




## Determining How Chinese Consumers that Purchase Western Food Products Prioritize Food Safety Cues: A Conjoint Study on Adult Milk Powder

Miranda Mirosa , Yang Liu & Phil Bremer


To cite this article: Miranda Mirosa , Yang Liu & Phil Bremer (2020) Determining How Chinese Consumers that Purchase Western Food Products Prioritize Food Safety Cues: A Conjoint Study on Adult Milk Powder, Journal of Food Products Marketing, 26:5, 358-371, DOI: [10.1080/10454446.2020.1782796](https://doi.org/10.1080/10454446.2020.1782796)

To link to this article: <https://doi.org/10.1080/10454446.2020.1782796>

 View supplementary material [↗](#)

 Published online: 22 Jun 2020.

 Submit your article to this journal [↗](#)



 Article views: 171

 View related articles [↗](#)

 View Crossmark data [↗](#)



# Determining How Chinese Consumers that Purchase Western Food Products Prioritize Food Safety Cues: A Conjoint Study on Adult Milk Powder

Miranda Mirosa <sup>1,2</sup>, Yang Liu<sup>1,2</sup>, and Phil Bremer <sup>1,2</sup>

<sup>1</sup>Department of Food Science, University of Otago, Dunedin, New Zealand; <sup>2</sup>New Zealand Food Safety Science & Research Centre, Palmerston North, New Zealand

## ABSTRACT

This study investigated how Chinese consumers prioritize cues when assessing the safety of imported milk powder. A choice-based conjoint survey was completed by 307 participants in Beijing, Shanghai, Tianjin, and Nanjing, using the internet-based software 1000minds. Important cues for consumers were “government certification logo shown on the product label/Website”; “ingredients and materials, free from preservatives and additives”; “having traceability techniques such as QR code included” and “realistic photos.” Distinct consumer segments reflecting differing trade-offs between safety cues were not detected suggesting that a single food safety communication strategy for this market may be sufficient. These findings add to extant literature by highlighting what cues give consumers the most confidence a product is safe and they provide a raft of actionable insights for government and the food industry in terms of designing and implementing effective risk or market communication strategies for Chinese consumers.

## KEYWORDS

Conjoint analysis; Chinese consumers; food safety; cues; milk powder

## Introduction

The food and beverage markets in China are lucrative and presents exciting market development opportunities for food and beverage companies, particularly those offering high-quality exports. In 2020, revenue in this sector has been estimated to be 129,543 m USD with an annual growth rate (2020–2024) of 10.9%, resulting in a market volume of 196,273 m USD by 2024 (Statista, 2020). China, however, can be a challenging market for foreign companies to succeed in owing to its specific consumer dynamics. For example, in China trust in the domestic food system is low due to frequent high-profile reports of food incidents and scandals (Quan, Yu, & Zeng, 2017; Wang, Tao, & Chu, 2020). This means that food safety is an incredibly important consumption motive in China (Liu, Pieniak, & Verbeke, 2013; Riccioli et al., 2020) that fundamentally shapes consumption behaviors in many ways. For example, food safety-seeking behaviors include: (1) actively seeking information prior to the purchase of food via trusted sources such as family and friends or social media product reviews (2) using authenticity cues as heuristics for safety such as product certifications, country of origin labeling, brand, price, and packaging; (3) carefully selecting acquisition sources such as premium supermarket chains that carry international brands, or relying on informal import networks or personal international travel; and (4) a range of domestically situated practices including producing and preparing foods at home, and using ozone washers to remove microbial contamination and chemical residues (Kendall et al., 2019).

The burgeoning field of literature that examines Chinese consumers’ demand for food safety assurances has demonstrated, fairly consistently, that consumers have a higher willingness to pay for

food safety attributes than for other credence attributes such as animal welfare assurance, environmental stewardship, organic production, or country of origin. This finding holds true across a range of different products and different types of retail channels. For example, Beijing consumers were found to have a higher willingness to pay for food safety than for assurances of animal welfare, organic, and green food status across different products such as pork, chicken and eggs, and different retail channels such as wet markets, domestic and international supermarkets (Ortega, Wang, Wu, & Hong, 2015). In a dairy-specific example, it has been reported that consumers of domestically produced infant formulas are willing to pay more for the quality certification attribute than for the attributes organic raw, farm-to-table traceability, region of origin, and animal welfare (Li, Chen, Chen, & Liu, 2019). The value of food safety attributes has been shown in some cases, such as with pork, to correspond to more than twice the value of other attributes such as country of origin labeling, environmental claims, and animal welfare (Lai, Wang, Ortega, & Olynk Widmar, 2018).

Thus, to be successful in this market, food manufacturers must first and foremost convincingly communicate the safety of their food products. To do this, understanding how safety perceptions influence Chinese consumers' food purchasing decisions is critical as this knowledge will enable companies to differentiate their products based on these criteria. However, while consumers' interest to invest in buying safe foods has been well documented, less is known about how Chinese consumers determine if a product is safe or not.

Consumers cannot always accurately assess the associated safety risks of each food decision and therefore they rely instead on information and signals provided to them by the food industry and its regulators (Siegrist & Cvetkovich, 2000). In the consumer behavior literature, such information/signals are called "cues" and products considered to consist of an array of cues, such as brand, price, color, or flavor (Cox, 1967). When consumers are shopping, their expectations of the product are formed based on the available cues provided on the pack or label or if shopping online via the Website of the product. A number of studies have shown that the cues Chinese consumers use to determine product safety include government certifications, country of origin, brand, shelf life, traceability, freshness, and hygiene standards (Guenther, Saunders, Dalziel, Rutherford, & Driver, 2015; David L; Ortega, Wang, Olynk, Wu, & Bai, 2012). There is a nascent body of literature that investigates more specifically how particular cues influence food safety expectations and willingness to pay. For example, Ortega, Wang, Wu, and Olynk (2011) measured urban Chinese consumers' willingness to pay for select food safety attributes (product traceability system, the current government-run certification program, a proposed third-party certification program, and a product-specific information label) in pork and found that the greatest willingness to pay was for a government certification program. Likewise, in their investigation of specific food safety certification cues Wang et al. (2020) have shown that Chinese consumers hold different levels of trust in different labels, depending on the food certifying body, with international bodies providing the highest level of confidence. In perhaps the most directly related study, El Benni et al. (2019) analyzed the importance of various cues (different labels, authenticity cues, and price) for infant milk formula to determine the best way to provide authenticity assurance. They identified that all authenticity cues served as indicators of food quality and safety and all were found to be highly important information sources for the respondents when making purchase decisions.

