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CONSUMERS' ATTITUDE and BEHAVIOR  
TOWARDS  
FOOD SAFETY and NUTRITION LABELING  
IN URBAN CHINA

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for the degree of Doctor (PhD) in Applied Biological Sciences

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Houding en gedrag van consumenten in verstedelijkt China ten aanzien van voedselveiligheid en voedingswaarde etikettering

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## List of abbreviations

ANOVA	Analysis of Variance
BMI	Body Mass Index
CAPP	Chinese Academy of Press and Publication
CI	Confidence Interval
CNNIC	China Internet Network Information Center
CNKI	China National Knowledge Infrastructure
CNPCSC	China's National People's Congress Standing Committee
EUFIC	European Food Information Council
FDA	Food and Drug Administration
GM	Genetically Modified
KMO	Kaiser-Meyer-Olkin
MOH	Ministry of Health, China
NCCD	National Centre for Cardiovascular Disease
NCDs	Non-Communicable Diseases
NRV	Nutrient Reference Value
OR	Odds Ratio
PPO	Partial Proportional Odds
SD	Standard Deviation
PRC	People's Republic of China
SEM	Standard Error of the Mean
SPSS	Statistical Package for the Social Science
USDA	United State Department of Agriculture
WTP	Willingness to pay





# **Chapter 1**

## **Introduction, objectives and outline of the thesis**

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## 1.1 General introduction

Food safety (shiping anquan) emerged in China as an international trade issue in the early years of the 21<sup>st</sup> century and has become a dominant concern since 2003 due to a spate of food safety incidents (Wang, Mao & Gale, 2008). Although studies have shown that organic food is not safer or more nutritious than conventional food (Bourn & Prescott, 2010), organic food, as well as green and hazard free food in China are called as “safe food”. All foods need to be produced in the way that ensures that they are safe to eat, irrespective of whatever food production system adopted (Codex-Allmentarius-Commission, 2003). The need for conventional food producers to adopt safe food production and processing should be as important as it for organic food producers. However, this is not the case in China. According to the report of the food safety situation in China in 2013, microorganism in 34 percent of drinking water in market exceeded food safety standard and 29 percent of curing meat products had excessive microorganism and food additives (Yang, 2014). In the local market, Ningxia province reported that about 50 percent of the aquatic products and 48 percent of bean noodles did not meet food safety standard (Shang & Jiang, 2014). Food safety has been the top concern in Chinese consumers’ decision of buying food, exceeding quality, price and brand (China Daily, 2013). A survey in 2010 reported that Chinese people considered food safety as their second-greatest risk in daily life, after earthquakes (Alcon & Ouyang, 2012).

Public scrutiny has been most focused on largely-reported food accidents in which food was chemically adulterated such as the melamine contamination in infant milk powder and the overuse of clenbuterol in animal food production. Except for chemical hazards, microorganism (e.g., salmonella), plant toxin (e.g., phytohaemagglutinin (PHA)) and animal toxin (e.g., histamine) are also the main causes of food-borne illnesses in China (Xue & Zhang, 2013). Food-borne illnesses have been the most explosive health issue in China (Alcorn & Ouyang, 2012; Chen 2005; Teng, 2011). In addition, non-communicable diseases (NCDs), which are associated with unhealthy dietary patterns like the excessive consumption of high-fat or high-salt food, have become the major causes of death in China (NCCD, 2013; Kang, Guan, Ning, Wu & Guan, 2012). The proportion of deaths caused by NCDs is as twice as that of all infectious diseases. NCDs have become a major threat to public health (Yang, Yang, Zhu, & Qiu, 2011).

Risk communication is the interactive exchange of information and opinions about risk and risk management between interested parties (e.g., government, scientist, industry, consumer, etc.) (FAO/WHO, 1999). Risk communication has been proven an effective tool for authorities in preparing the public for potential crises (De Vocht, 2014). Food risk communication with consumers can create awareness, increase knowledge and understanding of food hazards, influence their perceptions, attitude and beliefs, enable them to make informed decision about food safety, nutrition, and health, and avoid getting themselves or others hurt (McGloin et al., 2009). Thus, risk communication can influence or modify consumers' behavior in ways that will improve safety. For example, Lee et al. (2013) reported that consumers' awareness of and knowledge about food additives in Korea as well as their trust in the safety of food additives largely increased after they received printed education materials about food additives safety. In China, news reports of melamine-tainted milk powder can make Chinese consumers realize the existence of melamine in some brands of milk, understand the potential adverse effect of melamine on health, stop consumption of the milk with melamine and reduce the probability of adverse effect of this hazard on consumers' health. Kidney beans, for another example, if uncooked or not fully cooked, contain PHA (Phytohaemagglutinin) toxin (Xue & Zhang, 2013). Undercooked kidney beans are responsible for most of the food incidents by plant toxin in China (Xue & Zhang, 2013). Food and drug administrations in local cities in China such as Laiwu city (Feng, 2014), Changchun city (Changchun Evening News, 2014), Tengzhou city (Liu, 2014), etc., have strengthened the publishing information through mass media or lectures in communities to consumers about the potential hazard of PHA in kidney beans and the time requirement for cooking this type of beans in order to increase consumers' awareness of this hazard and help them adopt correct cooking way to avoid the risk caused by PHA toxin. Chinese consumers indicate that this kind of information has increased their awareness of PHA toxin in kidney beans and they will adopt the right way to cook kidney beans (Liu, 2014).

Chinese government plays an important role in food control system. It is responsible for providing food law and regulation, food control management, inspection service, laboratory services and information, education, communication and training (Jia & Jukes, 2013). The Chinese government has strengthened the communications with the public about food safety due to the frequently emerging food accidents. For example, alert information about food toxin, food contamination, etc., has been frequently published since 2010 (Tang, 2013). Regular reports of the results of food quality inspection have appeared in not only central but

also local level of television and newspaper. Food safety education campaigns on how to e.g., recognize counterfeit and fake food, avoid bacterial cross-contamination or clean fresh vegetable and fruit have been implemented through television programs as well as the lectures in public places like shopping and living areas (e.g., ChengduFDA, 2012). In addition, food safety education programs have been adopted by different levels of schools (from primary school, middle school to college) with the aim to improve food safety knowledge and skills among students (e.g., Peng & Liu, 2006; Zhang, Li, & Qiu, 2011). Serious food safety problems in China also result in more training programs for the people who work in the catering industries about the impact of food-borne illnesses, understanding Food Safety Law, food safety hazards and contamination, food preservation, storage and temperature control, personal hygiene, etc. with the aim to strengthen food hygiene control and avoid food mishandling at the later stage of the food chain (Zhang & Li, 2007; Zhang, Li, & Zhao, 2013).

Although the lack of effective and efficient supervisions of government on numerous and diversified food producers is an important reason for food safety problems in China (Zhang, et al., 2013), the role of consumers in improving the food safety situation should be encouraged and strengthened. First, food supply is driven by consumers' food demand and choice. If Chinese consumes increased their awareness of food safety and had the knowledge and abilities to identify unsafe food products, they will say no to these foods. The declined demand may push food producers to adopt safe food production and processing and may result in a safe food market. Second, consumers can play an active role in food supervision. It is reported that a woman in Beijing who is the mother of a three-year-old boy will call the food producers to ask what materials or what additives they have used in food production when she doubts the safety of the food products. However, consumers like this woman who has the knowledge about food-related hazards and actively searches food information are scarce in China (Xinhua Daily Telegraph, 2014). Most of Chinese consumers believe that food safety problems should be solved by government and they cannot do anything to change the situation (Teng, 2011). This is one reason why most of Chinese consumers who have encountered food scares never complain to the authorities (Alcon & Ouyang, 2012). Public supervision can contribute to the improvement of the food safety situation in China by pressuring food companies and the government to boost the enforcement of food safety law and make it more effective if Chinese consumers realize that they should and they can play an active and responsible role in solving food safety problems (Ni & Zeng, 2009). Thus, risk communication, especially food safety education campaign is necessary to increase not only

Chinese consumers' food safety knowledge, but also their awareness of public supervision and provide the feelings that they can do something to improve the food safety situation in China.

A better understanding of consumers' attitude and behavior is a prerequisite to develop effective strategies to communicate food safety issues to consumers (Jacob, Mathiasen & Powell, 2010). Wilcock, Pun, Khanona and Aung (2004) indicated that the consumers' willingness to change behavior is determined by perceptions and beliefs, and acknowledged the need to learn more about consumers' attitude and behavior towards food safety. This doctoral research will discuss three topics related to consumers' attitude and behavior towards food safety and nutrition labeling in urban China. First, Chinese consumers' risk perceptions of food-related hazards and trust in information sources will be discussed. Second, the impacts of information about the benefits and risks of eating pork on Chinese consumers' perceptions and intentions towards eating pork will be investigated. Third, Chinese consumers' understanding and use of a food nutrition label and their determinants will be discussed.

## **1.2 Conceptual framework**

The conceptual framework of this doctoral dissertation (Table 1.1) is based on a hierarchy of effects which indicates the different mental stages that consumers go through when making buying decisions and responding to information (Lavidge & Steiner, 1961; Barry & Howard, 1990). Proponents of hierarchy of effects proposed by Lavidge and Steiner (1961) claim that consumers respond to market communication in an ordered process which begins with belief (cognition), through attitude (affect) and to intention (conation). Belief as "mental activity" is reflected in knowledge or understanding that someone has about some aspect of their world. Belief is formed based on knowledge and understanding of information, and is the basis for the attitude formation. Attitude is treated as feelings, thinking and emotions which are based on physiological components. Intention refers to consumers' willingness to perform the behavior (Barry & Howard, 1990).

**Table 1.1 Conceptual framework of the doctoral research**

<b>Information</b>	<b>Hierarchy of effects</b> (Lavidge & Steiner, 1961)		
	<b>Cognition</b>	<b>Affect</b>	<b>Conation</b>
Food-related hazards	Trust	Trust Risk perception	
Benefit / Risk		Attitude	Intention
Nutrition label	Knowledge Understanding		Use

Knowledge is a key construct in consumer behavior decision-making process. Effective communication depends largely on the degree to which the information is adequately processed. An important prerequisite for information effectiveness is that consumers are able and willing to process information (Moorman, 1990). The level of knowledge determines consumers' ability to collect information and process the communication (Alba & Hutchinson, 1987; Brucks, 1985). More food safety knowledge has been found associated with high intention to perform risk-reduction behaviors (Takeda, Akamatsu, Horiguchi, & Marui, 2011). Bearth, Cousin and Siegrist (2014) found that higher knowledge about food safety was related to safer behavior and knowledge provision was a successful strategy to improve food safety behavior. Burger and Gochfeld (2008) reported that consumers' detailed knowledge about the nature of the benefits and risks of fish help them make decisions about fish consumption and the lack of detailed information was a major component of ineffective communication. Consumers' knowledge about a product can be conceptually divided into subjective knowledge and objective knowledge. Objective knowledge is the accurate information about the product stored in consumers' memory while subjective knowledge refers to people's subjective perceptions of what or how much they know about a product based on the own subjective interpretation of what one knows (Park, Mothersbaugh, & Feick, 1994; Selnes & Gronhaug, 1986). Subjective knowledge has been found to be a stronger motivator of behavior than objective knowledge. It is reported that consumers with more subjective knowledge about food safety have less panic responses to a food hazard issue (Jin & Han, 2014). Subjective knowledge relates to motivational factors such as self-confidence (Brucks, 1985). Subjective knowledge significantly differs from objective knowledge when there is a gap in consumers' confidence about their actual knowledge level.

Understanding has a central role in the processing of information. Effective communication draws heavily on the extent to which messages are adequately understood by the receiver. Understanding nutrition information requires a certain level of nutritional knowledge which is often lacking, especially detailed knowledge about daily dietary needs for specific nutrients (van Trijp, 2009). A lack of understanding is an important reason for consumers not to use nutrition labels (EUFIC, 2005; Gorton, Mhurchu, Chen & Dixon, 2009; Chen & Niu, 2009; Besler, Buyuktuncer & Uyar, 2012). A distinction is made between subjective (or perceived) and objective understanding of nutrition information which may be quite different for one and the same consumer (Grunert & Wills, 2007). Objective understanding is whether the consumer's interpretation of information is consistent with what is intended by the information sender (Grunert & Wills, 2007). Subjective understanding refers to "feeling states associated with the event, an appraisal of the purpose or intent of the event, and an appreciation of the significance of the event" (Powers, Welsh & Wright, 1994), i.e. the meaning a person attaches to the information and the extent to which a person believes he/she can understand it (Grunert & Wills, 2007). Subjective understanding has been reported to be important in shaping the acceptability of different nutrition label formats (Mejean, Macouillard, Péneau, Hercberg, & Castetbon, 2013).

Attitudes are the feelings or affective responses. An attitude is defined as the evaluation of the combination of the attributes or characteristics that an object possesses. Attitude can be formed by evaluative conditioning, which is a change in the valence of a conditioned stimulus due to its pairing with an unconditioned stimulus (De Houwer, Thomas, & Baeyens, 2001; Loebnitz & Grunert, 2014). Loebnitz and Grunert (2014) found that evaluative conditioning could explain Chinese consumers' attitude formation toward food technologies in China when they saw affective images. The concept of attitude implies that concepts such as perceived risk can be understood as particular types of attitudes. The word "perceived" or "perception" indicates the subjective nature of attitude. Risk perception is a psychological element which guides peoples' responses to a particular hazard rather than the technical risk estimates (Frewer, 1999, p 569). A large body of evidence shows that risk perception can have a substantial impact on behaviors and decisions (e.g., Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, 1999). Yeung and Morris (2001) found that food choice is more influenced by the psychological interpretation of product properties than the physical properties of the products themselves. Perception of food risk is one such psychological interpretation which influences consumers' attitude and behavior towards food products (e.g., Lobb, Mazzocchi, &



Traill, 2005). Understanding the target audience and their perceptions of risks is an important prerequisite to effective risk communication (Jung, 2006; Kennedy et al., 2010; Renn, 2006). Slovic's psychometric paradigm (1987) proposes that the risk perceptions of lay people are related to psychological factors, such as perceived catastrophic potential, fear or whether exposure to the hazard is voluntary. Risk perception can be measured by worry (Rosati & Saba, 2004), which can be defined as an "unpleasant state of mind with thoughts about uncertain and unpleasant events" (Sjöberg, 1998). Worry is characterized as a "feeling of anxiety, tension and apprehension; moderate awareness of somatic cues and concerns over the future rather than the past or present situation" (Borkovec et al, 1983; p9). Research on the relationship between worry and perceived risk showed that these concepts were moderately (Rosati & Saba, 2004; Siegrist, Cvetkovich & Roth, 2000; Lipkus, Klein, Skinner, & Rimer, 2005; Bjovatin et al., 2008; van Hulsteijn et al., 2014) to highly (Griffin & Dunwoody, 2002; Rundmo, 2002) related.

Food safety is treated as an experience attribute, but largely a credence attribute (Casewell & Mojdzuska, 1996). The key factor that makes it as credence attribute is that a consumer can not measure the quality and also can not learn it from his/her experience in consuming the product. Even if eating a contaminated food product results in illness, the probability of a food product being contaminated may not well be known. It is uncertain that one can well predict future experience from his/her past experience. Thus, the consumer can not assess food safety even after consumption. Consumers will depend on the information provided by information sources to assess the benefits and risks related to food consumption (Casewell & Mojdzuska, 1996). Trust plays a critical role in the utilization of the provided information and it is an important determinant of the effectiveness of the information (Thiede, 2005). Trust in authorities is especially important during crises since people need to follow up the guidelines and information provided by the government to ensure their safety (De Vocht, 2014). Trust is more influential in an environment where the knowledge about risk is low (Wachinger, Renn, Begg, & Kuhlicke, 2012) or people are not willing or able to process information in a detailed, rational and analytical way (Verbeke et al., 2008). Trust in information sources depends on a belief that the source is expert, unbiased, without vested interest and not sensationalist (Breakwell, 2000). Public trust in institutions responsible for risk management and communication is an important factor influencing public risk perception and a prerequisite for effective risk communication (e.g., Poortinga & Pidgeon, 2003). Kennedy et al. (2010) found that consumers who considered the authorities' management of the incident incomplete rated

the risk of eating pork to be higher. De Vocht (2014) reported that when the authorities communicate about a risk before it turned into a crisis, the level of public trust in the authorities was higher than in case that the government did not warn the public about the potential risk. Trust is defined as “the extent to which one believes that others will not act to exploit ones’ vulnerabilities” (Morrow et al., 2004). In this concept, trust is a combination of cognitive process (rational thinking) and affective influences (feelings, instinct and intuition) (Lewis & Weigert, 1985; Morrow et al., 2004). Cognitive trust is a consumer’s confidence to rely on a service provider’s competence while affective trust is the confidence on the basis of feelings generated by the level of care and concern the a service provider demonstrates. Trust is conceptualized as a multidimensional construct. Frewer et al. (1996) indicated that trust is based on perceived accuracy, knowledge and concern with public welfare. Peter, Covello and McCallum (1997) proposed knowledge, expertise, openness, honesty, concern and care as the dimensions of trust.

Communication is achieved by information flow between sources and receivers. Information can be divided into positive messages (about benefits), negative messages (about risks) and balanced information. Information about the benefits of food may result in positive attitudes and increase the likelihood of consumers accepting these foods (e.g., Koistinen et al., 2013; Siegrist et al., 2008; Smed, 2012), while negative information may reduce consumers’ perceptions of quality and their likelihood of (or actual) consumption (Adhikari et al., 2006; Ishida et al., 2010; Smed, 2012). Previous research about how positive and negative information influences consumer behavior has shown that negative information usually has a stronger impact than positive information on consumers’ perceptions and food choice behavior (Smed, 2012; Verbeke et al., 2008) because consumers consider the avoidance of possible harm to be more important than the chance of a possible benefit (Verbeke, 2005). Consumers usually base their decisions on information about both risks and benefits. Studies show that they may have difficulties balancing conflicting information about both risks and benefits (Verbeke et al., 2005; Verbeke et al., 2008). Findings about the impact of balanced information on consumers’ food consumption behavior are often contradictory. For example, Verbeke et al. (2008) reported that balanced information negatively influenced consumers’ perceptions of fish while Altintzoglou et al. (2010) found that balanced information had neither a positive nor a negative influence on consumers’ predominantly positive image of fish. Van Dijk et al. (2011) found that the impact of balanced information on consumers’ attitude and perception about risks and benefits depended on their initial attitude to the issue.

### **1.3 Research objectives and research questions**

The overall objective of this research is to investigate Chinese consumers' attitude and behavior towards food safety and nutrition labeling. To put up specific research objectives, a comprehensive review of Chinese consumers' decision-making processes in relation to safe food was first conducted. Based on the conceptual framework and this review, three main research objectives are distinguished, leading to seven research questions.

#### **1.3.1 Research objective 1: Investigate Chinese consumers' risk perception of food-related hazards and trust in information sources**

The frequent food scares have resulted in higher consumer concern about food safety and lower consumer confidence in the food supply chain and regulatory agencies in China. The low consumer confidence in information sources has led to a challenge for conducting risk communication in China. A better understanding of Chinese consumers' perceptions of food-related hazards and their trust in information sources would contribute to effective communications with Chinese consumers. The first research question (RQ1) is *what are the Chinese consumers' risk perceptions of food-related hazards?* Information about food safety is released through certain information channels by certain information sources. The second question is *which information channels are effective to reach consumers in China* (RQ2) and the third question is *which information sources are the trustworthy sources and what are the determinants of Chinese consumers' trust* (RQ3)? Effective communications identify and prioritize audience segments (Jacob, Mathiasen & Powell, 2010). Understanding specific target audiences' needs and perceptions are necessary to build an effective communication campaign with the goal of changing behavior (Andreason, 1995; McGloin et al., 2009). Risk communication strategies should be tailored to target particular sub-groups of the public in order to be effective. The fourth research question (RQ4) is *whether the different segments of Chinese consumers, based on their personal risk, degree of worry and knowledge about food-related hazards exist and what are the differences in terms of their use of information channels about food-related hazards and trust in information sources among these segments.*

### **1.3.2 Research objective 2: Assess the impacts of information about benefit and risk of pork consumption on Chinese consumers' perceptions towards, and intention to eat pork**

Understanding how consumers respond to information is important for developing effective risk communication strategies. The share of pork consumption in total meat consumption in urban areas in China has generally decreased from 73% in 1990 to 59% in 2011, giving up to beef, lamb and poultry for their (real or perceived) higher protein and lower fat content, and higher nutritional value compared with pork (Li, Zhao, & Chen, 2011). This decline was weighted after the Shuanghui clenbuterol event exposed in March 2011. Faced with a declining market position of pork and increasing consumer concerns about its safety the pork industry recognizes the importance of communication to promote pork consumption in China and reassure consumers of its safety. Communication is achieved by information flow between sources and receivers. Information can be divided into positive messages (about benefits), negative messages (about risks) and balanced information. The fifth research question (RQ5) is *how the positive, negative and balanced information affects Chinese consumers' attitudes and intentions towards eating pork and how information from different sources affects consumers' perceptions and intentions towards eating pork.*

### **1.3.3 Research objective 3: Investigate Chinese consumers' understanding and use of a food nutrition label and their determinants**

To better communicate food nutrition information with Chinese consumers, Chinese government published its first Chinese Food Nutrition Labeling Regulation in 2008. Based on consumer behavior models, people who understand and use nutrition labels are more likely to make better food choices (Hoefkens, Pieniak, Van Camp, & Verbeke, 2012; Grunert & Wills, 2007). Nutrition labels can possibly change the overall pattern of shopping by altering the perception of food categories that are subsequently considered more or less healthy than before. Nutrition information on food labels may hence affect consumers' dietary intake. Eastern society has a stronger tendency to show socially desirable behavior (Middleton & Jones, 2000), so food nutrition labels may potentially be successful in China not only in terms of use but also with regard to their impact on food choices, dietary intake and health. Given that China represents quite a different regulatory, industrial and socio-economical context compared to Europe or North America (Hawkes, 2008), it is interesting to know: First, *do Chinese consumers understand the nutrition information on food nutrition labels and what*

*factors affect their understanding (RQ6)? Second, do Chinese consumers (claim to) use nutrition information on food nutrition labels and what factors affect their use (RQ7)?*

#### **1.4 Research design and data sources**

Data required to meet the research objectives and to investigate the research questions are collected through quantitative research procedures. Table 1.2 provides an overview of the nature of the data sources and the different research design used in this doctoral research according to research field considered. Both primary and secondary data are used in this doctoral research. Secondary data were used in Chapter 2 of a review on Chinese consumers' attitudes and behavior toward safe food and collected from CNKI (China National Knowledge Infrastructure) database for Chinese papers, and ISI Web of Knowledge and Google Scholar for English language papers. The literatures used in the review were chosen first on an inclusion criterion resulting in 69 papers. After that an exclusion criterion was applied to the 69 papers to get the final 34 papers. More description about the method of literature selection was given in Chapter 2.

Primary data used in the Chapter 3-5 was collected during March 2012 through a consumer survey with two self-administrated structured questionnaires conducted in Beijing and Baoding, a medium-sized city close to Beijing. The survey in Beijing was performed at supermarkets, shopping malls, residence and public gardens in urban areas. Participants were selected in these areas based on convenience sampling with the restriction that they had lived in Beijing for more than one year, considering the large floating population in Beijing. The same questionnaires were delivered to about 700 students in one middle school in Baoding city. Here a self-selection sampling method was used: the students took the questionnaire home and asked their parents to fill it in and return it. Sample selection and contact procedures differed indeed between the two survey cities depending on cost efficiency and time effectiveness. Beijing and Baoding city have similar historical, cultural and policy environments. To obtain a more diverse sample not only limited to metropolitan citizens, data from the two subsamples were merged and analyzed together in Chapter 3-5. The two sub-samples in Chapter 3 did not significantly differ in terms of the segmentation variables: perceived worry, personal risk and knowledge in relation to food safety hazards. In Chapter 4 there were no big differences between the two cities in terms of participants' attitudes toward pork consumption and their reported frequency of eating pork. City acted as an explanatory variable in the regression models in Chapter 5. It did not yield a significant effect on Chinese

consumers' understanding and use of food nutrition labels. Detailed descriptions of the different study samples and methodologies applied were included in the methods section of the respective chapters.

The questionnaires were developed in English and translated into Chinese by a professional English-Chinese translator. The language in the Chinese version of the questionnaires was further checked by a Chinese language teacher. Then back-translation was undertaken to ensure linguistic equivalence. The author of this doctoral study, who is a native Chinese speaker, was closely involved in the back-translation process. The preliminary versions of the questionnaires were respectively pretested twice in a small sample of 20 Chinese adults for clarity of content, language/wording, overall understanding and length of the survey. Based on their feedback, the questionnaires were refined and finalized.

**Table 1.2 Research design and data sources**

	Data sources	Research design		Subject
		<i>Historical</i>	<i>Survey</i>	
<b>Chapter 2</b>	Secondary	Literature (n=69)		Safe food
<b>Chapter 3</b>	Primary		Consumer survey (n=971)	Risk perception & trust
<b>Chapter 4</b>			Consumer survey (n=909)	Information experiment & pork consumption
<b>Chapter 5</b>			Consumer survey (n=660)	Understanding and use of a food nutrition label

### 1.5 Contribution and Originality of this thesis

With increased income and improved market accessibility, Chinese consumers, especially those in urban areas, are shifting their food consumption from grains to meat, milk and other high value food products. These changes have resulted in a fast growing consumer market that has attracted the attention of international business and academic researchers (Grunert et al., 2011). This doctoral study empirically contributes to the scarce English literature about consumers' attitude and behavior toward food consumption in China, specifically on food safety and nutrition labeling the central issues in contemporary China. China presents a quite different regulatory, industrial and socio-economic context compared with western countries (Hawkes, 2008). The adoption of consumer behavior theories which have been largely used in western countries to China can derive conceptual similarities and dissimilarities between both

contexts. It will contribute to the development of the current theory and methodology and its application in a global scale since future consumer research will have a global orientation to support the globalization of food and developing methods working globally is necessary (Meiselman, 2013). Research about consumer behavior towards food consumption in China is in an early stage and some of the studies are exploratory in nature. The facts that relevant research in China is very scarce and consumer theories are specific to the Western context may make the formulation of relevant prior hypotheses difficult. This doctoral study hopefully contributes to the formulation of more precise problem statements for more conclusive investigation (e.g., in a comparative study) in the future work. From a vertical perspective, China itself is historically in a social transformation period with economic and political restructuring and experiencing significant changes in food consumption behavior. Thus the results of this doctoral study present unique characteristics from those in Chinese history and contribute to getting better insight into consumer behavior towards food consumption in contemporary China and its trend in the future. From a policy perspective, this doctoral study is valuable to government and food manufactures to make effective risk or market communications with Chinese consumers:

- (1) Food-related hazards in this doctoral study covered all the potential hazards in food market in China. Investigation of Chinese consumers' risk perception of these hazards provides an insight for the development of effective risk communication strategies to Chinese consumers;
- (2) Information channels in this doctoral study covered all the information channels Chinese consumers use to get information about food safety. Modern communication channels like the internet and traditional communication channel like newspaper coexist in Chinese consumers' lives. The findings are valuable for market or policy communicators to select the effective information channels to reach the targeted consumers;
- (3) Low consumer confidence in regulatory authorities is a challenge in risk communication in China. This doctoral research is the first study to investigate the determinants of Chinese consumers' trust in information sources. The findings will be helpful, especially for government and food producers, the two important information sources to increase their perceived reliability;
- (4) This doctoral thesis contributes to the scarce literature about the segments of Chinese consumers based on their risk perception. The findings will help to make tailed and

effective food risk communication strategies to target particular sub-groups in public in China;

- (5) Little is known about the information processing behavior of Chinese consumers with regard to food consumption. This is the first study to investigate the impacts of benefit and risk information about pork consumption on Chinese consumers' attitude and intention to eat pork. The findings get insight into Chinese consumers' responses to different types of market messages and provide valuable implication for the promotion of pork consumption in China;
- (6) Research on Chinese consumers' understanding and use of a food nutrition label is lacking. This doctoral study contributes to literatures by examining the determinants on Chinese consumers' understanding and use of a food nutrition label. Results from this study are valuable to government, non-governmental organization and food manufactures to gain insights into the potential effectiveness of nutrition labeling to provide nutrition information and to promote healthier food choices and dietary patterns in China.

## **1.6 Thesis outline**

This doctoral dissertation is a compilation of papers that have been published, accepted or submitted as contributions to international peer-reviewed journals, covering the scientific disciplines of agricultural and food marketing, food and nutrition science and consumer behavior. The thesis includes six chapters in total. Figure 1.1 presents an overview of the different chapters related to the conceptual framework.

Chapter 2 gives a comprehensive overview of the Chinese consumers' decision-making processes in relation to safe food. This review specifically focuses on consumers' use of and trust in information about safe food and their knowledge, attitudes and behavior towards safe food. Chapter 2 serves as the background of the doctoral thesis and proposes research questions for the next three chapters.

Results from Chapter 2 shows that high worry about food safety and a general distrust attitude in food quality are the important barriers for Chinese consumers to buy safe food. Chapter 3 focuses on Chinese consumers' risk perception of seven food-related hazards, use of information channels and their trust in information sources about food safety. It investigates segments of Chinese consumers based on their personal risk perceptions, degree of worry and



knowledge about food-related hazards and whether the identified segments differ in terms of their use of information channels about food-related hazards and their trust in information sources. The determinants of trust in information sources are also discussed in this chapter.

