Analysis of Factors that Impact on the Consumer Risk Perception of Dairy Product Safety in China

A thesis presented in partial fulfilment of the requirements of the degree of Masters in Agricommerce

Massey University

Palmerston North

New Zealand

Fang Wang

2014

ABSTRACT

Food safety is an international challenge that is felt strongly in China. A series of foodborne diseases and food fraud scandals around world have pushed concerns over food safety even further. With its rapid social and economic transformation in past 60 years, China is shifting its priority from food security to food safety. Melamine contaminated baby formula and many other food safety incidents in China have shaken Chinese consumer confidence in the food industry and even in regulatory institutions. China is one of the fastest growing markets for dairy products in the world. To understand how Chinese consumers form their perception of the safety of dairy products is critical for policy makers, regulatory institutions and the dairy industry to communicate food safety information with the consumer and establish food safety management with transparency and consistency.

The aim of this study was to explore and evaluate factors that influence the consumers' risk perception of dairy product safety in Lanzhou, northwest of China. The literature review helped to identify a set of factors that impact on the consumers' perception of food safety. A model of consumer risk perception in dairy food safety was developed to gain insight into the underlying drivers of the consumer demand for food safety. The study helped gain an understanding of how consumer social demographic information, reliance on extrinsic and intrinsic attributes, trust in actors and regulators in the dairy industry, personal experience and media use that impact on the risk perceptions of consumers.

A self-completion survey was used to collect the data and provide a big picture of consumer risk perception in food safety in China. Factor analysis was used to refine the dependent variables to produce a data set with less dimensions and more significant correlation, and binary logistic regression analysis identified the three significant factors that influenced the

consumers' opinion relating to food safety. These were: family structure, reliance on third party food safety assurance and reliance intrinsic attributes, listed in order of their importance.

The results of this study contribute the perception of risk relating to dairy products in China. The results will assist risk management and risk communication for policy makers and the food industry to develop their strategies towards improving consumer confidence in food safety.

ACKNOWLEDGEMENTS

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ABBREVIATIONS

MOH	Ministry of Health
MOA	Ministry of Agriculture
AQSIQ	Administration of Quality Supervision, Inspection and Quarantine Department
IAC	Industry and Commerce Department
SFDA	State Food and Drug Administration Department
HACCP	Hazard Analysis and Critical Control Point
ISO	International Organisation for Standardization
QS	Quality Scheme

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CHAPTER 1 Introduction

Food safety has become increasingly important with the development of the global agri-food system and international trade. Outbreaks of a series of foodborne diseases and food fraud scandals have eroded consumer confidence worldwide and have raised concerns from governments, the public and stakeholders in the food industry. Food safety issues are not only public health hazards, but also have a negative influence on international trade and the global economy.

1.1 Global food safety challenges

Some recent examples of food safety incidents and food fraud include the outbreak of the *Escherichia coli O157:H7* in August 2013 in Arizona, USA, which sickened 79 people and hospitalised 23 people and being the largest *E. coli* outbreak in the United States (Foodborne Illness Outbreak Dtabase, 2013). Beef burgers contaminated with horse meat were found in Britain and Ireland in January 2013 (O'Mahony, 2013). Fonterra's precautionary recall of whey protein in 2013 cost multimillions of dollars (Hussain & Dawson, 2013). In 2012, a *Salmonella* outbreak in salmon products caused sickness in 950 people in the Netherlands and 100 in the United States (Foodborne Illness Outbreak Database, 2013). The well-known melamine incident in China in 2008 affected 300,000 babies with 51,900 hospitalised and 6 deaths as a result of consuming melamine contaminated baby formula (Xiu & Klein, 2010). From 1993 to 2010, more than 184,500 cases of BSE (bovine spongiform encephalopathy) had been confirmed in the United Kingdom alone (Centers for Disease Control and Prevention, 2010). These foodborne illnesses and food fraud scandals around world remind us that there is much to be done to protect the global food system.

1.2 Factors contributing to global food safety

There are a number of factors contributing to global food safety issues. Changes in farming and husbandry practice, global food supply chain structure and agricultural technology contributed to global food safety issues. The global food supply chain is growing in volume and complexity yet food safety systems have not developed at same scale and speed (DeWaal & Robert, 2005). Increased international trade means the time between food being produced and being consumed is prolonged which increases the likelihood of contamination or adulteration. Modern farming and husbandry practices are driven by the need to maximise profits through reduced costs and maximum outputs and have resulted in an over-reliance on pesticides, fertilizers, antibiotics and growth regulators (DeWaal & Robert, 2005). The advancement of new technology in food production, processing and distribution offer greater convenience and variety of food to consumers. There are associated challenges that influence food safety. Shelf-life stable food and ready-to-eat foods are a potential source of microbiological contamination without proper handling (DeWaal & Robert, 2005).

Changes in world population structure, lifestyle and consumer demand also contributed to the global food safety issues. The development of medical treatments has resulted in an increase in the aging population (Sanderson, 2004). It is expected that by 2025 the population of over 60 years olds will exceed one billion (DeWaal & Robert, 2005). The aging population will increase the numbers people who are vulnerable to foodborne disease. As disposable income increases, people tend to spend more on dining out. Non-standard practices in restaurant kitchens may raise the risk of food poisoning incidents.

Other than the global trends discussed above, there are some unique challenges to food safety in developing countries, like China，including the economic situation, diet, and infrastructure. Farmers in China generally produce on a small scale, lack food safety knowledge and lack uniform farming practices (DeWaal & Robert, 2005). Food products are traded in traditional markets with large amounts of middle men operating on a cash basis. Food traceability become very difficult. Food safety regulations are often not in place or if they are, they are not followed (Lin, Zeng, Li, & Ni, 2010).

In response to an increasing numbers of food safety incidents and concerns about food safety , food safety regulating institutions and food industries around world endeavour to improve food safety in order to protect public health, consumer confidence, the domestic economy, and international trade. The European Union adapted Regulation (EC) 178/2002 in January 2002 to provide a general framework and a set of requirements for the development of food safety law in its member countries (Global Food Safety Forum, 2011). The core concept of this regulation is to establish a trace back system and an information sharing platform to monitor production, processing, prevention and management of the risk, making sure there is coherent and mutual recognition in its internal market and among its member countries (European Union, 2002).

In the United States, the Food Safety Modernization Act (FSMA) which replaces the Food, Drug, and Cosmetic Act in 1938, was introduced in 2010, based on the principles of scientific risk-based analysis and preventive control (Taylor, 2012). Under the FSMA, risk-based analysis has been used efficiently by establishing a partnership between the

food safety regulators and actors in the food industry(Global Food Safety Forum, 2011). The new law also strengthens the control on imported food.

In China, after the melamine incident in 2008, a new food safety law was introduced in 2009. The new law focuses on establishing a food safety system with a third party using scientific risk-based analysis. A new food safety regulating institution was established under the food safety law to coordinate the various authorities in food safety regulation in the old food safety regulating system (Global Food Safety Forum, 2011).

1.3 Food safety situation in China

With its rapid economic development, China is experiencing great change. The change from a command-oriented economy to a market-oriented economy after 1978 raised many social and economic issues. Food safety is one of the prominent ones. The Chinese Government has made a great effort to increase production and diversification of its food sources. The priority of government effort is shifting from food security to food safety. At the same time, consumers in China have been seeking improved safety and quality of food. The Twelfth Five-Year Plan (2011-2015) clearly recognizes that improving food safety is a critical national task, as a part of realizing a vision of human-centred, science-based development (General Office of the State Council, 2012).

Despite the effort of the Chinese government, food safety remains a serious problem in China. Various food safety incidents covered by the media have shaken consumer confidence in the food industry and public regulation. The media reported a total of 2489 food safety incidents during the period of 2004 to 2012 (Wu, 2012). That means

an average of 276 cases annually or two food safety incidents every three days. There are some interesting findings can be concluded from these media reports: first, the food processing sector is the most reported sector in the food supply chain. More than 64% of food safety incidents reported by media are related to the food processing sector. Second, among all the food safety incidents that were reported, animal products and dairy products are the most reported food groups (60.9%). Third, illegal use of food additives was the most reported issues, being 34% of food safety incident that were reported (Wu, 2012). Table 1.1 below lists selected food safety incidents widely reported by the media in China.

Table 1.1 Selected illegal food additives incidents which in China that had a major impact on consumer confidence and were extensively covered by the media

Illegal chemical Food additives	Year	Detail
Suden VI Dye	2006	The dye Sudan IV has been banned from use as food addictive for its potential carcinogenic effects. Sudan IV has been illegally added to chill powder and poultry feed to enhance colour to attract consumers in China (Kwok & Yau, 2006).
Melamine contaminated baby formula	2008	In 2008, the industry chemical melamine was found to be used in baby formula to boost the apparent protein level. Melamine adulteration caused 6 deaths, with 13,000 hospitalized (Pei et al., 2011).
Lean meat agent	2009	Lean meat agent increase muscle to fat ratio, which can be used as a growth promoter to produce lean carcass. The overuse of the agent causes nausea and dizziness if consumed by humans. Lean meat powder was reported to have cause an outbreak of food poisoning in 2001, and was subsequently prohibited in animal husbandry in 2002. After discovering the use of Lean meat powder in pig rearing in Henan province in 2009, the government launched an extensive investigation to remove lean meat powder from animal feed (SZE, 2011).
Gutter oil	2011	Recycling waste oil from restaurant drainage pipes produces gutter oil. It has been shown that cause acute abdominal pain. There are reports that long-term consumption of the oil can lead to stomach and liver cancer. It is widely used by small restaurants and food stands to lower costs(Chung, 2013). In 2011, joint action by AQISA from Zhejiang, Shandong, and Henan provinces has tracked down 60000 tons of gutter oil.

Source:(Lam, Remais, Fung, Xu, & Sun, 2013)

1.3.1 Food safety supervision at the central government level

Chinese food safety supervision has experienced three stages (administrative dependent style, administrative and legislative mix style, legislative style) from 1949 until now. From 1949 to 1982 food safety supervision in China was copied from the Former Soviet Union of Socialist Republics, dominated by administrative orders, ideological education, and mass campaigns against food adulteration (Tam & Yang, 2005). While a basic food hygiene law was put in place in 1982 and revised in 1993 and 2006, the law focused on the end-product and catering business checks by authorities instead of applying traceability and supply chain management (United Nations in China 2008). Food safety supervision was undertaken by nine government authorities with responsibilities overlapping and resources wasted (Skinner, Han, Luo, & Lou, 2004; United Nations in China 2008; W. Zhou, 2012).

In the wake of an increase in the number and severity of food safety incidents in China, especially after the 2008 melamine contaminated milk powder incident, the Chinese government strengthened its control over the food industry. On February 28th, 2009, the Chinese government passed the Food Safety Law of the People's Republic of China ("Food Safety Law"). The Food Safety Law came into effect on June 1, 2009 and replaced the "Food Hygiene Law"(The Nationl People's Congress, 2009). New Legislation in China has improved food safety supervision in some ways like strengthening control over food additives, producing unified food standards and establishing a politically important institute "The Office of State Council Food Safety Commission" to oversee the ministries of food safety regulation (Jia & Jukes, 2013). However some of the problems from previous legislation still remain. A preventive traceability and recall system is still not in place under the new legislation (Pei, et al.,

2011). The new law improved administrative coordination by building a food safety commission but a complex administrative body with fragmented and overlapping functions still exists, as shown in figure 1.1 (Pei, et al., 2011; Tam & Yang, 2005; Yang, 2004).
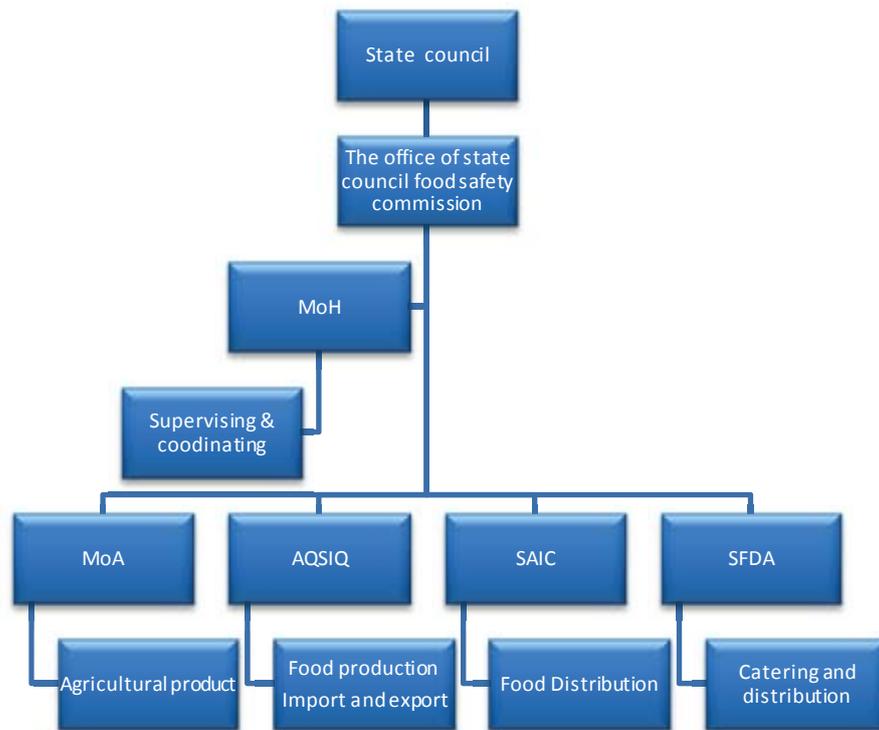
Figure 1.1 Food Safety Regulatory Framework under China Food Safety Law

Source:(Pei, et al., 2011)

In China, inspection and enforcement are limited by a lack of resources and an uneven distribution of resources (Tam & Yang, 2005). The responsibility of food safety supervision was shared by government, province and local authorities. Due to complex administration arrangements at the government level, the public resources at the provincial and local level were not used efficiently (Jia & Jukes, 2013). In order to streamline the administration and coordinate resources, the SFDA (State Food and Drug Administration) was established in 2003 (Jia & Jukes, 2013). With limited staff and resources, the SFDA cannot fully fulfil its coordinating role.

1.3.2 Food safety supervision at local government level

In China, the administrative structure involves 33 provinces, autonomous regions or municipalities directly under the central government, 333 regions, municipalities, autonomous prefectures and 2861 counties and county level municipalities (Jia & Jukes, 2013). Most of these provincial, regional and county level administrations are directly responsible to their respective regional government body, but report to the Ministry of Health (MOH), the Ministry of Agriculture (MOA), the Administration of Quality Supervision, Inspection and Quarantine Department (AQSIQ), the Industry and Commerce Department (IAC) and the State Food and Drug Administration Department (SFDA) in their respective areas of competence, as shown in figure 1.2.

Food safety supervision at the local level compromises central government legislation by tolerating illegal activities that may cause food safety incidents (Jia & Jukes, 2013). Local officials need enterprises to generate revenue and employment to improve their career paths (Tam & Yang, 2005). Regulating agencies put emphasis on fee and penalty collecting instead of regulating unsafe food production practices. Regulating agencies compete with each other on revenue-generating regulating activities, which lead to over enforcement in some areas and under enforcement in others. Official corruption is another factor which contributes to lax enforcement of food safety legislation (Tam & Yang, 2005; Yang, 2004).

At central Level

Food Safety Commette in State council

MOH

MOA | AQSIQ | IAC | SFDA

At local level

Provinces(34)

Government at provincial level

Provincial Department of Health

Provincial department of Agriculture | Provincial department of Quality Supervision | Provincial department of Inductry and commercial | Provincial department of Food and Drug Administration

Cities(333)

Government at cityl level

Municipal Bureau of Health

Municipal Bureau of Agriculture | Municipal Bureau of Quality Supervision | Municipal Bureau of Inductry and commercial | Municipal Burea uof Food and Drug Administration

Counties(2826)

Government at county level

Municipal Bureau of Health

Bureau of Agricultureat county level | Bureau of Quality Supervision at county leve | Bureau of Inductry and commercial at county leve | Bureau of Food and Drug Administration at county level

Figure 1.2 Structure of food safety control system in China
Source:(Jia & Jukes, 2013)

1.4 Background information on the dairy market in China

1.4.1 Demand for dairy in China

Until 1980, more than half of the expenditure in Chinese households was spent on food (Gale & Huang, 2007). Dairy consumption in China was one of the lowest in the world in 1996 with 8.18kg per capita. This number has tripled in last 16 years, reaching

34.1 kg in 2012 (China National Beareau of Statistics Various Years). Yet after significant growth, dairy consumption per capita in China is still lower than the world average. The major products of the domestic dairy industry are fluid milk (white milk and flavoured milk), yogurt, milk powder and ice cream (Fuller & Beghin, 2004). Figure 1.3 shows the proportion of different dairy products manufactured in China.
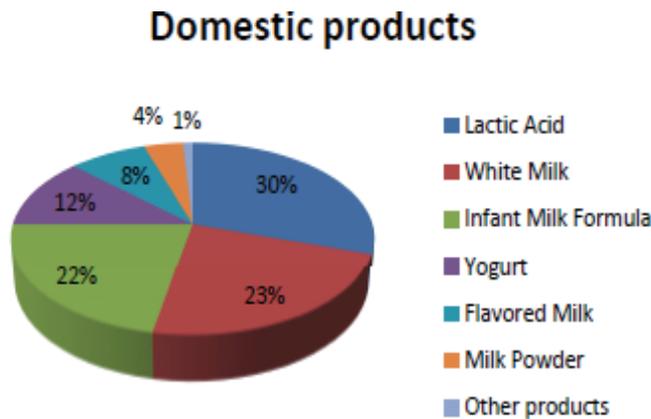
Figure 1.3 Domestic dairy products structure
Source:(Ing. J.W, 2012)

With the reforms of the market economy and opening up to the world in 1978, the GDP in China has grown at a rate of 9% to 10 % per year; the income of Chinese has risen dramatically but unevenly in the past 20 years (Fuller, Huang, Ma, & Rozelle, 2006). Personal income has climbed from 343.4 RMB to 24565 RMB from 1978 to 2012 (H. Chen, 2011; Scott & Jianping, 2012; Trading Economics, 2012). Along with the rise of income, the diet of Chinese households has shifted from a carbohydrate-dominated diet to a more diverse diet with more fresh fruit, meat, seafood, eggs and dairy products (Gale & Huang, 2007).

