumer preferences for food quality attributes, food habits, the respondents' personal food environments, and shopping behavior. Based on the research questions and focus group discussion interview guide *a priori* codes were defined. Additional codes emerged in two successive rounds of reviewing the focus group transcripts. Codes were reduced and combined further to identify the main themes (Creswell, 2013). All qualitative data were analyzed using NVivo Version 12.

## 3. Results and discussion

Select sociodemographic, food environment, and food consumption variables are presented given their relevance to individual preferences. The mean age of respondents was 35.5 years (SD 8.2 years). Respondents were given the option of self-reporting their weight in kilograms and 260 respondents provided their weight with a mean of 51.0 kg (SD 5.7). The average number of people per household was 4.7 (SD 1.2), with 86.7% of all households reporting ownership of agricultural land. In terms of educational attainment, our sample appears to be more educated than the national average (World Bank). Other variables not shown in Table 3, due to homogeneity across the sample, include electric light source (99.6%), electric cooking source (92.8%), marble floor material (98.9%), concrete wall material (88.6%), concrete roof material (73.1%), flush toilet (99.2%), mobile phones (97.7%), televisions (99.6%), refrigerators (99.6%), air conditioners (92.0%), and washing machines (86.4%). Computers (67.0%) and radios (11.7%) were owned by fewer respondents in the sample.

Respondents reported wet markets (82.6%) and own production (41.3%) as the main sources of food (>3 times per week). The strong reliance on traditional wet markets, despite an increasingly diversified food environment, is in line with other findings from Hanoi (Wertheim-Heck and Raneri, 2019, 2020). Motorbikes are the main mode of transportation to buy food (65.2%), almost three quarters of

**Table 3**  
Sociodemographic and food environment (personal domain) variables (n = 264).

| Sociodemographic variables           | Percentage | Food environment variables                                      | Percentage |
|--------------------------------------|------------|---|------------|
| Pregnant                             | 3.4        | Sources of food shopping/acquisition, >3 days per week          |            |
| Breastfeeding                        | 11         | Wet market  | 82.6       |
| Education level (some/all completed) |            | Own production  | 41.3       |
| Primary (ages 6–11)                  | 0.8        | Mom and pop shop (locally owned)                                | 14.1       |
| Lower secondary (ages 11–15)         | 22.7       | Colleagues or relatives   | 4.2        |
| High school (ages 15–18)             | 28.8       | Street market   | 3.8        |
| College/university                   | 43.2       | Supermarket   | 0.8        |
| No education                         | 0.4        | Convenience store (commercial)                                  | 0.4        |
| Professional training                | 4.2        | Online shops and specialty shops                                | N/A        |
| Source of drinking water             |            | Main mode of transportation to buy food                         |            |
| Rainwater                            | 45.8       | Motorbike   | 65.2       |
| Tube well                            | 24.6       | Bicycle   | 22.3       |
| Piped water                          | 22.7       | Walking   | 10.6       |
| Bottle water                         | 4.2        | Other   | 1.9        |
| Protected well                       | 2.3        | Frequency of preparing food for others in past 7 days           |            |
| Other                                | 0.4        | All or most of the time   | 74.2       |
| Household animal ownership           |            | Sometimes (3–6 meals)   | 16.7       |
| Poultry                              | 13.3       | Rarely (1–2 meals)  | 9.1        |
| Poultry + other animals              | 34.1       | Time cooking per meal (excluding processing, cleaning, washing) |            |
| Poultry + pigs + other animals       | 5.3        | 0–15 min  | 6.8        |
| Poultry + goats + other animals      | 0.4        | 16–30 min   | 65.2       |
| Cattle + other animals               | 0.4        | 31–45 min   | 17.8       |
| Other animals only (dogs, cats etc.) | 19.7       | 46–60 min   | 9.8        |
| No animals                           | 26.9       | >60 min   | 0.4        |

respondents frequently prepared food for others in the past seven days and on average spent 32.9 min (SD 12.0) cooking per meal, excluding processing, cleaning, and washing (Table 3).