While the abovementioned studies inform us that food safety is important and that consumers are willing to pay for this, and that a range of different cues can be used to determine safety, it is unknown which cues are perceived by consumers to be the most/least important in shaping decision-making about food safety. There is also limited understanding if segments of Chinese consumers prioritize food safety cues differently. Our study contributes to the limited literature on Chinese consumers' food safety cue prioritizations. This information supplements the existing studies on the product cues that consumers use when making food safety-related decisions and is obviously crucial for those wishing to maximize the effectiveness of their food safety communications, whether this be food markers or government officials promoting food safety awareness campaigns.

Rather than considering food safety cues in the abstract sense, it was deemed advantageous to consider these in relation to a specific food product in order to simulate a real shopping scenario by making the choices between cues as realistic as possible for participants. Imported adult milk powder, a category which consists of segmented products (which often make functional health claims such as enhanced immunity and digestive systems, and are targeted toward specific groups such as students, mothers, elderly, and sportspeople) was selected as a case study based on a number of considerations. Theoretically, the case study is useful because dairy product safety is one of the top food safety concerns in China, and consumers, therefore, pay more attention to their safety and quality attributes (Quan et al., 2017). While many scholars considering food safety in China have focused on infant formula given the widely publicized scandals such as the 2008 melamine crisis associated with such products, the fact is that sales of all brands and types of dairy products, including adult milk powder, declined in response to these scandals (Jun-Shi, 2009). According to Quan et al. (2017), the particularity of the purchasing group of infant formula might lead to estimation bias if used, and therefore part of the decision to focus the case study on the adult milk powder market was made to ensure that a broader demographic of potential consumers could be included in the study.

Practically, the case study results will be of interest to new brands seeking to enter the adult milk powder category who need to ensure that their food safety communication strategy is clear to engage Chinese consumers. Globally, the adult milk powder market has been valued at being over 4.1 billion USD in 2020 and it is expected to reach almost 5.3 billion USD by the end of 2026, growing at a rate of 3.4% during 2021–2026 (360 Market Research Report, 2020). China has become the center of the global dairy market, with milk powder (including infant formula and adult milk powder) being the most consumed dairy category, contributing nearly 70% to the import value of all dairy products in 2018 (China Research and Intelligence Report, 2020). The adult milk powder market in China is dynamic with an expected growth increase of 14% between 2019 and 2024 to 2.15 billion USD and diverse, with no single brand having a market share greater than 15% in 2018 (Ministry of Primary Industries [MPI], 2018). Its growth and diversity make the adult milk powder market attractive for companies seeking to enter this market.

Thus, to provide actionable insights that will yield improvements in communication theory and practice, this study addresses the following research questions:

- How do Chinese consumers perceive the relative importance of different food safety cues for imported adult milk powder?
- Do significant differences exist between groups of Chinese consumers as to how they prioritize these cues?

To answer these questions, an empirical investigation using a choice-based conjoint survey is required.

### **Conjoint analysis**

Conjoint analysis is a popular technique used to determine which features a product should have (or in our case, which food safety cues a product should contain), by conjointly measuring consumers' trade-offs between discretized factors or attributes (Orme, 2010). A key advantage of this approach is that it allows researchers to understand the relative importance of the different cues for consumers.

Conjoint analysis is consistent with the theories of consumer demand that propose that consumers derive value/utility from attributes present in a product (Lancaster, 1966) and random utility, which models consumer's choice among substitute product alternatives (Ben-Akiva & Lerman, 1985). Conjoint analysis includes several methods including the traditional, adaptive, and choice-based. The choice-based conjoint analysis method was selected for this study. Choice-based conjoint analysis focuses on choices instead of ratings or rankings of product concepts like the traditional and adaptive methods do. It asks consumers to make a series of trade-offs among a set of choice alternatives of products (each described by a set of attributes – or in our case “food safety cues”) and this approach

has been widely used in the field of consumer food marketing. Choice experiments are increasingly applied to examine preferences for Chinese consumers (Bai, Zhang, & Jiang, 2013; Hou, Hou, & Wu, 2020; Lee, Lusk, Miroso, & Oey, 2015; Wu, Hu, & Xiong, 2020; Xu, Yang, & Wu, 2019). Participants are presented with hypothetical product choices that are defined on two attributes at-a-time such that there is a trade-off between them and asked to choose which product they would prefer. Comparing just two attributes at a time simplifies decision-making and has been shown to increase accuracy given that participants are not overwhelmed with too much differing information at any one time (Hansen & Ombler, 2008).

The remainder of the paper is structured as follows: The materials and methods (Section 2) are detailed next, and then the results are presented (Section 3). The paper concludes by discussing the results and summarizing the theoretical and practical contributions and implications of this study (Section 4).