Understanding how consumers respond to information is important for developing effective food marketing and communication strategies (Chapter 2). Chapter 4 discusses the impacts of information on the benefits and risks of eating pork on Chinese consumers' attitudes and intentions. Specifically, first, it investigates the perceptions, attitudes and frequency of pork consumption among urban Chinese consumers. Second, it tests how three types of message (positive, negative and balanced) affect consumers' perceptions and intentions towards eating pork. Third, it examines the impact of different information sources on consumers' perceptions and intentions.

Nutrition concerns are important influencing factors on Chinese consumer behavior towards food consumption (Chapter 2). Nutrition labeling has been considered as an attractive and potentially effective policy instrument to provide nutrition information to consumers to select food. Chapter 5 investigates the effects of nutrition knowledge (objective and subjective), socio-demographic characteristics, diet status, diet-health awareness, BMI and familiarity with food nutrition labels on consumers' understanding (objective, subjective) of food nutrition labels in China. The effects of the determinants (i.e. the same factors used to explain label understanding and understanding (objective, subjective) itself) on Chinese consumers' use of food nutrition labels are also investigated.

## Chapter 1, 2

<b>Information</b>	<b>Cognition</b>	<b>Affect</b>	<b>Conation</b>	
Food-related hazards	Trust	Trust Risk perception		<b>Chapter 3</b>
Benefit / Risk		Attitude	Intention	<b>Chapter 4</b>
Nutrition label	Knowledge Understanding		Use	<b>Chapter 5</b>

**Chapter 6**

**Figure 1.1 Thesis structure related to the conceptual work**



# Chapter 2

## Consumers' attitude and behavior towards safe food in China: a review

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This chapter is based on:

Liu, R., Pieniak, Z., & Verbeke W. (2014). Consumers' attitudes and behavior towards safe food in China: a review. *Food Control*, 33, 93-104.

### **Abstract**

Frequent food safety incidents have increased Chinese consumers' concerns about food quality and safety. This has resulted in an expansion of the safe food market, a segment that includes hazard free, green and organic food. This paper evaluates Chinese consumers' decision-making processes in relation to safe food. It specifically focuses on consumers' use of and trust in information about safe food and their knowledge, attitudes and behavior towards safe food. The findings show that Chinese consumers have a high awareness of safe food but limited knowledge about the concept of safe food, low recognition of the relevant labels and limited ability to identify safe food. Despite limited knowledge about safe food, Chinese consumers generally hold positive attitudes towards it, particularly with regard to its safety, quality, nutrition and taste. They are willing to pay more for safe food products. The implications of this review for the food industry, food policy decision makers and future scientific research are discussed.






## 2.1 Introduction

This review focuses on Chinese consumers' behavior towards safe food. Safe food in this paper refers to hazard free, green and organic food, all three of which are legally defined in China. *Hazard free food*, is characterised as being of good quality, nutritious and safe: harmful or toxic residues, such as fertilizers, pesticides, heavy metals, and nitrates are controlled within limits set by national standards (Huang, Wu, Rong, You & Jiang, 1999). While the emphasis of the concept of hazard free food is on the residue content, the concept of *organic food* relates to crop cultivation. In the organic food production process, artificially synthesized fertilizers, pesticides, growth regulators, livestock and poultry feed additives and genetically engineered technology are prohibited (Jia, Liu, Wang & Liu, 2002). The concept of *green food* is based on concepts of environmental protection and sustainable development. From the choice of materials to production every stage of the green food production process must meet specified standards of environment protection (Zhang et al., 2002). According to different production standards, green food is classified into two levels: A and AA. The production criteria and requirements of AA green food are similar to those for organic food (Qin, Li & Qin, 2003).

There are differences in the standards used to define hazard free, green and organic food, in terms of production area, production regulation, processing, packaging, and especially the usage of production materials (Jia et al., 2002). The criteria for organic food are the strictest, followed by those for green food and hazard free food, so the safety ranking of the three kinds of food gradually increases from hazard free food, green food to organic food (Gao & Zhang, 2002). Detailed descriptions of the three kinds of safe food together with their logos are shown in Table 2.1.

**Table 2.1 Description of hazard free food, green food and organic food**

	Hazard free food	Green food	Organic food
Food Label			
Certificate Authority (Yin, Wu, Du, & Chen, 2010)	The center for Agri-food Quality and Safety, Ministry of Agriculture of PRC	China Green Food Development Center, Ministry of Agriculture of PRC	China Organic Food Certification Center, Ministry of Agriculture of PRC; China Organic Food Development Centre, Ministry of Environmental Protection of PRC
Validity of Certificated Label	3 years	3 years	1 year
Operation Year (Qin et al., 2003)	2001	1990	1994
Main Difference (Jia, Liu, Wang, & Liu, 2002; Qin et al., 2003)	Controlled and limited use of synthesized fertilizer, pesticide, growth regulator, livestock and poultry feed additive and gene engineering technology; no use of pesticide with high toxicity and high residue	Controlled and limited use of synthesized fertilizer, pesticide, growth regulator, livestock and poultry feed additive and gene engineering technology (for A level green food)	No use of artificially synthesized fertilizer, pesticide, growth regulator, livestock and poultry feed additive and gene engineering technology (for organic food and AA level green food)

These three kinds of food have been widely used in Chinese academic studies as representative of safe food (Jiang, 2004; Luo, 2010; Wang & Wei, 2006; Zhou, 2004; Zhou, 2005; Zhou, Huo, & Peng, 2004). In some studies they are also called safe agricultural products (Ma & Qin, 2009; Yang & Li, 2005; Zhang, 2010). To remain consistent within this paper, we use the term safe food as a unified concept that includes hazard free, green and organic food.

Due to the improved living standards and the frequent occurrence of food safety scares, Chinese consumers are increasingly concerned about food quality and safety (Chen, Zhou, & Yin, 2009; Zeng, Xia, & Huang, 2007; Zhou & Zhuo, 2010). These growing concerns have increased demand for safe food and contributed to the development of the safe food market in

China. The expansion of the safe food market has also been strongly supported by China's central government. The policy of "developing hazard free agricultural products, green food and organic agricultural products" has consecutively appeared in China's No.1 Central Document every year between 2004 and 2010, illustrating the government's intention and determination to develop safe food.

Product development and marketing strategies are led by consumers' beliefs, attitudes and behavior. Thus, from a marketing perspective it is relevant to explore Chinese consumers' behavior towards safe food. Research into Chinese consumer's behavior towards safe food is still at a relatively early stage, and this review provides a comprehensive overview of this growing stream of literature. It specifically evaluates consumer decision-making processes (Engel, Miniard & Blackwell, 1995), focusing on consumers' use of and trust in information about safe food, their awareness and knowledge, attitudes, behavioral intentions, purchasing behavior and the determinants of safe food consumption. The main conclusions and implications are presented at the end of the paper.

## **2.2 Selection of relevant studies**

This review is based on published English and Chinese language articles. The Chinese language papers were selected from the CNKI (China National Knowledge Infrastructure) database. CNKI is the biggest Chinese literature database, including Chinese academic journal articles, doctoral and master's dissertations, conference articles and other types of documents. The English language papers were mainly selected from the ISI Web of Knowledge and Google Scholar. The following key words were used to identify the relevant articles: China and [{consumption} or {consumer} or {consumer behavior} or {cognition} or {attitude} or {information} or {willingness to purchase} or {purchase intention} or {willingness to pay} or {purchase behavior}] and [{food consumption} or {food safety} or {food security} or {agricultural food} or {safe food} or {green food} or {organic food} or {hazard free food}] and combinations thereof.

The articles were chosen for review according to the following criteria: (1) the study focused on food and consumer behavior, (2) the study was conducted in urban areas in China, (3) the study provided insights and information about consumer awareness and knowledge, attitudes, intentions, willingness to pay or behavior related to, hazard free, green or organic food, (4) the study was published in academic journals included in CNKI, (5) the full-text article was available for review. Following these criteria, 69 papers, published between January 2000 and May 2012, were selected in a first round.

In a second round, papers focusing on a specific issue in the decision making process (with a thorough explanation and description) were prioritized for review. If there was more than one paper describing the same topic, the most recent paper (based on year of data collection) was included. After this second round selection, 34 papers, including four published in English and 30 published in Chinese, were selected for in-depth analysis (Table 2.2).

## **2.3 Results**

### **2.3.1 Use of and trust in information about safe food**

The review reveals that Chinese consumers mainly obtain information about safe food from television and newspapers, prior experience, relatives and friends. Magazines, professional books and the internet are less frequently used. Li (2007a) found that 44% of respondents in Nanjing City used television to get information about green milk, 20% used newspapers, while only 6% and less than 2% of respondents respectively used magazines and professional books. Li (2007b) reported that 35% and 26% of respondents in Shandong, Hubei and Sichuan Provinces got their information from television and newspapers respectively, 16% from family and relatives, 13% from personal experience and less than 10% from the internet.

About 15% of Chinese consumers claim to use the information from labels or product descriptions on food packaging (Li, 2007a). Though this percentage is low, a survey by Qing, Yan and Wang (2006) revealed that a large majority of consumers in Wuhan city claimed to read the information on food labels or production descriptions before making a purchase decision.

The availability of information about safe food significantly affects consumer behavior. Qing et al. (2006) reported that consumers of green vegetables indicated that information about quality as well as the production method, transportation and benefits to the environment and human beings played an important role in influencing their purchase decisions.

Zhou et al. (2004) found that the availability of positive information significantly affected the intention of consumers in Nanjing City to purchase safe food. Giving detailed information about the production process and quality testing of organic pork increased the number of consumers who were willing to buy organic pork by 20% and led to a 5% decrease in the percentage of consumers not willing to buy any safe food. Additionally, the average price that consumers were willing to pay for safe food significantly increased when product information was available. The willingness to pay of consumers with more negative information about food crises like meat or vegetable increased the most, by 12%.



**Table 2.2 Overview of selected studies (n=69) about consumer behavior towards safe food in China**

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
1	Bai (2011)	Influential factors of willingness to pay (wtp); purchasing behavior	2010	Supermarkets with green food sold in Jinan City	255	Consumers	Organic vegetable
2	Chang and Li (2005)	Cognition; wtp & its influential factors	2005	Nanjing City	246	Consumers	Green and organic vegetable
3	*Chen (2006)	Cognition; purchasing intention & influential factors; wtp; purchasing behavior & its influential factors	2004	Supermarkets in Beijing	366	Consumers	Hazard free food
4	*Chen (2007) (English)	attitude; purchasing intention	NA	Taiwan Province	470	Above 20 years old	Organic food
5	*Dai, Zhu, and Ying (2006)	Influential factors of wtp and purchasing behavior	2004	Supermarkets and farmers' markets with in Nanjing City	346	Food buyers in family; consumers having heard about organic vegetable;	Organic vegetable
6	Du and Luo (2011)	Cognition; purchasing behavior & its influential factors	2008	Shopping centers and residence communities in six prefecture-level cities in Hunan Province	280	Consumers and citizen	Green food
7	Feng and Li (2008)	Cognition; purchasing behavior & its influential factors	2006	Nine cities in Seven Provinces	454	Consumers	Hazard free food, green food, organic food
8	Hao, Ren, Feng, and Xiu (2009)	Cognition & influential factors; influential factors on purchasing behavior	2007	Supermarkets, vegetable markets and wholesale markets in eight cities in six provinces, Beijing City and Tianjin City	636	Consumers	Hazard free food

**Table 2.2 Continued**

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
9	He, Zhou, and Wang (2007)	Cognition; wtp; purchasing behavior & its influential factors	NA	Residence communities in Wuhan City	188	Vegetable buyers in supermarket	Hazard free vegetable
10	Huang and Xu (2007)	Cognition; influential factors of purchasing intention	2006	Streets in Wuhan City	173	Consumers	Hazard free vegetable
11	Jiang (2004)	Information searching & its influential factors	2004	Zhejiang Province	400	Consumers	Safe food(green, organic and hazard free)
12	*Jin and Zhao (2008)	Cognition; attitude; purchasing intention and its influential factors; purchasing behavior & its influential factors	2006-2007	Eleven cities in Zhejiang Province	468	Consumers	Green food
13	Le (2006)	Information searching; attitude; purchasing behavior & its influential factors	NA	Residence communities in Wuhan City	250	Consumers	Green food
14	Li and Guo (2007)	Cognition; purchasing behavior & its influential factors	NA	Supermarkets, farmers' market in Nanjing City	284	Rice buyer of family & above 20 years old	Green, organic and hazard free rice
15	Li and Li (2011)	Cognition; purchasing behavior	2010	Supermarkets, shopping centers, farmers' markets, residence communities in Dalian City	75	Consumers	Hazard free food, green food, organic food
16	Li (2004)	Information searching; cognition; attitude; purchasing behavior & its influential factors	2004	Zhejiang Province	1075	Consumers	Hazard free food, green food, organic food
17	*Li (2007a)	Information searching; cognition; wtp; purchasing intention; purchasing behavior & its influential factors	2006	Nanjing City	350	Consumers	Green liquid milk

**Table 2.2** *Continued*

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
18	*Li (2007b)	Cognition; attitude; information searching; purchasing behavior & its influential factors	2006	Shandong, Hubei & Sichuan Provinces	1080	Urban consumers; above 16 years old; not student	Hazard free food, green food, organic food
19	Li, Cheng, and Ren (2005)	Cognition; attitude	NA	Jiaxing City	NA	Consumers	Hazard free food, green food and organic food
20	*Liu and Qiao (2011)	Cognition & its influential factors	2009; 2010	Dalian City	346	Consumers	Hazard free food, green food, organic food
21	Liu (2007)	Purchasing behavior & its influential factors	2006	Changsha City	389	Urban adult consumers	Green food
22	Liu (2008)	Purchasing behavior & its influential factors	2007	Wuhan City	357	Consumers	Green food
23	*Liu et al. (2009)	Cognition; attitude; wtp	2008	Supermarkets, farmers' markets, specialty stores with organic food in Shanghai and Nanjing	458	Consumers	Organic pork
24	Lu, Wang & Zou, 2009	Cognition; attitude; purchasing behavior & its influential factors	NA	Chengdu City	120	Consumers	Organic vegetable
25	*Luo (2010)	Wtp & its influential factors	2008	Supermarkets in Xiamen City, Fujian Province	571	Consumers	Hazard free pork
26	Luo (2011)	Belief ; purchasing intention	2008	Supermarkets in Xiamen City, Fujian Province	571	Consumers	Hazard free pork
27	Luo, Tai, and Zheng (2009)	Influential factors on purchasing intention	2008	Supermarkets in Xiamen City, Fujian Province	571	Consumers	Hazard free pork

**Table 2.2** *Continued*

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
28	*Ma and Qin (2009)	Cognition & its influential factors	2007	Beijing City	203	Urban consumers	Hazard free food, Green food, Organic food
29	*Meng (2007)	Information searching; cognition; attitude; wtp	2006	Supermarkets, Wuxi City	670	Consumers	Hazard free food, green food, organic food
30	*Qing, Yan, and Wang (2006)	Cognition; attitude; wtp; purchasing intention & its influential factors; purchasing behavior	2005	Supermarkets and famers' markets in Wuhan City	343	Consumers	Green vegetable
31	*Sun et al. (2010)	Influences of information and value of green food on purchasing behavior	2008	Household survey in Wuhan City	426	Household	Green food
32	Tan (2010)	Cognition & its influential factors; purchase behavior & its influential factors	NA	Wuhan city	155	Consumers	Green eggs
33	*Tang, Li, and Jiang (2010)	Attitude; wtp; purchasing intention; purchasing behavior & its influential factors	2009	Supermarket, farmers' market and household, Nanjing City	305	Consumers and citizen	
34	*Tong (2006)	Cognition; purchasing intention; purchasing behavior & its influential factors	NA	Wenzhou City, Zhejiang Province	431	Urban & above 16 years old consumers	Hazard free food, green food, organic food
35	Wang and Gu (2007)	Influential factors on purchase behavior	2004	Supermarkets in Beijing	102	Consumers	Hazard free egg
36	Wang and Wei (2006)	Cognition and wtp	NA	Hangzhou City	358	Parents of middle school students	Hazard free food, green food, organic food
37	*Wang and Yu (2007)	Attitude; purchasing behavior & its influential factors	2006	Farmers' markets and supermarkets in Wuhan	151	Consumers	Green food

**Table 2.2** *Continued*

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
38	Wang (2003)	Cognition & its influential factors, purchasing behavior & its influential factors	2002	Supermarkets in Tianjin City	289	Consumers	Green and GM food
39	Wang, Liu, and Tian (2008)	Influential factors on purchasing behavior	NA	Beijing City	203	Consumers	Organic food
40	Wang, Qian, and Li (2008)	Cognition; purchasing behavior & its influential factors	NA	Six cities in Shandong, Hubei and Sichuan Provinces	1080	Consumers	Green food
41	*Wang et al. (2012)	Cognition; wtp; purchasing intention & its influential factors	2011	Supermarkets and residence communities in Beijing City	977	Consumers	Green pork
42	*Wang et al. (2009)	Cognition; attitude; purchasing behavior	2008	Business districts, living areas, teaching areas, industrial districts in Nanjing	4603	Consumers	Organic food
43	*Xia and Zeng (2011) (English)	Cognition; attitude; wtp & its influential factors	2005	Supermarkets in Beijing	420	Consumers	Green milk
44	*Xu et al. (2012) (English)	Wtp	2009	Supermarkets	386	consumers	Green sea food
45	Yang and Li (2005)	Purchasing behavior & influential factors	2004	Six cities in Zhejiang Province	1075	Consumers	Hazard free, green and organic food
46	Yang, Zhang, Zhi, and Zhang (2004)	wtp; purchasing intention	2003	Shijiazhuang city	200	Consumer	Hazard free cucumber and hazard free green pepper

**Table 2.2** *Continued*

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
47	Yin, Wu, and Chen (2008)	Cognition; wtp; influential factors of purchasing intention	2008	Five cities in Shandong Province	558	Consumers	Organic food
48	*Yin et al. (2010) (English)	Cognition; wtp; influential factors on purchasing intention	2009	Guangzhou, Zhuhai and Shenzhen city	432	Consumers	Organic food
49	*Zeng and Wang (2007)	Cognition; purchasing behavior & its influential factors	2003	Hebei province	203	Workers at medical institutions or health departments	Green food
50	*Zeng et al., (2007)	Cognition & its influential factors	2004	Supermarkets, vegetable markets and shopping centers in Beijing	300	Consumers	Green food
51	*Zhang and Han (2009)	Cognition & influential factors; wtp; purchasing intention; purchasing behavior & its influential factors	2007	Supermarkets, farmers' markets, hypermarkets in Shanghai city	416	Consumers	Hazard free food, green food, organic food
52	*Zhang and Wang (2009)	Purchasing intention & its influential factors; wtp & its influential factors	2008	Shopping malls, supermarkets, famers' markets, parks and school area in Guangzhou City	391	Consumers	Green food
53	*Zhang and Wu (2010)	Cognition; wtp; influential factors of purchasing behavior	2010	Supermarkets and shopping malls in Chengdu City	467	Consumers	Green food
54	*Zhang and Xu (2006)	Cognition; attitude; purchasing behavior & its influential factor	2005	Nanjing City	447	Consumers	Green food
55	*Zhang (2007)	Cognition & its influential factors; influential factors of purchasing intention; influential factors of wtp	2006	Supermarkets, parks, and residence communities in Shanghai City	305	Citizen and consumers	Green rice
56	*Zhang (2008)	Cognition; wtp; purchasing behavior	2008	Shopping malls, parks in Guangzhou City	146	Consumers	Green food

**Table 2.2 Continued**

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
57	Zhang (2009)	Attitude & its influential factors	2008	Shopping streets, plazas in Chongqing City	314	Consumers	Green food
58	*Zhang (2010)	Purchasing behavior & its influential factors	2008	Shopping malls, supermarkets, famers' markets, parks and school area in Guangzhou City	391	Consumers	Green food
59	*Zhang (2011)	Cognition & its influential factors	2008	Shopping malls, supermarkets, famers' markets, parks and school area in Guangzhou City	391	Consumers	Green food
60	Zhang and Wang (2009)	WTP & its influential factors	2008	Shopping malls, supermarkets, famers' markets, parks and school area in Guangzhou City	391	Consumers	Green food
61	Zhang, Li, and Zhang (2004)	Cognition; purchasing intention; wtp; purchasing behavior & its influential factors	2001	Supermarkets, farmers' markets, residence communities and streets in Tianjin City	298	Consumers	Green food, Organic food, hazard free food and GM food
62	Zhao and Xiong (2011)	Cognition; information search; purchasing behavior	2011	Supermarkets, vegetable markets out of door and shopping malls in Kunming City, Yunnan	252	Consumers	Hazard free food
63	Zhao, An, Sheng, Jiao, and Chen (2003)	Cognition; attitude; purchasing behavior	NA	Supermarkets in Beijing City	85	Consumers	Hazard free vegetable
64	Zhao, Jin, and Zhao (2008)	Influential factors on purchase intention; purchase behavior	2006	Zhejiang province	468	Consumers	Green food

**Table 2.2** *Continued*

No.	Author	Topic	Survey year	Survey Place	Sample size (valid)	Respondents	Food category
65	*Zhou (2004)	Cognition & its influential factors; wtp; information need from government	2003	Hangzhou city, Ningbo city and county-level cities in Zhejiang Province	518	Consumers	Green, organic and hazard free vegetable
66	Zhou (2005)	Cognition & its influential factors; purchase intention & influential factors	2004	Hangzhou and Ningbo City and twenty-two middle & small-sized cities in Zhejiang Province	514	Consumers above 16 years old and under 80 years old	Green, organic and hazard free vegetable
67	*Zhou, Huo, and Peng (2004)	Attitude; purchase intention; influence of information	2003	Supermarkets in Nanjing City	570	Consumer at supermarket	Green food, organic food, hazard free food
68	Zhou, Liu, Fan, Gou, and Sun (2011)	Cognition; information search; purchasing behavior	2010	Residence communities in Beijing	163	Consumers	Green food
69	*Zhou, Ma, Zhou, and An (2007)	Cognition; purchasing behavior & its influential factors	NA	Dalian, Shenyang, Jinzhou and Dandong city in Liaoning province	403	Consumers	Green food

NA: not available; willingness to pay.

\*Paper referenced in manuscript. Please see reference list for the full references.



A study conducted in 2008 by Zhang and Wang (2009) reported that consumers in Guangzhou City who got their information from television were more inclined to become regular purchasers of safe food and that those who got their information from magazines were likely to pay a higher price premium for green food. Sun, Li and Huang (2010) explored how information (from traditional print media, word of mouth, personal information searching and the internet) influenced the purchasing behavior of Chinese consumers. They found that consumers' satisfaction of end product and purchasing of green food were influenced by information from traditional print media and word of mouth. Information from traditional print media, the internet and word of mouth were most likely to lead consumers to recommend green food to others. The purchase frequency of green food was most affected by information from traditional print media and internet.

The majority of Chinese consumers considered the government to be the most trustworthy source of information, followed by specialized institutions and the mass media (Li, 2007b). While the government is regarded as very trustworthy, not all consumers approved of its information services. A majority of consumers believe that government does not sufficiently inform the public about safe food (or that its communications are not transparent). One recent study reported a relatively low knowledge of the Chinese Food Safety Law (2009) which improved the supervision and management of food products and should, if more widely known about, improve consumers' confidence in the food production industry (Qiao, Guo & Klein, 2012).

### **2.3.2 Consumers' awareness and knowledge about safe food**

#### **2.3.2.1 High levels of awareness about safe food**

Most Chinese consumers are aware of safe food. Green food has the highest consumer awareness followed by hazard free and organic food. Li (2007b) reported that more than 80% of consumers in the provinces of Shandong (East of China), Hubei (Central) and Sichuan (West) had heard about green food. About half of the respondents were aware of hazard free food, while one quarter knew about organic food. A study by Wang, Qiao and Ning (2012) showed different results, with hazard free food being the least known among consumers in Beijing, with 35% of respondents not having heard about it due to its low publicity rates.

Chinese consumers' awareness of specific safe food categories or food brands is still relatively low. In the study of Li (2007a) 52% of male and 49% of female consumers in Nanjing city did not know any green brands of liquid milk. Only 4% of female and 2% of

male consumers knew more than three brands of green liquid milk. Zhang (2007) reported that 40% of consumers in Shanghai city were not aware of green rice. Liu, Wang and Han (2009) found that only 38% of consumers in Shanghai and Nanjing City were aware of organic pork.

### **2.3.2.2 Low knowledge about safe food**

Ma and Qin (2009) reported that the majority of consumers in Beijing indicated that they knew about green food (81%) and hazard free food (66%) with 48% knowing about organic food. A study conducted in Dalian City in 2009 and 2010 by Liu and Qiao (2011) showed a similar pattern between the three types of safe food, although with much lower overall awareness rates for all of them (especially hazard free and organic food). Sixty six percent of consumers were familiar with the green food label, 12% with the hazard free food label and 9% with the organic food label.

While there is relatively high awareness of safe food, consumers' knowledge about all three types of safe food in terms of the concept, identification, safety ranking and label recognition is quite low. Ma and Qin (2009) found that less than half of consumers in Beijing knew the meaning of the various categories of safe food. Forty five percent of respondents correctly knew what hazard free food was, for green food (AA), organic food and green food (A) the figures were 40%, 33% and 21% respectively. Liu and Qiao (2011) reported that 44% of consumers in Dalian City knew the meaning of hazard free food while only 25% and 24% of consumers knew the meaning of green and organic food. Consumers in Dalian confused green food and organic food, with 47% of consumers confusing the two with each other.

The literature review also reveals that Chinese consumers have inconsistent interpretations about what safe food is. In the study of Zhang (2007) the large majority of consumers in Shanghai City described green food as food grown without pesticides or food that is green in colour. In a subsequent study (Zhang 2008), consumers in Guangzhou City described green food as food without chemical fertilizers, pesticides or additives (44%), non-polluted food (29%) or certified food (17%). Additionally, they mostly lacked detailed knowledge about the production standards or quality controls for safe food. Meng (2007) reported that most consumers in Wuxi City (Jiangsu Province) who indicated that they were aware of safe food could not tell any differences among the three categories of safe food. While they recognized that organic food was food grown without chemical fertilizers and pesticides, they lacked any knowledge about transgenesis, conversion periods, buffering, rotation, traceability, processing, storage, transportation, certification and sales permission for organic food. Zhang (2010)

found that only 9% of consumers in Guangzhou City knew that there were strict controls on every stage (origin, planting, transportation, processing and storage, etc.), of safe food and 40% of consumers knew that one of these stages was subject to strict criteria.

Knowledge about safe food is an important factor that positively influences consumers' safe food purchases. Li (2007a) found that consumers who knew about green milk and were able to recognize the green food label were more likely to buy green milk.

The literature shows that Chinese consumers do use the safe food logos on products in order to identify safe food, but only to a limited extent. Zhang (2010) found that only 40% of consumers could indentify green food by the certification labels and 12% by the packaging. Jin and Zhao (2008) reported that less than half of consumers in Zhejiang Province used the green food label to identify green food, 21% identified it by personal feeling and 18% by food brand. Zhang (2008) showed that a large majority of consumers depended on advertisements, the vendor's guarantee and friends' introductions to identify green food and only 13% actually used the green food label.

As for food label recognition, Zhang (2010) reported that 35% of consumers could recognize the more common green food label (A) in the market, less than 10% of consumers could identify the organic food label while only 0.4% of consumers could recognize all the labels of safe food. The literature also shows that most consumers lack more detailed knowledge about safe food labels, such as the expiry date of certificated labels. Zhang and Wu (2010) found that only 40% of consumers in Chengdu City (Sichuan Province) could recognize the green food label while 64% of consumers did not know that two levels (A and AA) of green food existed. One exception to this pattern came from the study of Liu et al. (2009), which found that a majority (74%) of consumers who were aware of organic pork could recognize its label and knew it was officially certified.

These studies show that Chinese consumers find it problematic to distinguish between green, hazard free and organic food in terms of quality and safety; and thus are unable to making a correct safety ranking for the three categories of safe food. Yin, Wu, Du and Chen (2010) reported only 16% of respondents in their survey were aware of the differences between conventional, green, hazard free and organic food. Jin and Zhao (2008) found that less than 17% of consumers knew the right safety ranking of three kinds of safe food.

### **2.3.3 Consumer attitudes towards safe food**

#### **2.3.3.1 The perceived benefits of safe food**

Despite a relatively low level of knowledge, Chinese consumers hold a generally positive attitude towards safe food. In general, safety is the most important reason to choose safe food, followed by health, nutrition and taste. Environmental concerns are of less importance, implying that the personal benefits of safe food are more important for the Chinese than social or environmental ones. For example, Jin and Zhao (2008) reported that a large majority of consumers (73%) bought green food for its safety, environment benefits (10%) and good taste (8%). In Yin et al.'s (2010) survey, consumer ranked lower pesticide levels as the primary purchase motive for organic food (68%) followed by health (62%), taste (59%) and environmental benefits (33%). Wang, Xiao, Zhang and You (2009) found a large majority (90%) of consumers in Nanjing purchased organic food for its safety and very few consumers considered the environment. By contrast Zhang's study (2010) showed that environmental concern was the second reason for purchasing safe food, which suggests that, to some extent, environmental concerns can provide an important motive for Chinese consumers to purchase safe food. This survey found that food safety was the most important factor, with nutrition ranking third. Concerning the taste of safe food, Meng (2007) reported that about 40% of consumers perceived safe vegetables as tastier than conventional ones.