### 3.1. Food group consumption habits based on 7-day recall of food groups

Most of the respondents reported consuming vegetables at least once per day (77.3%) or frequently (17.4%). In comparison, just under half of all respondents reported consuming fruits at least once a day (49.2%) or frequently (28.8%) in the past week. The inverse was generally true for instant foods and sweet and savory snacks which were reported as never or occasionally consumed by the vast majority of respondents (89.8% for instant foods and 87.9% for snack foods) (Fig. 3s).

Of those who reported consuming foods in a given food group, most respondents considered the amount they consumed to be “just right” (84.8% vegetables, 76.5% fruits, 86.8% instant foods, 85.64% snacks). Of all the food groups, the fruit food group had the highest dissatisfaction level with the amount consumed. Twenty-two percent of respondents reported that they consumed less fruit than they wanted to, compared to vegetables (10.0%), instant foods (6.8%), and snacks (4.9%) (Fig. 4s). The reasons reported by respondents for not eating the desired quantity varied by food group. In the case of both vegetables and fruits the reasons for not eating the desired amount ranged from only having access to poor quality produce, concerns with high chemical levels, expense and time required to prepare and consume, as well as disliking them. For instant foods and snack foods, the two main reasons people reported not consuming these foods were due to the poor quality and a dislike for such foods. These findings - especially related to vegetable and fruit consumption - were reinforced by the BWS and focus group discussion, and echo other recent findings from the region (Downs

et al., 2018).

### 3.2. BWS results: most important and least important food quality attributes

Table 4 presents the results for the vegetable food group containing the sum of the most important (column 1), sum of the least important (column 2), and the difference between the most and least important for each attribute (column 3). The most-least difference is then divided by the total sample size (n = 264) for each attribute resulting in the standard score (column 4) which is then ranked (column 5). Next, we take the square root of the sum of each most important attribute divided by the sum of the least important attribute (column 6) and then scale them so that the attribute with the largest square root is considered at the highest point of the scale (100) followed by the other attributes (column 7). The relative ranking follows (column 8), which determined the order of attributes listed. Detailed results for the fruit, instant food, and snack food groups are available in the Supplemental Materials (Table 1s, 2s, and 3s). For the case of the vegetable food group, these results illustrate that based on the standard score, the three most important attributes are nutrition, immediate food safety, future food safety, and the least important attributes are appearance, energy, and price. However, when considering the relative standardized square root interval scale, the order in ranking changes. Compared to nutrition, which was considered the most important attribute, naturalness was 0.36 times as important, followed by immediate food safety, which was 0.26 times as important. This difference in the relative ranking highlights that for the case of vegetables, nutrition is considered relatively much more important than the subsequent attributes.

Fig. 1 presents results summarizing the net importance (most minus least) for each attribute by food group ordered according to the ranking for vegetables (corresponding to column 3 in Table 4). Nutrition was most highly rated for the vegetable and fruit food groups, with immediate concerns about food safety as the second highest for vegetables followed by future food safety, while for fruits the ranking of these two were reversed. However, for instant foods and snack foods, convenience and taste received the highest net importance, respectively. The second and third most important attributes for both were immediate food safety concerns followed by nutrition. For all four food groups, the attribute with the lowest net importance was price.

While the net importance score allows for ranking of the attributes, it does not provide insight into the relative importance of each attribute. Fig. 2 provides insight into the relative importance of each attribute by quantifying the distance between preferences for the first, second, third etc. attributes. For example, for the vegetable food group, nutrition was the most important attribute followed by a large gap (64.4 points) before the second most important attribute of naturalness, indicating that nutrition strongly outcompetes the other attributes. This was quite different from fruits and snack foods where the first, second, and third attributes have very close relative rankings within each food group. For the fruit food group, future food safety is 0.97 times as important as nutrition, suggesting that these two food quality attributes are almost of equal importance to consumers when choosing to consume fruit. With snack foods, the relative ranking shows that taste was a close second to nutrition (0.98 times as important), followed by immediate food safety concerns, which were a close third (0.95 times as important). In the case of instant foods, convenience remained the most important with a gap of 42.79 points before the second relative important food quality attribute of nutrition, followed closely by immediate food safety (4.99-point difference).