## **Materials and methods**

### ***Research location and participant selection***

Data were collected via an online survey from four cities in China, including two tier-one cities, Beijing and Shanghai, and two tier-two cities, Tianjin and Nanjing. Beijing and Tianjin were selected as Northern cities and Shanghai and Tianjin as cities of the South. Both tier-one and tier-two cities were selected to represent differing socioeconomics of consumers. A link to the survey was distributed to participants by a professional market research company, the Consumer Insight and Market Research Center of COFCO Limited. To be eligible for inclusion in the survey, people had to be a Chinese resident aged over 18 years and currently living in one of the four target cities. They also had to be regular buyers of imported foods regularly (at least once a week), a purchaser of adult milk powder (at least once in the last 12 months). In total, 307 valid responses were received. This sample size is well above the minimum number of 100–200 consumers required to obtain reliable results from conjoint analysis (c.f. Quester & Smart, 1998) and is similar to that used in many other relevant conjoint/cluster analysis studies including Xu, Yan, and Wu's study (2019) that used conjoint to cluster 310 consumers from Shanghai based on their preference and willingness to pay for imported milk, Zheng, Li & Peterson's study (2013) that segmented 300 Chinese consumers distributed among three major cities based on their preferences for soybean attributes in soymilk, Silayoi and Speece's study (2007) that clustered 305 consumers based on their perceived importance of food packaging attributes, and Haddad et al.'s study (2007) that mapped 300 consumers' determinants of purchase intent of yogurt. Participation in the study was voluntary and before starting the survey, participants were informed of its intent and nature. Ethics approval to complete the study was granted by the University of [blinded for review] Human Ethics Committee (reference number 17/106).

### ***Survey design***

The survey, which took approximately 10 minutes to complete, consisted of the conjoint analysis to examine the importance of different food safety cues followed by a sociodemographic section which included a couple of general questions about food safety attitudes. The survey developed in English and translated into Chinese by a professional translator. Back-translation was undertaken to ensure linguistic equivalence before pilot testing the survey to verify that the instructions, contents, and structure of the survey were correct and understandable.

The conjoint survey was developed using the web-based software 1000minds which uses the PAPRIKA method (Potentially All Pairwise RanKings of all Possible Alternatives) (Hansen & Ombler, 2008). Every participant was shown a pair of hypothetical adult milk powder products defined by two food safety cues at given levels and asked to select one of the two products using the



Figure 1. Translated example of a pair-wise ranking question (a screenshot from 1000minds software). The actual was presented to participants in simplified Chinese.

question “which of these two adult milk powder products do you perceive to be safest if all else being equal?” (Figure 1).

The eleven food safety-related cues, which were selected based on the authors’ findings from previous qualitative focus group work which explored in-depth perceptions of a range of food safety cues in China for a range of product categories (blinded for review), are shown in Table 1. In our previous study, the most important safety cues were determined by having focus group participants look

Table 1. Cues and Levels for the Adult Milk Powder Product Used in the Conjoint Survey

Food safety cues	Levels
Food safety certification scheme	Not included on product label Private certification logo shown on product label Government certification logo shown on product label
Shelf life	Long shelf life (e.g. 20–24 months) Medium shelf life (e.g. 16–19 months) Short shelf life (e.g. 12–15 months)
Traceability technology (e.g. Quick Response (QR) code)	Not included Included
Ingredients and materials	Regular preservatives and additives Natural preservatives and additives Free from preservatives and additives
Availability	Online only In-store and online
Nutritional information	High-fat content Low-fat content
Brand	Sino-International joint venture 100% International owned & operated
Food safety inspection and quarantine documentation	Not provided Provided online on product’s Website
Processing technology and transport information	No information provided Pictures and information available online
Images provided online and/or on the package (e.g. country of origin and animals)	No images provided Photo-shopped idealized images Real photos
Available	Only in China In China and in other Western markets

Levels are ranked from lowest to highest level of preference.

at pictures of a range of real product examples and circle what they consider would be the most important safety cues when shopping either in-store or online. In total, 18 cues were identified. Among all product categories, certifications, availability, production date and shelf life, ingredients and materials, and nutritional information were the top five cues selected as being important indicators for the safety of imported food. Consequently, these cues, along with six other cues that were of specific relevance for adult milk powder (i.e. traceability technology, brand, food safety inspection and quarantine documentation, processing technology and transport information, images, country availability) were selected for the current study. Of note, price was not included as a cue because our previous exploratory study showed that price was not regularly used or discussed as a means to assess safety due to the overall high pricing level of imported foods in the Chinese market. Our exclusion of price should not be construed as a suggestion that Chinese consumers do not use price as indicator of quality, as it is evident that they do. In fact, a recent study Chinese consumers' preferences for food quality test/measurement indicators and cues of milk powder found price has an inverse-U-shaped relationship with consumer utility, implying that Chinese consumers may perceive low-price milk powder as low quality (Gao, Heng, & Shi, 2019). Rather, our position is that ignoring price is feasible when consumer expectation is that the imported product will obviously have a high price. By including the price cue, we would have biased the data analysis due to each of the cues requiring at least two levels (i.e. low price, high price) that could obviously be ranked from lowest to highest.

As is standard practice for this type of research (c.f. Ortega et al., 2015), levels were designed based on expert opinions, findings from the previous focus group work and a review of the relevant literature (key informative studies included Bai et al., 2013; Ortega et al., 2011, 2012; Zheng et al., 2013) and pre-testing of the choice experiment.

The paired attributes were initially shown randomly to the participants with all possible combinations. As the survey proceeded, the software automatically narrowed down the decisions based on participants' answers.

The way the 1000minds software works is that every time the participant makes a selection, the software immediately identifies all other hypothetical milk powder scenarios that can be pairwise ranked via transitivity and eliminates them from the survey ensuring that the number of trade-off questions asked is minimized. Thus, the number of trade-offs presented to participants varied. On average, the participants in this study were presented with 60 trade-off questions, with a minimum of 25, and a maximum of 103, when ranking a total of 10368 possible combinations.