#### **2.3.3.2 The Perceived barriers to safe food**

A large majority of Chinese consumers believe the prices of safe food are high. This is an important barrier to purchasing safe food and is an important factor restricting the expansion of the safe food market. Yin et al. (2010) found that 24% consumers in the economically developed cities of Guangzhou, Zhuhai and Shenzhen believed organic food was too expensive, 55% found it expensive and only 16% perceived it as properly priced. "Too expensive" was found to be the main reason (for 70% of the sample) for not purchasing organic food. Similarly in the study of Wang et al. (2012) high price was the main factor that deterred consumers from buying green pork.

The literature also shows a general distrust or suspicious attitude among Chinese consumers about the quality of safe food and the certification labels. Zhang and Wang (2009) reported that all participants in their in-depth interviews doubted whether green food companies strictly control the production area, process, transportation and storage. Liu et al. (2009)

revealed that 72% of consumers questioned if antibiotics, hormones or additives were excluded from the production of organic pork. About 40% of consumers distrusted and 30% could not judge if a non-polluting pig raising environment or organic feed was used when rearing organic pork. Respondents were more trusting about animal welfare standards in organic pork, with about 40% of participants trusting that higher welfare standards were used in organic pork rearing. Overall, however, these studies show a generally distrustful attitude towards safe food, another important barrier for purchasing safe food.

Aside from high price and suspicious attitudes Zhang and Xu (2006) reported that a majority (70%) of consumers also complained about the limited purchase channels for green food and 59% perceived a lack of variety or choice of green foods. Dai, Zhu and Ying (2006) reported that consumers in Nanjing City complained about the unappealing appearance of organic vegetables. Results showed that consumers who cared about product appearance were less willing to buy organic vegetables.

### **2.3.4 Behavioral intentions towards safe food**

The surveys reveal that, despite the aforementioned obstacles, Chinese consumers are willing to purchase safe food. Li (2007a) revealed that the great majority of consumers (98%) in Nanjing City would like to buy green milk. Zhang (2007) reported that only 11% of consumers in Shanghai City would be deterred from buying green rice because the price was higher than that of conventional rice. Tang, Li and Jiang (2010) reported that 94% of consumers in Nanjing City were keen on buying safe eggs.

However, some studies draw different conclusions. Zhang and Wang (2009) reported that despite the high levels of concerns about food safety caused by a spate of food safety crises at the time Chinese consumers had relatively low intentions to purchase green food. Of those consumers who did purchase green food, just over half of them intended to increase their purchases, while 38% hesitated to do so. Wang et al. (2012) reported that 71% of consumers were dissuaded from buying green pork by its high price (48%), quality and safety issues (22%), lack of availability (17%) and a lack of confidence in the certification label (14%).

With improved living standards, more Chinese people are able to pay extra for safe food. However, the Chinese are highly sensitive to the prices of safe food and their willingness to pay (WTP) extra is rather limited (Zhou, 2004). The price premiums that Chinese consumers are willing to pay are far lower than the current premiums in markets. Yin et al. (2010) found that consumers were willing to pay a price premium of 35% for organic food, far lower than

the market prices of organic food which were two or three times higher than prices of conventional food. Zhang and Wang (2009) reported that the average price premium Chinese consumers would pay for safe food was about 22%, far lower than the existing market premium of more than 100% for green food and 200% for organic food. Jin and Zhao (2008) found that market price premiums of safe grains were 194% (e.g., organic rice 124%), safe vegetables 147% (e.g., organic vegetables 425% and organic potatoes 274%) and safe meat 87%. This reality compares to the average price premiums Chinese consumers were prepared to pay for these three safe foods; 22%, 28% and 20% respectively.

Consumers' WTP varies between different food categories. Yin et al. (2010) found consumers were willing to pay more for frequently consumed, tasty products with a low level of chemical residues (e.g., fruits and vegetables) than for grains or dairy products. The price premiums paid for necessities was higher than that for relative luxuries. People were prepared to pay the highest price premiums paid for safe vegetables, followed by (in descending order) bean products, dairy products, fish products, grains, fruits and meat (Jin & Zhao, 2008). Zhang and Wang (2009) found that those most willing to pay a high price premium were young and unmarried consumers, consumers with a monthly income of between 10000 - 11999 Yuan (1218-1461 euro or 1605- 1925 \$) per household, and consumers with higher education. Teachers were more likely to pay a price premium. Xia and Zeng (2011) also found that young consumers had the highest WTP for green food, followed by older consumers. Middle-aged consumers had the lowest WTP.

### **2.3.5 Purchasing behavior towards safe food**

The surveys found most Chinese consumers to be occasional buyers of safe food. Li (2007a) reported that 23% of consumers bought green milk everyday, 13% three times a week, 29% once/twice a week, 23% twice/three times a month, 12% once a month or less frequently. One survey found that 80% of families spent less than 40% of their food expenditure on safe food and 40% spent less than 20%. Although Chinese consumers show a high level of concern about food safety, and claim a high willingness to purchase and pay extra for safe food, these claims do not generally translate into people's actual purchasing behavior (Jin & Zhao, 2008). One exception to this is the study of Tang et al. (2010) which reported that half of total egg consumption was safe-labeled.

Supermarkets are the main location for purchasing safe food, mostly because of consumers' high confidence in the safety and quality of food sold in supermarkets (Li, 2007a; Tang et al.,

2010; Qing et al., 2006). Several studies have shown that consumers who buy safe food at supermarkets have a higher knowledge, WTP and higher frequency of safe food purchases (Li, 2007b; Zhang, 2011; Zhang & Wang, 2009). Farmer's markets, small vegetable markets or stalls are also important outlets for safe food. Farmers' markets, which have the advantage of lower prices, fresher and more diverse produce and being closer to people's homes or places of work, are a strong competitor with supermarkets (Qing et al., 2006; Wang & Yu, 2007). Speciality safe food stores are not yet very popular among Chinese consumers although they are expected to have a bright future (Jin & Zhao, 2008).

### **2.3.6 Determinants of safe food consumption**

Steenkamp (1997) argues that consumer behavior is influenced by four main factors: personal, economic, socio-cultural, and marketing. This section follows this categorization and reviews each of these in turn.

#### **2.3.6.1 Personal Factors**

Demographic characteristics such as age, gender, education and marital status have been widely investigated and are reported to have a profound impact on Chinese consumers' behavior to safe food. Zeng et al. (2007) reported that female or well-educated consumers were more aware of green food, while Ma and Qin's study (2009) found male consumers or consumers with higher education to be more aware of safe food. Zhang (2011) found that female, married or well-educated consumers had more knowledge about green food. Zhang and Wu (2010) reported that female, young or well-educated consumers had higher intentions of buying green food. Dai et al. (2006) found that females were prepared to pay a higher price premium for organic vegetables than males. Older consumers were more willing to pay for organic vegetable and consumers with a lower level of education were less willing to pay extra. Zhang and Han (2009) reported that female or married consumers were more aware about safe food and male or elder consumers had stronger intentions to buy safe food.

The reviews also identify five personal characteristics with a potential impact on Chinese consumers' behavior towards safe food: food safety concerns, health consciousness, quality consciousness, environmental concerns and animal welfare. A number of food safety accidents, such as the melamine crisis in 2008 (Qiao et al., 2012), have increased concern over food safety in China. This has increased consumers' food safety concerns leading to them increasing their knowledge and intention to purchase safe food. Zhou (2004) reported that consumers' knowledge about safe vegetables increased in line with their concerns about

the safety of vegetables. Zhou et al. (2004) reported that 20% of consumers who perceived food borne health risks to be very low, were not willing to buy safe food and only 6% would accept organic pork priced as twice as expensive as conventional pork. By contrast, only 2.5% of consumers who believed food borne health risks to be very high would be unwilling to pay any price premium for safe food, 45% of this group would accept green pork with a 40% price premium and 17.5% would accept organic pork with a 100% price premium. However Wang et al. (2012) reported that when consumers' perceived risk of pork safety was very high, their general distrust about the quality of pork would lower their intention of purchasing green pork.

The Chinese have a long history of being health conscious (Agriculture and Agri-Food Canada, 2010) and health consciousness strongly influences their food purchasing behavior. Consumers who care more about their own health indicated a stronger intention to purchase safe food (Yin et al., 2010). Tong (2006) showed that health consciousness played a more important role than food safety concerns in influencing Chinese consumers' purchasing behavior.

The quality consciousness of Chinese consumers is demonstrated by their willingness to buy and pay more for safe food of a higher quality and their choice of supermarkets as the most trustworthy purchase location. Economic development in China also has been accompanied by increased awareness about environmental protection and animal welfare. Luo (2010) reported that consumers' belief that safe food benefits wild animals, plants and the environment also positively influenced their WTP for safe food.

Regarding personal characteristics, Chen (2007) reported that consumers in Taiwan with a high food neophobia tended to avoid organic foods and be unfamiliar with them, while consumers with a high level of involvement with food were more familiar with organic foods and more likely to hold a positive attitude to them. Li (2007b) demonstrated that the main person responsible for grocery shopping in a household or consumers who frequently eat at home or shop in a supermarket reported higher intentions of purchasing green food. Dai et al. (2006) revealed that the frequency of organic vegetable purchases as an indicator of personal experience was correlated positively with the price premium paid for organic vegetable.

Last but not least, trust is also a key determinant of peoples' behavior towards safe food. Zeng et al. (2007) reported trust as strongly influencing consumers' cognition of green food. The more trust consumers held in green food, the more knowledge they had. Yin et al. (2010) found that consumers' trust in organic food positively affected their purchase intention. Li



(2007a) reported that consumers' trust in certified green food labels increased purchases of green food.

#### **2.3.6.2 Economic factors**

Income is an important factor influencing consumer behavior towards safe food. Zhang (2007) reported that income was the most important factor on consumers' WTP and purchase intentions for green rice. Zhang and Han (2009) reported that families with a higher monthly per capita income had more knowledge about safe food and a higher likelihood to purchase it. Zhang and Wu (2010) found consumers with more family disposable monthly income were more inclined to buy green food. Xu, Zeng, Fong, Lone and Liu (2012) reported that monthly green-labeled seafood expenditure was positively correlated with WTP for this food. Ma and Qin (2009) stated that a large price difference between safe food and conventional food provided a motivation to consumers to learn more about safe food.

#### **2.3.6.3 Socio-cultural factors**

Family size and composition are important socio-cultural factors influencing consumer behavior. Large families hold less knowledge than small families about safe food and are less likely to buy it (Li, 2007a; Li, 2007b; Zhang & Han, 2009). Families with infants, children or elders hold more knowledge about safe food and are more inclined to buy it (Ma & Qin, 2009; Zhang & Wu, 2010).

Occupation is another socio-cultural factor that significantly affects Chinese consumer behavior. Li (2007b) reported that consumers working in research and education, culture and health care, the catering trade, finance and insurance, real estate and service industries were more inclined to buy green food. Zeng et al. (2007) found that consumers working in food and safety related industries such as catering, trade, government institutions, medical care services, education and research institutes reported higher awareness and knowledge about safe food.

#### **2.3.6.4 Marketing factors**

Sun et al. (2010) found that consumers' satisfaction with their purchases of green food was positively affected by its perceived social, emotional, functional and epistemic value. Price did not affect consumers' satisfaction of their green food purchases compared to these five factors. Consumers would recommend green food to others on the basis of its conditional, emotional and functional values, while the purchase frequency of green food was positively correlated with its emotional and epistemic values and price.

Liu (2008) found that brand sensitivity was an important factor influencing the frequency of purchasing green food. Brand-sensitive consumers in Wuhan city bought green food 2.5 times more often than brand insensitive consumers. Xia and Zeng (2011) reported that there was a strong brand loyalty to large-scale producers of green milk because they were perceived as providing a high quality product.

Introduction to a product by a salesman at the market also played an important role in consumers' purchasing behavior. Zhou, Ma, Zhou and An (2007) reported that consumers in Liaoning Province liked these kinds of promotion. More than half the respondents in the survey were willing to buy green food first introduced to them by a salesman. The same study also found that the presence of a certified label affected purchases of green food, especially in large cities.

Price is another important factor that influences Chinese consumer behavior towards safe food. Consumers' price perceptions were the factor that most influenced purchases of safe food (Li, 2007a). Consumers, who perceived safe food as more expensive, reported lower intention and lower actual purchases of safe food (Yin et al., 2010; Zhang, 2009; Zhang & Wu, 2010). However, Zeng and Wang (2007) reported that among consumers who worked at health departments or medical institutions in Hebei Province the higher price of safe food was associated with higher purchase intention of those who perceived safe food as the indicator of food quality.

A study by Xia and Zeng (2011) found that advertising has a positive influence on Chinese consumers' WTP for green food. This suggests that access to information about green food is very important. They found that consumers who got their information from television were inclined to pay more than others for green food.

Convenience of purchase place (in terms of proximity to people's living or work place) is another factor that influences safe food purchase intentions and behavior. Chen (2006) reported the convenience of purchasing hazard free food was an important influential factor on consumers' purchasing behavior. Consumers who perceived the purchasing place as convenient bought hazard free food 4.5 times more frequently than those who found the place of purchase to be inconvenient.

## **2.4 Conclusions**

This paper provides an overview of Chinese consumers' behavior towards safe food, a category that includes hazard free, green and organic food. Results show that consumers in

China mainly use mass media (television) and newspapers as their main information sources about safe food; although personal contacts and interpersonal trust also play an important role. Chinese consumers have a high awareness about safe food but limited knowledge about the concept, how to recognize the labels and identify safe food. Consumer awareness and knowledge play a critical role in determining the development of the safe food market in China, for at least two reasons. First, there is still a segment in the market that is unaware about safe food. Yin et al. (2010) reported that a lack of knowledge about organic food was one of the main reasons why consumers did not purchase it. Ma and Qin (2009) found that higher knowledge about organic food increased purchases and expenditure. Second, consumers who do not purchase safe food may have some general knowledge about it, but lack the detailed knowledge to distinguish safe food's unique attributes from those of conventional food.

Despite this low level of detailed knowledge, Chinese consumers hold generally positive attitudes towards safe food, particularly with regard to its safety, quality, nutrition and taste. They are willing to pay more for safe food and to purchase it, even when the price is higher than that of conventional food. However, most Chinese consumers are occasional buyers which demonstrates a strong inconsistency between attitudes and actual behavior. The high price of safe food and scepticism about its quality are two important reasons that inhibit many from purchasing safe food. High levels of confidence in the supermarkets make these the most popular place to buy safe food, followed by farmers' markets.

The findings of this paper are relevant to three different groups of stakeholders: safe food companies, policy makers and scientific researchers. They show that safe food companies could take advantage of the safe, healthy and tasty image of safe food among most Chinese consumers. They could adopt new technologies and innovations to enhance the variety, packaging and appearance of safe food. Brand building could be a useful strategy, since there is brand loyalty for safe food among Chinese consumers, although there are few well-established brands of safe food. Communication, such as advertising through the mass media and introductory sales promotions at supermarkets, could also be developed. Due to the important role of interpersonal information in influencing the decision-making process of Chinese consumers, the attitudes and opinions of leading consumers (e.g., innovators or early adopters) should be noticed and used at the beginning of the market entry. More diversified distribution channels would make it easier for consumers to access safe food on one hand and improve the efficiency of distribution networks which will also reduce the market price of

safe food on the other hand. Since the Chinese are very health conscious, educational efforts focussing on the specific attributes or ingredients of safe food might also help establish a market for premium safe foods.

Second, government could take the responsibility to serve as the monitoring body to strengthen the supervision of safe food production and regulate the certification system. This would help to promote the reputation of safe food and further increase consumers' trust in it. Additionally, since Chinese consumers have difficulty in identifying safe food certificates and labels, government could promote a food traceability system that could be applied to more safe food categories, a move that would reduce consumers' suspicions about safe food. The government should also consider strengthening dissemination of information about safe food. It is well placed to do so, since it is considered by Chinese consumers to be the most trustworthy source of information. Such a campaign would be likely to be effective in combating low levels of knowledge and increasing consumers' WTP for safe food and the frequency of purchase. The main areas where communication from government could make a difference would be in terms of explaining the labels, the advantages of safe food, the differences with conventional food and the quality certification system. If done through the mass media, this could reduce consumers' distrust, reduce the existing information asymmetry and give consumers more information on which to base their choices.

Finally, since consumers' concerns about food safety have been increasing and since there is a sceptical attitude towards safe food, further research - focusing on how to conduct risk communication through information to reduce distrust - is recommended.

# Chapter 3

## Food-related hazards in China: consumers' perceptions of risk and trust in information sources

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This chapter is based on:

Liu, R., Pieniak, Z., & Verbeke, W. (2014). Food-related hazards in China: consumers' perceptions of risk and trust in information sources. *Food Control*, 46,291-298.

### **Abstract**

This paper identifies segments of Chinese consumers based on their perception of personal risk, how worried they are and their subjective knowledge about seven possible food-related hazards: additives, residues, counterfeit, inferior, genetically modified, deteriorated and nutritionally imbalanced food. Data were collected through a consumer survey conducted in Beijing (534 participants) and in Baoding (437 participants). Three clusters were identified: worried and knowledgeable consumers (60.1%), worried and ignorant consumers (21.7%) and moderately worried consumers (18.2%). The first two groups reported a high level of worry and high perception of personal risk about food-related hazards in China. The two hazards they were most worried about were counterfeit food and inferior quality food. Television, internet and personal communication were the three information channels most frequently used by participants to obtain information about food safety. Worried and ignorant consumers reported less frequent use of magazines, books and brochures compared with other consumers. Medical doctors, personal experience and research institutes were the three most trusted information sources for the first two groups of consumers. Moderately worried consumers only placed high levels of trust in medical doctors and themselves. Consumers' perceptions about the knowledge, honesty and concern of different information sources significantly and positively affected their trust in those sources. The study concludes by making recommendations as to how to improve communications with the different identified consumer segments and identifies future research required to expand its validity.



### 3.1 Introduction

Consumers' perceptions of food-related risks and their trust in information about food risks are potential determinants of their food-related behavior (Rosati & Saba, 2004; Verbeke, Frewer, Scholderer, & De Brabander, 2007). An increased frequency of food scares in China in recent years has increased Chinese consumers' worries about food safety and reduced their confidence in the quality of food (Liu, Pieniak & Verbeke, 2013), which has resulted in a drop in demand for certain food products. For instance, one month after the occurrence of the melamine milk crisis, the consumption of domestic milk powder in China dropped to half the level before the crisis (Chen, Zhou, & Yin, 2009). A better understanding of Chinese consumers' perceptions of food-related risks and their trust in information sources would help improve effective communication about food hazards to Chinese consumers in China and thereby rebuild their confidence in food safety.

Slovic's psychometric paradigm (1987) proposes that the risk perceptions of lay people are related to psychological factors, such as perceived catastrophic potential, fear or whether exposure to the hazard is voluntary. Risk perception can be measured by worry (Rosati & Saba, 2004), which can be defined as an "unpleasant state of mind with thoughts about uncertain and unpleasant events" (Sjöberg, 1998). Worry is characterized as a "feeling of anxiety, tension and apprehension; moderate awareness of somatic cues and concerns over the future rather than the past or present situation" (Borkovec, Robinson, Pruzinsky, & Depree, 1983: 9). Research on the relationship between worry and perceived risk showed that these concepts were moderately (Siegrist, Cvetkovich & Roth, 2000; Rosati & Saba, 2004) to highly (Griffin & Dunwoody, 2002; Rundmo, 2002) related.

A number of studies have shown that trust strongly influences risk perception (e.g., Eiser, Miles, & Frewer, 2002; Groothuis & Miller, 1997; Siegrist et al., 2000). Trust is often conceptualized as a multidimensional construct. For example, Frewer, Howard, Hedderley, and Shepherd (1996) indicated that trust is based on perceived accuracy, knowledge and concern with public welfare. Peter, Covello and McCallum (1997) proposed knowledge, expertise, openness, honesty, concern and care as the dimensions of trust. Studies into the relationship between food risk perception and trust in information sources have largely focused on the role of mass media and the provision of food safety information (Frewer et al., 1996; Liu, Huang & Brown, 1998; Lobb, Mazzocchi & Traill, 2007; Rosati & Saba, 2004).

Risk perception also depends on the information sources that consumers use, which can include the mass media (Combs & Slovic, 1979; Kjærnes, 2006), friends and personal

experience. Information seeking and information use are typical components of consumers' risk and uncertainty reduction strategies in food-related decision-making (Danelon & Salay, 2012; Van Wezeamel et al., 2010). Word of mouth information is often used in high risk situations or by people who have high perceptions of risk (Mitra, Reiss & Capella, 1999; Yeung & Yee, 2003). More recently Rutsaert, Regan, et al. (2013) have explored what they view as the strong potential of new online information sources, such as social media, as tools for communicating information about food risks and benefits.

Studies have shown that people with different socio-demographic characteristics perceive food risks in different ways. Lin (1995) found that female, older, more educated, non-working, main meal planners were more likely to treat food safety as a very important issue. Kjærnes (2006) reported that women paid more attention to food safety issues than men because they take more responsibility for buying and preparing food. Young people were found to be less concerned about food safety than older people (Miles et al., 2004) and according to Zorba and Kaptan (2011), knowledge of food safety issues increases with age. These studies confirm that, in order to be effective, risk communication strategies should be tailored to target particular sub-groups of the public (Verbeke, 2005).

Recently a body of literature has emerged that explores Chinese consumers' risk perceptions (Hu & Hua, 2008; Ma & Zhao, 2009; Zhao, Tang & Li, 2012; Zhou, 2005), how they search for information (Cha, 2009; Han & Yuan, 2008; Hu, Qi, & Hua, 2007; Zhang & Liu, 2010; Zhou, Huo, & Peng, 2004;) and the trust they place in information sources (Hu et al., 2007) related to food safety. However, only a few of these studies used a segmentation approach to exploring Chinese consumers' food safety perceptions. Chen (2012) segmented Taiwanese consumers into three groups: pessimistic, neutral and optimistic about food safety, based on their trust in the actors and institutions involved in the food supply chain. Zhang, Huang, Qiu and Huang (2010) segmented urban Chinese into four groups based on their perceptions and attitudes towards genetically modified (GM) foods (food safety oriented, nutritional technology oriented, GM skeptical and non-food GM supporters). There is a need for further research to understand Chinese consumers' risk perception patterns (and possible differences within these) in order to develop more effective and targeted communication strategies for Chinese consumers.

The primary objective of this study is to identify different segments of Chinese consumers, based on their personal risk perceptions, their degree of worry and their knowledge about food-related hazards. Its second objective is to investigate whether the identified segments



differ in terms of their use of information channels about food-related hazards and their trust in information sources. The third objective is to investigate the determinants of trust in information sources. In conclusion this study presents a number of recommendations as to how to communicate more effectively with the identified consumer segments.

## **3.2 Materials and methods**

### **3.2.1 Data collection**

Quantitative data were collected through a survey conducted during March 2012 in Beijing and Baoding, a medium-sized city close to Beijing. The survey in Beijing was performed at supermarkets, shopping malls, residences and parks in urban areas. Participants were selected using convenience sampling. Because Beijing has a large transient population we screened out subjects who had lived in the city for less than one year. Participants' consent to use their personal data for scientific purposes was requested prior to starting the survey. Participants received a small cash incentive. The same questionnaire was distributed to households by about 700 students in a middle school in Baoding city. Here a self-selection sampling method was used: the students took the questionnaire home and asked their parents to fill it in and return it.

The questionnaire was constructed to measure consumers' perceptions of the risk of food-related hazards, the frequency with which they used different information channels and their trust in information sources (following on a study by Rosati and Saba (2004)). The master questionnaire was drafted in English, translated into Chinese and pre-tested with a sample of 20 Chinese adults through a pilot study.

This study explored a number of food-related hazards including: food containing additives, food containing pesticides or veterinary drug residues, counterfeit food, inferior food, GM food, deteriorated food and nutritionally imbalanced food. Counterfeit food (e.g., fake Coca-Cola) describes food which uses a brand or label of a recognized food manufacturer or quality grade without authorization or imitates its appearance, but is of far lower quality than the authentic version (Xie, 2009). Inferior food (e.g., water-injected meat) describes sub-standard food products, usually made using low-quality (or even prohibited) ingredients or in unhygienic conditions. Deteriorated food (e.g., rotted apples) is food which has significantly deteriorated because of spoilage caused by for example bacteria or mold. Nutritionally imbalanced food (e.g., pickled vegetables which are high in salt) is food with

excessive amounts of some nutritional component, e.g., excessively fat, sugar or salt, compared to equivalent products. These seven food hazards were derived from previous studies by Zhou et al. (2004), Wang (2005) and Xie, Shen, and Li (2010) and cover the major existing and/or potential hazards in the food market in China. Although food-related hazards can also be categorized by food pathogens such as microorganism, man-made chemical hazards, plant toxin and animal toxin (e.g., Xue & Zhang (2013)), the chemical terms in food pathogens are not familiar and understood by Chinese consumers. To increase the validity of the survey, this study chose the seven food-related hazards because they have been frequently reported in mass media and easily understood by Chinese consumers.

### **3.2.2 Segmentation analysis**

Segmentation analysis has successfully been applied in food marketing and health psychology research in order to better understand behavioral patterns and to select the appropriate target groups for public health promotion campaigns and communication (Pieniak, Verbeke, & Scholderer, 2010; Verbeke, Perez-Cueto, deBarcellos, Krystallis, & Grunert, 2010). For example, Kornelis, De Jonge, Frewer, and Dagevos (2007) used a segmentation analysis to explore food safety information-acquisition patterns, identifying five consumer segments, each of which relied on different sources of information about food safety. Kennedy, Worosz, Todd, and Lapinski (2008) identified five consumer segments (confident, independent, trusting, cautious and apprehensive) with different attitudes towards food safety. More recently, Rutsaert, Pieniak, Regan, McConnon, and Verbeke (2013) used a segmentation approach to determine consumer interest in using social media to obtain information about the risks of pesticide residues on vegetables.

In this study, segmentation analysis has been performed to identify segments of Chinese consumers based on worry, risk perception and knowledge. Worry, perceived personal risk and subjective knowledge about potential food risks were measured using a scale devised by Rosati and Saba (2004). Participants were asked the following questions: *To what extent are you worried about the following food-related hazards* (worry) on a 7-point interval scale ranging from 'not worried at all' (1), 'neutral' (4) to 'very worried' (7); *How serious do you think the following food-related hazards are* (perceived personal risk) on a 7-point interval scale ranging from 'not serious at all' (1), 'neutral' (4) to 'very serious' (7), and; *How much knowledge do you think you have about potential food-related hazards* (subjective knowledge) on a 7-point interval scale ranging from 'no knowledge at all' (1), 'neutral' (4) to 'very good knowledge' (7).

### 3.2.3 Segment profiling variables

#### 3.2.3.1 Use of information channels.

Participants were asked to report how often they use different information channels: newspapers, television, radio, magazines or books, brochures and personal communications. These six items are based on previous studies (Hao, Ren, Feng, Li, & Xiu, 2009; Hu et al., 2007; Li & Guo, 2007; Zhou, 2005; Zhou et al., 2011) which showed these to be the channels most frequently used by Chinese consumers to get information about food safety. A 7-point frequency scale was applied: 'every day', 'three times a week', 'twice a week', 'once a week', 'once every two weeks', 'once a month' and 'less frequently or never' (7). These responses were given scores of 7, 3, 2, 1, 0.5, 0.25 and 0, respectively, to obtain a metric measure of frequency per week.

#### 3.2.3.2 Trust in information sources

Participants were asked to rate a list of information sources, with the question *To what extent do you think information about food-related hazards from each of the following sources is trustworthy?* using a 7-point interval scale ranging from completely untrustworthy (1), neutral (4) to completely trustworthy (7). The sources were: relatives and friends, personal experience, food producers, government, consumers' association, researchers or scientists and medical doctors. These have been found to be the most frequently used sources of information on food risks in China (Hu et al., 2007). Participants were informed that government refers to specific functional departments, such as the Chinese Ministries of Agriculture or Health or the General Administration of Quality Supervision, Inspection and Quarantine.

To measure perceived knowledge of the information sources, participants were asked *To what extent do you think the following source is knowledgeable about the risk of this food-related hazard to human health?* using a 7-point interval scale ranging from 'not knowledgeable at all' (1), 'neutral' (4) to 'very knowledgeable' (7). Perceived honesty of the information sources was measured by asking *To what extent do you think the information about this food-related hazard to the human health from the following source is accurate?* using a 7-point interval scale ranging from 'not accurate at all' (1), 'neutral' (4) to 'very accurate' (7). To measure the perceived level of concern of the information sources about citizens' health, participants were asked *To what extent do you think the following source is concerned about protecting the health and safety of citizens from possible risks of food-related hazards?* using

a 7-point interval scale ranging from 'not at all concerned' (1), 'neutral' (4) to 'very concerned' (7). The same information sources were included as in the previous question.