Aside from an increase of income, increases in dairy consumption can also be explained by the following factors: (1) Urbanization: It is expected that more than 1

billion people will be living in cities by 2030, compared with 600 million in 2008. This is producing a strong drive in the growth of the consumer market; (2) Growing health awareness: health enhancing functions of dairy products are widely publicised by the health care and the dairy industry. Fluid milk and yogurt are regarded as a source of calcium and protein instead of just a supplementary feed for babies, patients and the elderly in China (Debham, 2008). Dairy products are becoming an integral part of the Chinese household diet (Chanda Beckman, 2011; Gale & Huang, 2007); (3) Improvement in the supply chain: a growing chilled product supply chain within China has increased the availability and affordability of dairy products. The modern retail chains with chilled storage facilities provides consumers with a great variety of products (Debham, 2008).

1.4.2 Supply of dairy products in China

The domestic supply of dairy products falls short of meeting the rapidly growing dairy market in China (Beijing Orient Agribusiness Consultants, 2012; Hunt, Moynihan, & Voboorgen, 2010; Ing. J.W, 2012). The gap between the soaring demand for dairy products and the domestic supply is caused by structural and temporary factors (Hunt, Moynihan et al. 2010; Beijing Orient Agribusiness Consultants 2012).

The Chinese dairy supply chain is highly fragmented. As shown in Table1.2, more than 60% of small dairy farmers own less than 100 cows (Ing. J.W, 2012). A large number of middle men in the supply chain increases the price of dairy products and poses a challenge for traceability (Hunt, et al., 2010), (see Figure 1.4). A total of 80% of the dairy market in China is dominated by domestic products, among which 60% are sourced from dairy farms with less than 100 cows (Ing. J.W, 2012). Small scale dairy

farmers struggle to survive with strengthening regulations in food safety and the surging cost of feed and labour. Large scale dairy farms in China emerged after 2008, increasing from 17% in 2008 to 27% in 2011 (Bower, Daeschel, & McGuire, 1998; Qiao, Guo, & Klein, 2012). But it will take years before the domestic supply meets the demand of the Chinese population

Table 1.2 Percentage of raw milk supply by different size of dairy farm

Dairy Farm size (Number of cows)	1-5	6-20	21-100	101-200	201-500	501-1000	>1000
Percentage of raw milk supply	23%	24%	15%	6%	9%	10%	13%

Source:(Ing. J.W, 2012)
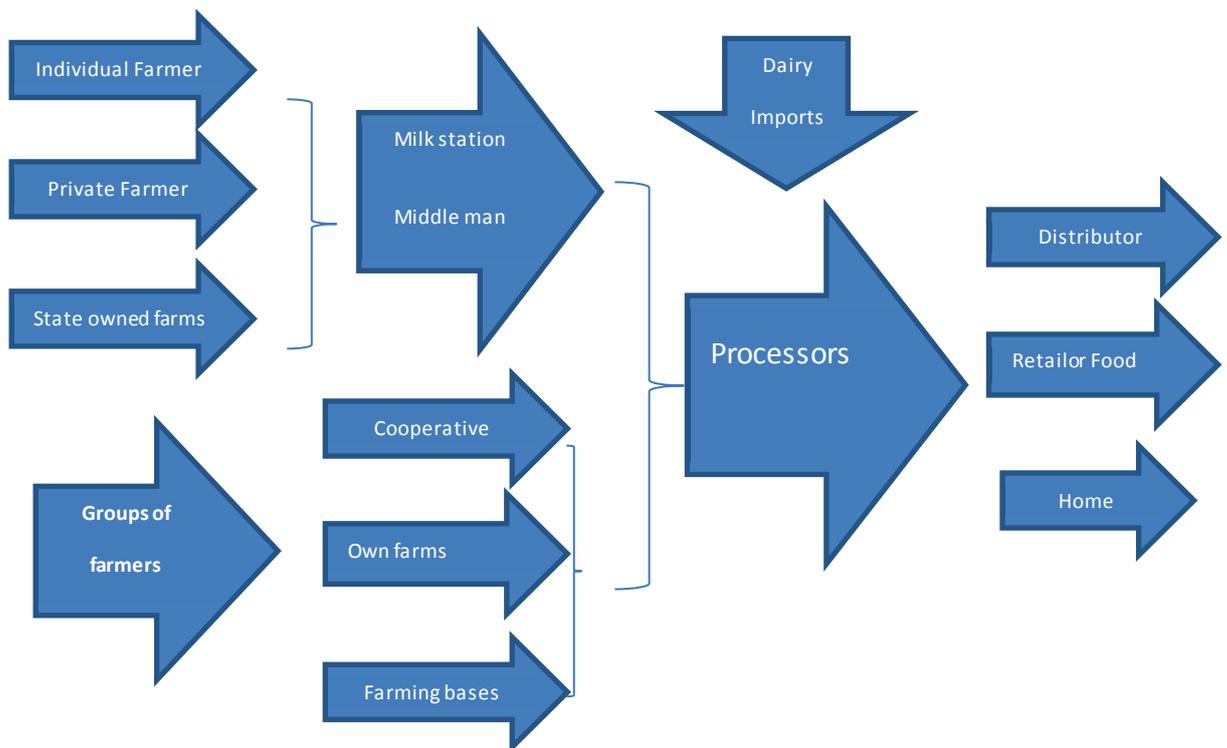
Figure 1.4 Structure of dairy supply chain in China
Source: (Ing. J.W, 2012)

The dairy industry in China is going through a dramatic change in terms of its supply chain structure. In the wake of a few food safety scandals in dairy products, the government is investing in changes in the supply chain structure. Regulatory pressure has put many small scale dairy farms out of business. The Chinese government supports the development of large scale dairy farms by granting preferential policy on agricultural subsidies, land and capital access. The processing companies are investing in the development of large scale dairy farms to raise the proportion of controlled raw milk sources (Beijing Orient Agribusiness Consultants 2012). As a result of the transformation of the dairy industry in China, the supply of dairy products from small scale dairy farms is shrinking. Yet the large scale dairy farm remains an emergent stage (Dairy News, 2013). The rising cost of feed, fuel and labour have forced an increasing number of small scale dairy farms out of business (Beijing Orient Agribusiness Consultants, 2012).

1.5 Melamine contamination scandal

In 2008, 16 infants were diagnosed with kidney stones and other kidney damage in Gansu Province China, after consuming baby formula produced by the Sanlu group, one of the major players in the Chinese dairy market (Hilts & Pelletier, 2009). In November 2008, it was reported that more than 13,000 had been hospitalized and six infants died from kidney failure. Melamine is a chemical used to boost the apparent level of protein (Hilts & Pelletier, 2009). The same problem was found in other products from 21 other companies (Xiu & Klein, 2010). The melamine incidents reveal the main issues that contribute to the current food safety situation in China. These issues include: the increasing income gap, disproportionate supply chain structure of the food industry and government regulatory failure (Pei, et al., 2011). The incident

itself also contributed to a restructure of the dairy industry and the enacting of new food safety legislation in 2009.

The social and economic situation is also a factor that contributed to the melamine incident. The income gap in China between urban and rural areas, and developed and underdeveloped areas is huge. The four most affected provinces by the melamine contamination scandal and their per capital incomes are listed in Table 1.3 .The four provinces are in the less developed part of China. The net per capita income is below the national average. The urban per capita income is three to five times higher than in the rural areas (Lu, 2011).

This gap leads to the separation of consumer groups. High-income consumers focus on the quality and safety of food products. They will pay a premium for food products with a quality guarantee. The price of imported baby formula (135 to 280 RMB per 900g) is three to five times the price of the low-end Sanlu baby formula (25-20RMB per 400g) (Lu, 2011). Consumers from rural underdeveloped areas are price sensitive. They tend to choose products at the low end of the price scale when it comes to baby formula. They were the major victims in the melamine incidents.

Table 1.3 Rural and urban income of the four Provinces most affected by the Melamine incidents

Province by number of patients	Net income of rural residents	Disposable income of urban residence
Gansu Province	2724	10969
Hebei Province	4759	13441
Henan Province	4454	13231
Xin jiang Uygur Autonomous Regions	3175	11432
National Average	4761	15781

Source: The cause and effect analysis of Melamine incident in China (Lu 2011)

The Chinese government implemented an inspection exemption which allowed certified business to inspect their own product by their own standards to reduce the cost of regulating and to improve efficiency, over a three year period (Lu, 2011). Table 1.4 shows five out of the twenty-two dairy companies involved in the melamine incident and their inspection exemption situation. The lack of government or third party supervision allowed the adulteration of dairy products on a large scale.

Table 1.4 Melamine of the dairy products of companies involved in Melamine incident and their inspection exemption situation.

Company name	Melamine Value mg/kg	Inspection exemption
Sanlu Group Co., Ltd	2563	YES
Shanghai Panda dairy product	619	YES
Qingdao Sheng Yuan dairy company	150	YES
Shanxi Gucheng dairy group	141.6	YES
Jiangxi Hero Dairy company	98.6	YES
Natinal Standard for Melamine in dairy products	1	
International Standard for Melamine in dairy products	0.15	

Source: The cause and effect analysis of Melamine incident in China (Lu 2011)

The estimated direct financial loss of the dairy industry in China during September 11th to December 31st 2008 was around $3 billion. Mengniu and Yili lost 80% of their sales (Xiu & Klein, 2010). The Sanlu Dairy Group declared bankruptcy in December 2008. Its biggest shareholder, New Zealand based Fonterra Company lost 153million of its investment in Sanlu (Qiao, Guo, & Klein, 2010). After the melamine incident, consumers in China tried to find alternative sources of infant formula. The first alterative was imported baby formula. The demand for imported baby formula soared after the incident.

The melamine contamination scandal revealed the legislation deficiency in food safety in China. The food safety law came into effect in June 2009 and contains 104 rules in 10 chapters (Qiao, et al., 2012). The national food commission was established to overcome a lack of coordination between the different authorities under the previous legislation. The inspection exemption system that was partly responsible for the scandal was removed from the legislation (Xiu & Klein, 2010). Traceability and third party certification were introduced to ensure the quality and safety of food along the entire supply chain (Lu, 2011).

1.6 Problem statement and rationale for study

This study focuses on dairy products for three reasons: (1) a dairy supply shortage, a growing population and increasing income make China one of the emerging markets in global dairy products. A study of consumer perception of dairy products in China is crucial for major dairy product exporting countries and major dairy companies to understand their market and consumers; (2) due to the melamine adulteration incident in 2008 and many other food safety incidents related to dairy products, Chinese consumers are highly sensitive to the safety of dairy products. In spite of various efforts that have been made to boost consumer confidence, a survey conducted by WHO in 2010 shows more than 70% of consumers are not confident in food safety (Global Food Safety Forum, 2011); (3) the safety of dairy products is particularly important because many consumer are infants and young children in China. Given China's "one child policy", the safety of dairy products is especially important.

To improve food safety management in China and consumer confidence in food safety, it is important to establish effective food safety communication among stakeholders in the food industry, and between the public and the food industry. Risk communication evaluates and adjusts the policy and the decisions of food safety management. Effective risk communications among stakeholders in the food supply chain enhances the consistency and the transparency of food safety risk management. One of the challenges for effective risk communication for the stakeholders in the food industry is to develop and adjust policy and decisions according to the food safety risks that the public perceives. Insight into the factors that impact consumer risk perception in food safety is critical for the stakeholders in the food industry in designing effective risk communication (see figure 1.5). In particular, a study on the factors that have an impact on consumer risk perception in the safety of dairy products in China is important for understanding consumer behaviour there.

Improving the food safety management and consumer confidence in food safety

Establishing effective food safety communication among stakeholders in food industry

Understanding consumer perception of food safety risk and factors impact public perception of food safety risk
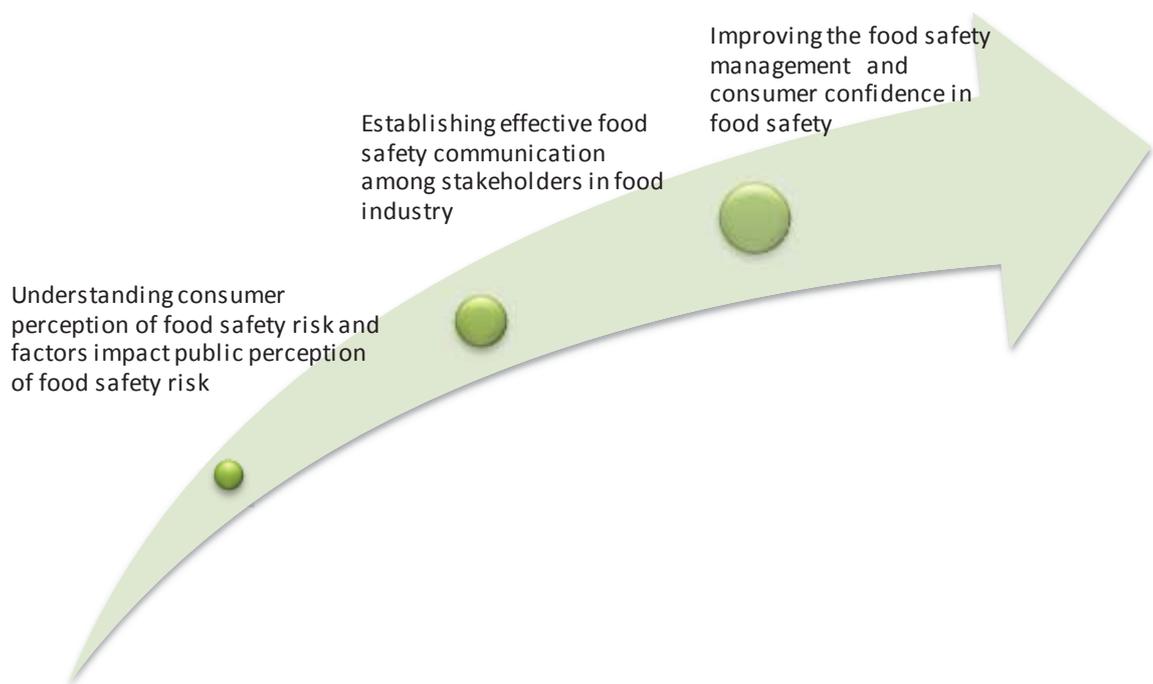
Figure 1.5 Study rationale

1.7 Study aims and objectives

1.7.1 Aim of the study

To identify and evaluate the factors that impact on the risk perception of food safety, with a focus on dairy products in Lanzhou, China

1.7.2 Specific objectives

1. To identify the most important factors that impact on consumer risk perception of food safety, particularly, dairy products

2. To evaluate the importance of each factor in a model and determine its influence on consumer risk perception of safety in dairy products.

1.8 Structure of the thesis

The thesis is structured in five chapters. Chapter 1 is the introductory chapter, providing background, motivation, aim and rational of the study and structure of the thesis. Chapter 2 reviews the literature that is central to the study. A model with four conceptual framework for investigating factors that impact on consumer's risk perception in the safety of dairy products in China was developed based on the literature. Twelve hypotheses were proposed based on the model. Chapter 3 details the methods employed-that is a questionnaire survey used to collect research data. Methods of analysing data (frequency distributions, cross tabulation, factor analysis, binary logistic regression) and statistical concepts that were important to study are explained. Chapter 4 focuses on the results of the data analysis. It investigates four sets of conceptual frameworks: (1) social demographic information that potentially has an impact on food safety perception; (2) level of reliance on extrinsic and intrinsic attributes of the dairy products; (3) trust in actors and regulators of the dairy industry;

(4) Media exposure, personal direct experience with unsafe food and recall of food safety incidents in the past six months. Chapter 5 summarises the results of the data analysis. Sections ondiscussion, limitations, future study directions and a conclusion. are presented.

CHAPTER 2 Literature Review

2.1 Introduction

To get a better understanding of how consumers perceive food safety in China, this research investigates the underlying factors affecting the consumer risk perception of food safety in dairy products. This chapter reviews relevant literature on consumer risk perception of food safety.

This chapter is structured as follows. First, the definitions, categories and research approaches of risk are reviewed. Second, factors that have an impact on the consumer risk perception of dairy products are identified from previous studies on consumer risk perception internationally. Third, a model using a conceptual framework of four underlying factors that impact on consumer risk perception is developed from factors identified in the literature review. Some relevant studies that have been done in China are reviewed in this section as well.

2.2 Risk

2.2.1 What is risk

The word "risk" has been defined many times in different contexts. One definition of risk is the "possibility of suffering harm and loss from a factor, course or element causing uncertain danger" (Houghton Miflin Co., 2006). Another similar yet more detailed definition is given by the Royal Society - "a combination of probability or frequency of occurrence of a defined hazard and the magnitude of the consequence of the occurrence" (Royal Society, 1992). This definition implies that risk can be measured

quantitatively as a variable in terms of probability and magnitude (Yeung & Morris, 2001).

The definitions discussed above have one thing in common. They are objective abstract explanations of risk. The social approach defines risk as a variable which is related to public and individual perception. Risk in a social context is defined as risk raised from public discourse about technology and political and economic conditions that influence expert assessment (Sapp, 2003). Frewer, Jonge and Kleef (1995) et al concluded that risk perception is socially constructed. People's response to risk is directed by psychological elements rather than technical assessment. The same idea was found in the "The social amplification of risk" which investigates how social and individual factors effect perception of risk and in turn create other social effects (Pidgeon, Kasperson, & Slovic, 2003; Slovic, 1999). The social definition of risk includes the perception and interaction of risk and behaviour.