### **Statistical analysis**

The 1000minds software uses mathematical methods based on linear programming to estimate the relative weights (also known as part-worth utilities) for the food safety cues and levels. The part-worth utilities indicate the relative importance of each level of each cue, in terms of its contribution to the overall preference for the milk powder. To determine if there were any defined segments of participants based on their cue prioritizations, cluster analysis was implemented via SPSS and R. First, logit transformation, a popular data transformation method for proportions when the numbers are close to zero (Carey, 2006), was used on the raw data to "stretch out" the data. Second, multiple methods on R were used to discover numbers of clusters, including k-mean and hierarchical clustering. Ward's method was used as a dissimilarity scale for hierarchical clustering.

### **Results**

Participants (50% male, 50% female) were mostly young (75% aged 18–34), married with children (68%), educated (89% had at least a bachelors' degree), and in fulltime employment (92%). This respondent profile is appropriate given the strong desire from foreign food companies to better understand this "ideal" young, educated, and working target market who desire imported safe and healthy food products (Table 2). Additional information collected on their attitudes and behaviors

Table 2. Demographic Characteristics of Survey Participants (n = 307)

	Number of participants (No.)	Percentage
Gender		
Male	153	49.8%
Female	153	49.8%
Prefer not to say	1	0.3%
Age		
18–24	55	17.9%
22–34	176	57.3%
35–44	57	18.6%
45–54	17	5.5%
55 and older	2	0.7%
Marital status		
Single	79	25.7%
Married, no child	20	6.5%
Married with children	208	67.8%
Monthly income		
Less than 3,000 rmb	10	3.3%
3,000–5,999 rmb	25	8.1%
6,000–7,999 rmb	38	12.4%
8,000–9,999 rmb	54	17.6%
10,000–14,999 rmb	86	28.0%
15,000–19,999 rmb	43	14.0%
20,000–24,999 rmb	19	6.2%
25,000–29,999 rmb	17	5.5%
More than 30,000 rmb	13	4.2%
I would rather not to say	2	0.7%
Highest level of education		
High school	7	2.3%
Diploma degree	23	7.5%
Bachelor's degree	221	72.0%
Master's degree	54	17.6%
PhD	1	0.3%
I would rather not to say	1	0.3%
Occupation		
Student	13	4.2%
Full time employed	282	91.9%
Part time employed	1	0.3%
Self-employed	4	1.3%
Others	4	1.3%
I would rather not to say	3	1.0%
Geographic location		
North China	120	39.1%
East China	91	29.6%
South China	74	24.1%
West China	13	4.2%
Central China	23	7.5%

toward food safety indicated that the majority (59.3%) of the participants reported that they were constantly concerned about the food they purchased and paid great attention to food safety news (86%), again making this an appropriate sample for this study in that these consumers are likely to be receptive to food safety messaging from food manufactures and government.

The overall response to the food safety of the different powered milk profiles is presented in Table 3. The utility values of all the highest levels of attributes were scaled by the software to sum up to 100%. The most important cue for participants was the “government certification logo shown on the product label” when shopping for imported milk powder, with a 14.4% relative importance. The second most important cue was “ingredients and materials, free from preservatives and additives,” with a 10.9% utility value. “Traceability techniques such as QR code included” was considered as the third most important cue with a 10% utility value.



**Table 3.** Estimated Part-worth Utilities for the Overall Participants of the Conjoint Survey Based on the Assurances of Safety that Different Cues Represent (n = 307)

Food safety cues	Levels	Overall utility value %
Food safety certification scheme	Not included on product label	0.0
	Private certification logo shown on product label	8.6
	Government certification logo shown on product label	14.4
Shelf life	Long shelf life (e.g. 20–24 months)	0.0
	Medium shelf life (e.g. 16–19 months)	3.7
	Short shelf life (e.g. 12–15 months)	7.0
Traceability technology (e.g. QR code)	Not included	0.0
	Included	10.0
Ingredients and materials	Regular preservatives and additives	0.0
	Natural preservatives and additives	6.7
	Free from preservatives and additives	10.9
Availability	Online only	0.0
	In-store and online	7.8
Nutritional information	High-fat content	0.0
	Low-fat content	6.3
Brand	Sino-International joint venture	0.0
	100% International owned & operated	6.9
Food safety inspection and quarantine documentation	Not provided	0.0
	Provided online on product's Website	9.7
Processing technology and transport information	No information provided	0.0
	Pictures and information available online	8.6
	Images provided online and/or on the package (e.g. country of origin and animals)	0.0
Available	Photo-shopped idealized images	3.5
	Real photos	9.5
	Only in China	0.0
	In China and in other Western markets	9.0

Part-worth utility means relative importance of the cue levels. Relevant importance values are bolded and sum up to 100. The Zero relative importance represents the lowest level of each attribute.

“Nutritional information, low-fat content” was the least important cue, with a utility value of only 6.3%.

Each lowest level was scored zero, which means these levels of cues were disfavored/perceived to represent the least level of assurance of safety. The medium levels of cues were scored between zero and their highest-level score indicating that these levels of cues were perceived as providing more assurance of safety than the lowest levels. Comparing single cue scores of the medium-leveled cues, the level “natural preservatives and additives” (of the ingredients and materials cue) had the highest score 61.6, followed by “private certification logo shown on product label” (of the food safety certification scheme cue) at 59.6 (Table 4). At the other end of the spectrum, the level “photo-shopped idealized images” (of the images cue) had a much smaller score of 36.4 indicating that this medium-leveled cue provided the least assurance of safety. This result suggests “natural preservatives and additives” and “private certification logo shown on product label” are more important/provide more assurance of safety to participants than other medium-leveled attributes, such as “medium shelf life” and “photo-shopped idealized images.”

In terms of the clustering, the two different approaches employed (i.e. k-mean and hierarchical) showed results of weak cluster structure suggesting that there were no distinct consumer segments who made differing trade-offs between safety cues when assessing the safety of adult milk powders (analyses available in the supplementary data).