#### **3.2.4 Data analysis**

Data were analyzed using IBM® SPSS® (Statistical Package for the Social Sciences) Statistics version 21.0. First, independent sample t-tests were used to investigate the differences in mean scores between respondents from Beijing and Baoding in terms of the key segmentation variables (perceived worry, personal risk and knowledge). Cross-tabulation and chi-square analysis were conducted to test for significant associations between socio-demographics and the two survey locations as categorical variables. Second, an exploratory factor analysis (using the principal components extraction method with Varimax rotation) was performed to discover the basic structure underlying the measures of consumers' worry, perceived personal risk and subjective knowledge about the seven food-related hazards (Mazzocchi, 2008). This technique allows identifying factors (or latent dimensions) and their relationship with the worry, perceived risk and knowledge items measured in the study. The Kaiser-Meyer-Olkin (KMO) test and Bartlett's test of sphericity were used to evaluate whether it was appropriate to perform a factor analysis. Cronbach's alpha was used to test the internal reliability of the resulting factors (Hair, Black, Babin, Anderson, & Tatham, 2006). Then, a two-step clustering procedure (Ward's hierarchical clustering followed by K-means clustering) was applied to identify distinctive, homogenous consumer segments (Wedel & Kamakura, 2000) on the basis of three confirmed factors: worry, personal risk and subjective knowledge. Bivariate analyses including cross-tabulation and chi-square analysis (in case of two categorical variables) and One-Way ANOVA F-tests with post hoc Tukey comparison of means were used to profile the clusters in terms of the use of, and trust in, information channels; perceived trust; the knowledge, honesty and concern of information sources; and socio-demographics. The latter analysis allows to test whether different levels of a categorical variable (e.g., cluster membership) induce a variation in a dependent variable (e.g., worry, perceived personal risk, or knowledge). Finally, a multiple linear regression analysis, using the enter method, was conducted for each information source, to investigate whether perceived knowledge, honesty and/or concern of the information source were determinants of perceived trust.

### 3.3 Results

A total of 534 participants in Beijing and 437 in Baoding city completed the survey. The two sub-samples did not differ in terms of gender or age, but they did vary in terms of education and income. There were more participants with higher education and higher income in the sub-sample from Beijing city and more participants with lower education and low income in Baoding. The two sub-samples did not significantly differ in terms of the segmentation variables: perceived worry, personal risk and knowledge in relation to food safety hazards. In aggregate terms the total sample ( $n=971$ ) was composed of 65.9% women and 34.1% men. All the participants were the primary household food shoppers. The mean age of participants was 40.2 years ( $SD =10.9$ ). About 42% had graduated from college or higher education and 58% had a lower level of education (completing high, middle or primary school) (see Table 3.1 for total sample description).

**Table 3.1 Socio-demographic profile of the total sample and consumer segments (%)**

Socio-demographic profile	Total sample n=971	Segment 1 n=584	Segment 2 n=211	Segment 3 n=176	p-value	Chi-square
<b>Gender</b>					.054	5.381
Male	34.1	31.8	34.1	41.7		
Female	65.9	68.2	65.9	58.3		
<b>Mean age (years)</b>	40.2	40.3	40.8	39.1		
<b>Age (classes)</b>					.142	6.878
< 30 years	17.6	15.9	17.1	23.9		
30-50 years	66.4	68.5	66.8	59.1		
≥ 50 years	16.0	15.6	16.1	17.0		
<b>Married</b>					.087	4.894
Yes	82.3	83.5	83.9	76.6		
No	17.7	16.5	16.1	23.4		
<b>Presence of Children</b>					.022	7.675
Yes	80.9	83.4	79.5	74.1		
No	19.1	16.6	20.5	25.9		
<b>Education</b>					.583	2.851
Middle school (junior, senior & technical secondary) and below	58.4	56.5	61.2	61.2		
College and Bachelor's	35.7	37.8	32.2	33.1		
Master's and above	5.9	5.7	6.6	5.7		
<b>Income</b>					.113	10.300
<1000 yuan*	14.0	14.7	9.5	17.2		
1001-3000 yuan	55.0	55.2	59.2	49.1		
3001-5000 yuan	19.2	17.4	20.9	23.4		
>5001 yuan	11.8	12.7	10.4	10.3		
<b>Family Size</b>					.095	10.790
1 person	2.3	1.6	2.9	3.9		
2 persons	9.2	8.8	10.5	9.2		
3 persons	56	59.4	48	53.1		
4 persons and more	32.5	30.2	38.6	32.5		
<b>Occupation</b>					.134	9.774
Paid public sector job	23.3	24.5	24.2	19.5		
Paid private sector job	35.7	34.0	40.3	35.6		
No paid job or retired	20.5	19.8	16.6	27.0		
Other	20.5	21.7	18.9	17.8		

\*1000 yuan = approximately 165 US\$ or 120 euro

### 3.3.1 Risk perception about food-related hazards

Participants generally reported a high level of worry about all food-related hazards (Table 3.2). The two hazards that participants were most worried about were counterfeit food and inferior food. Participants also thought that these foods carried the highest level of personal risk. Food containing pesticides or veterinary drug residues and deteriorated food were ranked as third and fourth in terms of the perceived personal risk. Participants perceived food containing additives and GM food as presenting the lowest level of personal risk and cause for worry. In general, participants reported a neutral degree of subjective knowledge about all food-related hazards. They evaluated themselves as most knowledgeable about deteriorated food and counterfeit food, and least knowledgeable about GM food and food containing additives.

**Table 3.2 Mean ratings (SD) of Chinese consumers' risk perception of food-related hazards (n=971)**

	Worry <sup>#</sup>	Personal risk <sup>§</sup>	Subjective knowledge <sup>§</sup>
Counterfeit food	6.24 <sup>c</sup> (1.06)	6.22 <sup>c</sup> (1.11)	4.96 <sup>b</sup> (1.52)
Inferior quality food	6.22 <sup>c</sup> (1.09)	6.24 <sup>c</sup> (1.03)	4.93 <sup>b</sup> (1.54)
Food containing residues of pesticides or veterinary drugs	6.14 <sup>c</sup> (1.11)	6.12 <sup>c</sup> (1.13)	4.83 <sup>b</sup> (1.57)
Deteriorated food	6.12 <sup>c</sup> (1.14)	6.11 <sup>c</sup> (1.13)	4.98 <sup>b</sup> (1.60)
Nutritionally unbalanced food	5.81 <sup>b</sup> (1.25)	5.75 <sup>b</sup> (1.25)	4.94 <sup>b</sup> (1.52)
Food containing additives	5.69 <sup>ab</sup> (1.34)	5.61 <sup>ab</sup> (1.39)	4.47 <sup>a</sup> (1.59)
GM food	5.63 <sup>a</sup> (1.43)	5.51 <sup>a</sup> (1.47)	4.35 <sup>a</sup> (1.74)

The a-c superscripts indicate significantly different means between seven food-related hazards using Tukey post hoc comparison test.

<sup>#</sup> 7-point interval scale ranging from 'not worried at all' (1), 'neutral' (4) to 'very worried' (7)

<sup>§</sup> 7-point interval scale ranging from 'not serious at all' (1), 'neutral' (4) to 'very serious' (7)

<sup>§</sup> 7-point interval scale ranging from 'not knowledgeable at all' (1), 'neutral' (4) to 'very good knowledge' (7).

### 3.3.2 Factor and segmentation analysis

The KMO measure was 0.90 and the Bartlett's test of sphericity was highly significant, indicating that the data matrix (971 cases x 21 variables) was suitable for factor analysis. Seventeen of the 21 worry, perceived risk and knowledge items across hazards had a high factor loading (>0.60) for one single dimension, meaning that these items can be considered to be exclusively related to that dimension. These items were grouped into three factors across the hazards and accounted for 73.4% of the variance in the original data. The dimensions were (as expected) knowledge, worry and personal risk, which thus emerged as three constructs that constitute distinct dimensions that run across the hazards (Table 3.3).

**Table 3.3 Factor loadings, variance explained and Cronbach's alpha for the three risk perception factors**

Variables used to construct factors	Factor loading	Variance explained (%)	Cronbach's alpha
<b>Factor 1 Subjective knowledge</b>		30.9	0.94
How much knowledge do you think you have about the hazards associated with ...			
Counterfeit food	0.889		
Inferior food	0.884		
Food containing pesticide or veterinary drug residues	0.897		
Deteriorated food	0.856		
Nutritionally unbalanced food	0.839		
Food containing additives	0.830		
GM food	0.794		
<b>Factor 2 Concern</b>		21.7	0.91
To what extent are you worried about hazards caused by ...			
Counterfeit food	0.839		
Inferior food	0.822		
Food containing pesticide or veterinary drug residues	0.799		
Deteriorated food	0.756		
Food containing additives	0.679		
<b>Factor 3 Perceived personal risk</b>		20.8	0.89
How serious do you think the hazards associated with ... are?			
Food containing pesticide or veterinary drug residues	0.812		
Food containing additives	0.766		
Inferior food	0.761		
Counterfeit food	0.750		
Deteriorated food	0.716		
<i>Total variance explained by the factors (%)</i>		73.4	

Note: KMO measure: 0.90; Bartlett's test of sphericity 14085.94, df=136, p<0.001

Participants' mean scores for their worry, subjective knowledge and perceived personal risk about food-related hazards were used as segmentation variables in a cluster analysis (Table 3.4). A three-segment solution emerged as the optimal solution from the analysis.

Segment 1 was the largest segment, accounting for 60.1% of the sample. Participants in this segment displayed a high level of worry and a high perceived personal risk over food-related hazards. Members of this segment also had the highest level of subjective knowledge. We therefore referred to this segment as 'worried and knowledgeable consumers'.

Segment 2 accounted for 21.7% of the sample. Participants in this group also showed a high level of worry about, and a high perceived personal risk from, food-related hazards. However,



the mean value of their subjective knowledge about hazards was the lowest among the three segments. Therefore, we called this segment 'worried and ignorant consumers'.

Segment 3 accounted for 18.2% of the sample. Participants in this group scored close to the neutral point of the scale for worry, personal risk and subjective knowledge about food-related hazards. Based on these characteristics, we referred to this segment as 'moderately worried consumers'.

**Table 3.4 Mean ratings of the segments on segmentation variables**

	Segment 1	Segment 2	Segment 3
Size (n and %)	584 (60.1%)	211 (21.7%)	176 (18.2%)
Subjective knowledge <sup>§</sup>	5.61 <sup>c</sup>	3.11 <sup>a</sup>	4.02 <sup>b</sup>
Perceived personal risk <sup>§</sup>	6.39 <sup>b</sup>	6.39 <sup>b</sup>	4.57 <sup>a</sup>
Worry <sup>#</sup>	6.44 <sup>b</sup>	6.36 <sup>b</sup>	4.56 <sup>a</sup>
Segment name	Worried and knowledgeable consumers	Worried and ignorant consumers	Moderately worried consumers

The a-c in columns 2-4 superscripts indicate significantly different means between segments using Tukey post hoc.

<sup>#</sup> 7-point interval scale ranging from 'not worried at all' (1), 'neutral' (4) to 'very worried' (7)

<sup>§</sup> 7-point interval scale ranging from 'not serious at all' (1), 'neutral' (4) to 'very serious' (7)

<sup>§</sup> 7-point interval scale ranging from 'not knowledgeable at all' (1), 'neutral' (4) to 'very good knowledge' (7).

### 3.3.3 Differences in the use of information channels between the segments

In general, television was the most widely used information channel, used almost every day by most participants (Table 3.5). The internet was the second most frequently used channel for information about food safety, followed by conversations with friends or relatives (word of mouth). Radio, magazines, books and brochures were less frequently used as information channels about food-related hazards. Consumers with high subjective knowledge (segment 1) used newspapers more frequently than consumers with lower knowledge levels (segments 2 and 3). The use of mass media, television, internet, radio and word of mouth were not significantly different among the three segments. Consumers with the lowest knowledge (segment 2) reported significantly less frequent use of magazines, books, and brochures than consumers with high knowledge (segment 1).

**Table 3.5 Use of various channels for food safety information across segments (mean frequency per week)**

Use of information channel	Segment 1 n=584	Segment 2 n=211	Segment 3 n=176	Total Sample n=971	p-value	F value
TV	5.98	6.02	5.55	5.91 <sup>F</sup>	0.067	2.718
Internet	5.43	5.18	4.96	5.29 <sup>E</sup>	0.118	2.14
Word of mouth	4.88	4.51	4.72	4.77 <sup>D</sup>	0.274	1.295
Newspaper	4.57 <sup>b</sup>	3.90 <sup>a</sup>	3.93 <sup>a</sup>	4.31 <sup>C</sup>	0.007	5.009
Magazine & book	3.74 <sup>b</sup>	2.97 <sup>a</sup>	3.21 <sup>ab</sup>	3.48 <sup>B</sup>	0.004	5.496
Radio	3.70 <sup>b</sup>	2.86 <sup>a</sup>	3.38 <sup>ab</sup>	3.46 <sup>B</sup>	0.005	5.349
Brochure	2.19 <sup>b</sup>	1.47 <sup>a</sup>	2.12 <sup>ab</sup>	2.02 <sup>A</sup>	0.006	5.089

The a-c superscripts in column 2-4 indicate significantly different means between segments using Tukey post hoc comparison test. The A-F superscripts in column 5 indicated significantly different means between information channels using Tukey post hoc comparison test. All items measured are on a 7-point frequency scale from 'every day' (code as 7), 'three times a week' (3), 'twice a week'(2), 'once a week'(1), 'once every two weeks'(0.5), 'once a month' (0.25) and 'less frequently or never' (coded as zero).

### 3.3.4 Differences in the perceived trust of information sources between the segments

Medical doctors and personal experiences were perceived as the most trustworthy sources of information, followed by research institutes, relatives and friends, and consumers' associations (Table 3.6). There was a neutral level of trust in government (4.90 on 7-point scale). Consumers with a high risk perception (segments 1 and 2) placed more trust in medical doctors, research institutes and consumers' associations than consumers in segment 3. Worried and knowledgeable consumers (segment 1) trusted more in their personal experiences, relatives and friends, and government than consumers in the other two segments. The least trusted source of information were food producers (but the level of trust here was relatively neutral, 3.79 on 7-point scale). Consumers with the lowest subjective knowledge (segment 2) had a lower level of trust in food producers than the other two segments.

**Table 3.6 Profile of the segments on degree of trust in information sources**

	Segment 1	Segment 2	Segment 3	Total sample	P value	F-value
Medical doctors	5.76 <sup>b</sup>	5.64 <sup>b</sup>	5.22 <sup>a</sup>	5.63 <sup>D</sup>	<0.001	13.588
Personal experience	5.66 <sup>b</sup>	5.27 <sup>a</sup>	5.22 <sup>a</sup>	5.50 <sup>D</sup>	<0.001	14.343
Research institutes	5.43 <sup>b</sup>	5.29 <sup>b</sup>	4.85 <sup>a</sup>	5.29 <sup>C</sup>	<0.001	10.841
Relatives & friends	5.34 <sup>b</sup>	5.04 <sup>a</sup>	4.87 <sup>a</sup>	5.19 <sup>C</sup>	<0.001	12.714
Consumer associations	5.27 <sup>b</sup>	5.17 <sup>b</sup>	4.80 <sup>a</sup>	5.16 <sup>C</sup>	<0.001	7.032
Government	5.01 <sup>b</sup>	4.81 <sup>ab</sup>	4.64 <sup>a</sup>	4.90 <sup>B</sup>	0.018	4.012
Food producers	3.90 <sup>b</sup>	3.46 <sup>a</sup>	3.84 <sup>b</sup>	3.79 <sup>A</sup>	0.001	7.487

The a-c in column 2-4 superscripts indicate significantly different means between segments using Tukey post hoc.

The A-E in column 5 superscripts indicate significantly different means (about knowledge, concern and honesty) between information sources using Tukey post hoc.

### **3.3.5 Perception of knowledge, honesty and concern of information sources across segments**

In general, medical doctors and research institutes were perceived as the most reliable information sources about food safety (since these were perceived as the most knowledgeable sources), followed by consumers' associations and government (Table 3.7). By contrast, consumers themselves, food producers and relatives and friends were perceived as having a rather neutral degree of knowledge about food-related hazards. Consumers with high risk perceptions (segments 1 and 2) held notably stronger beliefs about the knowledge level of medical doctors, research institutes, consumers' associations and government than consumers with a moderate perception of risk (segment 3). Consumers with high subjective knowledge (segment 1) also perceived themselves, relatives and friends and food producers as more knowledgeable about food related-hazards than consumers with lower subjective knowledge (segment 2) and moderately knowledgeable consumers (segment 3).

The information released by medical doctors and research institutes was perceived as the most accurate (honest, truthful), followed by consumers' associations and government. Worried and knowledgeable consumers in segment 1 reported a higher score for honesty for these information sources than the other two segments. Information received through personal experience, relatives and friends and food producers was rated neutrally (3.52-4.64 on a 7-point scale).

All segments considered food producers to be the least concerned about citizen's health. Consumers with low knowledge (segments 2 and 3) gave this information source the lowest score. Consumers themselves were perceived as the most concerned about their own health, followed by medical doctors, relatives and friends and research institutes. Consumers' associations and government were perceived as concerned but gained a relatively low score compared to other sources.

### **3.3.6 Socio-demographic profiling of segments**

The presence of children within the household was the only significant socio-demographic profiling variable (Table 3.1). The highest proportion of families with children was found in segment 1, (worried and knowledgeable), while segment 3 (moderately worried consumers) contained relatively more families without children.

**Table 3.7 Profile of the segments' perception of the knowledge, honesty and concern of information sources**

	Segment 1	Segment 2	Segment 3	Total sample	P value	F-value
<i>Perception of knowledge</i>						
Medical doctors	5.82 <sup>b</sup>	5.58 <sup>b</sup>	5.18 <sup>a</sup>	5.65 <sup>D</sup>	<0.001	17.405
Research institutes	5.79 <sup>b</sup>	5.63 <sup>b</sup>	5.15 <sup>a</sup>	5.64 <sup>D</sup>	<0.001	13.525
Consumer association	5.51 <sup>b</sup>	5.36 <sup>b</sup>	4.85 <sup>a</sup>	5.36 <sup>C</sup>	<0.001	14.996
Government	5.39 <sup>b</sup>	5.21 <sup>b</sup>	4.62 <sup>a</sup>	5.21 <sup>C</sup>	<0.001	19.883
Consumer himself	5.08 <sup>b</sup>	4.10 <sup>a</sup>	4.32 <sup>a</sup>	4.72 <sup>B</sup>	<0.001	63.135
Food producers	4.81 <sup>b</sup>	4.43 <sup>a</sup>	4.22 <sup>a</sup>	4.62 <sup>B</sup>	<0.001	13.570
Relatives & friends	4.68 <sup>b</sup>	3.85 <sup>a</sup>	3.95 <sup>a</sup>	4.36 <sup>A</sup>	<0.001	40.988
<i>Perception of honesty</i>						
Medical doctors	5.54 <sup>b</sup>	5.28 <sup>a</sup>	5.09 <sup>a</sup>	5.40 <sup>D</sup>	<0.001	9.041
Research institutes	5.46 <sup>b</sup>	5.29 <sup>ab</sup>	4.98 <sup>a</sup>	5.34 <sup>D</sup>	<0.001	7.818
Consumer association	5.27 <sup>b</sup>	5.02 <sup>ab</sup>	4.74 <sup>a</sup>	5.12 <sup>C</sup>	<0.001	10.194
Government	5.07 <sup>b</sup>	4.77 <sup>a</sup>	4.68 <sup>a</sup>	4.93 <sup>C</sup>	0.002	6.396
Personal experience	4.64 <sup>b</sup>	3.92 <sup>a</sup>	4.24 <sup>a</sup>	4.41 <sup>B</sup>	<0.001	22.618
Relatives & friends	4.25 <sup>b</sup>	3.66 <sup>a</sup>	3.73 <sup>a</sup>	4.03 <sup>A</sup>	<0.001	17.024
Food producers	4.08 <sup>b</sup>	3.52 <sup>a</sup>	3.86 <sup>ab</sup>	3.92 <sup>A</sup>	<0.001	9.806
<i>Perception of concern</i>						
Consumer himself	5.85 <sup>c</sup>	5.55 <sup>b</sup>	4.93 <sup>a</sup>	5.62 <sup>E</sup>	<0.001	42.95
Medical doctors	5.54 <sup>b</sup>	5.30 <sup>ab</sup>	5.02 <sup>a</sup>	5.39 <sup>DC</sup>	<0.001	11.362
Relatives & friends	5.55 <sup>b</sup>	5.36 <sup>b</sup>	4.60 <sup>a</sup>	5.34 <sup>C</sup>	<0.001	39.559
Research institutes	5.48 <sup>b</sup>	5.29 <sup>b</sup>	4.79 <sup>a</sup>	5.31 <sup>C</sup>	<0.001	16.616
Consumer association	5.36 <sup>b</sup>	5.10 <sup>ab</sup>	4.80 <sup>a</sup>	5.20 <sup>BC</sup>	<0.001	11.396
Government	5.27 <sup>b</sup>	5.08 <sup>b</sup>	4.66 <sup>a</sup>	5.12 <sup>B</sup>	<0.001	10.846
Food producers	4.23 <sup>b</sup>	3.80 <sup>a</sup>	4.13 <sup>ab</sup>	4.12 <sup>A</sup>	.005	5.284

The a-c in column 2-4 superscripts indicate significantly different means between segments using Tukey post hoc. The A-E in column 5 superscripts indicate significantly different means between information sources in terms of perceived knowledge, honesty and concern using Tukey post hoc.

### 3.3.7 Determinants of trust

Participants' perceptions of different actors' knowledge, honesty and concern had significant effects on the trust that they placed in different the different actors as information sources (Table 3.8). In general, consumers placed more trust in information sources that they perceived to be more knowledgeable, more honest in providing complete information and more concerned about citizens' health. A comparison of the regression coefficients within the information source showed that perceived honesty in providing accurate information was the most important determinant of trust in medical doctors, personal experience, research institutes, consumers' associations and food producers. In the case of relatives and friends and

government, perceived concern about citizens' health had the most impact on consumers' trust in those information sources.

**Table 3.8 Determinants of trust in information sources based on multiple linear regression analysis (enter method), parameter estimates and R<sup>2</sup> goodness of fit**

	Knowledge	Honesty	Concern	Constant	R <sup>2</sup>
Medical doctors	0.246	0.260	0.185	1.837	0.413
Personal experience	0.178	0.195	0.192	2.719	0.223
Research institutes	0.189	0.339	0.248	1.103	0.435
Relatives & friends	0.137	0.155	0.172	3.048	0.175
Consumers' association	0.098	0.352	0.331	1.114	0.448
Government	0.135	0.322	0.374	0.696	0.469
Food producers	0.108	0.264	0.234	1.297	0.314

Note: all parameter estimates were significant (t-test) at the 5% significance level.

### 3.4 Discussion

The results of this study showed a generally high level of worry and a moderate degree of knowledge about food-related hazards among Chinese consumers. Participants were most worried about counterfeit and inferior quality food, probably because Chinese consumers have been frequently confronted with such products (Xu et al., 2006). Recent mass media (e.g., TV news) coverage of food crises caused by counterfeit and inferior food may have further increased consumers' worry about these hazards (Feng, 2012; Gong, 2012). In line with previous studies (Wang & Wei, 2006; Zhou, 2005; Zhou & Peng, 2006), our respondents also reported a high level of worry about the hazards associated with residues from pesticides and veterinary drugs. Participants showed some worry about food risks from GM food, although less than for other issues, reflecting Chinese consumers' relatively low awareness and knowledge about GM food (see e.g., Ho & Vermeer, 2004; Huang, Qiu, Bai, & Pray, 2006; Li, Curtis, McCluskey, & Wahl, 2002). When thinking about the risks and benefits of GM foods, Chinese consumers are inclined to adopt the opinions communicated through the mass media (Liu, Wang, Li, Zhang, & Zhang, 2007; Zhao, Jin, & Peng, 2011; Zhou, 2012). While some influential newspapers, e.g., *The People's Daily* (an official and authoritative newspaper in China) communicate a positive but cautious attitude towards GM technology, a number of negative reports about the potential risks of GM food has recently increased public worry about GM food (Zhao et al., 2011).

Television and internet were the most used channels for obtaining information about food-related hazards. In contrast with previous studies, where newspapers were more frequently used and the internet less so (Jiang, 2004; Wan, 2008; Zhou, 2005), our findings showed that newspapers were used less frequently as a source of food safety information, even compared with interpersonal information channels. The main reasons for this could be linked to the growing popularity of online news in China (CAPP, 2012), fast-growing internet use in Beijing and Baoding (CNNIC, 2012) and the high participation rate by young and middle-aged participants in our survey.

The national government gained a moderate degree of trust. It was seen as knowledgeable, concerned about citizens' health and releasing relatively accurate information about food safety. This result is consistent with other studies (Jiang, 2004; Hu et al., 2007; Wan, 2008) which found that government and consumers' associations were perceived as credible information sources in China. This is in marked contrast with studies in western countries where the public often lacked trust in governments (Frewer et al., 1996; Pieniak, Verbeke, Scholderer, Brunso, & Olsen, 2007; Slovic, 1987; De Vocht, 2014).

Being an effective source of information about risk requires a high level of trust, which, in turn, involves being perceived as highly knowledgeable, highly honest and highly concerned about citizens' health. According to these criteria, medical doctors and research institutes appear to be the ideal communicators. According to the Food Safety Law (CNPCSC, 2009) government departments are responsible for releasing information. Our results suggest that government departments should work more closely with medical doctors and research institutes in order to increase the credibility of information and satisfy consumer demand for authoritative expert information (Kong, 2010).

Our results also show that participants perceived relatives and friends to be more trustworthy sources of information than government, which could possibly explain why interpersonal communication was a main source for participants' obtaining information about food safety. Personal sources of information have been found to be frequently used in high-risk situations as they are perceived to be reliable (Yeung & Yee, 2003). In China, there is a notable lack of accurate and up-to-date information about food quality and safety available on the official websites of governmental departments (Kong, 2010) and it is generally not easy to obtain information about food safety. While interpersonal communications were found to be the most important sources of information, they are generally incomplete: as such there is a need

for other information sources to release fuller and more accurate information about food safety.

Consumers' associations were perceived as a relatively trustworthy source of information and they are perceived as having a high level of knowledge, honesty and relatively high concern about citizen's health. Providing food-related information, including information about food safety, is part of the mission of consumers' associations. They are seen as being a reliable information source and could play a more central role in providing information about food safety, through for example, telephone hotlines or providing lectures or training courses (Cha, 2009), or social media (Rutsaert et al., 2014).

In line with previous studies (e.g., Cui & Yin, 2012; Hu et al., 2007; Van Wezemael, Verbeke, Kugler, De Barcellos, & Grunert, 2010) participants showed the least trust (but were still rather neutral) in food producers. The recent food crises in China have tremendously reduced people's confidence in food producers (Cheng, Zhou, & Yin, 2009; Lu, He & Min, 2010). Food producers are important communicators about food risk communication. They need to increase their perceived trustworthiness, particularly by providing more accurate information and increased transparency.

Overall, public trust in all types of information sources can be improved by strengthening people's confidence in their knowledge, honesty and concern. In particular, the provision of accurate and transparent information, which improves consumers' perceptions of honesty, plays an important role in determining participants' trust in information sources. Medical doctors, research institutes, consumers' associations and food producers fare relatively well here. Government should strive to be seen as more concerned about citizens' health in order to gain more trust.

The findings of this study are subject to some limitations. For reasons of convenience we focused mostly on samples of self-selected urban consumers, which limits the potential to generalize our findings to the Chinese population at large. As such, the study findings should be interpreted within the specific frame of the sample. Future studies, using a more representative consumer sample, would contribute to a better understanding of the findings reported here. In addition, this study only assessed consumers' self-reported, subjective knowledge. Subjective and objective knowledge are not always consistent (Pieniak, Aertsens, & Verbeke, 2010; Verbeke, 2008). Future studies about consumers' actual knowledge of food-related hazards and its impact on attitudes and behavior (e.g., Parra, Kim, Shapiro,

Gravani, & Bradley, 2014) are recommended to improve communication about food risks in China.

### **3.5 Conclusions**

One of the major findings of this study is that more collaboration between government departments, medical doctors and research institutes would improve the public's confidence in the credibility of information about food safety. Since Chinese people increasingly use the internet as an information channel, more accurate, transparent and up-to-date information should be put on official websites. This would facilitate public access to credible information. Although the government is perceived as a reliable source, its perceived trustworthiness could be increased if it were to show more concern about citizen's health. Supervision of food producers by public authorities would go a long way to restoring consumers' trust. The identification of three distinct segments on the basis of worry, perceived personal risk and knowledge about food-related hazards shows that the information channels and sources need to be chosen carefully in accordance with the needs of target consumers. Despite similar socio-demographic patterns across segments, these requirements are clearly not homogenous.



# Chapter 4

## The impacts of information about the risks and benefits of pork consumption on Chinese consumers' perceptions towards, and intention to eat, pork

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This chapter is based on:

Verbeke, W., & Liu, R. (2014). The impacts of information about the risks and benefits of pork consumption on Chinese consumers' perceptions towards, and intention to eat, pork. *Meat Science*, 98, 766-772.