2.3 Research approach of risk

The conventional approaches to the study of risk are risk assessment, risk management and risk communication (A. Lobb, 2005; Sapp, 2003). Risk assessment is the technical approach to investigating risk that can be objectively measured. In the case of a technological hazard, like genetically modified food, risk assessment is appropriate (Yeung & Morris, 2001). Risk management is a political and economic process that develops a regulatory response to public risk concerns. Risk communication is a social process of conveying information among the stakeholders of risk (A. Lobb, 2005). The conventional approach to study risk is displayed in Figure 2.1
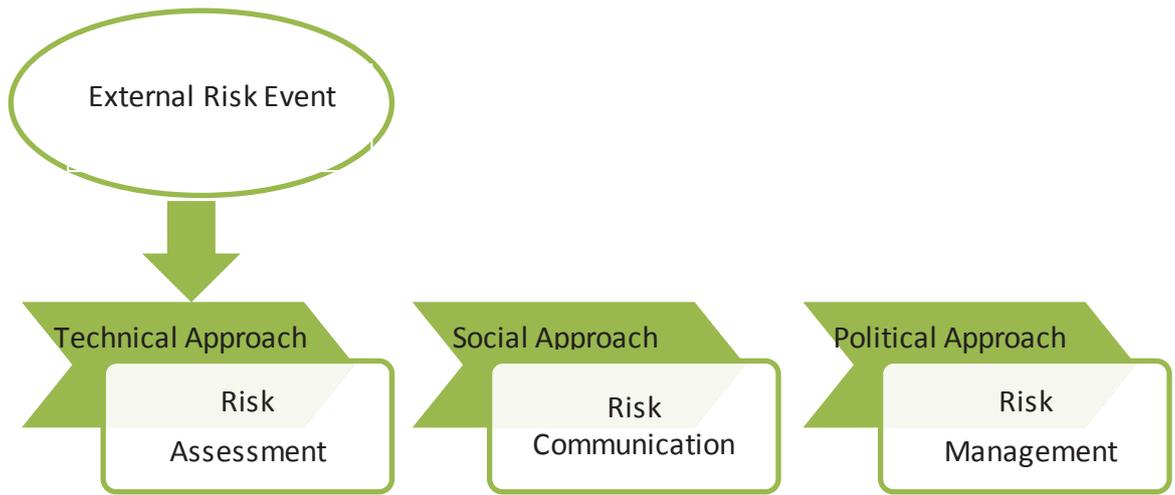
Figure 2.1 Different approaches for studies risk
Source: (Sapp, 2003)

Risk perception is an integral part of the study of risk (Bener, 2000). It actively interacts

with all four aspects of a risk study (the risk event, risk assessment, risk communication

and risk management, especially risk communication and risk management (Figure 2.2).
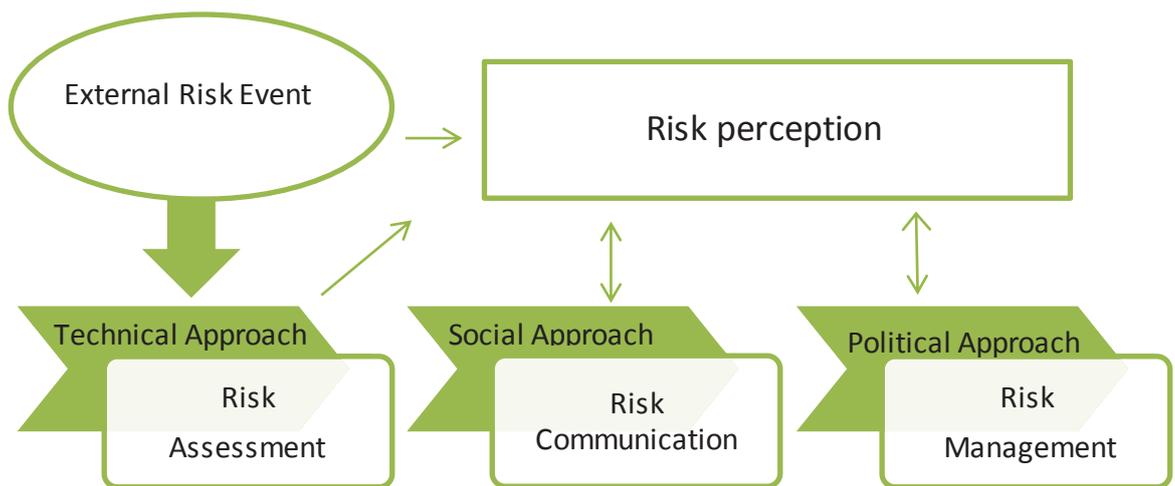
Figure 2.2 Role of risk perception in risk study

2.4 Factors impacting risk perception

2.4.1 Socio-demographic factors

To identify important socio-demographic factors, it is necessary to examine previous studies on the risk perception of food. A broad range of literature has been reviewed to make sure that the set of factors is as complete as possible. In general the findings regarding demographic factors indicate that gender, level of education, income and family structure have an influence on risk perception (Dosman, Adamowicz, & Hrudey, 2001; Frewer, 2000b; Mariani et al., 2007; Tonsor, Schroeder, & Pennings, 2009; Zepeda, Douthitt, & You, 2003).

One of the findings regarding demographic distinction is the gender difference. Females tend to perceive more risk in a particular hazard than males (Baker, 2003; Frewer, 2000b; Rosati & Saba, 2004). Women tend to take risk adverse action even in situations where there is low probability of risk. Slovic (1999) and Frewer (2000) found a difference in risk perception in Europe. A European female's perception was more similar to non-European females and males. Women and the non-European group are less involved in social decision making and management than European men, which makes them feel less in control when they face food safety issues like genetically modified food (Frewer, 2000b; Slovic, 1999). The rationale behind this is more about the socio-political situation rather than biological influence.

The level of education is another factor that is identified in the literature as important in the perception of risk. Two contradictory findings illustrate the relationship between the level of education and risk perception. First, the level of education is positively related to the level of risk perception. Individuals with a high level of education can

better understand the potential risk of chemical residues in food, biological contamination with bacteria and viruses, and the impact of a high-fat diet on the body. So those with a high level of education are more conscious about food safety risk than those with less education. Individuals with less education are less likely to realize the existence of these potential risks and therefore will perceive less risk in food (Adu-Nyako & Thompson, 1999; Baker, 2003; Tonsor, et al., 2009).

Meanwhile, there are researchers that support the view that the level of education is negatively related to risk perception. They argued that with a high level of education, individuals gain a sense of control and power by understanding the potential hazard (Dosman, et al., 2001; Muhammad, Sherif, & Gheblawi, 2010; Slovic, 1999). Furthermore, a high education is positively related to high income. Higher income offers more alternatives in food selection. They can therefore choose to purchase food that they perceive is of low risk (Dosman, et al., 2001; Mariani, et al., 2007).

Income is important in shaping risk perception. As income increases, the overall level of risk perception of food decreases. This can be explained as when income increases, the willingness to pay to avoid risk increases. Such individuals can choose alternatives to minimize the their exposure to a potential food hazard (Baker, 2003; Dosman, et al., 2001). Furthermore, groups that have high income in society consider themselves as having a high involvement and influence on social management and decision making. (Frewer, 2000a). This contributes to their sense of control over every aspect of their life, including food safety.

The household structure is another factor that influences risk perception. Dosman (2001) and Baker (2003) found that individuals with young children have a high

concern for food safety. Another study which was conducted in China comparing the risk attitude towards dairy products between households with young children and without young children came to the same conclusion (Qiao, et al., 2012).

2.4.2 Information sources

In a market place with asymmetric information, the risk perception of consumers is based on the information they receive from all indicators the products provide in various ways (Bennett, Calman, Curtis, & Smith, 2010; Slovic, 2013; C. Zhang, Bai, Lohmar, & Huang, 2010). Information on the package includes the best before date, green/organic/natural food labels, food safety assurance (QS, HACCP), government inspection, price, ingredients, nutrition facts and brands (Bernués, Olaizola, & Corcoran, 2003; FSANZ, 2008; Verbeke & Ward, 2006). Interestingly, government inspection is especially important to consumers in Asia including Japan and China (R. Liu, Pieniak, & Verbeke, 2013; Tonsor, et al., 2009). Information that is related to the consumers experience such as appearance, smell and taste are also found to be important in some recent studies (Schroeder, Tonsor, Pennings, & Mintert, 2007; Tonsor, et al., 2009).

Becker (2000) explained in his study that the information could be obtained from the product itself, which is referred to as a search and experience quality. These are attributes consumers are looking for when they purchase and consume food (Becker, 2000). Other information which cannot be perceived before or after consumption of a product is referred to as credence quality. Becker (2000) defined credence quality as "concerns of the consumer where no cues are accessible in the process of buying or

consuming" (Becker, 2000). The intrinsic attributes and extrinsic attributes of the search, experience and credence quality are illustrated in Table 2.1.

Table 2.1 Product attributes and means of confirmation

	Intrinsic Attributes	Extrinsic Attributes
Experience quality Search quality	Colour ,Smell, Flavour	Brand, product origin, price and place of purchase
Credence quality	Freshness, Food safety	origins, producer, organic, feed, hormones, fat/cholesterol, antibiotics and Salmonella

Source : (Becker, 2000)

Tensor and Schroeder (2007, 2009) support this argument by factor analysis of consumer reliance on different information sources in the US, Canada, Mexico and Japan. Information sources like product colour, product date, product flavour, place of purchase, and price are clustered into a factor that was named as observable attributes while information like organic, natural and traceability, brand and country of origin cluster into one factor which was named credence attributes (Mariani, et al., 2007; Tonsor, et al., 2009). Observable and credence attributes both have an impact on consumer risk perception. Consumers who rely on observable attributes perceive more risk than those who rely on credence attributes in beef (Tonsor, et al., 2009). The observable and credence attributes in Tensor'studies overlap with intrinsic attributes and extrinsic attributes in Becker's study.

Studies on consumers from different parts of the world indicate that most consumers claim they use information on the label when making a purchase decision (Grimes, Riddell, & Nowson, 2009; Grunert, Wills, & Fernández-Celemín, 2010; Sharf et al., 2012). Three issues are identified in the literature on information provided to communicate with consumers: (1) the availability of information on the product label

does not imply those consumers are able to use information appropriately; (2) increasing information on product labels might lead to information overload, which decreases the effectiveness of communication (Epplera & Mengisa, 2004); (3) credibility of information is based on the trust consumer have for the information provider. Intuitively, consumers have a higher level of trust in the information that offered by parties which they find to be trustworthy (A. E. Lobb, Mazzocchi, & Traill, 2007).

2.4.3 Trust in the actors of the food chain and regulatory institutions

Trust is an important factor in risk perception. Trust and risk are highly correlated. As trust increases, risk perception decreases. That is to say trust acts to offset factors influencing risk perception (Bener, 2000). Guinaliu and Tores (2006, p.409) pointed out: "Trust facilitates the adoption of decisions in risky situations, and reduces the number of possible alternatives, reduces the environmental complexity; facilitates cooperation and coordination; improves conflict resolution; reduces the need for control mechanisms; and helps to develop commercial exchanges in the long term." . To better understand the definition of trust, a list of definitions is given by Bener (2000) (see Table 2.2). The social definition of risk complements these definitions by including the perception and interaction of risk and behaviour, food industry and regulatory institutions to obtain safe food and information on food safety.

Table 2.2 List of definitions of trust

Source	Definition
Deutsh (1973)	"The confidence one will find what is desired from another "
Rotter (1980)	""A generalized expectance held by individual that word, promise, written or oral statement of other individual group can be held on to"
Rampel et.al (1983)	"A generalized expectation related to subjective probability assigns to occurrence of some set of future events "
Webster's second International Dictionary	"Total confidence in integrity, ability and good character of the another"
Webster's third International Dictionary	"Assured reliance on a person or a thing"

Source: Bener 2000

In the context of food safety, due to complexity of the food production system and extended supply chains around world, there is an asymmetry of information among different actors in the food industry (de Jonge, van Trijp, van der Lans, Renes, & Frewer, 2008; Ménard & Valceschini, 2005). Consumers have to rely on the actors in in the food chain and the regulatory system and these have been widely studied. These studies found that information provided by actors in the food chain, government institutions and other organizations has a direct impact on risk perception (Becker, 2000; W. Chen, 2013; de Jonge, et al., 2008; A. Lobb, 2005; Mazzocchi, Lobb, Bruce Traill, & Cavicchi, 2008; Rosati & Saba, 2004; Shang, 2010; Tonsor, et al., 2009). Two opposite findings about trust in the actors in the food industry are also identified in literature. The first set of findings concluded that trust in actors of the food industry is negatively related to the perception of food safety (Knight & Warland, 2005; Saba & Messina, 2003; Tonsor, et al., 2009). The second set of findings concluded that trust in actors of the food industry is positively related to the perception of food safety (Poppe & KjÊrnes, 2003).

Consumers obtain food safety information from various sources. They choose their sources by the degree of trust in these sources. The higher is the trust, the more

reliance consumer has on the resource (Kornelis, De Jonge, Frewer, & Dagevos, 2007; Tonsor, et al., 2009). Literature also suggests consumer from different parts of world have different preference in trusting information providers. Consumers from Asia place most trust in the government while consumers from western countries are more likely to trust the consumer organizations (R. Liu, et al., 2013; Tonsor, et al., 2009). Studies in the frequency of consumer use of the information on the label and how consumers understand information on food products are effective in understanding how the information on food products impacts on consumer risk perception of food safety.

It has been found that the risk perception of food safety is lower for those who trust in the government, experts and industry (de Jonge, et al., 2008; Siegrist, 2000). In a nation-wide study, Japanese consumers who rely on industry, retailors and the government perceive a low risk of food safety (Tonsor & Schroeder 2009), while Canadian consumers trust researchers and consumer groups and perceive a low risk of food safety (Mariani, et al., 2007; Tonsor, et al., 2009). These results are consistent with the findings of Lobb's study:information from food safety experts and food chain actors reduces while information from alternative sources tends to increase risk perception in (Mazzocchi, et al., 2008).

2.4.4 Food safety incident and media coverage of food risks

The public concerns about food safety issues are often aroused by food safety incidents and media coverage (Pennings & Garcia, 2001; Verbeke, Frewer, Scholderer, & De Brabander, 2007). Consumer experience with food safety incidents is found to be a factor affecting risk perception as well (Mariani, et al., 2007; Tonsor, et al., 2009).

Direct experience with food safety incidents increased the risk perception of food safety. Indirect experiences with food safety incidents also increased food safety risk perception. The existence of indirect effects suggest the impact of food safety incidents is transmitted and amplified. This is explained the BSE (Bovine spongiform encephalopathy) outbreak in the UK which had an impact on the consumer risk perception of beef consumption in most European countries (Setbon, Raude, Fischler, & Flahault, 2005).

The relationship between mass media and risk perception is complex (S. Liu, Huang, & Brown, 1998; Sjöberg, 2000). Mass media has more impact on the societal level of risk perception rather on the personal level of risk perception (McComas, 2006; Wahlberg & Sjoberg, 2000). Individual consumers rely on social networks to assess risk (Verbeke, et al., 2007). Negative and positive media coverage is asymmetric in the degree of acceptance at different stages of food safety incidents (S. Liu, et al., 1998). During food safety incidents, negative media coverage tends to have an immediate impact in increasing consumers' risk perception due to negative shock from the incident while the positive coverage will reduce risk perception in the long run (S. Liu, et al., 1998). The studies on the impact of media type and media credibility on risk perception are also explored (Wachinger, Renn, Begg, & Kuhlicke; Walter, Böhmer, Reiter, Krause, & Wichmann, 2012).

2.4.5 Summary

By identifying the factors that impact on consumer risk perception in four different dimensions, a framework of consumer perception of food safety risk can be established. The framework presents the key factors and the relationships between

these factors and the consumer risk perception of food safety. Four dimensions of factors that impact on risk perception are identified in the literature (Figure 2.3).

Figure 2.3 Conceptual model of consumer risk perception of food

This framework provides an understanding of how consumers form their perception of food safety risk and how these factors influence consumer risk perception of food safety. Twelve hypotheses were developed based on the conceptual model. The hypotheses will be empirically tested in chapter four.

2.5 Research objectives

Factors that impact on the consumer perception of food safety risk has received relatively little research attention in Asia. A small number of the empirical studies have focused on northwest part of China, where the melamine tainted milk scandal was first disclosed and most influenced, see Table 2.3 below.

Selected studies of Chinese consumers and their attitudes/perception regarding food safety in the past 10 years are summarised in the Table 2.3. These studies covered the food groups of pork, chicken, beef, fish, dairy products and cooking oil. Shelf life, government certification, brand and food safety certification are the most important indicators for consumers for food safety across these studies. Knowledge and awareness of food safety certification are generally low compared to the level of concern over food safety. The willingness to pay a premium for food safety is evolving with consumers moving from being price sensitive to safety sensitive. The higher income groups have a greater willingness to pay a premium for food safety.

Table 2.3 Summary of selected studies on perception/attitude of food safety in China

Author /Year	Research Location	Sample size	Food Groups	Topic	Conclusion
Qing Han Juan Qiao Ling-Yun He (Han, Qiao, & He, 2012)	Beijing	611	Pork	Consumer's willingness to pay for certified pork products,	Consumers' knowledge about certified agricultural products, income and family size are important factors in consumer's willingness to pay for certified pork products. Willingness to pay for certified pork is low compare to level of concern over safety of pork
Zhang, Caiping Bai, Junfei Wahl, Thomas I. (C. Zhang, Bai, & Wahl, 2012)	Nanjing	753	Pork, milk, and cooking oil	Consumers' willingness to pay for traceability	Consumer knowledge about food traceability and awareness of food quality- and safety-related certifications are low. Income and age also have statistically significant impacts on the WTP.
David L. Ortega H. Holly Wang Nicole J. Olynk Laping Wu Junfei Bai (Ortega, Wang, Olynk, Wu, & Bai, 2011)	Beijing Chengdu Hohhot Nanjing Shanghai Wuhan Xi'an	420	UHT milk	Consumers' willingness to pay for selected food safety attributes: price, shelf-life, government certification, third-party certification, and brand	Government certification and a national brand are most valued by consumers
Yingheng Zhou Erpeng Wang(Y. Zhou & Wang, 2011)	Nanjing	255	Food safety in general	Factors that influence urban consumers' attitudes towards food safety after the melamine scandal.	Education level, consumers' awareness of food safety incidents and their opinion of governments' action after the incident.
Wang, Feng Zhang, Jian Mu, Weisong Fu, Zetian Zhang, Xiaoshuan (F. Wang, Zhang, Mu, Fu, & Zhang, 2009)	Beijing	320	Fish products	Consumers' knowledge about nutrition, storage, production and processing, cooking, traceability, attention to quality and safety incidents, handling method for problematic products	There is a shortage of safety knowledge among customers including: processing, storage, and the traceability system of fish products. Consumers are willing to pay a 6% premium for safe, traceable fish products.
Wang, Zhigang Mao, Yanna Gale, Fred(Z. Wang, Mao, & Gale, 2008)	Beijing	312	Dairy Products	Factors that influence the evaluation safety of food products Shelf life, producer, food safety certification, retail outlet, trademarks, colour and taste	Shelf life, producer, food safety certification are important. Knowledge of food certification is low The willingness to pay for certification is higher for those with higher income
Xiaoyong Zhang (X. Zhang, 2003)	Shanghai	298	Pork beef, fresh milk chicken	Important factors for consumer to decide frequency of consumption of selected food products	Purchase place, price, taste and income level are the factors that are relatively important and influence the frequency of consumers' consumption of selected food products

A study of the factors that impact on the consumers' perception of food safety risk in northwest of China will help regulators to prioritise their resources and efforts to build effective public risk communication and risk management in food safety. It will also help actors in the food industry better to understand consumers and their food safety needs, and how that is related to consumer choice for the perception of food safety

A conceptual model of the consumer perception of food safety risk is presented, and the twelve hypotheses proposed in this study are discussed.