Measuring both the net importance and the relative importance, the BWS results from our research indicate that nutrition is the main motive when choosing to consume vegetables and fruit, which aligns with general public health messaging recommending consumption of these food groups. It appears that concerns with food safety (both immediate and future) are a close second concern, especially in the case of fruits

**Table 4**  
Vegetable food group long list of attribute importance measures.

| Attribute               | (1) Most important | (2) Least important | (3) Most-Least Difference | (4) Most-Least standard score | (5) Ranking standard score | (6) Sqrt of Most/Least Important | (7) Standardized sqrt interval scale (relative) | (8) Ranking standardized scale (relative) |
|-------------------------|--------------------|---------------------|---------------------------|-------------------------------|----------------------------|----------------------------------|---|---|
| Nutrition               | 142                | 1                   | 141                       | 0.534                         | 1                          | 11.916                           | 100.00  | 1   |
| Naturalness             | 18                 | 1                   | 17                        | 0.064                         | 4                          | 4.243                            | 35.60   | 2   |
| Food safety (immediate) | 39                 | 4                   | 35                        | 0.133                         | 2                          | 3.122                            | 26.20   | 3   |
| Taste                   | 7                  | 1                   | 6                         | 0.023                         | 6                          | 2.646                            | 22.20   | 4   |
| Food safety (future)    | 25                 | 8                   | 17                        | 0.064                         | 3                          | 1.768                            | 14.83   | 5   |
| Convenience             | 20                 | 9                   | 11                        | 0.042                         | 5                          | 1.491                            | 12.51   | 6   |
| Tradition               | 9                  | 10                  | -1                        | -0.004                        | 7                          | 0.949                            | 7.96  | 7   |
| Appearance              | 2                  | 18                  | -16                       | -0.061                        | 8                          | 0.333                            | 2.80  | 8   |
| Energy                  | 1                  | 56                  | -55                       | -0.208                        | 9                          | 0.134                            | 1.12  | 9   |
| Price                   | 1                  | 107                 | -106                      | -0.402                        | 10                         | 0.097                            | 0.81  | 10  |
| Modernity/Novelty       | N/A                | 49                  | N/A                       | N/A                           | N/A                        | N/A                              | N/A   | N/A                                       |

Notes: Column (3) = col (1)-(2); Column (4) = col (3)/N = 264; Column (6) = square root of col (1)/col (2); Column (7) = standardized square root interval scale.

| Attribute               | Vegetables | Fruits | Instant foods | Snack foods |
|-------------------------|------------|--------|---------------|-------------|
| Nutrition               | 141        | 136    | 31            | 38          |
| Food safety (immediate) | 35         | 28     | 35            | 42          |
| Food safety (future)    | 17         | 33     | 28            | 30          |
| Naturalness             | 17         | 9      | -14           | -12         |
| Convenience             | 11         | 3      | 84            | 14          |
| Taste                   | 6          | 25     | 9             | 72          |
| Tradition               | -1         | -10    | -9            | -10         |
| Appearance              | -16        | -21    | -20           | -24         |
| Energy                  | -55        | -55    | -13           | -34         |
| Price                   | -106       | -101   | -94           | -89         |
| Modernity/Novelty       | N/A        | N/A    | -37           | -27         |