### **Abstract**

This study investigates the impacts of information on the benefits and risks of eating pork on Chinese consumers' attitudes and intentions. Data were collected in March 2013 through a consumer survey (n=909) in Beijing and Baoding City. An experiment was conducted using three types of message (positive, negative, and balanced) combined with three information sources (government, research institutes, and the pork industry). Participants ate pork almost every second day. They perceived pork as rather nutritious and relatively expensive and had neutral views about its healthiness and safety. Exposure to negative information (about risks only) resulted in a significant and negative change in consumers' perceptions of pork's nutritional value, price, healthiness and safety, while exposure to positive information (about benefits only) caused a positive change in consumers' perceptions about pork's healthiness and safety. Exposure to balanced information resulted in a significant and negative change in the perceived nutritional value of pork. Participants' intended frequency of pork consumption was significantly lower after exposure to information, irrespective of the type of information received. Exposure to risks-only information decreased consumers' intention to eat pork, while exposure to benefit-only information had a positive effect on consumers' intentions to eat pork. Exposure to balanced risk/benefit information had no effect on intended pork consumption. Of the information used, governmental materials were found to have a positive impact on consumers' perceptions of pork's safety. Implications for communication strategies with Chinese consumers about pork consumption are discussed.



## 4.1 Introduction

Understanding how consumers respond to information is important for developing effective food marketing and communication strategies. While communication and information provision do not change the attributes of goods *per se*, they can shape the attitudes of consumers, and influence their choices and behavior. The topic of this paper is how information affects Chinese consumers' perceptions of, attitudes towards, and their intention to eat, pork.

China is the biggest consumer of pork in the world, accounting for half of all pork consumption worldwide. Pork consumption per capita in China gradually increased between 1975 and 2012. In 2012, pork consumption reached 52.7 million tonnes in China, twice as much as in the EU-27 (20.7 million tonnes) and six times as much as the United States (8.3 million tonnes) (USDA, 2013a). It is forecast to increase to 54.4 million tonnes by the end of 2014. The expectation is that the upward trend will continue with the growth in urbanization and disposable income in China (USDA, 2013b). China has been a net pork and pork offal importer since 2007 (China Daily, 2011); imports reached 0.73 million tonnes in 2012 (USDA, 2013a). To meet the growing demand, China continues to expand pork imports to fill the gap in domestic supply.

Pork has historically been the primary animal protein source in Chinese diets. Despite its dominant position, pork's share of total meat consumption (including beef, pork, lamb and poultry) in urban areas in China has generally decreased, from 73% in 1990 to 59% in 2011. With living standards improving, urban consumers prefer beef, lamb and poultry for their (real or perceived) higher protein and lower fat contents and higher nutritional value compared with pork (Li et al., 2011). In 2011, the illegal additive clenbuterol was found in pig feed produced by the Shuanghui Group, the largest meat producer in China. Liu et al. (2012) reported that pork's share of total meat consumption in Beijing was already less than 50% before news of the Shuanghui clenbuterol contamination event was broadcast by China Central Television in March 2011, indicating pork's long-term declining position in meat consumption in China.

Recent safety incidents in China and negative media coverage have left Chinese consumers with a high level of uncertainty and mistrust regarding the safety of pork. The contamination of fresh pork with clenbuterol was a major food safety incident in China (Zhou et al., 2012).

Clenbuterol is a prohibited additive that promotes muscle building and fat burning to produce leaner pork, but it can lead to dizziness, heart palpitations and profuse sweating in humans (Wang, 2009; He, 2011). The Shuanghui group's sales slumped at least 60% in the week after the Shuanghui clenbuterol incident (Cheng & Yin, 2012) showing that many Chinese consumers would reduce their pork consumption, or even stop it altogether, in order to avoid health risks (Cheng & Yin, 2012). A recent study by De Barcellos et al. (2013) confirmed Chinese consumers' focus on safety issues in pork production and their preference for pork from local large-scale industrial production (which is perceived to provide the best guarantee in terms of safety) using Chinese breeds rather than imported pork.

Faced with a declining market position of pork and increasing consumer concerns about its safety the pork industry recognizes the importance of communication to promote pork consumption in China and reassures consumers of its safety. Communication is achieved by information flow between sources and receivers. Information can be divided into positive messages (about benefits), negative messages (about risks) and balanced information. Information about the benefits of food may result in positive attitudes and increase the likelihood of consumers accepting these foods (e.g., Koistinen et al., 2013; Siegrist et al., 2008; Smed, 2012), while negative information may reduce consumers' perceptions of quality and their likelihood of (or actual) consumption (Adhikari et al., 2006; Ishida et al., 2010; Smed, 2012). Previous research about how positive and negative information influences consumer behavior has shown that negative information usually has a stronger impact than positive information on consumers' perceptions and food choice behavior (Smed, 2012; Verbeke et al., 2008) because consumers consider the avoidance of possible harm to be more important than the chance of a possible benefit (Verbeke, 2005).

Consumers usually base their decisions on information about both risks and benefits. Studies show that they may have difficulties balancing conflicting information about both risks and benefits (Verbeke et al. 2005; Verbeke et al., 2008). Findings about the impact of balanced information on consumers' food consumption behavior are often contradictory. For example, Verbeke et al. (2008) reported that balanced information negatively influenced consumers' perceptions of fish while Altintzoglou et al. (2010) found that balanced information had neither a positive nor a negative influence on consumers' predominantly positive image of fish. Van Dijk et al. (2011) found that the impact of balanced information on consumers' attitude and perception about risks and benefits depended on their initial attitude to the issue.

As well as message content, the impact of communication depends on the source of information (Breakwell, 2000). Trust in information sources is an important factor (Thiede, 2005). Trust in information sources depends on a belief that the source is expert, unbiased, without vested interest and not sensationalist (Breakwell, 2000). Trust is more influential in an environment where people are not willing or able to process information in a detailed, rational and analytical way (Verbeke et al., 2008). Consumers in western countries often lack trust in their governments, although they perceive scientists and the food industry to be quite trustworthy (Eurobarometer, 2006; Pieniak et al., 2007). In China, scientists and research institutes and the government are generally perceived as trustworthy information sources, while the food industry is perceived as unreliable (Liu et al., 2014). With regarding to message content, De Vocht (2014) found that for a spatially distant risk, a balanced message led to higher message credibility than a risk message while if a spatially risk is near, a risk message resulted in higher message credibility than when a balanced message was used.

Studies about the impact of information on consumer behavior in China are scarce. Hu (2010) investigated how Chinese consumers reacted to information about the effects of genetically modified (GM) food in increasing or reducing allergies. They concluded that negative information significantly increased consumers' worries about GM food. Trust in information sources only affected the impact of positive information on consumers' risk perceptions. Zhao et al. (2013) reported that Chinese consumers adjusted their lifestyles after receiving negative health information about chronic diseases and/or after being diagnosed with hypertension.

This study investigates the impact of positive, negative and balanced information provided by government, research institutes and the pork industry on Chinese consumers' attitudes and intentions towards eating pork. First, it investigates the perceptions, attitudes and frequency of pork consumption among urban Chinese consumers. Second, it tests how three types of message affect consumers' perceptions and intentions towards eating pork. Third, it examines the impact of different information sources on consumers' perceptions and intentions.

## **4.2 Materials and methods**

Cross-sectional consumer data were collected using a survey method that combined a classical attitude-behavior questionnaire with an experimental information study. Before being exposed to a positive, negative or balanced message dealing with pork, participants completed a questionnaire that probed their attitudes towards, their perceptions about, and the frequency with which they consumed, pork. After exposure to a message, participants were

asked to report on whether they trusted the message content, and how this changed their perception of pork and consumption intentions.

#### **4.2.1 Information experiment**

The experiment included three types of messages about pork: just about benefits, just about risks and balanced. The three message types and three information sources yielded nine different conditions in total. Each participant was presented with one of the nine message concepts. A full factorial between-subjects design was employed. Responses collected prior to the experiment (i.e. *ex ante*) were used as a baseline measure to assess participants' perceptions about pork and their current pork consumption frequency, while measurements collected afterwards (i.e. *ex post*) were used to test the impact of the information on participants' perceptions and behavioral intentions. The messages consisted of a short text related to the consequences of pork consumption. The benefits-only message mentioned potential health benefits from eating pork (provision of vitamin B (B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>6</sub>, B<sub>12</sub>) and minerals (such as phosphorus, calcium and iron); the risks-only message mentioned potential risks of pork consumption (the potential presence of hormone and antibiotic residues); the balanced message included information about both the potential health benefits and risks from pork consumption. The content of the messages was taken from previous studies about health benefits and risks related to pork consumption in a Chinese context (Lü, 2003; Zhou et al., 2009; Cheng et al., 2005; Tian et al., 2009). The messages used in the experiment are included in this chapter. The messages were all structured in the same way; they stressed the importance of the nutrient or contaminant components and their potential impact on human health, the fact that pork and its products are among the main sources of these components in the Chinese diet, and the potential positive/negative impact on human health that might result from eating pork.

The three information sources included in the experiment were government, research institutes and the pork industry. These sources were assumed to have different interests when communicating about the benefits and risks of pork consumption. The purpose of government communication may be improving public health and social welfare. Research institutes may focus more on communicating scientific developments and new evidence, while the pork industry may be more concerned about commercial (vested) interests and market penetration and development. The three sources cover the spectrum from the most trusted information sources (research institutes and government) to the least trusted (the pork industry) (Liu et al.,

2014). Participants were presented with the statement: “Please read the following message provided by (information source) and then answer the following questions.”

#### **4.2.2 Questionnaire**

First, consumers’ attitudes towards eating pork were measured with four items on seven-point semantic differential scales. Participants were asked to indicate how they feel when they eat pork. The bipolar adjectives were: bad/good, unsatisfied/satisfied, unpleasant/pleasant, and negative/positive. These items are typically used to measure general attitudes in marketing (Stayman & Batra, 1991) and food consumption studies (Sparks & Guthrie, 1998).

Second, participants’ pork consumption frequency was measured using a self-administered food frequency scale, asking about pork consumption during the past two weeks. The scale ranged from zero (never) to 15 times or more (every day). A similar question with reference to the coming two weeks was included to measure consumption intention after exposure to the new information. The difference between participants’ intended behavior and self-reported behavior was used as the benchmark to assess the impact of information on behavioral intention.

Third, consumers’ perceptions about pork and pork consumption were measured with five items on a seven-point semantic differential scale. Participants were presented with the statement “Please indicate to what extent you view pork as....” with the bipolar adjectives: unhealthy/healthy, unsafe/safe, not nutritious/nutritious and expensive/cheap. The selection of these items was informed by the content of the specific messages which focused on health, nutritional value and safety. Price (expensive/cheap) was included as a control attribute. Although price perception might not be directly influenced by exposure to information about benefits or risks, indirect effects may emerge in terms of changes in the perceived value for money. Data about perceptions was collected before and after the information was presented. The difference between the two measures was used to assess the messages’ impact on consumers’ perceptions.

Finally, perceived trustworthiness of the different information sources was measured directly through the question “To what extent do you think information provided by (information source) is trustworthy?” Participants were asked to choose their answer from a seven-point interval scale ranging from “not trustworthy at all” (1) to “completely trustworthy” (7).

### 4.2.3 Data collection and participants

Quantitative data were collected through a survey conducted during March 2012 in Beijing and Baoding, a medium-sized city close to Beijing. The survey in Beijing was performed at supermarkets, shopping malls, residences and parks in urban areas. Participants were selected using convenience sampling. Because Beijing has a large transient population we screened out participants who had lived in the city for less than one year. A total of 534 participants participated in the Beijing survey. The same questionnaire was delivered to about 700 students in a middle school in Baoding City with a request to get their parents to complete and return the questionnaire. A total of 438 adult participants from Baoding completed the survey. There were no big differences between the two cities in terms of participants' attitude towards pork consumption and their reported frequency of eating pork. Baoding is less developed than Beijing. In order to get a more diversified sample but not limited to metropolitan citizens only, the two samples were merged and analyzed together. From the total sample of 972 participants, 57 reported not having eaten pork during the two weeks preceding the study and another six did not report their pork consumption frequency. These participants were excluded from further analysis, thus restricting the analysis to a sample of 909 Chinese pork consumers. The distribution of the participants across the message and information source combinations is presented in Table 4.1.

**Table 4.1 Number of questionnaires completed according to type of information and source**

	Government	Research institute	Pork industry	Total
Benefit only	106	91	85	282
Risk only	94	103	121	318
Balanced message	101	112	96	309
Total	301	306	302	909

An overview of the socio-demographic characteristics of the sample is shown in Table 4.2. The total sample (n=909) was composed of 66% women and 34% men. This gender distribution reflected the fact that most of the participants were the primary household food shopper. The mean age of the participants was 40.2 years (SD =10.9). About 41.8% had graduated from college or had higher education and 56.3% had completed middle school.



**Table 4.2 Socio-demographic characteristics of the sample (n=909, %)**

Age	< 30 years	17.7	Education	Primary school	1.9
	30-50 years	66.2		Middle school	56.3
	> =50 years	16.1		College and above	41.8
Occupation	Paid job in public sector	23.2	Gender	Male	34.0
				Female	66.0
	Paid job in private sector	36.0	Children	Yes	81.1
	No paid job or retired	20.6		No	18.9
Others	20.2	Family size	1 person	2.2	
Income	<1000 yuan*		14.0	2 persons	9.5
	1001-3000 yuan		55.0	3 persons	55.5
	3001-5000 yuan		19.0	4 persons or more	32.8
	>5001 yuan	11.9			

\*1000 yuan = approximately 165 US\$ or 120 euro

#### 4.2.4 Data analysis

Data were analyzed using SPSS 20.0. Mean and standard deviations were used to describe consumers' general attitudes towards eating pork, their perceptions of pork's qualities and the frequency with which they consumed pork before exposure to the messages and their intended frequency of consumption after exposure. Reliability analysis with Cronbach  $\alpha$  was adopted to investigate the internal reliability of the four items measuring attitude to eating pork. ANOVA  $F$ -tests with Bonferonni *post hoc* comparison of mean scores was used to evaluate the differences in attitudes, consumers' perceptions of pork's qualities and pork consumption frequency between the groups exposed to the three different messages (hereafter referred to as message groups) before and after exposure, and the trust they placed in the three information sources. Differences in the changes in consumers' perceptions about pork's qualities and the frequency of pork consumption after exposure across message groups and across information sources were tested by means of one-sample  $t$ -tests. Independent sample  $t$ -tests were used to investigate the differences between male and female participants in terms of general attitudes

to eating pork and pork consumption frequency before exposure, perceptions of pork's qualities before exposure and changes after exposure. Bivariate correlation was used to test the correlation between general attitudes to eating pork and frequency of pork consumption before exposure and the correlation between attitudes and changes in perceptions about the attributes of pork after exposure. Chi-square analysis for association was applied to investigate whether the proportion of consumers who intended not to eat pork for two weeks after exposure was different between the message groups. General linear model analysis was used to test for interactions between message types and information sources on consumers' attribute perceptions and intentions to eat pork.

## 4.3 Results

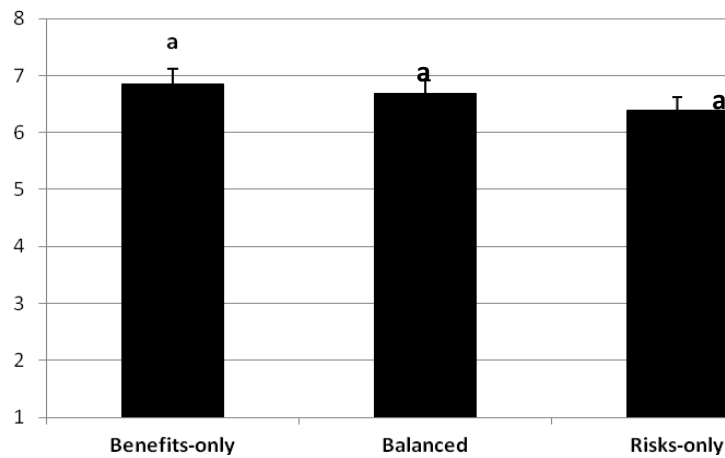
### 4.3.1 Pork consumption and attitudes to pork

Participants reported that they had eaten pork 6.64 (SD=4.18) times on average during the two weeks preceding data collection. Male participants reported a significantly higher pork consumption (mean=7.25) than female participants (mean=6.33) ( $t=3.14$ ;  $p=0.002$ ). Pork consumption frequency before exposure did not differ significantly between the three message groups ( $F = 0.929$ ;  $p=0.397$ ) (Figure 4.1).

The internal reliability consistency of the four items assessing attitudes to eating pork was high (Cronbach alpha = 0.95), which allowed the researchers to aggregate the individual item scores into one general attitude score. The mean general attitude towards eating pork was 4.30 (SD=1.21) on a seven-point scale, indicating that Chinese consumers have a neutral to slightly favorable general attitude to eating pork; 29.9% of the sample reported a negative to neutral attitude, 18.9% reported a neutral attitude, and 51.2% were neutral to positive. Participants' general attitudes to eating pork were significantly and positively correlated with the frequency of pork consumption ( $r=0.221$ ;  $p < 0.01$ ). Despite a higher consumption frequency among males, general attitudes to pork were not significantly different between men and women ( $t=0.54$ ;  $p=0.590$ ). General attitudes to pork did not differ significantly between the three message groups ( $F = 0.569$ ;  $p=0.566$ ).

Before exposure to the messages, pork was perceived as rather nutritious (mean=4.63; SD=1.21), neutral in terms of healthiness (mean = 4.13; SD=1.21) and safety (mean = 3.90; SD=1.30), but rather expensive (mean = 3.31; SD=1.26). Mean perceptions did not differ

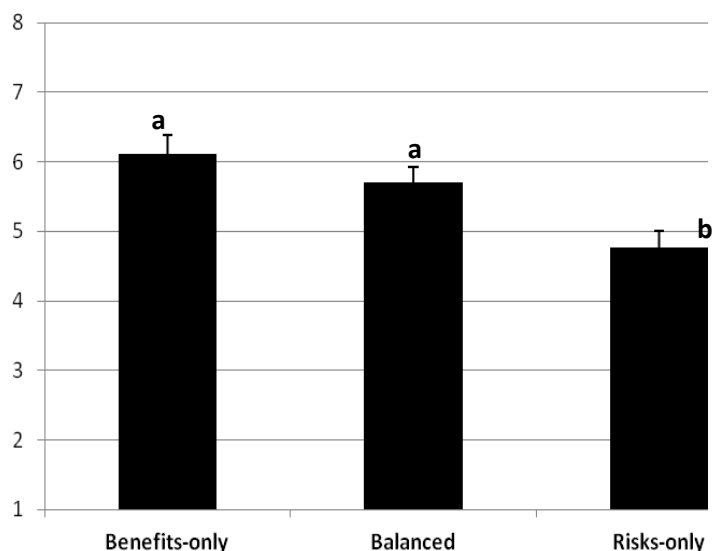
significantly between males and females, or between the three message groups (all  $p$ -values based on ANOVA  $F$ -tests  $> 0.05$ ).



**Figure 4.1** Reported pork consumption frequency (mean  $\pm$  SEM; per two weeks) by message group (ANOVA  $F$ -test,  $p=0.397$ ; no significant differences).

#### 4.3.2 The effects of exposure to information on pork consumption intentions

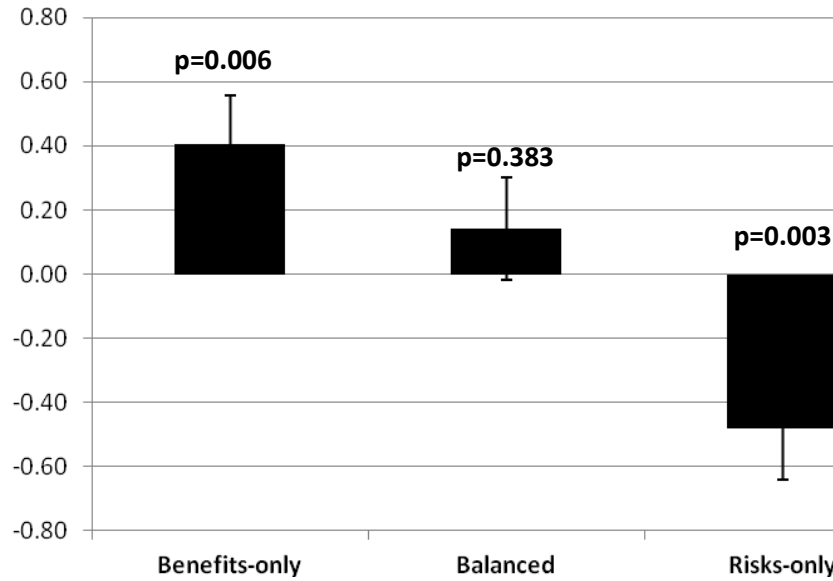
Participants had a neutral level of trust in the three types of messages, positive information (mean= 4.29; SD=1.35), balanced information (mean=4.39; SD= 1.33) and negative information (mean=4.35; SD=1.36). The perceived credibility of the three message types was evaluated as equal ( $F=0.39$ ;  $p=0.68$ ). After being exposed to the information, participants' average intended frequency of pork consumption over the next two weeks (15 days) was 5.51 (SD=3.93), significantly lower than the reported frequency from the two weeks prior to completing the survey ( $t=-12.336$ ;  $p<0.001$ ). Intended pork consumption differed significantly between the message groups ( $F = 9.54$ ;  $p<0.001$ ) (Figure 4.2). Consumers who were exposed to negative information reported a significantly lower intention to consume pork (mean=4.77; SD=3.73) compared to consumers who were exposed to balanced (mean=5.70; SD=3.74) and positive (mean=6.12; SD=4.21) information. Six percent of consumers who were exposed to negative information said they were unlikely to eat pork over the next two weeks (6%), which is more than the share of those exposed to positive or balanced information (2.8 and 2.9% respectively: Chi-square = 5.24;  $0.05<p<0.10$ ).



**Figure 4.2 Intended pork consumption frequency (mean  $\pm$  SEM; per two weeks) by message group (ANOVA F-test,  $p < 0.001$ ).**

Note: a,b indicate significantly different means between message groups using Bonferonni post hoc comparison test.

The mean difference between the reported past and the intended future frequency of pork consumption was -1.13 for the whole sample. Figure 4.3 shows the difference between past and intended pork consumption frequency, relative to the mean difference of -1.13 (which is used as benchmark). This analysis indicates that positive information had a kind of protective effect, i.e. the difference between pork consumption frequency before and after exposure was significantly less negative (-0.73 vs. -1.13 for the whole sample;  $t=2.768$ ;  $p=0.006$ ) among consumers who were exposed to positive information. In contrast, this difference was significantly more negative (-1.62 vs. -1.13 for the whole sample;  $t=-3.063$ ;  $p=0.003$ ) among those who were exposed to negative information. For consumers who were exposed to balanced information the figure was not significantly different from the benchmark (-0.99 vs. -1.13 for the whole sample;  $t=0.855$ ;  $p=0.383$ ). The difference between past and intended pork consumption frequency was not correlated with general attitudes towards eating pork.



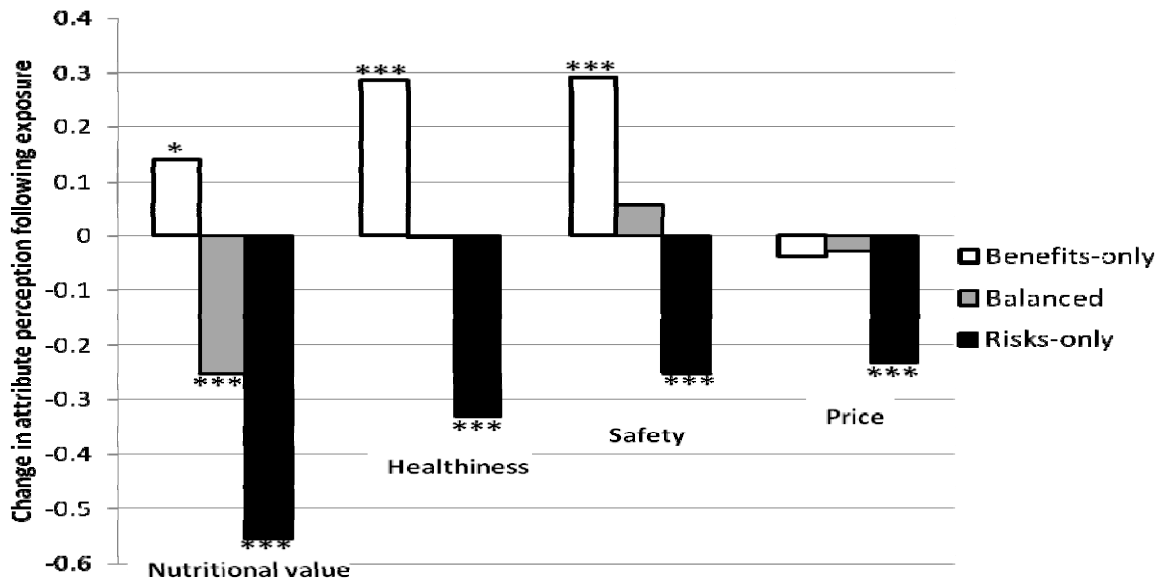
**Figure 4.3** Difference between past and intended pork consumption frequency (relative to the mean difference of -1.13 for the whole sample, e.g.  $-0.73 - (-1.13) = 0.40$  for benefits-only) (mean  $\pm$  SEM; per two weeks) by message group; p-values from one-sample t-test with test value = 0.

#### 4.3.3 The effects of exposure and information content on consumers' perceptions of pork's attributes

Similar, significant, differences were observed in consumers' perception of pork's nutritional value, healthiness and safety. Consumers who were exposed to negative information consistently reported lower scores than those exposed to positive or balanced information. Perceptions after exposure to balanced information differed significantly from those after exposure to positive information in terms of nutritional value, but not for healthiness and safety. Importantly, perceptions of price (included as a control variable) did not significantly differ between the three message groups ( $F=0.631$ ,  $p=0.532$ ).

Consumers exposed to positive information reported significant and positive changes in their perceptions of the healthiness ( $t=3.891$ ;  $p<0.001$ ) and safety ( $t= 4.052$ ;  $p<0.001$ ) of pork. Those exposed to negative information reported significant and negative changes in perception on all attributes (nutritional value, healthiness, safety, and even price). While for those exposed to balanced information the only significant (negative) change was in perceived nutritional value ( $t=-3.808$ ;  $p<0.001$ ) (Figure 4.4).

Changes in perceptions about nutritional value and healthiness were stronger (more negative) among female participants than males. With the exception of price perception, changes in perceptions were significantly negatively correlated with general attitudes to eating pork (Pearson correlation coefficients between -0.11 and -0.25; all  $p$ -values  $<0.01$ ). Thus a more positive general attitude to eating pork was associated with a less negative change in the perception of pork's qualities after exposure to information.



**Figure 4.4** Changes in attribute perceptions (mean) following exposure to information by message group; one-sample t-test  $p$ -values with \* means  $0.05 < p < 0.10$ ; \*\* means  $p < 0.05$ ; \*\*\* means  $p < 0.01$

#### 4.3.4 The effects of information source on consumers' perceptions of pork's qualities

The perceived credibility of the messages originating from the government (mean=4.66; SD=1.35) and research institutes (mean=4.43; SD=1.30) was rated significantly higher than from the pork industry (mean=3.95; SD=1.29). Significant negative, but similar ( $F=0.229$ ;  $p=0.795$ ) effects on consumers' perceptions of nutritional value were found after exposure to information provided by the government ( $-0.21$ ;  $t=-2.865$ ;  $p=0.004$ ), research institutes ( $-0.26$ ;  $t=-3.554$ ;  $p<0.001$ ) and the pork industry ( $-0.26$ ;  $t=-3.259$ ;  $p=0.001$ ). Use of governmental material as the information source yielded a small but significant ( $t=2.07$ ;  $p=0.039$ ) and positive effect (+0.14) on consumer's perceptions of pork's safety, while the other information sources did not lead to any significant changes in this regard. Using general linear model analysis, we detected no significant interaction effects between message type and

information source, possibly because the same message content presented for different information sources resulted that the impact of information sources did not depend on the message types.

#### **4.4 Discussion and conclusions**

This paper has investigated the impact of positive, negative and balanced information on Chinese consumers' attitudes towards, and intentions to eat, pork. Consumers perceived pork as rather nutritious but expensive. They did not have strong opinions about its healthiness or safety. On average, participants ate pork almost every second day but, after exposure to information about the attributes of pork, their intended consumption frequency was significantly lower. This finding suggests that exposure to information about pork triggers a kind of rational or socially desirable response in the sense of intending to reduce pork consumption, which is in line with the observed loss of market share of pork in China relative to other meats. The frequently emerging pork accidents are another possible reason for the declined intention to eat pork after exposure to information because negative news reports can increase consumers' negative feeling and reduce consumption intention (Jung, 2006).

Those exposed to negative information about pork's attributes showed the greatest propensity to reduce their pork consumption. Exposure to positive information resulted in a far lower reduction in the intended pork consumption. Those exposed to balanced information fell somewhere in the middle. The finding that the decline was less noted among those who received positive messages, indicates that the pork industry may well need to add proactive communication strategies to address pork's declining market share in China. In addition, concerning the fact of low consumer confidence in food industry (Liu et al., 2014), positive information only may cause doubts and not result in the desired effect on pork consumption. Balanced message should also be used in the communication between pork industry and Chinese consumers since balanced message with both positive and negative sides is perceived unbiased and objective (De Vocht, 2014). Thus, the usage of balance information can increase consumers' perceived honesty of pork industry and contribute to the re-establishing consumer confidence (Liu et al., 2014). Consumer intentions to reduce pork consumption may be a result of pork being perceived as rather expensive and only neutral in terms of healthiness and safety. A possible explanation is that recent meat safety incidents in China have worsened the image of pork in comparison to other meats (Cheng & Yin, 2012; Liu et al., 2012), resulting in an intention (either true or reported) to reduce pork consumption after being exposed to

information about pork. Restoring pork consumption to its previous level will probably require a communication strategy designed to restore Chinese consumers' confidence in pork safety.