The testing of the hypotheses will also address the following two research objectives:

1. To identify the most important factors that impact consumers' risk perception of safety in dairy products in Lanzhou, China.

2. To the rank the factors that impact on consumers' risk perception of safety in dairy products in Lanzhou, China.

2.6 Hypotheses Development

The conceptual model (see Figure2.3) developed in this study was based on the review of the literature. The research model suggests that consumers' perception of food safety risk is based on a number of factors: social demographic factors, intrinsic and extrinsic attributes, trust in different actors in the food supply chain, food safety incidents experience and media usage. Based on this four-fold conceptual framework, the following hypotheses were developed.

2.6.1 Hypotheses related to social-demographic factors

H1 Females perceive more risk than males in the safety of dairy products

H2 Education level is positively related to the risk perception of dairy safety.

H3 Household income is negatively related to the risk perception of dairy safety.

H4 The household structure (presence of children under 18 years old) is positively related to the risk perception of consumers in dairy safety.

2.6.2 Hypotheses related to the source of information

H5 The level of reliance on information of extrinsic attributes is positively related to the risk perception of consumers in dairy safety.

H6 The level of reliance on information about intrinsic attributes is positively related to the risk perception of consumers in dairy safety.

2.6.3 Hypotheses related to the trust in actors in the food supply chain

H7 Trust in actors in food industry is negatively related to the risk perception of dairy safety.

H8 The trust in government regulators food safety regulatory agencies is negatively related to risk perception of dairy safety.

H9 The trust in the retailers is negatively related to the risk perception of consumers in dairy safety.

H10 Trust in the academic researcher is negatively related to the risk perception of dairy safety.

2.6.4 Hypotheses related to experience with food safety incidents and media coverage

H11 Direct experience of food safety incidents is negatively related to the risk perception of consumers in dairy safety.

H12 Media use is positively related the risk perception in dairy safety.

CHAPTER 3 Research Methodology

3.1 Introduction

The aim of this study is to examine consumer perceptions of the safety of dairy products in China and the factors that may have an impact on this. These factors include trust in the industry actors and regulators, direct experience with unsafe food, media exposure, the reliance on extrinsic and intrinsic attributes and the social-demographic characteristics of the individual.

The purpose of this chapter is to: (1) explain the methodology of the research used to examine the research objectives and hypotheses, (2) provide details about the questionnaire, including design, format and administration, (3) discuss sampling and research ethics, (4) describe the methods of data analysis including frequencies, cross-tabulations/correlation, factor analysis and binary logistic regression.

3.2 Research method

3.2.1 Research instrument

A survey is used as the primary research method. There are several ways to collect survey data, including self-completion, face to face or telephone interviews and online surveys. Each of these methods has its place in social research (Babbie, 2010). Given the purpose of this study and in particular limited time and resource availability, the most appropriate method for this research is a self-completion questionnaire.

Questionnaires are easy to administer. The cost of a self-completion questionnaire is lower than an interview. Self-completion questionnaires can be sent out in large quantities and this helps to ensure a sufficient response (Russell K Schutt, 2012). The

results of questionnaires can be easy to code, record, quantify and interpret by statistical analysis (Marshall, 2005). The results of the analysis can be used to compare with similar research or to test hypotheses.

One of the limitations of self-completion questionnaires can be a low response rate, compared to face-to-face interviews. There is no help for the respondents if they have difficulty in understanding a question and there is more likely to be unanswered questions (Russell K Schutt, 2012). Self-completion questionnaires are unable to get additional information, such as the observations made by interviewers (Babbie, 2010).

3.2.2 Target population, research location sampling method

This study used a population in Lanzhou as its target population. Lanzhou is the capital city of Gansu Province, northwest China. The Yellow river, the second largest river in China, runs through the city. According to the census in 2010, the population of Lanzhou reached 3,616,163 (China National Beareau of Statistics Various Years). The urban area covers 13,300 square kilometres (China National Beareau of Statistics Various Years). It is a centre of regional transportation, connecting areas further west with the eastern half of China by railway and telecommunication.

Figure 3.1 Geographic location of Lanzhou
Source: http://sedac.ciesin.columbia.edu/data/collection/cddc

A convenience sample was used in this study because of limited time (approximately one month) and resources (costs were born personally) for the project. Yet efforts were made to diversify the range of respondents. A panel of college (tertiary) students, family members (mainly parents) of a primary school and parents of high school students, and hospital staff were recruited through the researcher's social network. The data was collected by a self-completed questionnaire from respondents from 16 to 82 years old.

3.2.3 Questionnaire development

For this study, a survey questionnaire was derived from the questionnaire "A monitor on consumer confidence in food safety" developed by Janneke de Jorge (2008) and from a model developed by Glynn Tonsor, Ted Schroeder & Joost Penning ,2009. Based on the existing literature (Chapter2, section 2.3), the questionnaire was developed to allow the examination of the relationship between the dependent variable, consumer risk perception in the safety of dairy products and the four groups of independent variables: namely social-demographic

information, trust in stakeholders of the food industry, reliance on intrinsic and extrinsic attributes and personal experience, recall of unsafe food incidents and exposure to the media. In addition, there were food safety related issues which provide information that may affect the correlation between the dependent and independent variables.

The type of data collected was primary data. Two types of variables, ordinal and numerical were used. The detailed information of variables is listed in Table 3.1

Table 3.1 Detailed information about the variables

Broad category of variables	Groups	Variables name	Type of Question
Independent Variables		Consumer risk perception of dairy products in food safety	Scaled questions
Dependent Variables	Social-demographic information	Gender	Dichotomous question
		Monthly income	Multiple choice
		Education level	Multiple choice
		Family Structure	Multiple choice
	Consumer's level of reliance on extrinsic and intrinsic attributes of dairy products	Government inspection	Scaled questions
		Food safety assurance	Scaled questions
		Products ingredients	Scaled questions
		Best before date	Scaled questions
		Country of origin	Scaled questions
		Ladled organic/green/natural food	Scaled questions
		Place of purchase	Scaled questions
		Brand name	Scaled questions
		Price	Scaled questions
		Government inspection	Scaled questions
		Food safety assurance	Scaled questions
		Products ingredients	Scaled questions
		Best before date	Scaled questions
		Country of origin	Scaled questions
		Ladled organic/green/natural food	Scaled questions
		Place you buy it	Scaled questions
		Brand name	Scaled questions
		Taste	Scaled questions
		Smell	Scaled questions
		Appearance	Scaled questions
	Consumer trust in the stakeholder of dairy industry	Dairy farmer	Scaled questions
		Milk station	Scaled questions
		Processing company	Scaled questions
		Retailor	Scaled questions
		Government inspector	Scaled questions
		Academic Researcher	Scaled questions
	Exposure to media ,recall of the incident Personal experience with unsafe food	TV/Radio	Scaled questions
		Newspaper Magazine	Scaled questions
		Online social website	Scaled questions
		Online news	Scaled questions
		Family/Friend/Colleague	Scaled questions
		Personal experience with unsafe food	Dichotomous question
		Recall of food safety incident in past six months	Dichotomous question

3.2.4 Questionnaire format

The questionnaire consisted 28 questions (see Appendix A for details). The questionnaire consisted of three parts. The first part asked about social-demographic information and the media use of respondents. The second part consisted of questions regarding consumer risk perception in the general area of food safety, including potential food safety issues and with different food groups. The third part contained questions regarding consumer risk perception in dairy products, and factors that may impact on the risk perception.

The questionnaire contained various types of questions, which are shown in table 3.1. A cover letter accompanied the questionnaire to explain the purpose and nature of the study and encourage participation (see Appendix A for details). The cover letter and questionnaire were translated into Chinese (simplified) for the respondents (see Appendix B for details). Table 3.2 presents the information obtained and question numbers and variable type in the questionnaire.

Table 3.2 Variables, information, question types in questionnaire

Type of Variable	Information obtained	Question no.
Dependent Variables	Consumer risk perception in food safety of dairy products	Q14
Independent Variables	Trust in actors and regulators	Q18
Independent Variables	Reliance on extricate and intricate attributes of dairy products	Q15, Q16, Q17
Independent Variables	Use and exposure to media	Q8
Independent Variables	Experience and recall of unsafe food	Q20,21,22,23,24,25,26.27
Independent Variables	Social–demongraphic factors	Q1,2,3,4,5,6,7,9
Background information	Consumer risk perception in different food groups ,different dairy products groups and in dairy products from different countries	Q10,11, 12,13 ,19

3.2.5 Pre-testing procedure

Before conducting the survey in China, a pre-testing procedure was carried out to evaluate the validity and relevance of the questionnaire. After the questionnaire was translated into Chinese, 20 copies of questionnaire were distributed to Chinese students studying at Massey University, New Zealand. Comments on the content or layout of the questionnaire were encouraged. The process ensured the respondents understood the questions being asked and had the ability to answer them in an appropriate   manner. Based on the respondents' feedback, some ambiguities and wording translation problems were identified. Some minor modifications were made as a result of this process, such as giving an explanation or using less technical terms.

3.2.6 Survey administration

The questionnaires were handed out from the 26th September to 1st October, 2013 and were collected on the 18th and 19th of October 2013. The questionnaires were handed out by the researcher and local assistants. A total of 300 copies were handed out to college students who study at the Gansu Agricultural University in Lanzhou, China. Another 300 copies were handed out to the headmasters of a primary school and a high school. The students of the primary school and high school were asked to take the questionnaires back home to their parents. Another 200 copies were handed out by the researcher to the medical stuff and patients in a local hospital in Lanzhou. A total of 566 copies of the questionnaires were collected. The response rate was 70.8%.

 After the collection of the questionnaires, the completeness and consistency of the raw data was checked before data entry. Of the questionnaires collected, 35 copies of the questionnaires were found to be seriously incomplete and hence not useful for

analysis. After this process, the total number of valid questionnaires was 531. The characteristics of the sample respondents are displayed in Table 4.1.

3.3 Data analysis

SPSS version 21 was used to analyse the data. Microsoft Excel 2010 was used to draw charts which were used in the analysis and discussion. A cleaning process was performed to ensure the completeness and validity of data, which includes checking the data for logically inconsistencies, out of range values and treating missing data by assigning a neutral value. After the cleaning process, each variable was given a variable name and a more detailed label. A value was assigned to each variable according to the content of each question. Once all the data was entered, the data was checked for entry errors.

3.3.1 Frequencies

The first thing to be examined were the frequency distributions for each variable as well as measures of central tendency and variability. Some of the variables were recoded into new variables with fewer categories to help with interpretation (Healey, 2012).

3.3.2 Cross-tabulations/correlation

Cross tabulations were run between the dependent variable, which was the consumer risk perception in the safety of dairy products (Question No.14), and the independent variables which included the trust in industry actors and regulators (Question No.18), reliance on extrinsic and intrinsic attributes for dairy products (Question No.15,16,17), direct experience with unsafe food (Question No.21,25), exposure to the media (Question No.8) and social demographic information (Question No.3,4,5).

3.3.3 Factor analysis

Factor analysis was conducted for two purposes: the first purpose was to create a data set with relatively unrelated variables for the binary logistic regression by loading the variables that are highly related to each other into a smaller number of factors. The second purpose was to understand the underlying relationship between variables. The loading of the dependent variable onto the new factors was used to better understand the association between the dependent variable and independent variables. From the factor analysis, factor scores were used to create new variables for use in binary logistic regression[1].

3.3.4 Binary logistic regression

Logistic regression was used to examine the quantitative impact and the significance level of each independent variable against the dependent variable. It identifies the strength of each independent variable associated with the probability that the binary variable falls in a particular category (Cramer, 2003).

The empirical model for this is:

$$logit(p) = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + \ldots + b_k X_k$$

Binary Logistic regression gives each independent variable (social-demographic information, extrinsic and intrinsic attributes, trust in stakeholders in the dairy industry, media exposure, personal experience, recall of incidents) a coefficient which measures

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[1] Rotate conponent table in the output of SPSS was used in the results of factor analysis. The rotate method is varimax

its contribution to the variation in the dependent variables (consumer risk perception in the food safety of dairy products). The dependent variables are binary or dichotomous, which means they can only take one of two values: 0 or 1. Therefore the dependent variable (consumer risk perception in the food safety of dairy products) has been recoded into two groups: not safe (0) or safe (1). The coefficient is the probability (p) of belonging to one group rather than the other. Instead of using least-squares deviations criterion for the best fit, it uses a maximum likelihood method, maximizing the probability of getting observed results given the fitted regression coefficients result (Burns & A.Burns, 2008). The b coefficient stands for the slope value. The slope can be interpreted as the change in the average value of Y (consumer risk perception in the food safety of dairy products) from one unit change of X (social-demographic information, extrinsic and intrinsic attributes, trust in stakeholder in dairy industry, media exposure,personal experience) (Burns & A.Burns, 2008).

3.4 Research ethics

This research was conducted in accordance with" the Code of Ethical Conduct for Research, Teaching and Evaluations involving Human Participant" (Massey University). Peer review of the research proposal determined that this was a low risk project. A low risk notification for this research was submitted to the Human Ethics Committee of Massey University. Each participant was informed about this research: the objective, significance, benefits and potential risks to the participants, the rights for participants (including voluntary participation), confidentiality issues and how their rights will be protected. It was not expected that there would be any risk to the participants undertaking this research. The results from each participant were to be shared only with that person, while the final aggregate results of the research will be available to

the public. Agreements were signed by all participants to make sure that each participant was fully informed and consenting to this research.

3.5 Research limitations

There are several limitations to this study, mostly centred on the sample. A probability sample of the population of Lanzhou was not possible for the researcher, largely because of limited time and resources. The respondents were recruited through the researcher's social network. About half of the respondents were college students, and many of the others were parents of school-age children. The interpretation of all results must be read with these limitations in mind; a sample in one mid-size Chinese city, with a sample heavily comprised of tertiary age students and people with school age children.

CHAPTER 4 Data Analysis

4.1 Introduction

This chapter analyses the data using the methods reported in Chapter Three. Results from the frequencies, cross tabulations, correlations, factor analysis and binary logistic regression are presented and discussed. Variables that are significant to consumer risk perception of safety in dairy products are identified.

4.1.1 Descriptive statistics

The descriptive statistics were obtained using SPSS version 21.0. After the collection of the questionnaires, the completeness and consistency of the data were checked before entering the data into a spread-sheet. The total number of valid questionnaires was 531 representing a response rate of 70.6%.

Among all respondents of the survey, 55.4% were male and 44.6% were female. The percentage of male respondents was 5% higher than that of the population[2]. The sample of respondents was predominantly between 16 and 49 (96%). Respondents had a relatively high level of education, with 43.3% in tertiary education. The majority of respondents (80%) had a monthly income of less than ¥ 4000.

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[2]Figures refer to population on 1st November, 2010, the sixth national census of China (Nation Statistic Bureau, 2010)

Table 4.1 Characteristics of the sample

	Sample (%) N=531	Population* (%)
Gender		
Male	55.4%	51.15 %
Female	44.6%	48.85%
Age		
16-19	19.2%	
20-29	40.1%	
30-39	17.3%	78.09%
40-49	19.4%	
50-59	2.7%	
≥60	1.2%	8.77%
Education Level[3]		
Low	21.5%	no data available for the population
Medium	63.3%	
High	15.2%	
Income(￥/Per capita)		
≤2000	51.2%	no data available for the population
2001-4000	28.8%	
4001-6000	13.3%	
≥600	6.7%	

4.1.2 Overview of consumer risk perception of food safety in general food and dairy products

Of the total respondents, 17.3% had a substantial degree of confidence (categories 4+5) (Appendix A,Q10) in the general food safety situation in China, while many (30.6%) of the respondents perceived consuming dairy products as safe (categories 4+5) (Appendix A,Q14). Overall, the data suggest consumers surveyed in China were

[3] Education Level: Low (No formal schooling to high school), Medium (Poly technical school, junior college and Bachelor degree), High (Master degree and above)

generally worried about food safety, but it appears that there was somewhat less concern with dairy products than there was food in general (see Table 4.2).

Table 4.2 Summary of the confidence level in the safety of food in general and dairy products.

In general how confident are you in the safety of food you consume?		I consider consuming dairy products	
1 Not Confident at all	12.9%	1Not safe at all	9.1%
2	23.7%	2	20.5%
3	46%	3	39.8%
4	14.6%	4	22.3%
5 Very Confident	2.8%	5 Very Safe	8.3%
Total (N=100%)	(528)	Total (N=100%)	(512)

Table 4.3 portrays consumer risk perception for different food groups. The type of food with the least perceived food safety risk (having the most confidence) was fresh fruit and vegetables (72.9%, somewhat and very much confidence). Processed meat had the highest perceived food safety risk (69.3%, not at all or a little confidence) (Table 4.2). More than half of respondents had a low level of confidence in dairy products (51.6% not at all or a little confidence). It is clear that respondents perceived more risk (less confidence) in processed food than fresh food. Meat products were considered to carry more risk than any other food group.