**Fig. 1.** Net importance (most minus least) of quality attributes by food group.

Note: Respondents were asked for each food group to identify the most and least important attribute with the following question “Which characteristic is most (least) important to you when you are deciding whether to eat dark green leafy vegetables (fruits/instant foods/snacks)”. The net importance (most minus least) is calculated by subtracting the least important score from the most important score. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

| Attribute               | Vegetables | Fruits | Instant foods | Snack foods |
|-------------------------|------------|--------|---------------|-------------|
| Nutrition               | 100.00     | 100.00 | 57.21         | 100.00      |
| Food safety (immediate) | 26.20      | 35.86  | 52.22         | 94.62       |
| Food safety (future)    | 14.83      | 97.10  | 45.23         | 81.65       |
| Naturalness             | 35.60      | 53.45  | 8.96          | 11.66       |
| Convenience             | 12.51      | 21.38  | 100.00        | 56.34       |
| Taste                   | 22.20      | 86.19  | 32.23         | 97.59       |
| Tradition               | 7.96       | 8.12   | 9.09          | 9.30        |
| Appearance              | 2.80       | 5.98   | 7.70          | 10.29       |
| Energy                  | 1.12       | 3.84   | 17.81         | 18.78       |
| Price                   | 0.81       | 2.36   | 3.75          | 5.57        |
| Modernity/Novelty       | N/A        | N/A    | 7.36          | 16.60       |

**Fig. 2.** Relative importance of quality attributes by food group.

Note: Respondents were asked for each food group to identify the most and least important attribute with the following question “Which characteristic is most (least) important to you when you are deciding whether to eat dark green leafy vegetables (fruits/instant foods/snacks)”. The standardized square root scale is calculated by dividing the most important score by the least important score and then take the square root and then scale each value so that the largest square root is the highest point of the scale (100) followed by the other attributes using the highest scoring attribute as the denominator. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

and a more distal concern for vegetables. The fact that food safety was not stated as the most important attribute, may be due to the fact that nearly half of the sample (41.3%) reported producing at least some of their own food on most days of the week (Table 3). These results also confirm that consumers consider the convenience of instant foods to be very important, while for snack foods the taste is most important. Food safety and nutrition were also highlighted as concerns for these food groups. Price was consistently considered the least important food quality attribute for all food groups whether using the absolute or relative measure.

In addition, it is worth noting that there was considerable overlap between the attributes of food safety (immediate), food safety (future), naturalness, and appearance and could potentially be aggregated for a

general measure of food safety. Relatedly five additional ways of describing food safety were used by participants during the focus groups (“origin” “quality”, “freshness”, “clean food”, and “in season”). It is possible that by not including these words explicitly in the BWS, it may have resulted in misidentification and underestimation of the importance of food safety in this context. Some of these issues were further explored in the focus group discussions as described below.

Comparing our results to other food preference related literature we see consistent emphasis on food safety and nutrition/health, with mixed importance of the other attributes. For example, Mergenthaler et al. found consumers in Viet Nam willing to pay a price premium of 60% for leafy greens with no chemical residue and 19% more for convenience attributes (2009). In Indonesia, Maulida et al. used the Food Choice

Questionnaire and found that the most important food choice motives were comfort, convenience, price, and health (2016). While Bailey et al. (2019) and Flax et al. (2020) used pile sorting and focus groups to measure preferences and found food safety and health were most important in India (Bailey et al., 2019), whereas cost, taste, freshness and healthiness were considered most important in Malawi (Flax et al., 2020). A qualitative study in Benin found availability, accessibility, nutrition education, unhealthy foods, and food safety were the largest barriers to adolescent consumption of fruits and vegetables (Nago et al., 2012). Research from the USA and Norway reported food safety most important in both countries, followed by price and taste in the USA and naturalness and taste in Norway (Bazzani et al., 2018).

### 3.3. Focus group discussions: nutrition, food safety, convenience, and price

#### 3.3.1. Nutrition and food safety: “If you want to have nutritious food, it must be safe”

While the BWS results indicate that nutrition is a stronger motive than food safety for consumption decisions related to vegetables and fruits, a more nuanced picture emerged during the focus group discussions. In general, there was a tension in the discussions between whether nutrition or food safety (related to both immediate and future health) was more important. For many participants, food safety was considered a precondition and therefore worrying about nutrition, without first considering whether the food was safe seemed futile. As one respondent noted “If you consider nutrition to be the most important but then when you eat you are poisoned... that is why food safety is more important than nutrition.” [Respondent 9, FGD #3]. As another respondent simply stated “If you want to have nutritious food, it must be safe” [Respondent 18, FGD #2], highlighting the extent to which it can be difficult to disentangle these two attributes and the fact that for some respondents’ food safety is a prerequisite to considering a food nutritious, is that it is safe. This nuance is especially important to note as it did not emerge directly in the BWS results as respondents could only select one “most important” attribute.