## Discussion and implications

In terms of contributions to the literature, this study has provided novel insights into which food safety cues are perceived by consumers to be the most/least important in shaping decision-making about the

**Table 4.** Mean Weights for the Overall Sample in the Conjoint Survey Based on the Assurances of Safety that Different Cues Represent (n = 307)

Food safety cues	Attribute weight (sum = 1)	Levels	Single attribute score (0–100)
Food safety certification scheme	0.144	Not included on product label	0.0
		Private certification logo shown on product label	59.6
		Government certification logo shown on product label	100.0
Shelf life	0.070	Long shelf life (e.g. 20–24 months)	0.0
		Medium shelf life (e.g. 16–19 months)	52.8
		Short shelf life (e.g. 12–15 months)	100.0
Traceability technology (e.g. QR code)	0.100	Not included	0.0
		Included	100.0
Ingredients and materials	0.109	Regular preservatives and additives	0.0
		Natural preservatives and additives	61.6
		Free from preservatives and additives	100.0
Availability	0.078	Online only	0.0
		In-store and online	100.0
Nutritional information	0.063	High-fat content	0.0
		Low-fat content	100.0
Brand	0.069	Sino-International joint venture	0.0
		100% International owned & operated	100.0
Food safety inspection and quarantine documentation	0.097	Not provided	0.0
		Provided online on product's Website	100.0
Processing technology and transport information	0.086	No information provided	0.0
		Pictures and information available online	100.0
Images provided online and/or on the package (e.g. country of origin and animals)	0.095	No images provided	0.0
		Photo-shopped idealized images	36.4
		Real photos	100.0
Available Market	0.090	Only in China	0.0
		In China and in other Western markets	100.0

safeness of an adult milk powder product. Note that while we refer to the participants throughout this section as “consumers,” we do so only for convenience as we acknowledge that our deliberate sampling meant that only frequent consumers of imported food products were included and therefore our results are not generalizable to all Chinese consumers. The results are now contextualized in relation to the extant literature for each cue in turn. Additionally, as aforementioned, a key driver of this study was to provide actionable insights that will yield improvements in communication theory and practice. Thus, for each result, practitioner-orientated recommendations are also provided.

The utmost importance of food safety certification schemes to Chinese consumers is in congruence with previous studies (Ortega et al., 2011, 2012). It is interesting to note that the “government certification scheme” was the highest-ranking safety cue despite the fact that the “government” of which country (e.g. Chinese or other) was not specified. Previous literature has shown that consumers lack trust in the governance and regulation of the Chinese food industry (Kendall et al., 2019; Knight, Gao, Garrett, & Deans, 2008; Quan et al., 2017; Wang et al., 2020) and that they have greater levels of trust in the European supply chain and its regulations (El Benni et al., 2019). Despite these differences, our results indicate any certification scheme, even a private one, is a critical cue in providing food safety assurance and thus must be included both on pack and online.

A “short shelf life” of 12–15 months was believed to be the safest for the milk powder. Other studies have reported that Chinese consumers have been found to use shelf life as a safety cue, with Lee, Lusk, Miroso, and Oey (2014), for example, reporting that beverages with a shorter shelf-life are considered to be fresh and natural and hence safer. Given there is very little in the literature about how consumers interpret the relationship between the shelf life of a processed product and its safety, especially in a Chinese context, further research here is encouraged. In the meantime, risk communicators are advised to be aware of the desire for short(er) shelf-life timeframes, even for processed products like milk powder and promote this accordingly.

It is not surprising that a preference for “traceability technology, e.g. QR code” was reported as the third most important safety cue given that others have likewise identified traceability technologies as important information sources about a product’s authenticity and determinant of safety for Chinese consumers when making purchase choices (El Benni et al., 2019). Therefore, there is a need to invest in traceability techniques such as QR codes or other smart (intelligent) traceability packaging technologies to demonstrate information such as safety certifications and company information.

In terms of the ingredients and materials, the “free from preservatives and additives” cue was the most favored. Public concern about the overuse of food additives, such as the excessive use of preservatives to extend a product shelf life and the illegal use of sweeteners and colorants to improve a product’s taste and appearance, has previously been noted (Liu et al., 2018). However, to the best of the authors’ knowledge, very little research to date has discussed ingredients and materials as a specific food safety assurance cue thus making any comparative claims here difficult. In one notable exception, Lee et al. (2014) found consumers were increasingly interested in products that are nutritious and additive-free driven in part by the succession of food safety scandals. Further research into this food safety cue is warranted given its apparent influence. Food manufacturers would be wise to be mindful of the “free-from” trend and look to phase out preservatives and additives where possible so that they can make these “free-from” claims that resonate well with this consumer market.

Products that were “available both in-store and online” were considered safer than those exclusively available online. Evidence of this desire to still have a brick and mortar presence is witnessed in China’s booming online-to-offline (O2O) retailing market where consumers use online channels to buy from physical supermarkets (He, Han, Cheng, Fan, & Dong, 2019). There has also been a recent explosion in China of a new e-commerce mode called New Retail, which digitalizes traditional offline retail stores by using big data, cloud computing, the internet of things, mobile payment, and artificial intelligence. Alibaba’s Fresh Hema, for example, provides a “three-in-one” service including online delivery, in-store purchase, and in-store cooking and dining (Wang, Somogyi, & Charlebois, 2020). This relationship between online/offline retail channel availability and the perceived product safety can be further demonstrated in the food service sector where, after a number of food safety issues, the China Food Drug Administrative (FDA) announced in 2017 that all online catering providers should obtain a business license and own a physical storefront which must operate under the supervision of local FDA (CFDA, 2020). Thus, manufacturers and retailers of imported food products such as milk powder should look to maintain (or create) a physical presence in China to provide this safety assurance to consumers.