Table 4.3 Summary of the confidence level in food safety in different food groups

How much confidence do you have in the safety of each of the following kinds of foods?					
	Processed meat	Fresh meat	Cooking oil	Dairy products	Fresh vegetables and Fruits
Not at all	10.8%	6.9%	17.5%	7.8%	2.5%
A little	58.5%	51.4%	38.3%	43.8%	24.4%
Somewhat	26.8%	36.2%	36.4%	41.8%	52.1%
Very Much	3.9%	5.4%	7.8%	7.0%	20.8%
Total(N =100%)	(511)	(519)	(514)	(512)	(520)
(N, Don't know)	(17)	(12)	(17)	(19)	(11)

Table 4.4 shows the degree of confidence that respondents have in the safety of different dairy products. The questionnaire asked about six groups of dairy products and the responses fell into two broad clusters. Baby formula, flavoured milk and ice cream were in the "high risk" category, with more than 60% of the respondents having little or no confidence in the safety of these three dairy foods. This compares with yogurt, fresh milk and UHT milk with a much lower risk perception, where less than 32% of respondents had little or no confidence in the safety of these three products.

Table 4.4 Summary of the confidence level of food safety in different types of dairy products

How much confidence do you have in the safety of each of the following kinds of dairy products?						
	Baby Formula	Flavoured Milk	Ice Cream	Yogurt	Fresh milk	UHT milk
Not at all	24.2%	15.2%	13%	2.1%	3.3%	1.7%
A little	52.4%	51.8%	46.3%	29.0%	24.9%	21.7%
Somewhat	18.8%	29.6%	30.5%	51.5%	51.5%	52.7%
Very Much	4.6%	3.4%	10.2%	17.4%	17.4%	23.8%
Total(N=100%)	(500)	(494)	(501)	(518)	(515)	(516)
(N, Don't know)	(28)	(37)	(28)	(11)	(13)	(13)
	"High risk" category			"Low risk" category		

The product perceived as having the highest risk was infant formula (76.6% of respondents with little or no confidence). The dairy product perceived as having the lowest risk was UHT milk (23.4 with little or no confidence). It seems clear that dairy foods with a higher the degree of processing have more perceived safety risk.

Table 4.5 Summary of concern over different potential food safety issues

Listed below are various issues that some people feel are related to food safety. How concerned are you about each of these issues?

	Overuse/ Misuse of food additives	Residue of hormones and antibiotics in meat	Animal disease (mad cow, avian flu etc.)	Bacteria and virus contamination	Residue of pesticides and fertilizer in fruit and vegetables	Genetically Modified Food
Not at all	1.0%	1.4%	1.9%	1.7%	1.5%	9.2%
A little	5.7%	10.6%	13.6%	16.5%	19.3%	31.3%
Somewhat	38.9%	37.1%	29.5%	33.1%	41.0%	30.1%
Very Much	54.4%	51.0%	55%	48.7%	38.1%	29.3%
Total (N=100%)	(524)	(518)	(515)	(520)	(522)	(498)
(N, Don't know)	(6)	(12)	(15)	(9)	(9)	(33)

Table 4.5 summarises concerns about different potential food safety issues. The level of concern ("somewhat" and "very much") is generally over 60%, suggesting a low degree of general consumer confidence in food safety in China. The highest level of concern was for "misuse and over use of food additives" (93.3%). This could help explain what was found in Table 4.4 where consumers perceive more risk with dairy products that are more highly processed. The next highest level was hormones and antibiotics in meat (88.1%), followed by animal disease (84.4%), suggesting a higher concern about the safety of animal products than other food groups. Interestingly, the food safety issue with the lowest level of concern is the risk in GMO food, although it is still high at about 60%.
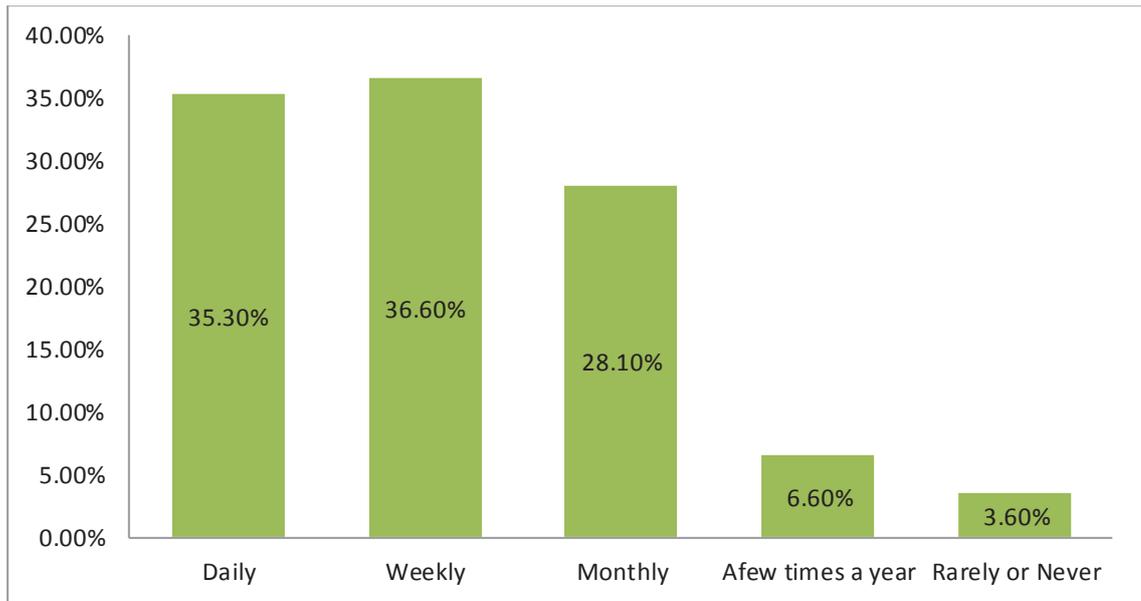
Figure 4.1 The frequency of consuming dairy products

Figure 4.1 shows that most respondents were frequent consumers of dairy products, with 72% of respondents consuming dairy products at least weekly. Figure 4.2 gives an overview of consumer reliance on the intrinsic and extrinsic attributes of dairy products. The percentage in the figure is a combination of "somewhat" and "a lot. Among extrinsic attributes, taste (85.3%) and smell (82%) were the most used to judge the safety of dairy products rather than appearance (52.4%). Among the intrinsic attributes, respondents depended more on the best before date (88.2%), third party food safety assurance (75.8%), and brand (73.5%)to judge the safety of dairy products than on government inspection (67%), place of purchase (62.1%), price (59%), ingredients (56.8%) and country of origin (51.4%). The best before date, smell and taste were the three most used attributes in judging the safety of dairy products.

Consumer reliance on intrinsic and extrinsic attributes of dairy products

Attribute	Percentage
Best Before date	88.20%
Taste	85.30%
Smell	82%
Green/organic/natural food lable	79.70%
Food safety assurance system	75.80%
Brand	73.50%
Government inspection	67%
Purchase place	62.10%
Price level	58.90%
Ingredients	56.80%
Looks of dairy products	52.40%
Country of origin	51.40%
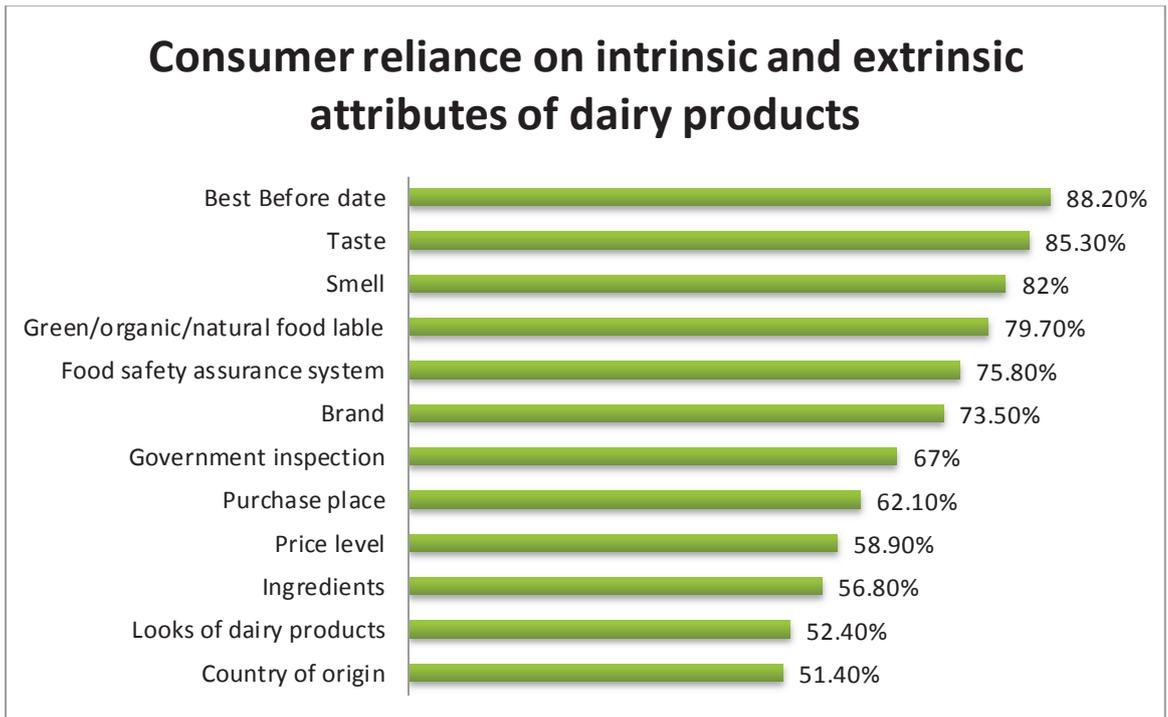
Figure 4.2 Consumer reliance on intrinsic and extrinsic attributes of dairy products (somewhat and a lot)

Consumer trust in the control stakeholder have over safety in the dairy industry

Stakeholder	Percentage
Milk station	93.10%
Government regulator	76.30%
Processing company	74.60%
Dairy farmers	72.30%
Academic researcher	67.20%
Retailer	44.30%
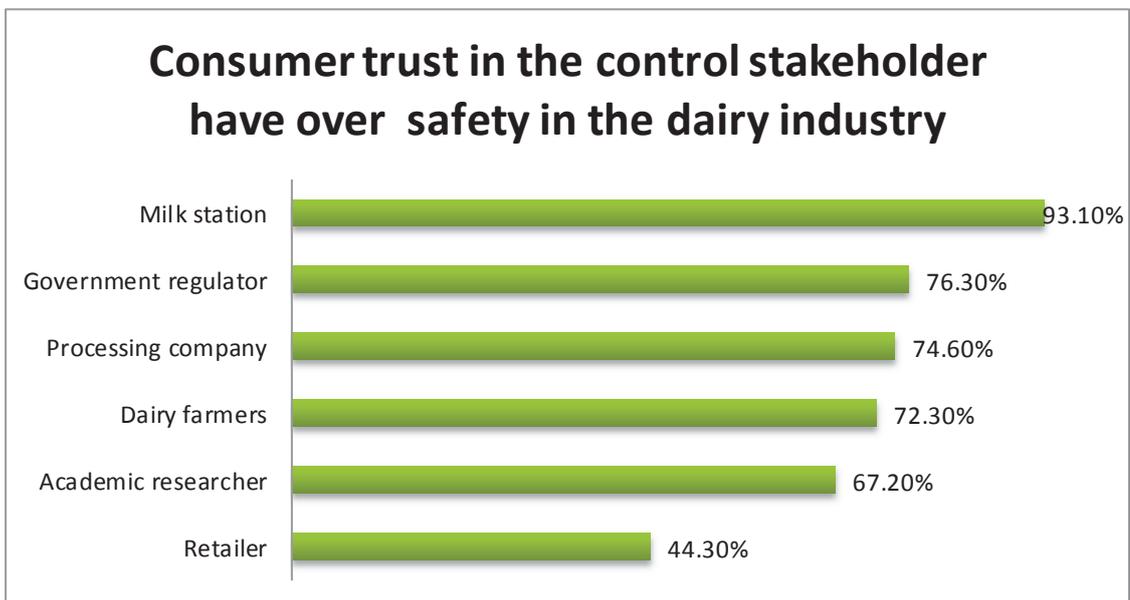
Figure 4.3 Consumer trust in the control stakeholders have over safety in the dairy industry (somewhat and a lot)

The percentages in Figure 4.3 are a combination of responses that were "somewhat" and "a lot", showing that 93.1% of the respondents had the most trust in the control

milk stations have over the safety of dairy products. Government regulators (76.3%), dairy processing companies (74.6%) and dairy farmers (72.3%) were considered to have a similar degree of control over the safety of dairy products. Academic researchers (67.2%) and retailers (44.3%) had lower levels of trust in controlling safety in dairy products.

More than 47% of respondents indicated that they or a close family member have had a direct experience with unsafe food products (Figure 4.4). Among them, 20% of respondents indicated that the incidents were related to dairy products. A total of 24% of the respondents could recall a food safety incident within the past six months (Figure 4.5).

Figure 4.4 Consumer direct experience with unsafe food

Recall of food safety incident in past 6 months

Yes N=125
No N= 390
Missing No.=16

Figure 4.5 Recollection of food safety incident in past 6 months

These are relatively substantial proportions of people with a personal experience of unsafe food, and/or a recall of recent food safety incidents. These can raise a person's sensitivity about food safety and contribute to a high overall level of concern over food safety.

4.2 Cross tabulation /correlation and association

Cross tabulation/correlation was undertaken to examine the relationship between the dependent variable, consumer risk perception of food safety in dairy products (question 14), and the four groups of independent variables: (1) social-demographic information, (2) extrinsic and intrinsic information on dairy products, (3) consumer trust in actors and regulators of the dairy industry and (4) personal experience, recall of food safety incidents and media exposure. An ordinal measure of association, Gamma, was used to assess the strength of the association between the independent and dependent variables. The value of Gamma varies from -1 to 0 to +1. The value of Gamma is greater (closer to 1), the more that same-ordered pairs predominate over reverse-ordered pairs, and *vice versa* (Russell K. Schutt & Engel, 2012), indicating the

relative strength of the association. Also examined, was the level of significance (the P value) of each association. Using the results from SPSS, the degree of association between the independent variable and dependent variables were grouped into 3 levels: relatively high, medium and low. The associations were also grouped as to whether they were positive or negative according to the Gamma values.

In the questionnaire, the consumer risk perception of safety in dairy products was measured by asking the respondents to react to "I consider consuming dairy products: Not safe at all 1 2 3 4 5 Very safe" (See Appendix B, question no.14). Thus all the correlations in following discussion need to be interpreted with this structure in mind. A negative correlation with an independent variable suggests consumer risk perception of safety in dairy products is high (less safe), a positive correlation with an independent variable shows a low consumer risk perception of safety in dairy products (more safe).

4.2.1 The impact of social-demographic characteristics

The characteristics of respondents in terms of different social-demographic variables are shown in Table 4.6. The percentage of male respondents (55.4%) was slightly higher than female respondents (44.6%) . Most respondents had a monthly income of less than ￥4000 (US$ 640) (80%). The education level of respondents is was primarily in tertiary education (63.3%). A high proportion (41.6%) of respondents were married and had children. This likely reflects the nature of the sample used in Lanzhou.

Table 4.6 Profile of respondents with different social-demographic characterist

Social demographic information	Categories	% of total respondents
Gender	Female	44.6% (233)
	Male	55.4% (291)
Monthly income (¥)	≤2000	51.2% (245)
	2001-4000	28.8% (169)
	4001-6000	13.3% (68)
	≥6000	6.7% (35)
Education	High school graduate	21.5% (113)
Level	Tertiary Education	63.3% (331)
	Master degree and above	15.2% (79)
Family structure	In relationship/Single/ widowed/Separated	55.1% (289)
	Married without children	3.2% (17)
	Married with children below 18	30.4% (158)
	Married with children Above 18	11.2% (59)

A Gamma and significance level were calculated for the cross-tabulations/correlations between all pairs of social-demographic variables and the consumer risk perception of safety in dairy products. There was a moderate correlation between education level and the risk perception of safety in dairy products that was significant (P=0.009). See Table 4.7. The Gamma value for the education level was -0.195, indicating that there was a negative correlation between education level and the risk perception of safety in dairy products. Respondents who had higher education levels were somewhat more likely to perceive consuming dairy products as risky while respondents who had less education were somewhat more likely to perceive consuming dairy products as less risky.

Monthly income was also moderately correlated with consumer risk perception of safety in dairy products and was significant. The Gamma value of 0.241 indicates a reasonable correlation between the two variables. Respondents who had a high monthly income were more likely to perceive consuming dairy products as of low risk,

while respondents who had a low monthly income were more likely to perceive a high risk in consuming dairy products, contrary to common belief that the education level tends to be positively correlated to monthly income (Adu-Nyako & Thompson, 1999; Baker, 2003; Tonsor, et al., 2009). A possible explanation is the sample used in this survey. Half of the respondents were college students, with little or no income. This could be the reason that results regarding monthly income and education level were going in different directions. Family structure was significantly correlated with the consumer risk perception of safety in dairy products (Gamma =0.330). Consumers who were married with children under 18 years old tended to perceive less risk in consuming dairy products, compared to consumers not in this category. Gender made very little difference in the consumer risk perception of safety in dairy products, with a low correlation (Gamma=0.061) and p-value of 0.35.

Table 4.7 Association between consumer risk perception in the safety of dairy products and social demographic variables

Social demographic Information	Gamma Value	P
Gender	0.061	0.35
Monthly income	0.241	0.00
Education level	-0.195	0.009
Family structure	0.330	0.00

Note: This is a summary of four sets of cross-tabulations/correlations analysis

4.2.2 The impact of the extrinsic and intrinsic attributes of dairy products

Among the three extrinsic attributes, taste, smell and appearance of dairy products, taste and smell had a very modest correlation with consumer risk perception in safety of dairy products. See Table 4.8. For the appearance of dairy products, there was a more substantial correlation with consumer risk perception in the safety of dairy products. The Gamma value was negative, -0.155, for the appearance of dairy

products. It suggests that the more consumers rely on the appearance of dairy products, the more risk they perceive from consuming dairy products.

Government inspection (Gamma value 0.203), food safety assurance (Gamma value, 0.255) and organic/green/natural food labels (Gamma value, 0.225) all have more substantial Gamma values with the consumer perception of the safety of dairy products, with all three being significant (see Table 4.8). The more consumers rely on these three intrinsic attributes the less they consider consuming dairy products as risky.

The Gamma value for the variables "place of purchase" and "best before date" had moderate correlations (-0.143 and 0.116) (Table 4.8). For ingredients, country of origin, brand and price, the correlations were very low.