Exposure to negative information about pork's qualities resulted in significant and negative change in consumers' perceptions on all attributes, while exposure to positive information caused significant and positive changes in regard to healthiness and safety. The adverse effect of exposure to negative information on pork's price perception suggests that consumers start doubting the product's value-for-money when negative attributes are stressed during communication. Balanced information resulted in significant and negative changes in consumers' perceptions of pork's nutritional value. Those who were exposed to governmental sources of information had an enhanced perception of the safety of pork.

As expected, exposure to negative information had the most negative effects on consumers' perceptions about pork quality and their future intentions to eat pork. Such exposure was associated with an almost 30% decrease in intended consumption frequency. In real life such negative information mainly comes in the form of news reports about meat safety incidents. The only way to reduce this is to make strenuous efforts to reduce the likelihood of such incidents occurring, which will probably entail stricter food safety regulations and appropriate controls. Positive information about the results of these efforts can be used in the current market environment, with low consumer confidence in pork safety, to promote pork consumption.

The government has a potential role to play in information provision and can make a difference in improving consumer perceptions about the safety of pork. In China, government departments are responsible for releasing information about food safety. The government is perceived as a reliable information source, as knowledgeable, concerned about citizens' health and releasing relatively accurate information about food safety (Liu et al., 2014). Chinese consumers are more interested for example in information about the results of inspections, safety controls and the sanitary conditions in places where pork is sold (Lin et al., 2008). This kind of information, as well as information on the new regulations assuring pork safety, should be released in order to rebuild Chinese consumers' confidence in pork.

Communication strategies about pork need to take consumers' attitudes into account. Our survey results show that consumption intentions are negatively related to changes in



consumer's perceptions about pork's qualities. Our findings also signal that a strong positive attitude prevents dramatic changes in consumption. The finding that consumer perceptions are only moderately positive implies that there is much scope for improving Chinese consumers' perceptions of pork's qualities, through marketing communications that provide information on the benefits of eating pork.

Men reported eating pork more frequently, in line with other studies reporting higher meat consumption among men (e.g., Yen et al., 2008; Verbeke et al., 2011; Papanagiotou et al., 2013). Females are more responsive to exposure to information in terms of perceptions of pork's health and nutrition qualities; they tend more towards healthy food than men (Rappoport et al., 1993; Wardle et al., 2004) and take information about health and nutrition more seriously than men (Ragaert et al., 2004). Our findings indicate that female consumers could be chosen as a primary target group for communication about the healthiness, nutritional value and safety of pork.

For the Chinese pork industry there is a need to develop communication strategies that will increase consumers' perceptions of the safety of pork and their confidence in pork quality, in addition to the numerous challenges facing stakeholders of pig production systems in China related to rural and environmental development as recently flagged by De Barcellos et al. (2013). Such strategies are required to address the decline in pork's market share within China. This decline is largely due to food scares, resulting from news reports about the safety of pork. As such, any communication strategy needs to be backed up by far more robust hygiene and safety controls on the production and processing sites. Food safety incidents in the pork chain cannot be hushed up and have a long term and deleterious effect on pork consumption.

The government can play a key role here. First it is an information source that Chinese consumers trust. Second it is responsible for undertaking pork hygiene inspections and issuing new regulations on pork safety. It could combine these two roles by sending out messages about progressive improvements being made in ensuring higher safety and quality standards along the pork supply chain. For example government has strengthened pork hygiene inspection and increased punishments for illegal pork production after Shuanghui clenbuterol contamination event. This would help assuage the growing doubts that many Chinese consumers have about the standards within the industry. Such communication strategies should primarily focus on female consumers, who are more responsive to exposure to information about health and nutrition.

Finally, it should be noted that this study is subject to some limitations. The urban bias of this study and the use of non-probabilistic sampling procedures mean that it is not possible to generalize the findings to the wider Chinese population. Therefore, the findings of the study need to be interpreted within the specific frame of the sample.

### **The messages presented in this study**

#### **1. Positive message, mentioning only the potential health benefits from pork consumption**

Vitamin B (B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>6</sub>, B<sub>12</sub>) and minerals (phosphorus, calcium, iron) have a beneficial impact on human health. Vitamin B contributes to the normal physiological functioning of the nervous system, maintaining healthy skin, protein metabolism and absorption and the formation of erythrocyte, while a sufficient of intake of phosphorus, calcium and iron contributes to the growth of bone and the synthesis of hemoglobin. Pork is an important natural source of vitamin B and phosphorus, calcium and iron in the human diet. Regular consumption of pork contributes to a sufficient intake of these beneficial nutrients.

#### **2. Negative message, mentioning only potential risks of pork consumption**

Hormones and antibiotics have a negative impact on human health. Hormones can cause precocious puberty in humans and increase the risk of breast, colon, prostate and lung cancers, while antibiotics can lead to drug resistance and a decrease in immune functions. Pork is a major source of hormones and antibiotics in the human diet. Regular consumption of pork contributes to a high intake of these harmful substances.

#### **3. Balanced message, including information about both potential health benefits and risks from pork consumption.**

Vitamin B (B<sub>1</sub>, B<sub>2</sub>, B<sub>3</sub>, B<sub>6</sub>, B<sub>12</sub>) and minerals (phosphorus, calcium, iron) have a beneficial impact on human health. Vitamin B contributes to the normal physiological functioning of the nervous system, maintaining healthy skin, protein metabolism and absorption and the formation of erythrocyte, while a sufficient of intake of phosphorus, calcium and iron contributes to the growth of bone and the synthesis of hemoglobin. Pork is an important natural source of vitamin B and phosphorus, calcium and iron in the human diet.

Pork is also a main source of hormones and antibiotics in the human diet. Hormones and antibiotics have a negative impact on human health. Hormones can cause precocious puberty

in humans and increase the risk of breast, colon, prostate and lung cancers while antibiotics can lead to drug resistance and a decrease in immune functions. Regular consumption of pork contributes to a sufficient intake of these beneficial nutrients, however, regular consumption of pork also contributes to a high intake of these harmful substances.

**Note:** Half of the participants exposed to a balanced message were presented the balanced message with the potential benefits presented before the risks, the other half with the potential risks presented before the benefits. No significant order effects or differences with respect to consumers' perceptions and intention to eat pork were detected.



# Chapter 5

## Chinese consumers' understanding and use of a food nutrition label and their determinants

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This chapter is based on:

Liu, R., Hoefkens C., & Verbeke, W. 2014. Chinese consumers' understanding and use of a food nutrition label and their determinants. *Food Quality and Preference, in press*. DOI:10.1016/j.foodqual.2014.11.007.

### Abstract

This paper investigated Chinese consumers' understanding and use of the Chinese food nutrition label and their determinants. Quantitative data were collected during March 2012 through a self-administrated structured questionnaire conducted in Beijing (n=213) and Baoding city (n=447). Questions assessed Chinese consumers' use and understanding (objective and subjective) of food nutrition labels, nutrition knowledge (objective and subjective), socio-demographic characteristics, diet status, diet-health awareness, body mass index (BMI) and familiarity with food nutrition labels. A moderate degree of subjective understanding and a low degree of objective understanding of food nutrition labels were found among the participants, and 70% of the participants claimed to rarely or never use nutrition labels when shopping for food. Nutrition knowledge (objective and subjective) positively affected participants' understanding (objective and subjective) of food nutrition labels. Familiarity with food nutrition labels had a strong positive effect on understanding of and use of food nutrition labels. Subjective nutrition knowledge and subjective understanding also played a significant and positive role in Chinese consumers' label use. Age yielded a negative effect on both subjective and objective understanding, while education only affected participants' objective understanding. None of the socio-demographic characteristics associated with self-reported use. Implications for future policies to improve Chinese consumers' understanding and promote their use of food nutrition labels are discussed.



## 5.1 Introduction

The improvement of living standards has brought about significant changes in Chinese consumers' dietary behavior, lifestyle as well as their health and disease pattern (Chen & Zhao, 2012). Non-communicable chronic diseases (NCDs) such as obesity, diabetes, cardiovascular diseases, hypertension and stroke have become the major causes of death in China (Chen & Zhao, 2012; NCCD, 2013; Xu et al., 2013; Yang, Yang, Zhu, & Qiu, 2011). Scientific evidence strongly supports the relation between diet and health (Buckland et al., 2013; Yamamoto, 2013). In China the prevalence of NCDs has been associated with high-fat and high-salt diets and other unhealthy dietary choices (e.g., NCCD, 2013; Kang, Guan, Ning, Wu, & Guan, 2012). Notwithstanding this nutrition transition, Chinese consumers have become increasingly aware of the relationship between food and health (Cheng, Cao, & Xu, 2007; Sakamaki, Toyama, Amanoto, Liu, & Shinfuku, 2005; Zhang, 2012) and concerned about diet-related hazards (Liu, Pieniak, & Verbeke, 2013, 2014).

In 2011 the Chinese government has announced the "Healthy China 2020" program. The program's primary goal is to reduce the incidence of NCDs by promoting healthy eating (Hu, Liu, & Willett, 2011). In this regard, nutrition labeling has been considered to be an attractive and potentially effective policy instrument as it provides nutrition information to consumers while maintaining freedom of choice and reducing information search costs (Grunert & Wills, 2007; Capacci et al., 2012). Nutrition information on food labels may help consumers to appraise the nutritional contribution of foods to the overall diet and, as such, to make better informed and more healthful food choices (Campos, Doxey, & Hammond, 2011; Wahlich, Gardner, & McGowan, 2013). To better communicate about food and nutrition to Chinese consumers, China published its first Chinese Food Nutrition Labelling Regulation in 2008 (MOH, 2008). In 2011 China's Ministry of Health released the National Food Safety Standard for Nutrition Labelling of Pre-packaged Foods (GB 28050-2011). This regulation requires that the energy value and the amount of protein, fat, carbohydrate and sodium as well as their percentages in relation to Nutrient Reference Values (NRV) are mandatory items to be labeled on a food nutrition label. The content of trans fatty acids shall be listed on the nutrition label if the ingredients contain hydrogenated fat and/or partial hydrogenated fat, or if these trans fatty acids are used in the production process. From 1<sup>st</sup> of January 2013 this national standard for mandatory nutrition labeling went into force. This changing regulatory environment is expected to have long-term positive effects on Chinese consumers' diets which may eventually reduce the incidence of NCDs.

Based on consumer behavior models, people who understand and use nutrition labels are more likely to make better food choices (Hoefkens, Pieniak, Van Camp, & Verbeke, 2012; Grunert & Wills, 2007). Labels need to be used in order to affect both immediate and future decisions about purchasing the product. These labels can also change the overall pattern of shopping, e.g., by altering the perception of food categories that are subsequently considered more or less healthy than before. Nutrition information on food labels may hence affect consumers' dietary intake. Provided that the Eastern society has a stronger tendency to show socially desirable behavior (Middleton & Jones, 2000), food nutrition labels may potentially be very successful in China not only in terms of use but also with regard to their impact on food choices, dietary intake and health. While there is a growing body of literature on the use and understanding of nutrition labels in Europe and North America (Cowburn & Stockley, 2005; Grunert & Wills, 2007), in China nutrition labels are a new source of nutrition information and relevant research is very scarce. Given that China represents quite a different regulatory, industrial and socio-economical context compared to Europe or North America (Hawkes, 2008), three questions are raised. First, do Chinese consumers understand nutrition information on food nutrition labels? Second, do Chinese consumers (claim to) use nutrition information on food nutrition labels? Third, what factors affect their understanding and use of food nutrition labels?

Understanding and use of nutrition labeling are influenced by numerous factors. The theoretical framework of Grunert and Wills (2007) presents the most prominent factors that have been discussed in the literature and/or are likely to play a role based on consumer behavior and food choice theory. In this framework consumers' use of nutrition labels is influenced by factors associated with their understanding of the nutrition information on food nutrition labels (including subjective and objective understanding), while understanding and use are both affected by socio-demographic characteristics and nutrition knowledge.

Understanding has a central role in the processing of information in general, and nutrition label information in particular (Grunert, Fernández-Celemín, Wills, Storcksdieck genannt Bonsmann, & Nureeva, 2010; Hoefkens, Veetil, Van Huylenbroeck, Van Camp, & Verbeke, 2012). Understanding nutrition information requires a certain level of nutrition knowledge which is often lacking, especially detailed knowledge about daily dietary needs for specific nutrients (van Trijp, 2009). A lack of understanding is an important reason for consumers not to use nutrition labels (Besler, Buyuktuncer, & Uyar, 2012; Chen & Niu, 2009; EUFIC, 2005; Gorton, Mhurchu, Chen, & Dixon, 2009). A distinction is made between subjective (or



perceived) and objective understanding of information on food nutrition labels which may be quite different for one and the same consumer (Grunert & Wills, 2007). Objective understanding is whether a person's interpretation of information is consistent with what is intended by the information sender (Grunert & Wills, 2007). Subjective understanding refers to "feeling states associated with the event, an appraisal of the purpose or intent of the event, and an appreciation of the significance of the event" (Powers, Welsh & Wright, 1994), i.e. the meaning a person attaches to the information and the extent to which a person believes he/she can understand it (Grunert & Wills, 2007). Subjective (or perceived) understanding has been reported to be important in shaping the acceptability of different nutrition label formats (Mejean, Macouillard, Péneau, Hercberg, & Castetbon, 2013).

Both subjective knowledge (i.e. what individuals perceive that they know, also indicated as perceived or self-rated knowledge) and objective knowledge (i.e. what an individual actually knows) have been shown to influence information search and processing, although probably in different ways (Brucks, 1985). A low level of subjective knowledge, resulting from a lack of confidence in current knowledge, may motivate the search for additional information, whilst a high level of subjective knowledge increases reliance on previously stored information (Brucks, 1985; Ruddell, 1979). Objective knowledge facilitates deliberation and the use of newly acquired information (Ruddell, 1979; Selnes & Gronhaug, 1986). Both positive and no effects of objective nutrition knowledge on consumers' use of nutrition labels have been reported in literature (positive effects in e.g., Fitzgerald, Damio, Segura-Pérez, and Pérez-escamilla (2008), Grunert, Wills, and Fernández-Celemín (2010), Grunert, Fernández-Celemín, et al. (2010); no effects in e.g., Drichoutis, Lazaridis, Nayga, Kapsokefalou, and Chryssochoidis (2008), Nayga, Lipinski, and Savur (1998) and Nayga (2000)). Subjective nutrition knowledge has been found to positively affect consumers' use of nutrition labels (Hess, Visschers, & Siegrist, 2011; Petrovici & Ritson, 2006). Raju, Lonial, and Mangold (1995) and Pieniak, Aertsens, and Verbeke (2010) found that subjective knowledge was related to consumer decision making more strongly than objective knowledge. Specifically, consumers' decoding of nutrition messages largely depends on subjective inferences (van Trijp, 2009).

Socio-demographic factors are important because unhealthy eating habits are usually unequally distributed across social subgroups. In addition, accounting for socio-demographic differences helps to investigate whether a lower use of nutrition information on food nutrition labels in a particular social subgroup is due to a lower understanding, lower level of nutrition

knowledge or other factors (Grunert, Fernández-Celemín, et al., 2010). Conflicting effects of age, gender and education on the use of nutrition labels have been described in previous studies (see reviews of Drichoutis, Lazaridis, and Nayga (2006) and Hieke and Taylor (2012)), probably due to the differences in samples, method and study time (Drichoutis, Lazaridis, & Nayga, 2005) or the different sets of variables used in the different studies (Hess et al., 2011). Other factors such as the diet status have been reported to positively influence label use, which is mainly due to the consumers' diet-health awareness (Drichoutis et al., 2005). Obese consumers (Body Mass Index (BMI) $>30$  kg/m<sup>2</sup>) have been found to be more likely to use food nutrition labels than consumers with a normal weight (BMI between 18.5 and 25 kg/m<sup>2</sup>) (Satia, Galanko, & Neuhouser, 2005).

Familiarity with the nutrition label is found to be a key factor in consumer information processing in general, and nutrition label use in particular (Moorman, 1990; EUFIC, 2012). Consumers evaluate themselves more able to process nutrition information if they are familiar with the information (Moorman, 1990). Consumers may search food labels more actively (Grunert & Wills, 2007) or read labels more accurately (Cowburn & Stockley, 2005) if they are familiar with the label. By contrast, consumers' perceived understanding of nutrition labels may decrease if they are not familiar with the information cues on the label and their meaning (Burton, Biswas, & Netemeyer, 1994).

The first objective of this study was to investigate the effects of nutrition knowledge (objective and subjective), socio-demographic characteristics, diet status, diet-health awareness, BMI and familiarity with food nutrition labels on consumers' understanding (objective, subjective) of food nutrition labels in China. The second objective was to gain insights into the determinants (i.e. the same factors used to explain label understanding and understanding (objective, subjective) itself) of Chinese consumers' use of food nutrition labels. Results from this study are valuable to governmental and non-governmental organisations, food manufacturers and retailers to gain insights into the potential effectiveness of nutrition labeling to provide nutrition information and to promote healthier food choices and dietary patterns. Recommendations for how to promote nutrition label use in China will be presented.

## 5.2 Methods

### 5.2.1 Data collection

Quantitative data were collected during March 2012 through a self-administrated structured questionnaire conducted in Beijing and Baoding, a medium-sized city close to Beijing. Baoding is a less developed city compared with Beijing. In order to obtain a more diverse sample not only limited to metropolitan citizens, data collection was extended beyond Beijing alone. Beijing and Baoding city have similar historical, cultural and policy environments. Although Beijing and Baoding city differ in terms of economic development, income, as an important indicator of economic development level, has previously been reported not to influence Chinese consumers' use of food nutrition labels (Chen & Niu, 2009).

Sample selection and contact procedures differed between the two survey cities depending on cost efficiency and time effectiveness. The data collection in Beijing was performed at supermarkets, shopping malls, residence and public gardens in urban areas. Participants were selected in these areas based on convenience sampling with the restriction that they had lived in Beijing for more than 1 year, considering the large floating population in Beijing. A total of 213 participants from Beijing completed the survey. The same questionnaire was delivered to about 700 students of a middle school in Baoding city. A self-selection sampling method was applied. The students were told to ask their parents to complete the questionnaire and return it. A total of 447 participants from Baoding completed the survey. This yields a total valid sample of 660 adult participants. The sample from Beijing included younger (Chi-square test,  $\chi^2=79.718$ ,  $p<0.001$ ) and higher educated (Chi-square test,  $\chi^2=122.463$ ,  $p<0.001$ ) participants and participants with a lower familiarity with nutrition labels (Chi-square test,  $\chi^2=13.547$ ,  $p<0.001$ ), while participants from Baoding city were older, less educated and claimed to be more familiar with nutrition labels. There were no differences between the city samples in terms of gender (Chi-square test,  $\chi^2=1.682$ ,  $p=0.195$ ), diet status (Chi-square test,  $\chi^2=0.857$ ,  $p=0.355$ ) and BMI (Chi-square test,  $\chi^2=5.119$ ,  $p=0.163$ ).

Compared to the census data for China, there was an overrepresentation of the middle-aged population group (40-60 years), as well as female and higher-educated (college and above) participants. The over-representation of female and middle-aged participants is probably due to the self-selection method in Baoding city, i.e. participants were the parents of high schools students. The over-representation of higher educated participants is due to the selection of the survey city Beijing whose population has a higher education compared to the national Chinese population.

### 5.2.2 Questionnaire

The questionnaire included the following measures: use and understanding (objective and subjective) of food nutrition labels, nutrition knowledge (objective and subjective), socio-demographic characteristics, diet status, diet-health awareness, BMI and familiarity with food nutrition labels.

Familiarity relates to the experience a consumer has about an object (Bettman & Park, 1980; Park & Lessig, 1981). Familiarity (unaided) with nutrition labels in this study measured visual familiarity by means of a yes-no question without showing the participants an example of the food nutrition label (Aldridge, Dovey, & Halford, 2009): "Have you ever noticed food nutrition labels before?" Participants' awareness of the relation between diet and health was measured by five items (e.g., "My health is determined by the food I eat") using the 7-point Likert scale described by Ragaert, Verbeke, Devlieghere and Debevere (2004) (Cronbach's alpha = 0.72).

Subjective knowledge is measured by asking participants to rate how much they think they know about an object (Brucks, 1985; Park, Mothersbaugh, & Feick, 1994). Subjective nutrition knowledge in this study was assessed by three items on a 7-point interval scale ranging from 'totally not know' (=1) to 'totally know' (=7) (Cronbach's alpha = 0.82; e.g., "To what extent do you think you know a lot about food and nutrition?"; "To what extent do you think you know how to evaluate the nutritional value of a food?"; "To what extent do you think you know which food has the nutrients your body needs?").

Objective nutrition knowledge was measured by three components. The first two components were based on the study of Grunert, Wills, et al. (2010). The first component assessed participants' knowledge on dietary recommendations and consisted of 12 items measuring awareness of whether health experts recommend one should have more, about the same, less, try to avoid or 'don't understand what it means' for a series of nutrients, energy or ingredients. Seven items measured awareness of whether experts recommend that one should have more, about the same, less, try to avoid or 'don't understand what it means' for different food groups (i.e. referring to the food-based dietary guidelines for China (Ge, Jia, & Liu, 2007)). The second component including 36 items measured participants' knowledge about the sources of nutrients. Ten food products (rice, wheat products, beans, red meat (e.g., beef, pork), skimmed milk, full-fat yoghurt, vegetable, soft drink, chocolate, edible oil) that Chinese consumers are familiar with, were chosen as sources of nutrients. Participants were asked whether these 10 food products were high or low (or 'not sure') in fat, cholesterol and

sugar, each, thus resulting in a total of 30 items. In addition, based on the study of Nayga (2000), participants were asked which of two foods (egg yolks versus egg white, skimmed milk versus whole milk, pig liver versus hair tail) contained more cholesterol, and which of two foods (beans versus wheat, rice versus hair tail, and egg yolks versus egg whites) provided more protein, resulting in another six objective nutrition knowledge items. The third component which was based on the study of Hoefkens (2011) consisted of four items measuring participants' knowledge on salt and energy recommendations. Participants were asked the maximum amount of salt that an adult on average should eat a day and whether they agree or disagree (or are not sure) with three statements about energy requirements (e.g., 'An active man needs the same amount of energy as an active woman'). The selection of three parts of nutrition knowledge was based on the Chinese dietary guidelines and the literature linking diet and diseases in China (e.g., Chen et al., 2008; Yang et al., 2008) and tried to cover as much nutrition knowledge of Chinese consumers as possible. The answer for each item was coded as correct or wrong. For analysis, an overall index of objective nutrition knowledge was calculated as:

$$\text{OBJ\_KNOW} = (\text{number of correct answers on dietary recommendations} / 19) + (\text{number of correct answers on sources of nutrients} / 36) + (\text{number of correct answers on salt and energy requirements} / 4).$$

With regard to subjective understanding of nutrition labels, participants were asked to indicate to what extent they believed to understand the terms fat, saturated fat, sodium, carbohydrate, energy and sugar on nutrition labels, and to what extent they believed to understand the role that different nutrients on labels play in the diet. These questions were adapted from Cowburn and Stockley (2005) and measured on a 7-point interval scale ranging from 'not understand at all' (=1) to 'totally understand' (=7) (Cronbach's alpha = 0.90).

Objective understanding of nutrition labels was measured by three questions about the Nutrition Reference Values (NRV): the meaning of "NRV%" on a nutrition label (Figure 1), the percentage of energy and fat per 100g that the example food contributed to the respective daily recommendation. The overall objective understanding of the nutrition label was calculated as the average number of correct answers to the three questions resulting in four values: 0, 0.33, 0.67 and 1, which were categorized and recoded as 'not understand' (=1), 'understand slightly' (=2), 'understand moderately' (=3) and 'totally understand' (=4). The latter two response categories were further merged for regression analysis.

每1包装(平均43克)含有		营养成分表	
项目	每100克(g)	NRV%	
能量	2301千焦(kJ)	27%	989kJ
蛋白质	6.7克(g)	11%	脂肪
脂肪	34.7克(g)	58%	14.9g
-饱和脂肪	21.8克(g)	109%	12%
碳水化合物	55.7克(g)	19%	25%
钠	83毫克(mg)	4%	% 营养素参考值

**Fig. 5.1 Sample of a food nutrition label in China**

Participants' use of nutrition labels was measured on a 4-point scale (ranging from never to always) by asking: "In general, how often do you look for nutrition information on a food package when you go shopping"<sup>1</sup> with answering possibilities: 'never' (=1), 'rarely/not often' (=2), 'regularly' (=3) and 'always' (=4). This formulation is based on a large-scale cross-European study on the use and understanding of nutrition information on food labels (Grunert, Fernández-Celemín, et al., 2010). The same formulation has been used in other studies as well (e.g., Satia, Galanko and Neuhouser (2005), Kim, Nayga and Capps (2000), Nayga (2000)).

The overall diet status was measured based on whether a participant followed any of the following diets: low-fat, low-sugar, low-salt and low-energy diet. Participants on any of these diets were coded as '1', the others as '0'.

The questionnaire was developed in English and translated into Chinese by a professional English-Chinese translator. The language in the Chinese version of questionnaire was further checked by a Chinese language teacher. Then back-translation was undertaken to ensure linguistic equivalence. The first author of the study, who is a native Chinese speaker, was closely involved in the back-translation process. A preliminary version of the questionnaire was pretested twice in a small sample of 20 Chinese adults for clarity of content, language/wording, overall understanding and length of the survey. Based on their feedback, the questionnaire was refined and finalized.

<sup>1</sup> Translated to Chinese the statement probing for participants' use of nutrition information on food labels reads as follows: "一般来说, 当您购物时您会经常寻找食品包装上的营养信息吗?".

### 5.2.3 Data analysis

Descriptive analysis including the calculation of mean values and standard deviations (SD) was conducted using SPSS 20.0 software (IBM SPSS, Armonk, NY, USA). Cross-tabulation and chi-square analysis were conducted to test differences in demographic characteristics between the two city samples. One-way ANOVA *F*-tests with post hoc Tukey comparison of means were used to test the differences of understanding (subjective and objective) and use of food nutrition label among socio-demographic groups and other factors. Reliability tests with Cronbach's alpha were performed to test construct reliability of consumers' awareness of the relation between diet and health, subjective nutrition knowledge, and subjective understanding of nutrition labels. Cronbach's alpha coefficients above 0.70 were considered to denote acceptable internal consistency reliability (Nunnally, 1978). Correlation analysis was applied to test the relationship between diet-health awareness and subjective nutrition knowledge. Six regression models were estimated with Stata/SE 12.0 software (Statacorp, College Station, TX, USA). Depending on the nature of the dependent variable, a linear regression model or an ordered logistic regression model was applied. Results from ordered logistic regression model are reported as odds ratio (OR) with 95% confidence intervals (95% CI). An OR larger than 1 indicates that higher values on the independent variable make it more likely that participants will be in a higher category of the dependent variable while an OR lower than 1 indicates that a higher value of independent variable increases the likelihood of participants to be in the current or a lower category of the dependent variable. In case the assumption of parallel lines was violated in some independent variables of the ordered logistic regression models, a generalized ordered logit model with partial proportional odds (PPO) was estimated using the STATA `gologit2` command with its `autofit` option (Williams, 2006).

The dependent variables in the first two regression models were subjective understanding and objective understanding of nutrition labels, respectively. The dependent variable in the other four regression models was the use of food nutrition label. The common explanatory variables in the six regression models included socio-demographic characteristics like age, gender, education and other factors: BMI, diet status, consumers' familiarity with nutrition labels, and subjective and objective nutrition knowledge. To investigate city difference on understanding and use of food nutrition labels, city was included as an additional explanatory variable in the six regression models. To investigate the impacts of subjective and/or objective understanding on use of food nutrition labels, subjective and/or objective understanding also served as explanatory variables in the models with use as the dependent variable.

## 5.3 Results

### 5.3.1 Description of nutrition knowledge, understanding and use of food nutrition label

Participants reported on average a moderate degree of both subjective knowledge (SUBJ\_KNOW; Mean=4.15 on 7-point scale) and objective nutrition knowledge (OBJ\_KNOW=1.65 in a range from 0 to 3). Regarding the *knowledge about expert recommendations*, more than half of the participants were familiar with the dietary recommendations for fat, salt, sugar, fiber, while only less than 10% of the participants knew the recommendation for omega-3 fatty acids and polyunsaturated fat. The recommendations for monounsaturated fat, omega-3 fatty acids and trans fat were not known among about 40% of the sample. Most of participants (75%) knew the recommendation of increasing the intake of whole grain. Regarding food-based dietary guidelines, a large majority of participants (88%) knew they should eat more fruits and vegetables. More than half of the participants knew that they should consume more milk and dairy products, maintain the current level of intake of starchy food and try to avoid food and drinks high in fat, sugar and salt. The recommendation of increasing the consumption of food rich in protein was less known; only 38.1% could provide the correct answer to this issue.