For the nutritional informational cue, “low-fat content” was considered to reflect a safer product that “high-fat content” but it was the least important cue of all the provided food safety cues. Fat content might be a controversial issue for health, and different consumers might have different understandings of it in relation to food safety. Further research could be undertaken to investigate other aspects of nutritional information related to safety, such as the presence of vitamins and minerals, or the presence of a nutritional table. While scholars have purported that a broad definition of food safety encompasses nutritional qualities (Grunert, 2005), it still appears to be a relatively weak cue in terms of safety of milk powder products.

A 100% international owned and operated brand was preferable than a Sino-international joint venture. The preference among Chinese consumers for Western rather than Chinese food products is

well documented (Walley et al., 2014). However, most of the relevant literature on the influence of country on product has focused on the product's origin rather than ownership model. For example, authenticity labels such as the 'protected designation of origin (PDO)' that indicate the place of origin of the food, have been shown by El Benni et al. (2019) to serve as highly important indicators of quality and safety. Before committing to Sino-international joint ventures, international companies should at least be mindful that such ventures may be perceived as less safe than 100% international owned and operated companies given consumer mistrust of the domestic food industry. Therefore, entering such ventures has the possibility of causing reputational damage to their brand. Given the importance of this issue, further research is highly advised.

Food safety inspection and quarantine documentation served as an important food safety cue for this imported food product. Although not mandatory to be included on a product's Website or label, consumers have become accustomed having access to such information. To strengthen their risk communications with the public, the Chinese government provides regular reports on the results of food quality inspections through mass central and local media. In addition, the China Food and Drug Administration established the national food safety traceability platform (<http://www.chinatrace.org>) which is available for producers, governmental officials, and consumers and is updated in real time based on sampling inspections (Liu, Mutukumira, & Chen, 2019). The recommendation here is that food safety inspection and quarantine documentations increase consumer confidence and therefore providing this information on a product's Website is highly advisable.

Pictures and information available online about the processing technology and transport were deemed a useful food safety cue. Transparency in these aspects is important with consumers wanting to be able to see for themselves how the product is processed, for example, the hygienic conditions during production and how the products are stored and transported. While such information is difficult to provide on pack, companies may be able to provide this sort of information in store via televisions or additional aisle promotional materials, or of course by ensuring there are clear links to online easily accessible (e.g. via the pack's QR code).

The fact that real photos were preferred over photo-shopped idealized images on pack or online was an interesting finding. This may relate to trust with photos perceived to be more difficult to replicate and thus more authentic than idealized images. As reported earlier, the recent food crises in China have tremendously reduced people's confidence in food producers so conveying authenticity, in this case, using real photos, is important.

The availability of very similar or identical products in Western markets was also important to these consumers. This is interesting given that many companies to date have focused their efforts on designing and tailoring their products and marketing communications specifically for the Chinese market. Manufacturers of imported products may emphasize their product's foreign origins by retaining the original packaging/labeling (e.g. that is written in English), or by including information on the Website about where the product is retailed in Western countries, including perhaps sales statistics in these overseas locations.

Therefore, in conclusion to the first research question "How do Chinese consumers perceive the relative importance of different food safety cues?" Safety certifications, shelf life, country of origin, and ingredient labeling were all found to be important safety cues for Chinese consumers. As a result, there is a need to include, at a minimum, these safety cues on the package, as well as the online Website. While it is appreciated that origin, shelf life, ingredients, and sometimes certification needs by law to be indicated on a food package, this research suggests that it would be advantageous to the food manufacturer to ensure that this data is very prominently displayed.

In relation to the second research question "Do significant differences exist between groups of Chinese consumers as to how they prioritize these cues?" Cluster analysis suggested that there were not distinct consumer segments in the sample data. In other words, all participants regardless of who they were (e.g. male or female, married with children or not) or where they were from (e.g. north or south, tier-one or tier-two cities), all prioritized the cues in a similar way when assessing the safety of adult milk powders. Given the homogeneity of the sample and the target market (young, educated, working,

desire imported food products) and the specificity of the selected product (adult milk powder), this conclusion makes some sense. Thus, because of this, a single marketing strategy is suggested to be effective for delivering the safety message of imported adult milk powders to these Chinese consumers. However, this result could also be somewhat controversial, as previous studies have found distinct clusters in how consumers make consumption decisions when other factors such as price are included in the segmentation analysis. El Benni et al. (2019), for example, identified two consumer segments, with one preferring lower priced infant formula and the second choosing higher priced products, and Lee et al. (2015) found three consumer segments based the rank order for a range of attributes for juice. Given the inconsistency in these results, future studies that explore if this consumer heterogeneity persists for food safety cue preferences across different products are therefore recommended.

## Conclusions

This study has several limitations which are fruitful venues for further research. The first limitation of this study is that the sample was not selected to be representative of China but to rather represent the type of consumer that might feasibly buy an imported food product from a Western country. This deliberate sampling of respondents should be kept in mind and the results need to be interpreted in this deliberately targeted market (i.e. young, educated, working, and desire imported food products) context. Past research has shown consumer segmentation in China to be affected by demographics such as age, gender, educational level, and economic conditions (e.g. Xu & Wu, 2010) and so further research with different subpopulations based on such demographics within China is recommended to explore results in these differing contexts. A second limitation is that this study has focused exclusively on Chinese consumers. Given that food safety is often a much more important consumption motive for Chinese consumers than for Western consumers (where food safety is simply assumed), the types of food safety cues required and the prioritization that consumers place on these are likely to differ and so a further cross-national population study to explore cultural differences between Western and Chinese consumers in terms of cue usage related to safety perception would also be worthwhile. The third limitation is that the attribute prioritization was conducted in the context of just one specific product category, adult milk powder, and while there may feasibly be opportunities to extrapolate these to other product categories, confirmatory research is advised before doing so. It would be of interest to see if consumers prioritized food safety attributes differently for organic, green, and hazard-free foods (called “safe foods” in China). It would also be of interest to see if prioritizations changed for imported vs. domestic, fresh vs. processed foods, high risk vs. low-risk foods, and healthy vs. non-healthy foods. The fourth limitation is that the research focus was limited purely to extrinsic food safety cues in order to better understand how consumers use these to make decisions. Of course, in real decision-making processes, consumers might trade off food safety for other product attributes, both intrinsic (e.g. sensory) and extrinsic (e.g. animal welfare) and thus further work here is encouraged. The next step from a practical risk communication perspective is to pilot the suggested practical strategies presented here within to assess their effectiveness in real-life shopping situations.