In general, if participants were able to grow the food or get it from a known source then they were not as concerned about food safety. As one participant said, “Safety is first, but in the countryside the origin is well known not like in the city, and we know which household to buy from. We feel safe and do not worry about chemicals that are harmful for our health.” [Respondent 10, FGD #1]. In other instances where the food was purchased from the market, potentially due to a lack of other options, there was increased concern about food safety. For example, as one respondent noted, “If we go to the market to buy food, then I do not know if it is safe or its origin. But no vegetable means not enough [nutrients], so then we have to buy” [Respondent 6, FGD #4]. This quote also highlights that for some people the only choice may be an option that is potentially unsafe, but this is seen as a necessary risk to ensure adequate nutrition.

The respondents noted ways that unsafe vegetables had contributed to short term illness (e.g., stomachache, diarrhea), while also attributing consumption of chemicals in certain foods such as vegetables, fruit, and meat to longer term health problems (e.g., memory loss, cancer). The concern with food safety, especially related to future health problems due to chemical residues and other issues, was particularly apparent when discussing fruits. One of the reasons noted for this was that households can more easily grow a variety of vegetables but for fruits they remain largely reliant on the market. As one respondent noted: “It is often that the fruit looks good and is very delicious, but there are a lot of drugs [chemicals]. We cannot differentiate if it should be eaten or not, but we still buy it ...” [Respondent/Reference 1, FGD #4]. These findings are aligned with the net importance BWS results (Fig. 1) which indicated that food safety (future) was the second most important attribute for

fruits, and food safety (immediate) was the second most important attribute for vegetables.

Across both the BWS and focus group discussions, nutrition and food safety (both immediate and future health) were considered major drivers of food choice for vegetables and fruits. Our findings highlight the importance of nutrition to consumers, as well as concerns with the consequences of eating unsafe food, particularly vegetables, fruits, and meat. Concerns with food safety in Viet Nam, especially for urban populations, are indisputable and have been well documented in recent years. For example, a nationally representative survey found that food safety was considered one of the most pressing issues for people in Vietnam, more important than education, health care or governance (World Bank, 2017). Another large survey (n = 1404) from Hanoi found that 93% of all respondents were concerned about food safety and that 71% trusted existing food safety certification (Wertheim-Heck et al., 2014), while other research has indicated that consumer trust in safe certified foods is much lower at only 33% (Mergenthaler et al., 2009). The concerns about food safety are an issue when reflected in consumption choices. For example, 88% of consumers in a recent study said they avoided eating vegetables that were perceived as unsafe, and 33.5% said that they ate fewer vegetables than previously due to their concerns with food safety (Thanh et al., 2020).

#### 3.3.2. Convenience: “Easy to buy, easy to prepare”

While the BWS instrument explicitly asked about the most and least important food quality attributes for instant foods and snack foods, less time was spent discussing these food groups directly in the focus group discussions. However, the food quality attribute of convenience emerged in the discussion and was defined by one participant as “Easy to buy, easy to prepare” [Respondent/Reference 1, FGD #1] and by another as “Easy to buy as I have little time because work is too busy, so we want to buy things that are easy and quick to prepare and ensure that they give us time to work” [Respondent/Reference 4, FGD #1]. Both examples underscore that convenience refers to not only the preparation process, but also the ease of acquisition in the food environment.