Table 4.8 Association between consumer risk perception in the safety of dairy products and extrinsic and intrinsic attributes of dairy products

Extrinsic and Intrinsic attributes	Categories	Gamma Value	P
Extrinsic attributes	Taste of dairy products	0.098	0.089
	Smell of dairy products	0.013	0.824
	Look of dairy products	-0.155	0.003
Intrinsic attributes	Government inspection	0.203	0.00
	Food safety assurance	0.255	0.00
	organic/green/ natural food label	0.225	0.00
	Place of purchase	-0.143	0.011
	Best Before date	0.118	0.055
	Product Ingredients	0.046	0.380
	Country of origin	-0.057	0.306
	Brand name	0.013	0.825
	Price	-0.065	0.245

4.2.3 The impact of trust in actors and regulators in the dairy industry

Among all of the stakeholders in the dairy industry, the processing company had the highest correlation with the consumer perception of risk in the safety of dairy products.

See Table 4.9. Gamma was -0.173 and significant, indicating a moderate negative correlation between the two variables. The more consumers consider the processing company has control over food safety, the more risk they perceive from consuming dairy products. The next highest correlation (Gamma = -0.113, p = .044) was for the perceived control retailers have over the safety of dairy products. The correlations for the dairy farmer, and the milk station were lower (-0.102 and -0.101) and not significant (P=0.550 and 0.119). All the Gamma values for the actors in dairy industry were negative, which suggests a low level of trust by the consumer towards the actors in the dairy industry. The distrust was stronger towards the latter stages of the dairy supply chain, namely the processing company and retailer, rather than the dairy farmer and milk station.

For the degree of perceived control by government regulators and academic researchers there was a rather low degree of correlation with the consumer perception of safety in dairy products (0.037 and -0.056, P=0.479 and 0.300).

Table 4.9 Association between consumer risk perception in the safety of dairy products and degree of control of actors and regulators in the dairy industry

Trust in stakeholders in dairy industry	Categories	Gamma Value	P
Actors	Dairy farmer	-0.102	0.550
	Milk station/Middle man	-0.101	0.119
	Processing company	-0.173	0.001
	Retailer	-0.113	0.044
Regulators and Researchers	Government Regulators	0.037	0.497
	Academic researchers	-0.056	0.300

4.2.4 The impact of media exposure, direct experience and recall of food safety
incidents

Almost half of those surveyed have had a personal experience of being sick from unsafe food. Almost one-quarter could recall food safety incidents in the past six months. See Table 4.10. The correlation (Table 4.11) for personal experience was substantial (Gamma = -0.209, P =0.001) with consumer risk perception of dairy products. This suggests that consumers who have direct experience with unsafe food tend to perceive more risk in consuming dairy products. The correlation between the recall of incidents in which food safety was compromised and the perception of the safety of dairy products was lower (-.085) and not significant (P=.209), suggesting that the recall of food safety incidents is of less importance.

Consumer exposure to traditional media (newspapers/magazines, TV /radio) did not have a significant correlation with the risk perception of the safety of dairy products. See Table 4.12. The emerging media like online news and online social websites had more substantial correlations with the consumer perception of food safety in dairy products. The Gamma for online news was 0.118 (P=0.036) while for online social websites Gamma was -0.207 (P=0.000). It appears that emerging media have more impact on the consumer perception of safety in dairy products, although this may related to the nature of the sample. Online news was positively associated with the perception of the safety of dairy products, which means the more consumers accessed online news, the less risk they perceived with the consumption of dairy products. Online social websites was negatively correlated with the consumer perception of the safety of dairy products, which means the more consumers accessed the information

from online social websites the more risk they perceived from consuming dairy products.

Personal social networks like family, friends and colleagues were moderately correlated with the consumer perception of safety in dairy products (-.161, P=.02). The more consumers are exposed to information from their social network, the more risk they perceive from consuming dairy products as shown in Table 4.12.

Table 4.10 Number and percentage of respondents with different personal experience and recall of unsafe food incidents

Personal experience/Recall of incidents	Categories	% of total respondents
Personal experience With unsafe food	Yes	47.2% (248)
	No	52.8%(277)
Recall of food safety incidents	Yes	24.4%(125)
	No	75.6%(388)

Table 4.11 Association between consumer risk perception in food safety of dairy products and direct experience and recall of food safety incidents

Personal experience/Recall of incidents	Gamma Value	P
Personal experience with unsafe food	-0.209	0.001
Recall of food safety incidents	-0.085	0.209

Table 4.12 Association between consumer risk perception in food safety of dairy products and different categories of media exposure

Media exposure	Categories	Gamma Value	P
	Newspaper/Magazine	-0.08	0.83
	TV/Radio	-0.017	0.739
	Online news	0.118	0.036
	Online social website	-0.207	0.00
	Family/Friends/Colleague	-0.161	0.02

4.2.5 Summary

In this section, the summarised results from the relationships between the dependent variable (perception of safety of dairy products) and the four groups of independent

variables, are examined. The independent variables can be divided into three groups according to the their Gamma value with the dependent variable: a relatively high level of association (a Gamma value of 0.200 or higher), a medium level of association (a Gamma value between 0.100 and 0.199) and a relatively low level of association (a Gamma values less than 0.100) (See table 4.13).

Table 4.13 The different levels of association between independent variable and dependent variables

	Independent variables	Gamma value	Group of undependent variables
High (|Gamma|≥ 0.200)			
	Family Structure	0.330	Social-demographic Information
	Food safety assurance	0.255	Intrinsic attributes
	Monthly income	0.241	Social-demographic Information
	Organic/Green/Natural food label	0.225	Intrinsic attributes
	Direct Experience	-0.209	Consumer experience
	Use of online social website	0.207	Media Exposure
	Government Inspection	0.203	Intrinsic attributes
	Education	0.195	Social-demographic Information
	The control of processing company	-0.173	Trust in actors and regulators of dairy industry
Medium (0.100≥|Gamma|≥0.199)	Family /Friends/Colleague	-0.161	Media exposure
	Appearance of diary products	-0.155	Extrinsic attributes
	Purchase place	-0.143	Intrinsic attributes
	Control of milk station have over safety of dairy products	0.119	Trust in actors and regulators of dairy industry
	Best before date	0.118	Intrinsic attributes
	Use of online news	0.118	Media exposure
	Control of retailors have over safety of dairy products	-0.113	Trust in actors and regulators of dairy industry
	Control of milk station have over safety of dairy farmers	-0.102	Trust in actors and regulators of dairy industry
	Gender	0.061	Social-demographic Information
Low (|Gamma| less than 0.100)	Taste	0.098	Extrinsic attributes
	Newspaper/Magazine	0.088	Media exposure
	Recall of food safety incidents	-0.085	Recall of incidents
	Price	-0.065	Intrinsic attributes
	Country of origin	-0.057	Extrinsic attributes
	Control of academic researcher have over safety of dairy products	-0.054	Trust in actors and regulators of dairy industry
	Product ingredients	-0.046	Intrinsic attributes
	Control of government regulators have over safety of dairy products	-0.037	Trust in actors and regulators of dairy industry
	Smell	0.013	Intrinsic attributes
	Brand name	0.013	Extrinsic attributes
	TV/Radio	-0.017	Media exposure

4.3 Factor analysis

This section discusses the factor analyses that were conducted among the independent variables and between the dependent variable (consumer risk perception of safety of dairy products) and the independent variables. The first purpose of the factor analyses was to see how the independent variables within several conceptual groups clustered together, or otherwise, allowing the creation of a set of composite variables (factors), each of which contained clusters of highly related variables that were relatively unrelated to the other clusters of variables. These factors were to be used as independent variables in the bivariate logistic regression. The second purpose of the factor analyses provides another way of examining the underlying relationships between the independent variables and the dependent variable. This was achieved by taking the variables in each of the sets of created factors, adding in the dependent variable, and rerunning the factor analysis to see how the dependent variable loaded on each factor. Twenty nine variables were divided into four groups based on the established conceptual frameworks.

Two factors emerged from the four variables in the conceptual framework of social-demographic information submitted for factor analysis (see Table 4.14). The two factors explained 68.09% of the variation in the data. Four factors were extracted from the twelve variables in the conceptual framework of extrinsic and intrinsic attributes. These four factors explained 55.56% of the variance (see Table 4.15). Two factors were extracted from six variables in the conceptual framework of trust in the control of actors and regulators of dairy industry (see Table 4.16). The two factors explained 54.2% of the variance. Three factors were extracted from seven variables in the conceptual

framework of media exposure, personal experience with unsafe food, and recall of food incidents (see Table 4.17). These three factors explained 62.42% of the variance.

4.3.1 Factor interpretation

Each factor was subsequently named according to the construct they represented. The nine factors were named: (1) SD1 (education level, monthly income, family structure), SD2 (Gender); (2) RA1 (Reliance on place of purchase/brand name/ country of origin/ product ingredients/ price); RA2 (Reliance on products food safety assurance/government inspection/labeled organic, green, natural food); RA3 (Reliance on taste/smell/appearance of dairy products); RA4 (Reliance on best before date); (3) TC1 (Trust in the control of dairy farmer/milk station/processing company/retailor); TC2 (Trust in government inspection/academic researcher); (4) M/E1 (use of online social website/use of online news/information from family, friends and colleague) M/E2 (use of newspaper and magazine/use of TV and radio) M/E3 (direct experience with unsafe food/recall of food safety incidents in last 6 months). SD stands for social-demographic information. RA stands for reliance on attributes. TC stands for trust in the control. M/E stands for media and experience.

4.3.2 Factor analysis of demographic information and dependent variable

The loading of the dependent variable on SD1 (family structure, income, education) was larger than its loading on SD2 (gender), which suggests that factor SD1 has a more notable relationship with the dependent variable than factor SD2. The loading of the dependent variable on either factor was less than 0.5, which suggests the relationship with the consumer perception of safety in dairy products is moderate at best (see Table4.14).

Table 4.14 Result of factor analysis of social-demographic information and with the dependent variable added in

Conceptual framework	Factor components	
Social demographic information	SD1 (family structure, income, education)	SD2 (gender)
Family structure	*0.890*	-0.059
Monthly Income	*0.795*	-0.134
Education level	*-0.412*	-0.303
Gender	-.0132	*0.886*
Variance explained	42.80%	25.29%
Loading of the dependent variable on factors SD1 and SD2	0.470	0.368

4.3.3 Factor analysis of intrinsic and extrinsic attributes and dependent variables

Four factors resulted from the analysis of extrinsic and intrinsic attribute variables. Government inspection for food safety, food safety assurances and organic/green/natural food labels loaded highly onto one factor RA2, (Table 4.15). The dependent variable had the highest loading, by far, on RA2, suggesting more of a relationship with these three variables.

The three extrinsic attributes (appearance of dairy products, smell of dairy products and taste of dairy products) were loaded highly on factor RA1, suggesting that they are highly correlated with each other. The dependent variable did not have a high loading on RA 3, which suggests intrinsic attributes have a weak association with the dependent variable .

The best before date by itself loaded highly onto factor RA4. The dependent variable did not load highly onto this factor. The best before date did not show a strong correlation with the dependent variable. The factor RA2 has Price, purchase place, brand, country of origin and product ingredients loading highly, The dependent variable had a relatively modest loading on it of -0.133 (see Table 4.15).

Table 4.15 Result of factor analysis between extrinsic and intrinsic attributes and loading of the dependent variable on the factors

Conceptual framwork	Factor components			
	RA 1 Reliance on extrinsic attributes	RA 2 Reliance on third party quality assurance	RA3 Reliance on intrinsic attributes	RA4 Reliance on best before date
Reliance: place of purchase	0.129	-0.042	*0.716*	-0.081
Reliance: brand name	-0.005	0.086	*0.650*	0.116
Reliance: country of origin	-0.085	0.299	*0.612*	0.057
Reliance: price	0.194	-0.228	*0.572*	0.350
Reliance: product ingredients	-0.052	0.413	*0.469*	0.305
Reliance: product food safety assurance (e.g. QS ISO)	0.151	*0.780*	0.047	0.157
Reliance: government inspection	0.161	*0.690*	-0.020	0.066
Reliance: Ladled organic/green/natural food	-0.002	*0.518*	0.429	-0.367
Reliance: tastes of dairy products	*0.772*	0.150	-0.022	0.070
Reliance: smells of dairy products	*0.770*	0.156	-0.009	0.020
Reliance: Appearance of dairy products	*0.497*	-0.059	0.403	-0.097
Reliance: best before date	0.017	0.208	0.138	*0.840*
Variance explained	10.8%	12.7%	23.6%	8.46%
Loading of factor RA1,RA2,RA3and RA4 on dependent variable (I consider consuming dairy products is risky)	-0.090	0.644	-0.133	0.065

4.3.4 Factor analysis of stakeholders in the dairy industry and dependent variable

For the group of independent variables including the trust in the control of stakeholders in the dairy industry, the variables loaded into two factors. TC1 has Trust in control from a dairy farmer / processing company / milk station / retailer loading highly, while TC2 sees trust in control from government regulators and from academic researchers loading highly (Table 4.16). The dependent variable had a moderate loading on TC1 and a very low loading on TC2.

Table 4.16 Result of factor analysis of consumer trust in stakeholders in dairy industry with dependent variable added in

Conceptual framework	Factor components	
	TC1 Trust in the control of actors of dairy industry	TC2 Trust in the control of regulators and researchers of dairy industry
Trust: dairy farmer	*0.768*	-.0.085
Trust: processing company	*0.752*	0.110
Trust: milk station	*0.524*	0.418
Trust: retailors	*0.515*	0.125
Trust: government regulators	0.080	*0.837*
Trust: academic research	0.067	*0.798*
Variance explained	34.24%	19.97%
Loading of the dependent variable on factors TC1 and TC2	-0.383	-0.024

4.3.5 Media exposure, personal experience and recall of incidents and dependent variable

The factor analysis of media exposure, experience with unsafe food,and recall of food incidents produced three factors: M/E1 with the use of online social website, online news and family /friend /colleagues loading highly; M/E2 with use of TV/Radio and the use of newspaper and magazine loading highly and M/E3 with personal experience and recall of food safety incidents having high loadings. M/E1 explained the most variance and the dependent variable had a moderate loading (-0.327). The loading of the dependent variable on M/E2 was very low. The dependent variable had the highest loading on M/E 3 (-0.555), which indicates that personal experience with unsafe food and the recall of a food safety incident were of more importance in relation to consumer risk perception of safety of dairy products (see Table 4.17).

Table 4.17 Factor analysis of consumer media exposure, personal experience with unsafe food, recall of food safety incidents and with the dependent variable added in.

Conceptual Framework	Factor Component		
	M/E1 Use of Internet Media and social network	M/E2 Use of traditional media	M/E 3 Personal Experience and recall of food safety incidence
Use of online social website	*0.869*	-0.118	0.090
Use of online News	*0.849*	0.149	0.008
Information from Family/Friends/Colleague	*0.474*	0.427	0.066
Use of Newspaper/Magazine	0.011	*0.799*	0.040
Use of TV/Radio	0.059	*0.778*	0.025
Personal Experience with unsafe food	0.050	-0.069	*0.777*
Recall of food safety incidents	0.046	0.141	*0.697*
Variance explained	28.48%	18.97%	14.97%
Loading of the dependent variable on factors M/E1,M/E2 and M/E3	-0.**327**	-0.**075**	-0.**555**

4.3.6 Summary

By using factor analysis, new factors (composite variables) were created. The new factors are each comprised of variables that are highly correlated, suggesting they share common underlying traits. The dependent variable was included in a series of factor analyses for each group of variables to see which of the created factors of independent variables were most related to the dependent variable. This can be seen by examining the loading of the dependent variable on each factor. It can be concluded from the above analysis that a high loading of the dependent variable on particular factors suggests a substantial association between the dependent variable and the independent variables that comprise the factor. Among demographic variables the factor representing family structure, monthly income and education level had a more substantial relationship with the dependent variable than did the factor representing gender. In the conceptual framework of extrinsic and intrinsic attributes the factor representing government inspection, food safety assurance and green

/organic/natural food labels had a stronger association with the dependent variable than any of the other factors representing intrinsic and extrinsic attributes. In the group that included trust in the stakeholders in the dairy industry, neither of the factors representing these independent variables indicated a particularly strong relationship with the dependent variable. Note, however, that the factor (TC1) with trust in dairy farmers, the processing company, the milk station and the retailer was substantially more important to the dependent variable, than the factor with trust in government regulators and researchers. In the group that included media exposure, personal experience with unsafe food and recall of incidents the loading of the dependent variable on the factor (M/E3) with personal experience and recall of food safety incidents was the most substantial, more so than the loading on M/E1 (online sources) or especially M/E2 (traditional media) (see Table 4.18).

Table 4.18 Summary of factors with the highest loading results of factor analysis

Groups	Variables	Factors	Loading of dependent variable on the factor
Social-demographic information	Monthly income	SD1	0.470
	Family structure		
	Education level		
Reliance on extrinsic and intrinsic attributes	government inspection	RA2	0.644
	food safety assurance		
	green /organic/natural food label		
Trust in control of stakeholder in dairy industry	Processing company, dairy farmer, retailor, milke station	TC1	-0.383
media use, personal experience and recall of incidents	Personal experience and recall of incidents	M/E3	-0.555

4.4 Results from the binary logistic regression

Binary Logistic Regression was used to examine the impact of four conceptual groups of variables: (1) the social-demographic information of respondents, (2) consumer reliance on extrinsic and intrinsic attributes, (3) trust in the control of stakeholders over food safety in the dairy industry, (4) media exposure, personal experience with unsafe food and recall of food safety incidents. A dichotomous dependent variable takes a value of 0 when the respondents consider consuming dairy products is not safe all, not safe or neither and 1 when the respondents consider consuming dairy products as safe or very safe.

The outliers were examined and removed from the analysis to reduce the effects of their influence. The Pearson correlation matrix was inspected for the correlations between the independent variables. No correlations exceeded 0.90. As a result, the assumption of multi-collinearity was satisfied.

To conduct the binary logistic regression, factors were created by conducting three different factor analyses with three conceptual groups of variables according to their underlying traits. Factor scores were used to create new variables for the binary logistic regression. Nine factors were extracted from the three groups of independent variables: (1) consumer reliance on extrinsic and intrinsic attributes, (2) trust in the control of stakeholders over food safety in dairy industry, (3) media exposure, personal experience with unsafe food and recall of food safety incidents (Table 4.19). Note that the social-demographic variables were used in the regression as separate variables, rather than as composite variables based on factors.