## Acknowledgments

The authors would like to thank Tim Jowett, for his valuable statistical support for this research. The authors would also like to thank Associate Professor Paul Hansen and Mr Franz Ombler for providing access and help to the use of 1000minds software.

## Funding

This work was supported by the New Zealand-China Food Protection Network under Grant [number 3000030866].

## ORCID

Miranda Mirosa  <http://orcid.org/0000-0002-4476-3793>

Phil Bremer  <http://orcid.org/0000-0002-7890-8970>

## References

- 360 Market Research Report. (2020, May 18). *20202026 global and regional adult milk powder industry production, sales and consumption status and prospects professional market research report*. Retrieved from <https://www.360researchreports.com/enquiry/request-sample/15061997>
- Bai, J., Zhang, C., & Jiang, J. (2013). The role of certificate issuer on consumers' willingness-to-pay for milk traceability in China. *Agricultural Economics*, *44*(4–5), 537–544.
- Ben-Akiva, M. E., & Lerman, S. R. (1985). *Discrete choice analysis: Theory and application to travel demand* (Vol. 9). Cambridge, MA: MIT Press.
- Carey, G. (2006, February 8). *Carey: Psyc 5741: QMIN: Quantitative methods in neuroscience*. Retrieved from <http://psych.colorado.edu/~carey/Courses/PSYC5741/ClassHandouts.htm>
- CFDA. (2020). 国家食品药品监督管理总局令第36号 [Food Safety Supervision and Management Measures for online Catering Services]. Retrieved from <https://archive.is/YhTs4>
- China Research and Intelligence Co., Ltd. (2020). *Research report of import of dairy products industry in China 20202024*. Retrieved from <https://www.marketresearch.com/China-Research-and-Intelligence-Co-Ltd-v3627/Research-Import-Dairy-Products-China-12933726/>
- Cox, D. F. (1967). The sorting rule model of the consumer product evaluation process. In D. F. Cox (Ed.), *Risk taking and information handling in consumer behavior* (pp. 324–369). Boston, MA: Division of Research, Graduate School of Business Administration, Harvard University.
- El Benni, N., Stolz, H., Home, R., Kendall, H., Kuznesof, S., Clark, B., ... Chan, M.-Y. (2019). Product attributes and consumer attitudes affecting the preferences for infant milk formula in China – A latent class approach. *Food Quality and Preference*, *71*, 25–33. doi:10.1016/j.foodqual.2018.05.006
- Gao, W. E., Heng, Z., & Shi, L. (2019). Chinese consumers' preferences for food quality test/measurement indicators and cues of milk powder: A case of Zhengzhou, China. *Food Policy*, *89*, 10179.
- Grunert, K. G. (2005). Food quality and safety: Consumer perception and demand. *European Review of Agricultural Economics*, *32*(3), 369–391. doi:10.1093/eurrag/jbi011
- Guenther, M., Saunders, C. M., Dalziel, P. C., Rutherford, P., & Driver, T. (2015). *Maximising export returns: Consumer attitudes towards attributes of food and beverages in export markets relevant to New Zealand*. Christchurch, New Zealand: Lincoln University.
- Haddad, Y., Haddad, J., Olabi, A., Shuayto, N., Haddad, T., & Toufeili, I. (2007). Mapping determinants of purchase intent of concentrated yogurt (Labneh) by conjoint analysis. *Food Quality and Preference*, *18*(5), 795–802. doi:10.1016/j.foodqual.2007.01.009
- Hansen, P., & Omblor, F. (2008). A new method for scoring additive multi-attribute value models using pairwise rankings of alternatives. *Journal of Multi-Criteria Decision Analysis*, *15*(3–4), 87–107. doi:10.1002/mcda.428
- He, Z., Han, G., Cheng, T., Fan, B., & Dong, J. (2019). Evolutionary food quality and location strategies for restaurants in competitive online-to-offline food ordering and delivery markets: An agent-based approach. *International Journal of Production Economics*, *215*, 61–72. doi:10.1016/j.ijpe.2018.05.008
- Hou, B., Hou, J., & Wu, L. (2020). Consumer preferences for traceable food with different functions of safety information attributes: Evidence from a menu-based choice experiment in China. *International Journal of Environmental Research and Public Health*, *17*(1), 146. doi:10.3390/ijerph17010146
- Jun-Shi, C. H. E. N. (2009). What can we learn from the 2008 melamine crisis in China? *Biomedical and Environmental Sciences*, *22*(2), 109–111. doi:10.1016/S0895-3988(09)60031-3
- Kendall, H., Kuznesof, S., Dean, M., Chan, M. Y., Clark, B., Home, R., ... Frewer, L. (2019). Chinese consumer's attitudes, perceptions and behavioural responses towards food fraud. *Food Control*, *95*, 339–351. doi:10.1016/j.foodcont.2018.08.006
- Knight, J., Gao, H., Garrett, T., & Deans, K. (2008). Quest for social safety in imported foods in China: Gatekeeper perceptions. *Appetite*, *50*(1), 146–157. doi:10.1016/j.appet.2007.06.010
- Lai, J., Wang, H. H., Ortega, D. L., & Olynk Widmar, N. J. (2018). Factoring Chinese consumers' risk perceptions into their willingness to pay for pork safety, environmental stewardship, and animal welfare. *Food Control*, *85*, 423–431. doi:10.1016/j.foodcont.2017.09.032
- Lancaster, K. J. (1966). A new approach to consumer theory. *Journal of Political Economy*, *74*(2), 132–157. doi:10.1086/259131
- Lee, P. Y., Lusk, K., Mirosa, M., & Oey, I. (2014). The role of personal values in Chinese consumers' food consumption decisions. A case study of healthy drinks. *Appetite*, *73*, 95–104. doi:10.1016/j.appet.2013.11.001