In several instances participants discussed the virtues of already prepared and instant foods and the importance of convenience in relation to their children. As one participant noted “My family has small children, eating porridge is fast and convenient” [Respondent/Reference 1, FGD #4], and another commented “... buying food is the fastest, the most convenient, feed the kid and then go to work” [Respondent/Reference 2, FGD #4]. Another respondent stated “... I eat rice for breakfast, sometimes I eat instant noodles. I have small kids and in general it is convenient” [Respondent/Reference 4, FGD #4]. Respondents noted that it was necessary to feed these foods to their children, although there was some concern expressed about sweet snacks (i.e., confectionaries) leading to excessive sugar consumption and increased rates of obesity and diabetes.

These very preliminary qualitative findings highlight the growing role of instant and snack foods, particularly in children’s diets, in Viet Nam and the need for more research in this area. Research in other LMIC contexts has found consumption of snack foods to displace consumption of more nutritious foods, further contributing to the burden of child malnutrition (Baker et al., 2020; Huffman et al., 2014; Nordhagen et al., 2019; Pries et al., 2019; Sharma et al., 2019).

#### 3.3.3. Price: “The price is not important, little, little”

Price was considered the least important attribute for all food groups in the BWS results, with few respondents noting it as the most important attribute for each food group (vegetables n = 1, fruit n = 2, instant foods n = 3, snack foods n = 3). The lack of importance of price was further reflected in the focus group discussions. As one participant in the focus group noted, “The price is not important, little, little. Because if I want it to be

safe, and I want it to be fresh then it must be expensive” [Respondent/Reference 1, FGD #1]. In addition, participants in the focus group noted that the perceived safety of the food was often signaled through higher prices as exemplified in this quote from one of the respondents “One bunch of vegetables picked in the river and a bunch of clean [safe] vegetables, one selling for one thousand VND and the other selling for two thousand VND, then I will choose the more expensive one” [Respondent/Reference 2, FGD #2]. This quote indicates that price is used to signal food safety, which is especially important given the credence quality of food safety. Despite the lack of importance of the price attribute in the BWS results and a similar sentiment expressed in the focus groups, some respondents did note that price was an important consideration to them when making food choices. For example, as one respondent said, “If I know the origin but the price is too high, I dare not buy.” [Respondent 6, FGD #3], suggesting that in some cases even guaranteed food safety (based on origin) could be too expensive for some consumers.

In contrast to research from other countries, the price of food in Viet Nam was strikingly the least important attribute across all food groups. Methodological differences across studies make it difficult to make direct comparisons with other LMIC research, however, of the existing studies the price of food (in general) appears to have mixed importance. For example, in India, the price of food was of mid-importance ranked after food safety, health, taste, knowledge, attitudes, and time (Bailey et al., 2018), while in Indonesia, health, comfort, price and convenience were of importance (Maulida et al., 2016). Contrary to our findings, in Malawi the price of food was considered to be a major driver of food choice, along with taste, freshness, and healthiness (Flax et al., 2020). In Madagascar, Farris et al. found food price, availability, and health to be most important using focus group discussions (2020). Using a very similar instrument as this study, research in the USA found that price was repeatedly considered one of the most important food quality attributes (Bazzani et al., 2018; Lusk and Briggeman 2009). These mixed findings across countries warrant further investigation to better understand how different cultures and socio-economic groups weight price when determining consumption baskets.

Possible explanations for the lack of importance of price in the Vietnamese context could be related to the economic growth experienced in recent decades and ability for consumers to purchase increasingly diversified food baskets (Bairagi et al., 2020). Furthermore, since consumers consider price to be a signal for quality and safety, as noted in the focus group discussions, they might interpret low prices as a sign of unsafe food and therefore not consider it an important attribute. Another factor could relate to shopping practices and the fact that the vast majority of the sample reported shopping at wet markets where prices are somewhat negotiable. In addition, we cannot rule out the homogeneity of our sample, which was well educated and relatively well-off, as a factor that could have played a role in the lack of importance of price. Had there been more variability in our sample it would have been possible to investigate different preferences based on wealth quintiles, which could have identified further nuance. Finally, unlike many of the other attributes, price is a clear “search quality” that is known before purchasing the food (even if negotiable), which differs from attributes like food safety and nutrition which are credence qualities and cannot be observed by the consumer.