Table 4.19 List of variables for the binary logistic regression

Variables	Description	
Dependent variable		
Consumer risk perception of food safety in dairy products	Y=1, the respondents consider consuming dairy products as safe or very safe	
	Y=0, the respondents consider consuming dairy products not safe all, not safe or neither	
Independent variables		
Social demographic information	Monthly income	
	Family Structure	
	Education level	
	Gender	
Reliance on Extrinsic and Intrinsic attributes of dairy products	RA 1	Reliance on extrinsic attributes
	RA 2	Reliance on third party quality assurance
	RA 3	Reliance on intrinsic attributes
	RA 4	Reliance on best before date
Trust in the control of stakeholder in dairy industry	TC 1	Trust in actors of dairy industry
	TC 2	Trust in regulators and researcher of dairy industry
Media Exposure **Personal Experience and recall of food safety incidence**	M/E 1	Use of internet media
	M/E 2	Use of traditional media
	M/E 3	Personal Experience and recall of food safety incidence

The outliers were examined and removed from the analysis to reduce the effects of their influence. The Pearson correlation matrix was inspected for the correlations between the independent variables. No correlations exceeded 0.90. As a result, the assumption of multi-collinearity was satisfied.

To conduct a binary logistic regression, factors were created by conducting three different factor analyses with the three groups of variables according to their underlying traits. Factor scores were used to create new variables for the binary logistic regression. Nine factors were extracted from three groups of independent variables: (1) consumer reliance on extrinsic and intrinsic attributes, (2) trust in the

control of stakeholders over food safety in dairy industry, (3) media exposure, personal experience and recall of food safety incidents.

The results from the Omnibus Test of Model Coefficients was used to suggest that the full model significantly increased the ability to predict the risk perception of respondents, compared to a model with an intercept only, $\chi2(13,N=531)=63.33$, $p<0.000$. The model is capable of correctly classifying 91.1% of those who consider consuming dairy products as very safe, safe and neither safe or not safe and 32.0% of those who consider consuming dairy products as very safe, for an overall correct rate of 72.7%. The p-value of the Homers and Lemes-how Test was 0.459 and indicated that it was non-significant. Hence, the model fits the data well.

Table 4.20 lists the Binary Logistic Regression coefficients, p-values, and odds ratios for each of the independent variables. Family structure, RA2 (Reliance on third party quality assurance) and RA3 (Reliance on intrinsic attributes) had significant partial effects ($p<0.05$). The odds ratio for "Family structure" indicated that when keeping all other independent variables constant, a respondent with children under 18 years old is 5.13 times more likely to consider consuming dairy products as safe compared to the respondents with children above 18 years old or having no children. The odds ratio for RA3"Reliance on intrinsic attributes" indicates that that when keeping all other independent variables constant, a respondent who relies on intrinsic attributes is 1.3 times more likely to consider consuming dairy products as not risky than respondents that do not rely on intrinsic attributes. The coefficient B for RA2"Reliance on third party quality assurance" was negative. Inverting the odds ratio for "Reliance on third party quality assurance" suggested that the odds of respondents considering the

consumption of dairy products as risky was 0.73 times higher than for the respondents who rely on third party quality assurance.

RA1 (reliance on extrinsic attributes), M/E 2 (use of traditional media), M/E3 (personal experience with unsafe food and recall of food safety incidents in the past six months) show a moderate effect with the dependent variable (P values between 0.100 and 0.204).

The odds ratio for RA 1 (reliance on extrinsic attributes) indicates that when keeping all other independent variables constant, the odds of respondents considering consumption of dairy products as risky was 0.84 times higher for those who rely on extrinsic attributes of dairy products. The odds ratio for M/E 2 (Use of traditional media) suggests that the odds of considering consuming dairy products as risky is 1.179 times greater for respondents exposed to traditional media than those who were not. The odds ratio for M/E 3 (personal experience with unsafe food and recall of food safety incidents in past six months) suggests that the odds of considering consuming dairy products as risky is 1.165 times greater for respondents who have personal experience with unsafe food or can recall food safety incidents in the past six months than those who do not. For the rest of the independent variables (gender, monthly income, education level, reliance on best before date, trust in the control of actors in the dairy industry and trust in the control of regulators and researchers, use of internet media) the Beta values are not significant, with P values of 0.300 or more, indicating that these are very moderate effects.

Table 4.20 Results of the binary logistic regression

Independent variable		B	P value	Exp B (Odds ratio)
Social demographic information				
Monthly income		-0.034	0.828	0.967
Family Structure		**1.635**	**0.000**	**5.132**
Education level		0.021	0.875	1.021
Gender		0.105	0.660	1.111
Reliance on Extrinsic and Intrinsic attributes of dairy products				
RA 3	*Reliance on intrinsic attributes*	*0.262*	*0.032*	*1.300*
RA 2	*Reliance on third party quality assurance*	*-0.306*	*0.015*	*0.737*
RA1	Reliance on extrinsic attributes	-0.174	0.121	0.840
RA 4	Reliance on best before date	-0.117	0.323	0.889
Trust in stakeholder of dairy industry				
TC 1	Trust in the control of actors of dairy industry	0.115	0.358	1.122
TC 2	Trust in the control of government regulators and researchers	-0.022	0.861	0.978
Media Exposure				
M/E 1	Use of internet media and social network	0.129	0.415	1.138
M/E 2	Use of traditional media	0.164	0.204	1.179
M/E 3	Personal Experience with unsafe food	0.153	0.181	1.165
	Recall of food safety incidents			

CHAPTER 5 Discussion

5.1 Introduction

This study investigated what consumers consider to be risky in food safety and the factors that impact on consumer risk perception in the safety of dairy products in China. These factors include social-demographic characteristics of the individual (e.g. gender, education level , income level, family structure), consumer trust in the control of the stakeholders over safety in the dairy industry, the reliance on extrinsic and intrinsic attributes, direct experience with unsafe food, media exposure and recall of food safety incidents. A general summary of the results is presented first in this chapter, followed by a discussion and interpretation of those results. Finally, the implications, recommendations, limitations, possible direction for future study and conclusions of the study are presented.

5.2 Summary of results

The results and findings of this study present a picture of the consumer risk perception of dairy products in China. The results showed the confidence level of consumers in China and their perception of different food groups, different dairy products, dairy products from different countries of origin and potential food safety issues. While the majority of the respondents (69.7%) indicated they do not have sufficient confidence in the food safety of dairy products in China, the confidence level toward food safety in general in China was even lower, with only 17.4% of respondents indicating that they have confidence in general food safety .

Among all the food groups listed in the questionnaire (processed meat, fresh meat, cooking oil, dairy products and fresh fruit and vegetables) processed meat was considered as the most risky in terms of food safety. Fresh fruit and vegetables were considered the least risky group. Dairy products were considered less risky than processed meat, fresh meat and cooking oil in terms of food safety. The results suggest that respondents have a higher concern over the safety of animal products than plant products in terms of food safety. Among all the dairy product groups listed in the questionnaire (baby formula, flavoured milk, ice cream, yogurt, fresh milk and UHT milk), baby formula, flavoured milk and ice cream were considered to have a higher risk of food safety than groups of less processed dairy products like UHT milk, fresh milk and yogurt. This suggests that respondents considered more highly processed dairy products to have a higher risk of food safety than the less processed products.

Among potential food safety issues (overuse or misuse of food additives, hormones and antibiotics, animal disease, bacteria and viruses, pesticides and fertilisers in fruits and vegetables, genetically modified food) overuse and misuse food additives was the highest on the list in terms of the risk of food safety perceived by consumers with 93.3% of the respondents indicating they were concerned. This result explains respondents' concerns about processed meat and processed dairy products. GMO food was perceived as being one of the least concerning potential food safety issues, yet the percentage of respondents concerned about GMO food was still over 59%. The results point to the overall consumer confidence level in food safety in China as being rather low.

In the rating of the food safety of dairy products from different countries and regions, China had the lowest rating among all countries and regions listed in the survey. See Table 5.1. The rating for New Zealand, while much better than China, was notably lower than all of the other developed countries listed in the survey. This included the European Union, the USA, Australia, and Canada. The "not safe" rating for New Zealand dairy products was roughly double that of the other listed developed countries. The survey for this study was conducted in September-October 2013, two months after the Fonterra Botulism scare. The results suggest (but do not prove) that the botulism scare had a negative influence on the image of New Zealand dairy products in the Chinese market. This study result were widely reported by internation media(Appendix C). A follow-up study on how changes to consumers' risk perception of dairy products occur over time would be useful.

Table 5.1 Rating the safety of dairy products from different countries or regions

Country or Region	Not very safe/Not safe at all	Very Safe /Safe	Total (N=100%)	Don't Know (N) (Percent of total sample)
European Union	12.5%	87.6%	(409)	(120) (22.6%)
USA	13.2%	86.9%	(442)	(86) (16.2%)
Australia	14.8%	85.1%	(403)	(126) (23.7%)
Canada	14.8%	85.3%	(367)	(160) (30.1%)
New Zealand	28.1%	71.9%	(428)	(99) (18.6%)
China	64.9%	35.1%	(507)	(21) (4.05)

About 71.3% of respondents consume dairy products more than weekly. Among the intrinsic attributes, the best before date, food safety/quality assurance and brand were the three attributes that respondents claimed they looked for when they purchase dairy products. Among the extrinsic attributes, taste and smell came before the appearance of dairy products. In terms of trust in the stakeholders of dairy products, the milk stations, government regulators and processing companies were those that respondents considered to have more influence on the safety of dairy products.

About 24% of respondents indicated that they or a close family member had direct experience with unsafe food. Over 47% of respondents could recall food safety incidents in the past six months.

Results from the cross-tabulations/correlations gave a picture of the interrelationship between variables that impact on consumer risk perception in food safety (the independent variables) and consumer risk perception in dairy food safety (dependent variable). Gamma (an ordinal measure of association) and its associated measure of significance were used to determine the magnitude of importance of the independent variables in relation to dairy food safety. The independent variables were divided into three groups according to their Gamma value: a relatively high level of association (Gamma 0.200 or more), a medium level of association (Gamma between 0.100 and 0.199) and a relatively low level of association (Gamma less than 0.100) with the dependent variable. The results indicated that the following variables have a relatively high association with the dependent variable, consumer risk perception of safety in dairy products,: education level, family structure, food safety assurance, organic/green /natural food labels, government inspection, direct experience with unsafe food and the use of online social websites. The results are presented in Table 5.2

Table 5.2 Summary of results of the degree of association between consumer risk perception of safety in dairy products and the independent variables

	Independent variables	Gamma value	Group of independent variables
High (|Gamma|≥ 0.200)	Family Structure	0.330	Social-demographic Information
	Monthly income	0.241	Social-demographic Information
	Food safety assurance	0.255	Extrinsic attributes
	Organic/Green/Natural food labels	0.225	Extrinsic attributes
	Direct Experience	-0.209	Consumer experience
	Use of online social website	0.207	Media Exposure
	Government Inspection	0.203	Extrinsic attributes
Medium (0.100≥|Gamma|≥0.199	Education level	0.195	Social-demographic Information
	The control of processing company	-0.173	Trust in actors and regulators of dairy industry
	Family /Friends/Colleagues	-0.161	Media exposure
	Appearance of dairy products	-0.155	Intrinsic attributes
	Purchase place	-0.143	Extrinsic attributes
	Control milk station has over safety of dairy products	0.119	Trust in actors and regulators of dairy industry
	Best before date	0.118	Extrinsic attributes
	Use of online news	0.118	Media exposure
	Control retailers have over safety of dairy products	-0.113	Trust in actors and regulators of dairy industry
	Control of milk station over safety of dairy farmers	-0.102	Trust in actors and regulators of dairy industry
Low (|Gamma|≤ 0.099)	Gender	0.061	Social-demographic Information
	Taste	0.098	Intrinsic attributes
	Newspaper/Magazine	0.088	Media exposure
	Recall of food safety incidents	-0.085	Recall of incidents
	Price	-0.065	Extrinsic attributes
	Country of origin	-0.057	Extrinsic attributes
	Control academic researcher has over safety of dairy products	-0.054	Trust in actors and regulators of dairy industry
	Product ingredients	-0.046	Extrinsic attributes
	Control of government over safety of dairy products	-0.037	Trust in actors and regulators of dairy industry
	Smell	0.013	Intrinsic attributes
	Brand name	0.013	Extrinsic attributes
	TV/Radio	-0.017	Media exposure

Factor analyses were conducted for two purposes: (1) to create new composite variables (factors) within each of four conceptual frameworks of independent variables, ultimately for use (via factor scores) in a binary logistic regression; (2) to examine how much the dependent variable loaded on each of these factors. A factor analysis was conducted in each conceptual group of independent variables. Eleven factors were extracted from the four conceptual frameworks. Two factors were extracted from the variables of social demographic information. Four factors were extracted from the variables of extrinsic and intrinsic attributes of dairy products. Two factors were extracted from trust in the control of stakeholders in dairy products. Three factors were extracted from the variables of media exposure, personal direct experience with unsafe food and recall of food associated with food safety incidents in the past six months. The details of factors abstracted from the four groups of variables are listed in Table 5.3 below.

Table 5.3 Factors details

Conceptual framework	Factors	Variables	Variance explained	Loading of dependent variable on factor
Social demographic information	SD 1	Education Level	45.3%	0.47
		Income Level		
		Family Structure		
	SD 2	Gender	25.9%	0.368
Reliance on Extrinsic and Intrinsic attributes of dairy products	RA1	Reliance on Smell of dairy products	10.8%	-0.09
		Reliance on Taste of dairy products		
		Reliance on Appearance of dairy products		
	RA 2	Reliance on Food quality assurance system	12.7%	0.644
		Reliance on Government inspection		
		Reliance on Green/Organic /Natural food labels		
	RA 3	Reliance on price of dairy products	23.6%	0.133
		Reliance on country of origin		
		Reliance on brand of dairy products		
		Reliance on purchase place		
	RA 4	Reliance on best before date	8.46%	0.065
Trust in the control of stakeholders of food safety of dairy products	TC1	Trust in the control of dairy farmer over food safety	34.24%	-0.383
		Trust in the control of processing companies over food safety		
		Trust in the control of milk stations over food safety		
		Trust in the control of retailors over food safety		
	TC2	Trust in the control of government over food safety	19.97%	0.024
		Trust in the control of academic research over food safety		
Media exposure, Direct experience with unsafe food, recall of food safety incidents	M/E1	Use of online social website	28.48%	-0.327
		Use of online News		
		Information from Family/Friends/Colleague		
	M/E 2	Use of Newspaper/Magazine	18.97%	-0.075
		Use of TV/Radio		
	M/E 3	Direct experience with unsafe food	14.97%	-0.555
		Recall of food safety incident in past six months		

The results indicate that the dependent variable, consumer risk perception of the safety of dairy products in China, had a relatively higher loading on the following factors: SD1 comprising social demographic information which consists of monthly income, family structure and education level; RA2 which comprises extrinsic and intrinsic attributes variables which consists of government inspection, food safety assurance and green /organic /natural food labels; M/E 3 which comprises personal direct experience with unsafe food and recollection of food safety incidents in the past 6 months. The details of these factors and the loading of the dependent variables on them is shown in Table 5.4.

Table 5.4 Summary of factors where the dependent variable, consumer perception of safety in dairy products, have the highest loading variables

Groups	Variables	Factors	Loading of dependent variable
Social-demographic information	Monthly income Family structure Education level	SD1	0.470
Extrinsic and intrinsic attributes	government inspection food safety assurance green /organic/natural food labels	RA 2	0.644
media exposure, personal experience and recall of incidents	personal experience and recall of incidents	M/E 3	-0.555
Trust in stakeholders in dairy industry	Trust in the control of dairy farmers Trust in the control of milk station, Trust in the control of processing companies	TC1	-.0383

The results of the binary logistic regression indicate that three variables: family structure, (RA2) reliance on government inspection or third party food quality assurance system, and green/organic/natural food labels and (RA3)reliance on intrinsic attributes (place of purchase, brand, price, country of origin) have a statistically

significant effect (p<0.05), and have a greater impact on consumers' risk perception of safety in dairy products than the other independent variables. The detail of the results of the binary logistic regression are shown in Table 5.5 (the variables that are more important are in bold).

Table 5.5 Results of the binary logistic regression

Independent variable		B	Wald χ^2	P	Odds ratio
Social demographic information					
Monthly income		-0.034	0.047	0.828	0.967
Family Structure		***1.635***	***19.579***	***0.000***	***5.132***
Education level		0.021	0.025	0.875	1.021
Gender		0.105	0.194	0.660	1.111
Reliance on Extrinsic and Intrinsic attributes of dairy products					
RA 1	*Reliance on intrinsic attributes*	*0.262*	*4.593*	*0.032*	*1.300*
RA 2	*Reliance on third party quality insurance*	*-0.306*	*5.968*	*0.015*	*0.737*
RA 3	Reliance on extrinsic attributes	-0.174	2.411	0.121	0.840
RA 4	Reliance on best before date	-0.117	0.979	0.323	0.889
Trust in stakeholder of dairy industy					
TC 1	Trust in actors of dairy industry	0.115	0.845	0.358	1.122
TC 2	Trust in government regulators and researcher	-0.022	0.030	0.861	0.978
Media Exposure					
M/E 1	Use of internet media	0.129	0.665	0.415	1.138
M/E 2	Use of traditional media	0.164	1.616	0.204	1.179
M/E 3	Personal Experience Recall of food safety incidence	0.153	1.791	0.181	1.165

Note: The numbers highlighted in bold and italic are the factors that have more substantial correlation with independent variables

In conclusion, cross tabulation/correlation, factor analysis and binary logistic regression were used to identify the variables that have an influence on the consumer risk perception of safety in dairy products. Family structure, reliance on government inspection, reliance on food safety assurance (ISO, QS, and HACCP) and reliance on organic/green/natural food labels are the variables that came out of all three methods of analysis as variables having the strongest influence on the consumer perception of

safety in dairy products. Monthly income, education level and direct experience of unsafe food are the variables that came out of the cross tabulation/correlation and factor analysis as variables that influence consumer perception of safety in dairy products. Recall of food safety incidents is the variable the came out only in the factor analysis when it was included with direct experience with unsafe food.