The average number of correct answers for *sources of nutrients* was 19.7 out of 36. More than half of the participants got fat and sugar items right, except that only about 30% of them knew that rice and full-fat yoghurt were low in sugar and that cola was low in fat. For cholesterol, a common mistake was that participants estimated that chocolate and edible oils were high in cholesterol. However, more than 60% of the participants answered correctly to the questions about which of two foods has more cholesterol.

Less than half of the participants knew the maximum amount of salt that an adult on average should eat a day. With regard to calories, a large majority of participants were aware of differences in energy requirement between subpopulations.

Participants reported to have a moderate level of subjective understanding (SUBJ\_UND) of the nutrient terms presented on nutrition labels. Very few (about 20%) participants had a good objective understanding of "NRV" on the example nutrition label (Fig. 5.1). About two thirds of the participants reported that they rarely or never used a nutrition label during food shopping, while only 7% indicated to always use nutrition labels. Young participants with a higher education or who were familiar with a food nutrition label reported a significantly higher subjective understanding compared with their counterparts. A higher level of objective



understanding (OBJ\_UND) of a food nutrition label was found among participants who were familiar with food nutrition labels or participants without a special diet status. Females, as well as participants who were familiar with food nutrition labels used food nutrition labels more frequently when they went shopping (Table 5.1).

**Table 5.1 Description of the study sample (n=660); mean (SD), use, objective understanding and subjective understanding of a nutrition label**

Sample characteristics		Frequency %	Use	Objective understanding	Subjective understanding
				Mean (SD)	
City	Beijing	32.3	2.04 <sup>a</sup> (0.65)	0.18 <sup>a</sup> (0.26)	4.38 <sup>a</sup> (1.29)
	Baoding	67.7	2.17 <sup>b</sup> (0.62)	0.24 <sup>b</sup> (0.31)	4.33 <sup>a</sup> (1.26)
Gender	Female	64.8	2.18 <sup>b</sup> (0.65)	0.22 <sup>a</sup> (0.30)	4.36 <sup>a</sup> (1.23)
	Male	35.2	2.04 <sup>a</sup> (0.68)	0.22 <sup>a</sup> (0.28)	4.28 <sup>a</sup> (1.32)
Age	Below 25	15.0	2.14 <sup>a</sup> (0.66)	0.24 <sup>a</sup> (0.27)	4.76 <sup>b</sup> (1.29)
	26-40	31.4	2.04 <sup>a</sup> (0.68)	0.24 <sup>a</sup> (0.31)	4.27 <sup>a</sup> (1.25)
	41+	53.6	2.17 <sup>a</sup> (0.34)	0.20 <sup>a</sup> (0.29)	4.27 <sup>a</sup> (1.25)
Education	Middle school and below	58.1	2.15 <sup>a</sup> (0.63)	0.23 <sup>a</sup> (0.30)	4.19 <sup>a</sup> (1.23)
	College and above	41.9	2.10 <sup>a</sup> (0.69)	0.20 <sup>a</sup> (0.28)	4.53 <sup>b</sup> (1.27)
Diet status	Yes	81.2	2.13 <sup>a</sup> (0.66)	0.21 <sup>a</sup> (0.29)	4.35 <sup>a</sup> (1.26)
	No	18.8	2.06 <sup>a</sup> (0.63)	0.29 <sup>b</sup> (0.31)	4.31 <sup>a</sup> (1.34)
Familiarity	Yes	71.6	2.26 <sup>b</sup> (0.60)	0.24 <sup>b</sup> (0.30)	4.47 <sup>b</sup> (1.24)
	No	28.4	1.79 <sup>a</sup> (0.67)	0.17 <sup>a</sup> (0.29)	4.01 <sup>a</sup> (1.29)
BMI (kg/m <sup>2</sup> )	Underweight (BMI <18.5)*	9.0	2.30 <sup>a</sup> (0.69)	0.20 <sup>a</sup> (0.31)	4.55 <sup>a</sup> (1.27)
	Normal weight (18.5 ≤ BMI <24)	62.1	2.11 <sup>a</sup> (0.63)	0.24 <sup>a</sup> (0.30)	4.37 <sup>a</sup> (1.25)
	Overweight (24 ≤ BMI <28)	22.2	2.08 <sup>a</sup> (0.67)	0.22 <sup>a</sup> (0.30)	4.15 <sup>a</sup> (1.23)
	Obese (BMI ≥28)	6.7	2.07 <sup>a</sup> (0.75)	0.15 <sup>a</sup> (0.22)	4.30 <sup>a</sup> (1.44)

Note: <sup>a,b</sup> subscripts indicate significant differences by one-way ANOVA with post hoc Tukey comparison of means.

\* According to China-defined cut-off points (China Obesity Group, 2002).

### 5.3.2 Regression results

To avoid multicollinearity, consumers' awareness of the relation between diet and health (Cronbach's  $\alpha=0.72$ ; Mean=4.98;  $SD=1.10$ ) was excluded from the regression models because it was moderately correlated with subjective nutrition knowledge (correlation=0.528;  $p$  value <0.001). To reduce the number of empty cells in running the ordered logistic model, two approaches were adopted: keeping less categorical explanatory variables and reducing the number of categories of a variable. Accordingly, first, only five categorical variables, i.e. city, gender, education, diet status and familiarity served as explanatory variables. Second, the categories 'understand moderately' and 'totally understand' of the variable objective understanding were merged. Similarly, the categories 'regularly' and 'always' of the variable nutrition label use were combined. The description of the different dependent and independent variables is presented in Table 5.2.

**Table 5.2 Variable description for regression analyses, frequency and mean (SD)**

	Variable	Description	Frequency	(%)
<b>Dependent variables</b>	Use of nutrition label	Ordinal (1-3)	Never (=1)	16.0
			Rarely (=2)	55.5
			Regularly or always (=3)	28.5
			Not understand (=1)	57.1
	Objective understanding (OBJ_UND)	Ordinal (1-3)	Understand slightly (=2)	23.6
			Moderately or totally understand (=3)	19.2
			<b>Mean</b>	<b>SD</b>
<b>Independent variables</b>	Subjective understanding (SUBJ_UND)	Metric	4.35	1.27
	City	Baoding=0; Beijing=1	0.32	—
	Gender	Female=0; Male=1	0.35	—
	Age	Metric	37.98	10.04
	Education	Middle school & below = 0; College & above= 1	0.42	—
	BMI	Metric	22.75	3.39
	Diet status	Special diet=1; No special diet=0	0.81	—
	Familiarity	Yes=1; No=0	0.72	—
	Subjective nutrition knowledge (SUBJ_KNOW)	Metric	4.15	1.25
	Objective nutrition knowledge (OBJ_KNOW)	Metric	1.65	0.47

Results of the regression models 1 and 2 with subjective and objective understanding as the dependent variables, respectively, are shown in Table 5.3. City did not yield a significant effect on participants' subjective and objective understanding in food nutrition labels. A higher subjective understanding of nutrition labels was found with decreasing age (Model 1). Both subjective and objective nutrition knowledge positively affected participants' subjective understanding. Participants with a higher educational level or a special diet status were more likely to have a lower objective understanding of nutrition labels (Model 2). Younger and more knowledgeable participants were more likely to (objectively) understand the nutrition label while participants with a lower BMI were more likely to totally understand the food nutrition label. The coefficient estimates of familiarity in Model 1 and 2 indicated that the participants were more likely to understand, both subjectively and objectively, nutrition labels if they were more familiar with them.

**Table 5. 3** Determinants of subjective understanding (Model 1: linear regression): coefficient estimates, and objective understanding (Model 2: generalized ordered logit regression): odds ratios, OR (95% CI)

Variables	<sup>a</sup> SUBJ_UND (Model 1)	<sup>b</sup> OBJ_UND (Model 2)
City	-0.041	0.762 (0.512-1.134)
Gender	-0.071	1.216 (0.863-1.713)
Age	-0.017***	<sup>c</sup> 0.977* (0.961-0.994) <sup>d</sup> 0.996 (0.976-1.016)
Education	0.175	0.721* (0.495-1.052)
BMI	-0.012	<sup>c</sup> 0.989 (0.939-1.042) <sup>d</sup> 0.932* (0.872-0.997)
Diet status	0.006	0.643* (0.429-0.962)
Familiarity	0.308**	1.541* (1.047-2.267)
SUBJ_KNOW	0.373***	<sup>c</sup> 1.184* (1.028-1.363) <sup>d</sup> 1.000 (0.840-1.190)
OBJ_KNOW	0.403***	<sup>c</sup> 1.469* (1.006-2.144) <sup>d</sup> 0.910 (0.570-1.453)
Pseudo R <sup>2</sup>		0.039
R <sup>2</sup> adjusted	0.217	

Note: a. *p* values was calculated based on robust standard errors because heteroskedasticity was not satisfied (Breusch-Pagan test:  $\chi^2(1)=19.82$ ;  $p < 0.001$ ).

b. Independent variables age, BMI, subjective nutrition knowledge and objective nutrition knowledge in this model did not fill the parallel assumption. Coefficients from general ordered logit model (gologit2) were reported.

c. Category “not understand” vs. categories “understand slightly” and “moderately & totally understand”.

d. Categories “not understand” and “understand slightly” vs. category “moderately & totally understand”.

\*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

Results of the ordered logistic regression models 3 to 6 with use as the dependent variable are shown in Table 5.4. There was no significant city effect on participants' use of food nutrition labels. Participants with a lower BMI, a higher familiarity with nutrition labels and participants who perceived themselves to be more knowledgeable about nutrition labels were more likely to use nutrition labels when shopping for food. Based on the coefficient estimates, the effect of familiarity on label use appeared to be stronger than that of subjective nutrition knowledge.

Models 4 to 6 in Table 5.4 included subjective understanding and/or objective understanding as explanatory variables. A higher Pseudo  $R^2$  for these models compared to Model 3 indicated that the entry of label understanding, especially subjective understanding resulted in a better model fit. Subjective understanding played a significant and positive role in Chinese consumers' use of nutrition labels, while objective understanding did not. The effect of familiarity with the nutrition label was consistently the strongest among all studied explanatory variables. This significant positive effect remained even when subjective and objective understanding were entered into the models as additional explanatory variables.

Subjective nutrition knowledge was also an important determinant of label use. Its effect remained significant and positive in models 3 and 5 while it became not significant when subjective understanding entered models 4 and 6. The negative effect of BMI on the use of nutrition labels remained significant with subjective understanding as explanatory variable but was not significant when objective understanding entered models 5 and 6. City, gender, age, education, diet status, objective nutrition knowledge and objective understanding did not significantly affect the use of food nutrition labels.

**Table 5. 4 Determinants of use of food nutrition label (ordered logistic regression models): odds ratios, OR (95% CI)**

Variables	Use (Model 3)	Use (Model 4)	Use (Model 5)	Use (Model 6)
City	0.907 (0.615-1.338)	0.917 (0.620-1.356)	0.906 (0.613-1.340)	0.916 (0.619-1.357)
Gender	0.764 (0.542-1.078)	0.785 (0.556-1.110)	0.752 (0.533-1.062)	0.775 (0.548-1.096)
Age	1.003 (0.987-1.020)	1.009 (0.992-1.026)	1.005 (0.988-1.022)	1.010 (0.993-1.027)
Education	0.811 (0.562-1.169)	0.760 (0.525-1.099)	0.827 (0.573-1.195)	0.771 (0.532-1.118)
BMI	0.949* (0.902-0.998)	0.949* (0.902-0.999)	0.949* (0.902-0.998)	0.949* (0.902-0.999)
Diet status	1.294 (0.850-1.971)	1.279 (0.838-1.952)	1.356 (0.887-2.075)	1.328 (0.867-2.036)
Familiarity	3.934*** (2.634-5.878)	3.663*** (2.440-5.498)	3.814*** (2.549-5.707)	3.579*** (2.381-5.379)
SUBJ_KNOW	1.291*** (1.123-1.484)	1.159 (0.998-1.346)	1.277** (1.110-1.469)	1.152 (0.992-1.338)
OBJ_KNOW	1.065 (0.743-1.524)	0.942 (0.654-1.357)	1.038 (0.723-1.490)	0.926 (0.641-1.336)
SUBJ_UND		1.350*** (1.159-1.572)		1.339*** (1.149-1.561)
#OBJ_UND_2			1.375 (0.913-2.071)	1.298 (0.862-1.956)
<sup>s</sup> OBJ_UND_3			1.242 (0.813-1.898)	1.173 (0.765-1.799)
Pseudo R <sup>2</sup>	0.073	0.086	0.075	0.088

Note: \*\*\*  $p < 0.001$ ; \*\*  $p < 0.01$ ; \*  $p < 0.05$

# OBJ\_UND\_2 is 1 if OBJ\_UND is equal to 2 and zero otherwise.

<sup>s</sup> OBJ\_UND\_3 is 1 if OBJ\_UND is equal to 3 and zero otherwise.

## 5.4 Discussion

A moderate degree of subjective understanding and low degree of objective understanding of nutrition labels were found among the participants. Subjective understanding of nutrition labels was affected by age, familiarity with food nutrition labels, subjective and objective nutrition knowledge, while objective understanding was determined by age, education, BMI, diet status, familiarity with food nutrition labels, subjective and objective nutrition knowledge. Nutrition labels are not commonly used yet in China. 70% of the participants reported that they rarely or never used nutrition labels when shopping for food. The empirical findings of this study indicated that familiarity with the nutrition label, subjective nutrition knowledge and subjective understanding were significant and positive determinants of Chinese consumers' nutrition label use.

Age negatively affected the subjective and objective understanding of nutrition labels, indicating that younger consumers have a better understanding of nutrition labels. This result corroborates the study of Moorman (1996) which found that aging worsens consumers' comprehension level although it may increase consumers' perception of their abilities to process nutrition information on food nutrition labels. Although age yielded significant effects on understanding, socio-demographic factors such as age, gender and education as well as the diet status did not yield significant direct effects on participants' use of nutrition labels, which is consistent with previous studies (e.g., Drichoutis et al., 2005; Fitzgerald et al., 2008; Grunert, Fernández-Celemín, et al., 2010).

Both education and diet status were negatively associated with objective understanding of nutrition labels. However, education and diet status did not explain the use of nutrition labels, which is consistent with the study of Nayga (2000). Consumers' understanding of nutrition information depends on motivation (Cowburn & Stockley, 2005; Miller, Gibson, & Applegate, 2010). For education, a possible explanation could be that higher educated individuals are less likely to believe that nutrition labels contribute to healthier food choices (Nayga, 1999). Moreover, education has been shown to negatively influence consumers' motivation to process nutrition information (Moorman, 1990). For diet status, no proper explanation was found for our finding that participants who were not in a special diet status had a higher objective understanding. Future study focusing on the motivation of this subgroup might help to get insight into their objective understanding of nutrition labels.

BMI significantly affected nutrition label use. The negative effect of BMI on label use is not in line with previous research (Drichoutis et al., 2008). A possible reason could be that individuals with higher BMIs are less likely to agree that nutrition information on food labels is useful to them (Nayga, 1999). This result suggests that normal and underweight consumers in China are more likely to use nutrition labels on food.

Familiarity played a predominant role in participants' understanding and use of nutrition labels. Familiarity, as a kind of experience could increase the perceived validity of information (Park et al., 1994). Nutrition labels have only been introduced on a voluntary basis in China in 2008. Most of the Chinese consumers indicate that they have noticed nutrition labels on food packages and that they trust this new kind of information (Ye, Feng, & Wu, 2010; Zhao, Xia, Yu, & Wu, 2009). However, because Chinese consumers are not used to reading nutrition labels (Chen & Niu, 2009), familiarity with nutrition labeling indicates that they are aware of it but probably without knowing much about it (Ye et al.,

2010; Zhang, 2012). Future communication should make more efforts to increase Chinese consumers' familiarity with the nutrition information on labels, e.g., explaining its content, and stressing the advantages and different uses of nutrition labels.

This study's empirical results showed that participants' subjective nutrition knowledge was also an important and positive determinant of label use. However, objective nutrition knowledge did not determine label use, which is consistent with the study of Nayga (2000) suggesting that consumers with more objective nutrition knowledge do not necessarily use nutrition labels. Subjective knowledge relates to motivational factors such as self-confidence (Brucks, 1985). Subjective knowledge differs from objective knowledge when there is a gap in consumers' confidence about their actual knowledge level. Chinese consumers indicate not to have much knowledge about the hazards caused by unhealthy diets (Liu et al., 2014), implying a low confidence in food nutrition issues which may hamper their actual use of nutrition labels. Future educational campaigns might focus more on how to increase Chinese consumers' confidence and motivation to use nutrition labels. Results with respect to the role of objective nutrition knowledge suggest that the Chinese government should put more efforts to recommend consumers to increase the intake of foods rich in protein, polyunsaturated fat and omega-3 fatty acids. In addition, efforts to increase consumers' understanding of NRV and trans fat which are compulsory information items on the food nutrition label, are also needed.

Another cognitive variable, subjective understanding, also yielded a positive effect on the use of nutrition labels. Chinese consumers indicated that they perceive nutrition labels as too difficult to understand (Chen & Niu, 2009; Zhao et al., 2009). Reading nutrition labels appears to be too time consuming or irrelevant (Zhang, 2012). Reducing Chinese consumers' perceived difficulty in their understanding of nutrition labels – and herewith also improving their subjective understanding – is a crucial factor to stimulate nutrition label use in China.

Objective understanding did not yield a significant effect on the use of food nutrition labels. A possible explanation is twofold. First, food nutrition labels have been introduced in China since 2008, though only on a voluntary basis mainly on dairy products and food products from large-scale producers (Jiang, 2012). Although Chinese consumers were exposed to (voluntary) nutrition labels in the period 2008-2013, there was limited communicative support introducing the new label standard, explaining its content and motivating its use in the period preceding the implementation of the national standard for mandatory nutrition labeling in China (January 1st 2013). Another possible reason is that the present study measured

conceptual understanding and not the practical understanding on how to apply the label information for relative judgments of products. Previous research has shown that these two types of understanding may differ significantly as such that consumers often experience more difficulties in understanding the concepts than in making intra-category comparisons between food products (Grunert & Wills, 2007; Grunert, Fernández-Celemín, Wills et al., 2010; Malam et al., 2009). The measurement of practical understanding or a combination of both types of objective understanding beside subjective understanding are recommended for future studies.

The findings of this study are subject to some limitations. First, we focused on samples of self-selected urban consumers, which limits the potential to generalize our findings to the Chinese population at large. Future studies, using a more representative consumer samples and extending to less urbanized areas in China, would provide further insight and contribute to a better understanding of the findings reported here. Second, the present study just like most research in this field depended on self-reported behavior. Although such self-reported and subjective opinions provide valuable insights into consumer behavior, they likely suffer from so-called social desirability bias and hence may deviate from actual behavior (Fisher, 1993). As according to Middleton and Jones (2000), especially people from Eastern cultures are likely to provide more socially desirable responses consistent with the cultural dimensions predominant in their country of origin as compared to people from Western cultures. In this respect, participants' actual use of food nutrition labels may be lower than their reported use. In addition, self-reported measurements are based on participants' interpretation of their past behavior and may be of limited predictive power for their future label use. Therefore, more experimental and observational studies on Chinese consumers' use of food nutrition labels are recommended. Third, objective understanding of a food nutrition label as measured in this study is limited to the understanding of the concept of nutrition reference values. It is recommended to investigate consumers' objective understanding of compulsory nutrient items such as protein, fat, carbohydrate and sodium on a food nutrition label in order to improve educational strategies and programmes to promote Chinese consumers' use of food nutrition label.

Finally, the pseudo- $R^2$ -values in the present study were low, which implies that there is not a lot of variance left to explain and much of the variance that is left is probably due to unobserved causes. This means that other cultural, situational, behavioral, psychological factors (among others) may influence nutrition label use among Chinese consumer, which is



not surprising given the quite different context of China compared to Western countries. Further research, such as qualitative focus group discussions or depth interviews may be necessary to identify other potential determinants of label use among Chinese.

## 5.5 Conclusions

NCDs have become major causes of death in China due to the nutrition transition encouraged by industrial growth, alongside related socioeconomic changes and government policies. Chinese consumers are increasingly aware of the relationship between diet and health. This evolution has urged the Chinese government to bring the mandatory food nutrition labeling policy into force in January 2013. This study investigated the factors affecting Chinese consumers' understanding and use of food nutrition labels. The results suggest that familiarity with food nutrition labels has a strong positive effect on label understanding and use. Nutrition knowledge (subjective and objective) positively affects participants' understanding (subjective and objective) of food nutrition labels. Subjective nutrition knowledge and subjective understanding play a significant and positive role in Chinese consumers' label use. Age yielded a negative effect on both subjective and objective understanding, while education only affected participants' objective understanding. None of the socio-demographic characteristics associated with self-reported use.

Our study has important implications for future educational campaign or policies to promote nutrition label use in China. There is no national or regional educational campaign to promote nutrition labeling in China until now, except for some scattered efforts through programs on television and articles in newspapers or on the internet. These programs and articles are often limited to explaining the meaning of nutrient items on nutrition labels, which might increase consumers' objective knowledge and objective understanding but may not yield the desired effect on nutrition label use unless Chinese consumers would also *feel* or *believe* they are knowledgeable and understanding. Promotion of nutrition labeling among Chinese consumers is recommended to focus more on how to increase consumers' familiarity with the advantages and possible uses of nutrition labels, as well as on reinforcing consumers' subjective beliefs in this respect. The findings suggest that, apart from educating consumers with respect to nutrition labels, additional efforts will be needed to foster also their subjective knowledge and understanding, i.e. apart from making consumers capable of understanding nutrition labels, providing them with the subjective feeling that they can do so indeed equally matters.



# **Chapter 6**

## **General discussion and conclusions**

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Pervious chapters have presented study-specific findings and discussed implications in detail. This final chapter (Chapter 6) provides a general discussion of the main findings and conclusions in the light of the proposed conceptual framework presented in Chapter 1. This chapter includes three sections. The first section recapitulates the research procedure and the research questions outlined in Chapter 1 in response to the research objectives. The second section provides a general discussion and conclusion of the main research findings and their implications. The third section acknowledges the limitations of this doctoral research and the perspectives for further research.

## **6.1 The research objectives revisited and research questions answered**

The overall objective of this dissertation was to investigate consumers' attitudes and behavior towards food safety and nutrition labeling in urban China. This investigation was carried out based on the conceptual framework outlined in Chapter 1 and the literature review about consumers' attitude and behavior towards safe food in China (Chapter 2). Based on the conceptual framework and the review, three specific research objectives and seven research questions were formulated, which are discussed in the following subsections. To explore the three research objectives, a cross-sectional consumer survey was conducted in Beijing and Baoding city in March 2012.

### **6.1.1 Investigate Chinese consumers' risk perceptions of food-related hazards and trust in information sources**

*RQ1. What are the risk perceptions of food-related hazards among Chinese consumers?*

*RQ2. Which information channel is effective to reach Chinese consumers?*

*RQ3. Which information sources are the trustworthy sources and what are the determinants of Chinese consumers' trust in information source?*

*RQ4. What are the different segments of Chinese consumers, based on their personal risk perceptions, their degree of worry and their knowledge about food-related hazards exists and what are the differences in terms of their use of information channels about food-related hazards and their trust in information sources among these segments.*

The results of this study showed a generally high level of worry and a moderate degree of knowledge about food-related hazards among participants. Participants were most worried about counterfeit food and inferior quality food, probably because they have been frequently confronted with such products (Xu et al., 2006). Food containing pesticides or veterinary drug residues and deteriorated food were ranked as third and fourth in terms of the perceived

personal risk. Food containing additives and GM food were perceived as presenting the lowest level of personal risk and cause for worry. Participants evaluated themselves as most knowledgeable about deteriorated food and counterfeit food, and least knowledgeable about GM food and food containing additives.

Participants most frequently used television to get information about food safety. The internet was the second most frequently used channel, followed by conversations with friends and/or colleagues (word of mouth). Radio, magazines, books and brochures were less frequently used as information channels about food safety. Inconsistent with previous studies (Jiang, 2004; Wan, 2008; Zhou, 2005), newspapers were used less frequently, probably due to the growing popularity of online news in China (CAPP, 2012), fast-growing internet use in Beijing and Baoding (CNNIC, 2012) and more young and middle-aged participants in the survey.

Medical doctors and personal experiences were perceived as the most trustworthy sources of information, followed by research institutes, relatives and friends, and consumers' associations. Participants reported a neutral level of trust in government, which is consistent with other studies (Hu et al., 2007; Jiang, 2004; Wan, 2008) while in contrast with studies in western countries where the public often lacks trust in governments (Frewer et al., 1996; Slovic, 1987; De Vocht, 2014). Participants least trusted food producers because the recent food crises in China have dramatically reduced people's confidence in food producers (Cheng et al., 2009; Lu, He & Min, 2010).

Medical doctors and research institutes were perceived as the most knowledgeable sources, followed by consumers' associations and government. The information released by medical doctors and research institutes was perceived as the most accurate (honest, truthful), followed by consumers' associations and government. Consumer themselves were perceived as the most concerned about their own health, followed by medical doctors, relatives and friends and research institutes. Consumers' associations and government were perceived as concerned but gained a relatively low score compared to other sources. Food producers were the least concerned about citizen's health.

In general, information sources, which were perceived to be more knowledgeable, more honest in providing complete information and more concerned about citizens' health, gained more trust from participants. Perceived honesty in providing accurate information was the most important determinant of trust in medical doctors, personal experience, research

institutes, consumers' associations and food producers. Perceived concern about citizens' health had the most impact on consumers' trust in relatives and friends and government.

Three distinct consumer groups were identified on the basis of risk perception of and subjective knowledge about food-related hazards: worried and knowledgeable consumers (60.1%) (segment 1), worried and ignorant consumers (21.7%) (segment 2) and moderately worried consumers (18.2%) (segment 3). The three segments differed in their use of information channels, perception of risk and trust in information sources. Compared with the other two segments, participants with the highest subjective knowledge about food-related hazards in segment 1 used newspaper more frequently and trusted more in their personal experiences, relatives and friends, and government. Participants with the lowest subjective knowledge (segment 2) reported the lowest frequencies using of newspapers, magazines, books and brochures than those with high knowledge in segment 1. Participants in segment 2 as well as those with high perceived personal risk in segment 1 perceived medical doctors, research institutes, consumers' associations and government more knowledgeable than participants with a moderate perception of risk in segment 3. Participants with moderate perceived personal risk and moderate degree of subjective knowledge (segment 3) trusted all information sources but with relatively low scores to these information sources compared with the other two segments.

### **6.1.2 Assess the impact of information about benefit and risk of pork consumption on Chinese consumers' attitude and intention to eat pork**

*RQ5. How the positive, negative and balanced information affects Chinese consumers' attitudes and intentions towards eating pork and how information from different information sources affects consumers' attitudes and intentions?*

Participants ate pork almost every second day. They perceived pork as rather nutritious, relatively expensive and neutrally healthy and safe. Exposure to negative information about pork's qualities resulted in a negative change in consumers' perceptions of all attributes, while exposure to positive information caused significant and positive changes in regard to healthiness and safety. Balanced information resulted in significant and negative changes in consumers' perceptions of pork's nutritional value. After exposure to information about the attributes of pork, their intended consumption frequency was significantly lower. Exposure to negative information about pork's attributes caused the greatest reduction in participants' pork consumption. Although exposure to balanced risk/benefit information did not yield a

significant effect on intended pork consumption, exposure to positive information resulted in a far lower reduction in the intended pork consumption. Consumers' intentions to eat pork were found negatively related to the changes in their perceptions about pork's qualities. Messages originating from government were perceived as the most credible. Use of government material as the information source yielded a small but significant and positive effect on consumer's perception of pork's safety.

### **6.1.3 Evaluate Chinese consumers' understanding and use of a food nutrition label and their determinants**

*RQ6: Do Chinese consumers understand the nutrition information on food nutrition labels and what factors affect their understanding?*

*RQ7: Do Chinese consumers (claim to) use nutrition information on food nutrition labels and what factors affect their use?*

Participants reported a moderate degree of subjective understanding and low degree of objective understanding of nutrition labels. Subjective understanding of nutrition labels was affected by age, familiarity with food nutrition labels, subjective and objective nutrition knowledge, while objective understanding was determined by age, education, BMI, diet status, familiarity with food nutrition labels, subjective and objective nutrition knowledge. Nutrition labels are not commonly used yet in China. 70% of the participants reported that they rarely or never used nutrition labels when shopping for food. Familiarity with the nutrition label, subjective nutrition knowledge and subjective understanding were significant and positive determinants of Chinese consumers' nutrition label use. None of the socio-demographic characteristics associated with self-reported use.

Familiarity played a predominant role in participants' understanding and use of nutrition labels. Familiarity, as a kind of experience could increase the perceived validity of information (Park et al., 1994). However, participants' familiarity with nutrition labeling indicated that they were aware of it, but probably without knowing much about it because Chinese consumers are not used to reading nutrition labels (Chen & Niu, 2009). Participants' subjective nutrition knowledge also positively affected Chinese consumers' label use. Subjective knowledge relates to motivational factors such as self-confidence (Brucks, 1985). More efforts in the future educational campaigns should be put on how to increase Chinese consumers' confidence and motivation to use nutrition labels. Subjective understanding also yielded a positive effect on the use of nutrition labels. Reducing the consumers' perceived difficulty in their understanding of nutrition labels is important to promote the nutrition label



use in China. Objective understanding did not yield a significant effect on the use of food nutrition labels. One possible reason is that food nutrition labels have been introduced in China in 2008 on a voluntary basis mainly on food products from large-scale producers. There were limited communications to the public about introducing the new label standard and explaining its content during 2008 to 2013. Another possible reason is that this study measured conceptual understanding but not practical understanding. Consumers experience more difficulties in understanding the concepts than in making intra-category comparisons between food products (Grunert, Fernández-Celemin, Wills et al., 2010). The measurement of practical understanding or a combination of both objective and subjective understanding is recommended for future studies.