- Lee, P. Y., Lusk, K., Miroso, M., & Oey, I. (2015). An attribute prioritization-based segmentation of the Chinese consumer market for fruit juice. *Food Quality and Preference*, 46, 1–8. doi:10.1016/j.foodqual.2015.06.016
- Li, S. W., Chen, Z. H. U., Chen, Q. H., & Liu, Y. M. (2019). Consumer confidence and consumers' preferences for infant formulas in China. *Journal of Integrative Agriculture*, 18(8), 1793–1803. doi:10.1016/S2095-3119(19)62589-X
- Liu, A., Shen, L., Tan, Y., Zeng, Z., Liu, Y., & Li, C. (2018). Food integrity in China: Insights from the national food spot check data in 2016. *Food Control*, 84, 403–407. doi:10.1016/j.foodcont.2017.08.033
- Liu, R., Pieniak, Z., & Verbeke, W. (2013). Consumers' attitudes and behaviour towards safe food in China: A review. *Food Control*, 33(1), 93–104. doi:10.1016/j.foodcont.2013.01.051
- Liu, Z., Mutukumira, A. N., & Chen, H. (2019). Food safety governance in China: From supervision to coregulation. *Food Science & Nutrition*, 7(12), 4127–4139. doi:10.1002/fsn3.1281
- Ministry of Primary Industries, Economic Intelligence Unit. (2018) *Dairy in China; A consumer assessment of the market size and relative pricing premiums of product claims in various categories*. Retrieved from <https://www.mpi.govt.nz/dmsdocument/34932-market-insights-dairy-in-china-pdf>
- Orme, B. (2010). *Getting started with conjoint analysis: Strategies for product design and pricing research second edition*. Madison, WI: Research Publishers LLC.
- Ortega, D. L., Wang, H. H., Olynk, N. J., Wu, L., & Bai, J. (2012). Chinese consumers' demand for food safety attributes: A push for government and industry regulations. *American Journal of Agricultural Economics*, 94(2), 489–495. doi:10.1093/ajae/aar074
- Ortega, D. L., Wang, H. H., Wu, L., & Hong, S. J. (2015). Retail channel and consumer demand for food quality in China. *China Economic Review*, 36, 359–366. doi:10.1016/j.chieco.2015.04.005
- Ortega, D. L., Wang, H. H., Wu, L., & Olynk, N. J. (2011). Modeling heterogeneity in consumer preferences for select food safety attributes in China. *Food Policy*, 36(2), 318–324. doi:10.1016/j.foodpol.2010.11.030
- Quan, S., Yu, X., & Zeng, Y. (2017). Chinese consumers' preferences towards country of origin of milk powder. *Journal of Agricultural Economics*, 1, 52–66.
- Qvester, P. G., & Smart, J. (1998). The influence of consumption situation and product involvement over consumers' use of product attribute. *Journal of Consumer Marketing*, 15(3), 220–38. doi:10.1108/07363769810219107
- Riccioli, F., Moruzzo, R., Zhang, Z., Zhao, J., Tang, Y., Tinacci, L., ... Guidi, A. (2020). Willingness to pay in main cities of Zhejiang province (China) for quality and safety in food market. *Food Control*, 108, 106831. doi:10.1016/j.foodcont.2019.106831
- Siegrist, M., & Cvetkovich, G. (2000). Perception of hazards: The role of social trust and knowledge. *Risk Analysis*, 20(5), 713–720. doi:10.1111/0272-4332.205064
- Silayoi, P., & Speece, M. (2007). The importance of packaging attributes: A conjoint analysis approach. *European Journal of Marketing*, 41(11/12), 1495–1517. doi:10.1108/03090560710821279
- Statista. (2020). *Food and beverage China report*. Retrieved from <https://www.statista.com/outlook/253/117/food-beverages/china>
- Walley, K., Custance, P., Feng, T., Yang, X., Cheng, L., & Turner, S. (2014). The influence of country of origin on Chinese food consumers. *Transnational Marketing Journal*, 2(2), 78–98. doi:10.33182/tmj.v2i2.411
- Wang, J., Tao, J., & Chu, M. (2020). Behind the label: Chinese consumers' trust in food certification and the effect of perceived quality on purchase intention. *Food Control*, 108, 106825. doi:10.1016/j.foodcont.2019.106825
- Wang, O., Somogyi, S., & Charlebois, S. (2020). Food choice in the e-commerce era. *British Food Journal*, 122(4), 1215–1237. doi:10.1108/BFJ-09-2019-0682
- Wu, X., Hu, B., & Xiong, J. (2020). Understanding heterogeneous consumer preferences in Chinese milk markets: A latent class approach. *Journal of Agricultural Economics*, 71(1), 184–198. doi:10.1111/1477-9552.12327
- Xu, L., & Wu, L. (2010). Food safety and consumer willingness to pay for certified traceable food in China. *Journal of the Science of Food and Agriculture*, 90(8), 1368–1373. doi:10.1002/jsfa.3985
- Xu, L., Yang, X., & Wu, L. (2019). Consumers' Willingness to Pay for Imported Milk: Based on Shanghai, China. *International Journal of Environmental Research and Public Health*, 17(1), 244. doi:10.3390/ijerph17010244
- Zheng, Y., Li, X., & Peterson, H. H. (2013). In pursuit of safe foods: Chinese preferences for soybean attributes in soymilk. *Agribusiness*, 29(3), 377–391. doi:10.1002/agr.21342