### 3.4. Limitations

While this research has many strengths, there are also some limitations. A primary consideration for future researchers in LMICs is to conduct further testing of the BWS method and selected food values. The BWS method and values were pilot tested in Hanoi with randomly selected respondents who agreed to respond to the questions and provide feedback. However, future efforts to use the BWS method should consider carrying out cognitive debriefing, or a similar method, which could be used as part of the testing process to ensure that the attributes, descriptions, and underlying constructs are clear. For example, the

attribute of ‘nutrition’ could be interpreted in a positive sense (i.e., nutritious) or in a negative sense (i.e., not nutritious) depending on the type of food group that is being asked about. Further cognitive testing could also have resolved any potential issues with food quality attributes overlapping, as well as any additional terms (e.g., to describe food safety as were identified in the focus group discussion).

Additionally, within the focus group discussions, the time spent on instant foods and snack foods was lacking in comparison to that on vegetables and fruits. Part of this stemmed from the interest of participants in the discussion groups who tended to speak more about concerns related to food safety and nutrition in relation to fruits and vegetables. However, further research – both qualitative and quantitative – on consumption of instant foods and snack foods in light of Viet Nam’s rapidly changing food system is warranted.

The relevance of these results lies in the novel nature of the research and the contribution to expanding the knowledge on food preferences of women in peri-urban Viet Nam. Additional research on a more diverse sample that reflects a wider cross-section of Viet Nam is needed for generalizability of the findings, which was not achieved by this study due to the homogeneity of the sample and lack of representativeness on a wider scale. More generally, drawing conclusions about preferences from the existing literature can be difficult given the lack of research in LMICs and the varied use of preference elicitation methods such as pile sorting, BWS, Food Choice Questionnaire, amongst others (e.g., Downs et al., 2018; Flax et al., 2020; Maulida et al., 2016; Mergenthaler et al., 2009). Further, public health nutrition researchers need to familiarize themselves with the range of methods available for preference elicitation and critically apply them in more studies related to food preference and the drivers of consumption in LMICs. Additional research should be carried out to develop a better understanding of the ways in which the food environment shapes preferences, as well as the association between food preferences and actual consumption.

## 4. Conclusions

This study looks beyond prices and income, to explore the role of consumer preferences and food values in order to characterize the importance of nutrition, food safety, convenience, price, and other food quality attributes across a variety of food groups in Viet Nam. We find that people have varied preferences depending on the food group. Nutrition and food safety (immediate and future) are ranked as the top-most important attributes for vegetables and fruits, while convenience and taste were considered most important for instant foods and snacks, respectively. The price of food in Viet Nam was strikingly the least important attribute across all food groups, which is in contrast to research from other countries. These findings, and the overall measurement of preferences for different food quality attributes, indicate what types of qualities are important to consumers when determining which foods to eat.

This type of research is important as it goes beyond the typical focus on food prices and income frequently used in economics, and the standard public health nutrition approach of reporting what people eat, and instead investigates which food quality attributes are of most and least importance for particular food groups. Our approach of applying the BWS method to specific food groups allowed more nuance and specificity rather than asking about preferences more generally. These findings, and other similar research that investigates the drivers of food choice, should be heeded by public health nutrition practitioners and policy makers when designing behavior change communication interventions and related food system policies that seek to shift consumer choices. Future research should continue to use BWS and other innovative transdisciplinary techniques in conjunction with qualitative methods, to better understand preferences and drivers of food consumption.



## Authorship

WB formulated the research questions, designed the study and instruments, carried out data collection, analyzed the data and drafted the manuscript. JC, JF, WM, and NW provided critical feedback on the research questions, study design, instruments, and reviewed the manuscript.

## Ethical standards disclosure

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving research study participants were approved by the Tufts Internal Review Board and the Viet Nam National Institute of Nutrition Internal Review Board. Written informed consent was obtained from all subjects.

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## Declaration of competing interest

None

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## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.appet.2021.105439>.

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