## **6.2 General discussion, conclusions and implications**

Results from this doctoral study are valuable to governmental and non-governmental organisations, food manufacturers and retailers to gain insights into consumers' attitude and behavior towards food safety and nutrition labeling in China to make effective risk communication strategies.

Government plays an important role in communicating food safety with consumers in China. Communicating risks has become a core ingredient in the regulatory functions of Chinese government. According to the Food Safety Law (CNPCSC, 2009) government departments are responsible for releasing information about food safety. However, as information provider, the national government gained a moderate degree of trust. Our results suggest that government departments should work more closely with medical doctors and research institutes who gained high trust from Chinese consumers, in order to increase the credibility of information and satisfy consumer demand for authoritative expert information (Kong, 2010). Public trust in government can be improved by strengthening people's confidence in its knowledge, honesty and concern. Government should put more effort to increase its perceived concern about citizens' health in order to gain more trust.

Negative information has negative effects on consumers' perception of food attributes and consumption intention. Negative information mainly comes from news reports about food safety accidents. The only way to reduce this is to make strenuous efforts to reduce the likelihood of food accidents occurring by entailing stricter food safety regulations and appropriate controls. Positive information about the results of efforts can be used in the current market environment, with low consumer confidence in food safety, to promote food

consumption. Reassuring information should be added into the future news report of food accidents because a risk message containing reassuring information has been found not to increase public anxiety and negative feeling because they are better informed and reassured (De Vocht, 2014). For the food industry, providing balanced information helps to re-establish consumers' confidence since balanced information is unbiased and objective and can increase the consumers' perceived honesty of the food industry. Except for information provider, government is also responsible for undertaking food safety inspections and issuing new regulations on food safety. It could combine these two roles by sending out messages about progressive improvements being made in ensuring higher safety and quality standards along the food supply chain. This would help assuage the growing doubts that many Chinese consumers have about the standards within food industry. It should be noted that risk communication itself can not rebuild Chinese consumers' confidence as long as food safety problems exist. The only effective way to restore consumers' confidence in food safety is to solve the existing and potential problems regarding to food safety e.g., by strengthening government supervision.

Food labeling is a kind of attribute information about e.g., production methods and country of origin. A quality label can assist the imperfectly informed consumers in their decision-making process because it structures their information environment (Fotopoulos & Krystallis, 2003). Food labeling in western countries is a commercial activity driven by consumer demand. Consumers in Europe have increased their knowledge about the relationship between diet and health and awareness of quality characteristics, and have more access to information about new production and process technologies. These changes have resulted in an increasing demand for improved-quality foods and information about the improved quality. Food producers and retailers respond to these changes by modifying their food products and providing quality information by attaching food labels on package in order to gain a market competitive edge (Caswell & Moiduszka, 1996; Fotopoulos & Krystallis, 2003). Government acts as the role of introducing regulations concerning the standardization, certification and labeling of food, and using informational labeling to shape consumers' knowledge and purchasing pattern (Caswell & Moiduszka, 1996; Giannakas, 2002). In contrast, food labeling in China is a more government-led activity in order to provide improved-quality food to relieve the increasing worry about food safety (Zhu, 2014). For example, government made the policy of "developing hazard free agricultural products, green food and organic agricultural products" in China's No.1 Central Document every year from

2004 to 2010, indicating its intention and determination to develop the three kinds of certificated and labeled food. However, Chinese consumers are not used to identifying food quality by labels, and their capacity to pay for the extra label information is low, which has resulted in the fact that the labeled foods in China are not so popular as government's expectation and the failure of the pork traceability system (Zhu, 2014). The role of government in the future promotion of food labeling in China should change to strengthen consumer demand by increasing consumers' awareness of the links between diet and food, their capacity to identify food quality by food labels and importantly, their trust in and purchasing capacity for the labeled food.

Food producers are also important communicators in food risk communication. Participants showed the least trust in food producers. Food producers in China are largely small workshops and usually out of government regulation of food hygiene and food safety (Grunert, Perrea & Zhou et al., 2011). The recent food crises in China have reduced consumers' confidence in food producers (Cheng et al., 2009; Lu, He & Min, 2010). Food producers need to increase their perceived trustworthiness, particularly by providing more accurate information and increased transparency. Public food production and processing is one effective way to increase information transparency and rebuild consumers' confidence in food producers.

Internet was the second most frequently used channel for participants to obtain information about food safety. Internet users in China have grown to 618 million and 45.8% of population has internet access by the end of 2013 (CNNIC, 2014). With the fast-growing internet use (CNNIC, 2014) and the growing popularity of online news in China (CAPP, 2012), the Internet, with the advantages of openness, accessibility and transparency will become an important channel for Chinese consumers to get information, implying the use of internet as an effective tool in the future food risk communication. According to OGI regulations (The Regulations of the People's Republic of China on Open Government Information) conducted in 2007, Chinese governments, from central to local level, have established their official websites to publish government information. However, there is a notable lack of comprehensive, accurate and up-to-date information about food quality and safety available on the official websites of governmental departments (Kong, 2010) and it is generally not easy to obtain information about food safety. It is suggested that government should improve its information service by increasing information publication and update on internet.

Chinese consumers' understanding of food nutrition labels is affected by objective nutrition knowledge. So the current education campaign which usually focuses on explaining the meaning of nutrient items on nutrition labels can continue since it might increase consumers' objective nutrition knowledge. Familiarity with food nutrition labels, subjective knowledge and subjective understanding play an important role in Chinese consumers' understanding and use of food nutrition labels. Future education campaign should put more efforts to increase consumers' familiarity with the advantages and possible uses of nutrition labels and reinforce consumers' subjective beliefs in this respect. That is, apart from educating consumers with respect to nutrition labels, future focus should be put on increasing their subjective knowledge and understanding, i.e. providing them with subjective feeling that they can do so is equally important.

### **6.3 Limitations and future research**

The results of this doctoral thesis contribute to risk communication about food safety and nutrition labeling with Chinese consumers through a better understanding of their attitude and behavior. Nevertheless, there are limitations associated with this research which need to be acknowledged and which also open up opportunities for further research.

First, this doctoral study focused mostly on samples of cross-sectional and self-selected urban consumers for the sake of convenience. The non-random sampling method limits the potential to generalize the findings to the Chinese population at large. As such, the study findings should be interpreted within the specific frame of the sample. Future studies, using a more representative consumer sample are recommended to achieve a better understanding of the findings reported here.

Second, there is a lack of discussion on the methodology used in the literature review of Chinese consumers' attitude and behavior towards safe food in Chapter 2. One major limitation regarding to the methodology in current research about Chinese consumer behavior towards food consumption (including this doctoral study) is the adoption of survey questionnaire and self-reported measures. Although self-reported questionnaires are in the "methods of choice" in the field of organizational behavior for its popularity of cheapness and being easy to get, self-reported behavior may be subject to tendencies of socially desirable answering patterns or general beliefs (Moorman & Podsakoff, 1992). Eastern individuals are likely to exhibit more a socially desirable response set consistent with the cultural dimensions predominant in their country of origin than Western individuals (Middleton & Jones, 2000). In this respect, participants' actual knowledge about food-related hazards or participants'

actual uses of food nutrition labels during their purchasing food may be much lower than their reported ones. Thus, more objective method, observational study is recommended to be preferentially used in the future studies since observational data provides the most reliable information indicating consumers' actual behavior towards food safety (Redmond & Griffith, 2003).

Third, risk perception was treated as a unidimensional factor in Chapter 3. Psychometric paradigm approach results in two main cognitive factors dominating individuals' perception of risk: the dread risk factor (e.g., perceived lack of control, feelings of dread, perceived catastrophic potential and severity of the consequences involuntariness, etc.) and the unknown risk factor (e.g., knowledge about the risk, familiarity, unknown or unobservable hazard) (Slovic, 1987). Dread risk refers to the catastrophic level of a hazard, while unknown risk describes the level of perceived controllability of a hazard. The relationship between these two factors decides to what extent one person exaggerates or minimizes his/her judgments of risk. Dread and unknown risks have been successful in predicting the distortion of risk across a variety of hazards and have a direct application to the development of government-supported risk prevention (Slovic, 1987). Future segmentation studies based on the different types of perceived food risk will be useful in risk management and making tailored communication strategies. For example, for a specific food hazard, consumers who put a higher score on dread risk will perceive it highly risky, and they will hope more regulations to reduce this risk. If consumers put higher scores on unknown risk, they will perceive themselves less knowledgeable about this hazard and need more education campaigns to increase their knowledge.

Fourth, pseudo- $R^2$ -values in Chapter 5 were low, implying that there may be other potential variables driving Chinese consumers' understanding and use of food nutrition labels. Given China presenting a quite different context compared to Western countries, other cultural, situational and psychological factors which may influence nutrition label understanding and use among Chinese consumers should be adopted in future studies. To identify the other potential determinants, a qualitative study such as focus group or depth interviews is recommended.

Fifth, cultural perspective is not only recommended in studies about nutrition label use in China, but needs to be considered in the future work about food risk communication in general. Individual's perception and evaluation of risks are shaped by certain social or cultural

contexts (Stern, Dietz, & Guagnano, 1995). Cultural factors that could hamper risk communication need to be addressed as part of the process of designing messages for target audiences (FAO, 1999). Chinese culture, compared with others, is high in collectivism, hierarchy and uncertainty avoidance, but low in individualism and masculinity (Yang, Kahlor & Li, 2013; Jahandideh et al., 2014). Chinese consumers under this culture believe that decisions about risk should be left to authorities and experts, which may partly explain why participants hold more trust in medical doctors, scientists and government compared to those in western countries. Compared with psychometric approach, cultural approach treats risk perception as a process of implementation of norms, values and cultural practices within a group of people, and can explain the different level of risk perception among the social and ethical group (Rippl, 2002). Cultural approach in future food risk research in China will be valuable in getting better insight into Chinese consumers' risk perception and its difference from those of western consumers. Cross-cultural analysis has been applied to compare the differences of risk perception between Chinese and the people in other countries (e.g., Yang, Kahlor & Li, 2013; Zhai & Suzuki, 2009; Jacobs & Worthley, 1999) and found that Chinese are high in risk tolerance. To what extent Chinese consumers tolerate food risk since food plays an important role in their daily life? How the food risk tolerance affects their behavior towards food consumption?

Sixth, new internet technology puts up new topics for future research on food risk communication in China. Mobile Internet users in China have grown to 500 million, accounting for 81% of internet users by the end of 2013 (CNNIC, 2014). The mobile media devices, with the advantages of easy use and easy carry are providing a completely new way to interact with information (Zhong, 2013). These devices facilitate online connectivity and allow users to access information wherever and whenever they want. Will this change in location and environment alter the way that Chinese consumers seek and respond to information about food risks and benefits? Except for having the world's biggest Internet user base, China has the worlds' most active environment for social media (Chiu, 2012). More than 300 million people use social media from microblog (Weibo), Tencent QQ to other online communities. Social media can facilitate the immediate transmission of important information to as many people as possible. It can also increase public involvement and interaction, provide an opportunity to gauge how consumers perceive food issue and how perceptions may influence their search and understanding of information, and allow consumers to take a leading role as a communicator and a source of information (Rutsaert et

al., 2012). Mou (2014) reported that the public in China tends to use microblogging to express opinions on food safety accidents, regulation and /or policy, rather than simply disseminating information. It will be interesting to investigate the role of social media in risk communication in China with regard to, for example, the reliability of information on social media and the amplification of public risk perception.

Seventh, the study of Chinese consumers' understanding and use of a food nutrition label is exploratory in nature. The adoption of an exploratory approach for this particular study is justified by the non-randomly selected samples and the fact that in China nutrition labels are a new source of nutrition information and that relevant research is very scarce. In addition, only the informed use of nutrition labels does not necessarily lead to healthier choices. Food choice is influenced by many factors. Even if consumers are able to use nutrition information on food package to identify which products are healthier, they may not necessarily use this information to choose the food they prefer. Other factors such as motivation are a major factor affecting the impact of nutrition labels on consumers' food choice. It is not clear yet whether Chinese consumers' use of food nutrition labels leads to healthier food choices and to what extent because food nutrition labels come into Chinese consumers' daily life only in recent years and relevant research is scarce. Nutrition labeling in China is at a relatively early stage of development. Our study is in the first step to investigate whether Chinese consumers understand and use food nutrition labels. The impact of Chinese consumers' use of food nutrition labels on their food choices, furthermore, whether this impact is sustained and whether Chinese consumers will have healthier diets as a result is recommended to be investigated in the future studies.





# Appendix

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## Appendix I: Complete scales and scale items used in Chapter 5

Constructs and items	Scales	References
<b>Diet-Health awareness</b>	7-point Likert scale	Ragaert et al. (2004)
-I feel to eat healthier now as compared to three years ago.	1=Totally disagree	
-I feel to have control over my own health.	4=Neither agree, nor disagree	
-Food plays an important role in keeping me in good health.	7=Totally agree	
-I know which food is healthy for me.		
-My health is determined by the food I eat.		
<b>Familiarity with nutrition labels</b>		
-Have you ever noticed food nutrition labels before?	Yes/No	Aldridge, Dovey and Halford (2009)
<b>Subjective nutrition knowledge</b>	7-point interval scale	Hoefkens (2011)
-To what extent do you think you know a lot about food and nutrition?	1=totally not know	
-To what extent do you think you know how to evaluate the nutritional value of a food?	7=totally know	
-To what extent do you think you know which food has the nutrients your body needs?		
<b>Objective nutrition knowledge</b>		
<i>Health expert generally recommends that we should try to eat more/ eat about the same/eat less/ or try to avoid/ don't understand what it means</i>	True/ false	Grunert, Fernández-Celemín, et al. (2010)
- Fat		
- Polyunsaturated fat		
- Calories		
- Sodium		
- Saturated fat		
- Whole grains		
- Salt		
-Trans fat		
-Sugar		
-Omega-3 fatty acids		
-Fiber		
-Monounsaturated fat		

**Appendix I: Continued**

Constructs and items	Scales	References
<p><i>Health expert generally recommends that we should try to eat more/ eat about the same/ eat less/ or try to avoid/ don't understand what it means</i></p> <ul style="list-style-type: none"> <li>-Fruits and vegetables</li> <li>-Starchy foods (bread, rice, pasta, potatoes)</li> <li>-Protein sources (meat, fish, eggs, beans)</li> <li>-Milk and dairy products</li> <li>-Foods and drinks that are high in fat</li> <li>-Foods and drinks that are high in sugar</li> <li>-Foods and drinks that are high in salt</li> </ul>	True/ false	Grunert, Fernández-Celemín, et al. (2010)
<p><i>For each food type listed below, please indicate whether you think it is high or low in Fat/ Cholesterol/ Sugar/ don't understand what it means</i></p> <ul style="list-style-type: none"> <li>- Rice</li> <li>- Wheat products</li> <li>- Beans</li> <li>- Red meat (beef, pork, etc.)</li> <li>- Skimmed milk</li> <li>- Full-fat yoghurt</li> <li>- Vegetable</li> <li>- Soft drink (e.g. cola)</li> <li>- Chocolate</li> <li>- Edible oil</li> </ul>	True/ false	Grunert, Fernández-Celemín, et al. (2010)
<p><i>Which food in the each of the group has more cholesterol or not sure?</i></p> <p>Egg yolks vs. Egg whites</p> <p>Skim milk vs. Whole milk</p> <p>Pig liver vs. Hairtail</p>	True/ false	Nayga (2000)
<p><i>Which food in the each of the group has more protein or not sure?</i></p> <p>Beans vs. Wheat</p> <p>Rice vs. Hairtail</p> <p>Egg yolks vs. Egg whites</p>	True/ false	Nayga (2000)

**Appendix I: Continued**

Constructs and items	Scales	References
<p><i>What do you think is the maximum amount of salt that an average adult should eat a day?</i> 0g, 1-3g, 4-6g, 7-9g, 10-12g, not sure</p>	True/ false	Hoefkens (2011)
<p><i>Do you think the following statements are true, false or not sure?</i></p> <ul style="list-style-type: none"> <li>- An active man needs the same amount of calories as an active woman.</li> <li>- A 70 year old man calories need the same amount of calories as a 40 year old man.</li> <li>- Children calorie needs are higher than those of an adult man.</li> </ul>	True / False	Hoefkens (2011)
<p><b>Subjective understanding in food nutrition labels</b></p>	7-point interval scale	Cowburn and Stockley (2005)
<p><i>To what extent do you believe you can understand the following terms on a food nutrition label?</i></p> <ul style="list-style-type: none"> <li>- Fat</li> <li>- Saturated fat</li> <li>- Sodium</li> <li>- Carbohydrate</li> <li>- Energy</li> <li>- Sugar</li> <li>- To what extent do you believe you can understand the role that different nutrients on labels play in your diet</li> </ul>	<p>1=Totally not understand</p> <p>7=Totally understand</p>	
<p><b>Objective understanding in food nutrition labels</b></p>	True/ false	MOH (2012)
<p><i>What is the meaning of “NRV%” in the sample of a food nutrition label:</i></p> <ul style="list-style-type: none"> <li>- In every 100g food, the percentage of some nutrient in the essential daily nutrient intake</li> <li>- the percentage of some nutrient in every 100g food</li> <li>- a criteria used to compare nutritional value of food</li> <li>- I don’t know</li> </ul>		

**Appendix I: Continued**

Constructs and items	Scales	References
<i>What percentage of recommended energy per day you can get from per 100g of this food?</i> 27%; 30%; 12%; 58%; I don't know	True/ false	
<i>What percentage of recommended fat per day you can get from per 100g of this food?</i> 27%; 30%; 12%; 58%; I don't know	True/ false	
<b>Use of food nutrition labels</b>	4-point interval scale	Grunert, Fernández-Celemín, et al. (2010)
<i>In general, how often do you look for nutritional information on a food package when you go shopping?</i>	1= Never 2= Rarely/not often 3= Regularly 4= Always	

# Summary

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The overall objective of this research is to investigate consumers' attitude and behavior towards food safety and nutrition labeling in urban China. Specifically, it focuses on: (1) Chinese consumers' risk perceptions of food-related hazards and trust in information sources; (2) the impacts of information about the benefits and risks of pork consumption on Chinese consumers' perceptions towards, and intention to eat pork; and (3) Chinese consumers' understanding and use of a food nutrition label and their determinants. This doctoral thesis is based on the conceptual framework of the hierarchy of effects proposed by Lavidge and Steiner (1961) which indicates the different mental stages that consumers go through when making buying decisions and responding to market messages. To put up the specific research objectives, a comprehensive review of Chinese consumers' decision-making processes in relation to safe food was first conducted. Primary data used in this thesis were collected through a cross-sectional consumer survey conducted in Beijing and Baoding city during March 2012.

From the applied research, the following major conclusions are drawn:

- There was a generally high level of worry and a moderate degree of knowledge about food-related hazards among Chinese consumers. The two hazards that participants were most worried about were counterfeit food and inferior quality food. Food containing pesticides or veterinary drug residues and deteriorated food were ranked as third and fourth in terms of the perceived personal risk. Participants showed some worry about food risks from GM food, although less than for other issues, reflecting Chinese consumers' relatively low awareness and knowledge about GM food. In general, participants reported a neutral degree of subjective knowledge about all food-related hazards.
- Television was the most widely used information channel, used almost every day by most participants. The internet was the second most frequently used channel for information about food safety, followed by conversations with friends and/or colleagues (word of mouth). Radio, magazines, books and brochures were less frequently used as information channels about food-related hazards.
- Medical doctors were perceived as the most trustworthy source of information. It was perceived as the most knowledgeable, releasing the most accurate information about food safety and concerned about citizen's health. The national government gained a moderate degree of trust. It was seen as knowledgeable, concerned about citizens' health and releasing relatively accurate information about food safety. The least trusted information source was food producers. They were perceived as the least concerned about citizen's health, the least knowledgeable about food safety and releasing the least accurate

information.

- Perceived knowledgeable, honest in providing complete information and concerned about citizens' health had positive effects on consumers' trust in information sources. Perceived honesty in providing accurate information was the most important determinant of trust in medical doctors, personal experience, research institutes, consumers' associations and food producers. Perceived concern about citizens' health had the most impact on consumers' trust in government and relatives and friends.
- Three distinct consumer groups were identified on the basis of their risk perceptions of and subjective knowledge about food-related hazards: consumers with high risk perception and high knowledge (60.1%), consumers with high risk perception and lowest knowledge (21.7%) and consumers with moderate risk perception and moderate knowledge (18.2%). These three segments differed in their use of information channels and trust in information sources.
- Participants ate pork almost every second day. They perceived pork as rather nutritious, relatively expensive and neutrally healthy and safe. After exposure to information about the attributes of pork, their intended consumption frequency was significantly lower. Risk-only message led to worse perceptions of pork attributes and lower intentions to eat pork. Benefit-only message led to better perceived healthiness and safety of pork and yielded a protective effect on the intention to reduce pork intake. Balanced message resulted in a lower perceived nutrition value of pork and had no effect on intended pork consumption. Messages originating from government were perceived as the most credible. Governmental material had a positive effect on consumers' perception of pork's safety.
- A moderate degree of subjective understanding and a low degree of objective understanding of food nutrition labels were found. Nutrition labels are not commonly used in China. 70% of the participants reported that they rarely or never used nutrition labels when shopping. Nutrition knowledge (objective and subjective) positively affected participants' understanding (objective and subjective) of food nutrition labels. Familiarity with food nutrition labels had a strong positive effect on understanding of and use of food nutrition labels. Subjective nutrition knowledge and subjective understanding also played a significant and positive role in Chinese consumers' label use. Age yielded a negative effect on both subjective and objective understanding, while education only affected participants' objective understanding.

# Samenvatting

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De algemene doelstelling van deze studie is het onderzoeken van de houding en het gedrag van consumenten ten aanzien van voedselveiligheid en nutritionele labeling in stedelijke China. Specifiek richt dit onderzoek zich op: (1) risicoperceptie van voedselgerelateerde gevaren en vertrouwen in informatiebronnen bij Chinese consumenten; (2) het effect van informatie over de voordelen en risico's van varkensvleesconsumptie op de perceptie en intentie om varkensvlees te eten bij Chinese consumenten; en (3) het inzicht in en gebruik van een nutritioneel voedingslabel bij Chinese consumenten en hun determinanten.

Dit proefvoorschrift is gebaseerd op een conceptueel kader bestaande uit de hiërarchie van effecten die de verschillende mentale stadia aanduiden die de consumenten doorlopen bij het maken van aankoopbeslissingen en bij het reageren op berichten in de markt. Om specifieke doelstellingen op te stellen, werd een uitgebreide review op de besluitvormingsprocessen van Chinese consumenten met betrekking tot veilig voedsel voor het eerst uitgevoerd. Primaire gegevens voor dit proefschrift werden verzameld door middel van een cross-sectioneel consumentenonderzoek uitgevoerd in Beijing en Baoding tijdens maart 2012.

Uit dit toegepast onderzoek, zijn de volgende belangrijke conclusies getrokken:

- Er was een algemeen hoog niveau van bezorgdheid en een matige graad van kennis over voedselgerelateerde risico's onder Chinese consumenten. Deelnemers waren het meest bezorgd over nagemaakte voedingsmiddelen en voedsel van inferieure kwaliteit. Levensmiddelen die pesticiden of residuen van diergeneesmiddelen bevatten alsook bederfd voedsel werden gerangschikt als derde en vierde in termen van de gepercipieerde persoonlijk risico. Deelnemers toonden bezorgdheid over voedingsrisico's van genetisch gemodificeerd voedsel, hoewel minder dan voor andere zaken, als gevolg van het relatief laag bewustzijn en kennis over genetisch gemodificeerd voedsel bij Chinese consumenten. In het algemeen rapporteerden de deelnemers een neutrale mate van subjectieve kennis over alle voedsel-gerelateerde gevaren.
- Televisie was de meest gebruikte informatiekanaal, bijna elke dag gebruikt door de meeste deelnemers. Het internet was de tweede meest gebruikte kanaal voor informatie over de voedselveiligheid, gevolgd door gesprekken met vrienden en / of collega's (van mond tot mond). Radio, tijdschriften, boeken en brochures werden minder vaak gebruikt als informatiekanaal over voedselgerelateerde risico's.
- Medische artsen werden gezien als de meest betrouwbare informatiebron. Deze bron werd gepercipieerd als het meest deskundige, met de meest accurate informatie over

voedselveiligheid en bezorgd over de gezondheid van de burger. De nationale overheid kreeg een matige graad van vertrouwen. De overheid werd gezien als deskundige bron, bezorgd over de gezondheid van de burgers en die relatief accurate informatie over de voedselveiligheid vrijgeeft. De minst betrouwbare informatiebron was voedselproducenten. Ze werden gezien als het minst bezorgd over de gezondheid van de burger, het minst goed geïnformeerd over de voedselveiligheid en het vrijgeven van de minst accurate informatie.

- Gepercipieerde deskundigheid, eerlijk zijn in het verstrekken van volledige informatie en de bezorgdheid over de burgers hun gezondheid had een positief effect op de consument zijn vertrouwen in de informatiebronnen. Gepercipieerde eerlijkheid in het verstrekken van accurate informatie was de belangrijkste determinant voor het vertrouwen in artsen, persoonlijke ervaring, onderzoekinstellingen, consumentenorganisaties en voedselproducenten. Gepercipieerde bezorgdheid over de burgers hun gezondheid had de grootste impact op de consument zijn vertrouwen in de overheid en familieleden en vrienden.
- Drie verschillende consumentengroepen werden geïdentificeerd op basis van hun risicoperceptie en hun subjectieve kennis over voedsel-gerelateerde risico's: consumenten met een hoge risicoperceptie en hoge kennis (60.1%), consumenten met een hoge risico perceptie en de laagste kennis (21.7%) en consumenten met een lage risicoperceptie en lage kennis (18.2%). Deze drie segmenten waren verschillend in hun gebruik van informatiekanaalen en het vertrouwen in informatiebronnen.
- De deelnemers aten bijna om de twee dagen varkensvlees. Ze ervaren varkensvlees als eerder voedzaam, relatief duur en ervaren gezondheid en veiligheid eerder als neutraal. Na blootstelling aan informatie over de kenmerken van varkensvlees, was de intentionele consumptie significant lager. Indien de boodschap enkel risico informatie bevatte, leidde dit tot een negatievere perceptie van de kenmerken van varkensvlees en een lagere intentie om varkensvlees te consumeren. Een boodschap met enkel voordeel informatie leidde tot een positievere perceptie voor wat betreft gezondheid en veiligheid van varkensvlees en leverde een beschermend effect op de intentie om de inname van varkensvlees te verminderen. Een gebalanceerde boodschap resulteerde in een lagere perceptie ten aanzien van de voedingswaarde van varkensvlees en had geen effect op de beoogde consumptie van varkensvlees. Een informatiebericht afkomstig van de overheid werd als meest geloofwaardig gepercipieerd. Een boodschap afkomstig van de overheid had een positief effect op de perceptie ten aanzien van de veiligheid van varkensvlees.

- Een matige graad van subjectieve kennis en een lage graad van objectieve kennis van nutritionele labeling werd geobserveerd. Nutritionele labels worden niet vaak gebruikt in China. 70% van de deelnemers gaf aan dat zij zelden of nooit nutritionele labels gebruiken bij het winkelen. Nutritionele kennis (objectieve en subjectieve) beïnvloedde op een positieve manier de objectieve en subjectieve kennis van nutritionele labels. Vertrouwdheid met nutritionele labels had een sterk positief effect op de kennis en het gebruik van nutritionele labels. Subjectieve kennis speelde ook een belangrijke positieve rol in het gebruik van het label. Leeftijd had een negatief effect op zowel objectieve en subjectieve kennis, terwijl onderwijsniveau enkel een effect had op de deelnemer zijn objectieve kennis.





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# Curriculum Vitae

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#### **Articles in peer-reviewed international journals in the Science Citation Index (A1)**

Liu, R., Pieniak, Z., & Verbeke, W. (2013). Consumers' attitudes and behavior towards safe food in China: a review. *Food Control*, 33, 93-104.

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#### **Articles in national journals (A3) (In Chinese)**

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### **Conference proceedings**

Liu, R., Pieniak, Z., & Verbeke, W. 2013. Chinese consumers' risk perception towards food-related hazards and trust in information sources. International Congress on Social Science and Business 2013. 8-10, January, 2013. Taipei, Taiwan (Oral presentation).

Liu, R., Hoefkens, C., & Verbeke, W. 2014. Chinese consumers' use of a food nutrition label and its determinants. EuroSense 2014: A sense of life. 7-10, September, 2014. Copenhagen, Denmark (Oral / poster presentation).

Liu, R., Pieniak, Z., & Verbeke, W. 2014. Food-related hazards in China: consumers' risk perceptions of food risk and trust in information sources. The Nineteenth Conference on Food Microbiology. 18-19 September, 2014, Brussels (Poster presentation).

### **Awards**

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Outstanding Teacher of China Women's University, 10/09/2006;

Excellent Scientific Research, Department of Science & Technology, Hebei Province, 1/2006.