Table5.6 The summary of the results from three different methods of analysis

Independent Variables	Cross tabulation /correlation	Factor analysis	Binary logistic regression
Monthly income	√	√	
Education level		√	
Family Structure	√	√	√
Gender			
Reliance on Smell of dairy products			
Reliance on Taste of dairy products			
Reliance on Appearance of dairy products			
Reliance on Food quality assurance system	√	√	√
Reliance on Government inspection	√	√	√
Reliance on Green/Organic /Natural food labels	√	√	√
Reliance on price of dairy products			√
Reliance on country of origin			√
Reliance on brand of dairy products			√
Reliance on purchase place			√
Reliance on best before date			
The control of processing company over the food safety	√		
Trust in the control of dairy farmer over food safety			
Trust in the control of processing companies over food safety			
Trust in the control of milk stations over food safety			
Trust in the control of retailers over food safety			
Trust in the control of government over food safety			
Trust in the control of academic research over food safety			
Use of online social website	√		
Use of online News			
Information from Family/Friends/Colleagues			
Use of Newspaper/Magazine			
Use of TV/Radio			
Direct experience with unsafe food	√	√	
Recall of food safety incidents		√	

5.3 Discussion and interpretation

5.3.1 Hypotheses related to social demographic information

Hypothesis 1: "Females perceive more risk than males in the safety of dairy products", was not supported by the results of the three methods of analysis. According to the results from all three methods of analysis, gender difference does not have much impact on consumer risk perception of safety in dairy products. This finding differs from what Fewrer (2000) found in previous research done in the UK on the risk perception of food and environment which concluded that females perceive more risk than males from food and the environment due to their social involvement and roles in the family. It also different from the finding of Dosman and Adamowicz (2003) in Canada.

Hypothesis 2: "Education Level is positively related to the risk perception of dairy safety" was partially supported, by the results of the factor analysis. The results from the binary logistic regression and cross tabulation/correlation did not support hypothesis 2. This result partially supports the findings of Dosman and Adamowicz (2003) relating to the consumer perception of food safety risk. The higher the education level of respondents, the more information they can find regarding food hazards and the potential impact on food safety and human health. The reason that education level was more robust in the factor analysis could be that education level was loaded together with two other variables: family structure and monthly income into one factor. The factor loading of SD1 is not only for education level but also for family structure and monthly income.

Hypothesis 3: " Household income is negatively related to the risk perception of dairy safety" was partially supported, by the results of cross tabulation/correlation and factor analysis. The results suggest the higher one's income, the less risk they perceive from consuming dairy products. Respondents with a higher income have more disposable income. Thus they have more choice when they purchase dairy products. They can avoid potential food safety risks in dairy products by paying more. This result is similar to what Dosman and Adamowicz (2001) and Baker (2003) found in their research.

Contrary to common belief that education level and income are supposed to move in same direction, the results of this research found that education level and monthly income went in the opposite direction. This can, perhaps, be explained by the structure of sampling in this research. Half of the respondents were college students, which means half of the respondents were obtaining tertiary education, but had a monthly income of less than ¥ 2000.

Hypothesis 4: "The household structure (the presence of Children under 18 years) is positively related to the risk perception of dairy safety" was not supported through all three methods of analysis. Family structure (presence of young children in family) is a strong predicator for consumer risk perception of safety in dairy products. The results of all three analysis indicated that if there are children under 18 years of age, the perceived risk in those families from consuming dairy products is less than for families with children older than 18 years of age. This finding is contradictory to what has been found in the research by Dosman in 2001 in Alberta, Canada and what Baker (2003) found in his research in United States. One possible explanation is that the parents of young children are willing to spend more than they would otherwise spend on the

dairy products for their children to consume to avoid a potential food safety risk. The risk of unsafe dairy products is avoided by the willingness to paying more to get safer and better dairy products. Another possible explanation is that families with children less than 18 years of age may include a majority with children in primary school and middle school. They may not be as sensitive to the safety of dairy products as parents of new bourns or infants, who would likely make up a minority of this sampling group.

5.3.2 Hypotheses related to extrinsic and intrinsic attributes

Hypothesis 5: "The level of reliance on information of extrinsic attributes is positively related to the risk perception of dairy safety" was not supported by any of the three methods of analysis. That is to say taste, smell and appearance of dairy products are the variables that show less of an association with consumer risk perception of safety in dairy products. This result is different from that of Tensor and Schroeder (2007, 2009) in their research on factors that impact on risk perception in beef in Canada, Mexico and Japan, in which consumers rely on the extrinsic attributes to judge the safety of beef products.

Hypothesis 6: "The level of reliance on information of intrinsic attributes is positively related to the risk perception of dairy safety". This hypothesis was partially supported. The credence attributes were divided into two groups of variables by the factor analysis: (1) reliance on government inspection, reliance on food safety assurance standard system (QS, ISO), reliance on green/organic/natural food labels; (2) reliance on the best before date, reliance on place of purchase, reliance on product ingredients, reliance on country of origin, reliance on brand name, reliance on price level by factor analysis. In the results from the cross tabulation correlation of data, the first group of intrinsic attributes had a high association with the perceived risk of food

safety. The second group of intrinsic attributes had a medium or low association with the perceived risk of food safety. The results from factor analysis also separated the intrinsic attributes into two groups. RA 1 includes reliance on government inspection, reliance on food quality assurance systems and reliance on organic/green/natural food labels. RA2 includes reliance on place of purchase, reliance on product ingredients, reliance on country of origin, reliance on brand name and reliance on price level. The loading of RA1 on the consumer perception of safety in dairy products is highest in the concept framework of extrinsic and intrinsic attributes. This suggests that reliance on government inspection, reliance on food quality assurance systems and reliance on organic/green/natural food labels have a strong correlation with consumer perception of safety in dairy products. The results from binary logistic regression support this result as well. The coefficient for RA1: Reliance on third party quality insurance was 0.306. The coefficient for the factor 1: reliance on place of purchase, reliance on products ingredients, reliance on country of origin, reliance on brand name and reliance on price level was 0.262. Both factors in the binary logistic regression were significant ($P<0.05$). In summary, in all the information sources (extrinsic and intrinsic attributes) relating to dairy products, the third party food quality assurance information, government inspection and green natural/organic food labels were what respondents appeared to rely on the most to judge the safety of dairy products. This result is similar to Tensor and Schroeder (2009) in their research on factors that impact on the risk perception of beef in Canada, Mexico and Japan.

5.3.3 Hypotheses related to trust in the control of stakeholders in the dairy industry

Hypothesis 7 "The trust in food industry source is negatively related to the risk perception of dairy safety" is not supported by the three methods of analysis;

Hypothesis 8 "The trust in government food safety regulatory agencies is negatively related to the risk perception of dairy safety is not supported by the three method of analysis; Hypothesis 9 "The trust in retailer is negatively related to the risk perception of dairy safety" is not supported by the three method of analysis; Hypothesis 10 "The trust in academic researchers is negatively related to the risk perception of dairy safety" is not supported by the three method of analysis.

Among the variables relating to trust of the stakeholders in the dairy industry, none of the variables were significant by any of the three methods of analysis, except for trust in the control of the processing company where there was a medium level of association with consumer risk perception of safety in dairy products using analysis by cross tabulation/correlation. The results indicate that trust in the control of stakeholder's with respect to safety in the dairy industry does not have much impact on the consumer perception of safety in dairy products. This result differs from previous research by Tensor and Schroeder (2007, 2009) on the factors impacting on the risk perception in beef in Canada, Mexico and Japan and the study of Janneke de Jonge (2009) which focuses on European consumers and the factors that impact on their confidence in food safety. This can be explained by the current situation regarding food safety in China where the public has a low level of confidence in food safety, particularly relating to the dairy industry.

5.3.4 Hypotheses related to media exposure, personal direct experience with unsafe food and recall of food safety incidents in the past 6 months

Hypothesis 11 "Direct experience of food safety incidents is positively related to the risk perception of dairy safety" is partially supported by the analysis. The results from cross tabulation and factor analysis suggest that experience with unsafe food is the

variable that has a strong correlation with consumer risk perception in food safety of dairy products. The variable "the recall of food safety incidents in the past six months" does not have a strong correlation with consumer risk perception in the safety of dairy products except when it was combined with the variable "direct experience with unsafe food" as one factor.

Hypothesis 12 "Media exposure of food safety incidents is negatively related to the risk perception of dairy safety" is partially supported by the analysis. The results for the variable "media usage" was split in two directions by cross tabulation: (1) The use of traditional media like newspaper /magazine, TV /Radio which was negatively associated with consumer risk perception of safety of dairy products, which means the more respondents use tradition media, the less risk they perceived . (2) The use of internet media like online social websites and online news was positively associated with consumer risk perception of safety of dairy products which means the more respondents use internet media, the more risk they perceived from the consumption of dairy products. The results of factor analysis and binary logistic regression both indicate that media usage was not a significant factor in consumers risk perception of safety of dairy products.

Table 5.6 The summary of hypotheses

Hypotheses	Supported[4]	Partially supported[5]	Not supported[6]
H1 Females perceive more risk in dairy safety than males.			√
H2 Education Level is positively related to the risk perception of dairy safety.		√	
H3 Household income is negatively related to the risk perception of dairy safety.		√	
H4 The household structure (the presence of Children under 18 years) is positively related to the risk perception of dairy safety.			√
H5 The level of reliance on information of extrinsic attributes is positively related to the risk perception of dairy safety.			√
H6 The level of reliance on information of intrinsic attributes is positively related to the risk perception of dairy safety.		√	
H7 The trust in food industry source is negatively related to the risk perception of dairy safety.			√
H8 The trust in government food safety regulatory agencies is negatively related to the risk perception of dairy safety.		√	
H9 The trust in retailer is negatively related to the risk perception of dairy safety.			√
H10 The trust in academic researchers is negatively rel related to the risk perception of dairy safety.			√
H11 Direct experience of food safety incidents is positively related to the risk perception of dairy safety.		√	
H12 Media exposure of food safety incidents is negatively related to the risk perception of dairy safety.		√	

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4 "Supported" means the hypothesis is supported by the resultes of all three methods of analysis that were employed in this research.

5 "Partially supported" means the hypothesis is supported by the resultes of one or two of methods of analysis that were employed in this research including : Hypothses 2,3,5, 8,11,12 or only part of the hypothesis is supported by the resultes of all three methods of analysis that were employed in this research inclding hypothesis 6.

6 "Not supported" means the hypothesis is supported by the resultes of none of the methods of analysis that were employed in this research including hypotheses 1,4,5,7,9,10.

5.4 Implications and contributions

5.4.1 Theoretical implications

This study has contributed to the existing knowledge about the Chinese consumers' risk perception of the safety of dairy products. There are limited empirical studies on consumers risk perception of food safety in China, especially in a northwest China context. The study offers insight into the consumers' risk perception of safety of dairy products by empirically identifying the factors that influence consumers' risk perception.

Secondly, the research model examined in this study provides a framework for future research. Future researchers can use the model applied in this study and the results to inform further studies about consumer risk perception in food safety, especially in dairy products.

Thirdly, this research has analysed and ranked the factors in China that have been previously identified as important to consumers risk perception in food safety in the world. These factors are family structures, reliance on government inspection, reliance on third party food quality assurance and reliance on organic/green/natural food labels. It provides some empirical support for the results of other international studies (see for example Tensor &Schroeder 2007, 2009, Janneke de Jonge 2009, Dosman & Adamowicz 2001 and Baker 2003).

5.4.2 Social contributions

The results of the study provide an understanding of consumers for risk communication and management. Factors identified by the study will help food safety regulators make decisions on policies, options and strategies with respect to

communication with the public in the case of food safety incidents and help address public concerns over food safety and food safety management. Information on the characteristics of consumers who may perceive a greater risk in food safety than others, can help risk communication focus on the appropriate population.

According to the results, intrinsic qualities such as third party certification, government inspection and food quality assurance schemes are the most effective way to communicate food safety information to consumers. The social-demographic characteristics identified by the study can help food safety regulators and the food industry to better allocate the resources and efforts of risk communication. The study also gives information on the food groups that concern consumers as potential food safety issues. This will assist sectors of the food industry to effectively communicate with consumers.

5.5 Limitations and future research

5.5.1 Limitations of this study

While this study provides some contribution to the study of consumer perception of food safety, there are also some limitations. As this research focuses only on dairy products, the results of this study may not apply to other food groups or food in general. Consumers may take different factors into account when considering purchasing other foods. The samples for this study were drawn from a limited group of consumers who were living in Lanzhou, China. The profile of consumers may vary if the survey were conducted in other cities, or with different sampling methods.

5.5.2 Future research

 Future studies could explore food safety and factors that impact on the consumer perception of food safety in other food groups and in other segments of the food industry. Further studies also could explore food safety in general food instead of a specific food group. A similar study could be done in different cities or different countries or use a different data collection approach such as face-to-face interviews.

A comparative study between consumers from different countries would be interesting. In addition, future research may extend the study to include other influential factors that were not included in this study such as consumers' psychological traits and attitudes. Future research may examine the viewpoints of other stakeholders in the food industry. Moreover, in the ever changing food industry, the factors that influence consumers' risk perception will change over time. A time sequence study to compare changes in the factors that influence consumers' risk perception in food safety would be an interesting topic for future study.

5.6 Conclusion

In summary, this thesis contributed to a better understanding of the factors that impact on Chinese consumer's perception of the safety of dairy products. The factors identified by the research: family structure, the reliance on government inspection, the reliance on third party quality assurance and the reliance on green/organic/natural food labels are variables that have a more significant impact on the risk perception of consumers of dairy safety than other variables that were studied in this research. The results show the importance t build up a science-based, transparent and participatory food safety management system.

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10. 总体来讲，您对食品安全有多少信心？

请圈出相应数字

非常没有信心　1　2　3　4　5　非常有信心

11. 您对以下的各类食品的食品安全有多少信心？

请在每一行勾选一个相应选项

	非常有信心	比较有信心	不太有信心	完全没有信心	不清楚
A. 乳制品	4	3	2	1	9
B. 鲜肉	4	3	2	1	9
C. 肉制品	4	3	2	1	9
D. 蔬菜水果	4	3	2	1	9
E. 食用油	4	3	2	1	9

12. 您对以下潜在的食品安全问题有多担忧？

请在每一行勾选一个相应选项

	非常担忧	比较担忧	不太担忧	不担忧	不清楚
A. 滥用食品添加剂	4	3	2	1	9
B. 细菌或病毒污染引起的食物中毒	4	3	2	1	9
C. 鲜肉中的激素和抗生素残留	4	3	2	1	9
D. 蔬果中化肥和农药残留	4	3	2	1	9
E. 转基因食品	4	3	2	1	9
F. 动物疾病 (疯牛病，禽流感等)	4	3	2	1	9

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乳制品相关食品安全问题

乳制品包括级体乳（巴氏杀菌乳、灭菌乳、调制乳、发酵乳）；乳粉（全脂乳粉、脱脂乳粉、部分脱脂乳粉、调制乳粉、牛初乳粉）；其他乳制品（炼乳、奶油、干酪等）。婴幼儿配方乳粉包括婴儿配方乳粉、较大婴儿配方乳粉、幼儿配方乳粉。

13. 您的消费乳制品的频率是：

每天	每周	每月	一年几次	基本不消费
☐ 5	☐ 4	☐ 3	☐ 2	☐ 1

14. 在判断乳制品是否安全时，你对以下食品特性的依赖程度有多少？

请在每一行勾选一个相应选项

	非常依赖	比较依赖	不太依赖	完全不依赖	不清楚
A. 味道	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
B. 气味	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
C. 外观	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9

15. 我认为乳制品的食品安全有保证

请圈出相应数字

完全不同意　　1　　2　　3　　4　　5　　完全同意

16. 在判断乳制品是否安全时，你对以下产品标示的依赖程度有多少？

请在每一行勾选一个相应选项

	非常依赖	比较依赖	不太依赖	完全不依赖	不清楚
D. 政府检测	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
E. 食品安全认证 *	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
F. 食品原料表	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
G. 保质期	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
H. 原产地/国家	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9

*QS（质量安全）、绿色食品、有机产品、 ISO 9000（国际标准化认证）ISO 22000、HACCP 等

17. 在判断乳制品是否安全时，你对以下因素的依赖程度有多少？

请在每一行勾选一个相应选项

	非常依赖	比较依赖	不太依赖	完全不依赖	不清楚
I. 有机/绿色/天然 标示产品	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
J. 购买地点	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
K. 品牌	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
L. 价格	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9

18. 你认为下列几个方面对乳制品的食品安全影响有多大？

请在每一行勾选一个相应选项

	非常有影响	比较有影响	不太有影响	完全没有影响	不清楚
A. 奶农	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
B. 乳品加工企业	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
C. 奶站*	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
D. 零售商	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
E. 政府监管部门	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
F. 学术机构/ 食品安全专家	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9

19. 你对以下的各类乳制品的食品安全有多少信心？

请在每一行勾选一个相应选项

	非常有信心	比较有信心	不太有信心	完全没有信心	不清楚
A. 鲜奶	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
B. 高温灭菌奶 (UHT)	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
C. 酸奶	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
D. 婴儿配方奶粉	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
E. 调味乳饮料	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9
	☐ 4	☐ 3	☐ 2	☐ 1	☐ 9

24. 你是否曾因乳制品食品安全事件降低对乳制品的消费？

☐₁ 是 ☐₀ 否

25. 你是否能回忆起发生更在过去 6 个月中的 食品安全事件？

☐₁ 是 ☐₀ 否

26. 此事件是否和乳品相关？

☐₁ Yes ☐₀No
请回答 27 和 28 题 请回答 27 题

27. 请简短描述此事件？

_____

_____

28. 在此事件后你对乳制品的消费行为有什么变化？

A. 停止购买与食品安全事件相关品牌的产品
B. 选测其他品牌
C. 选择进口乳制品
D. 选择乳制品替代产品，如豆奶
E. 选择价格更贵的乳制品
F. 还是选择相同品牌乳制品

如果您对此调查问卷涉及的内容有任何意见或建议，请写在下面：

_____

_____

_____

_____

感谢您参加本调查问卷。

Appendix C Media reports about somefindings in the study

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Home > About Massey > News > New Zealand's fragile food safety reputation in China

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New Zealand's fragile food safety reputation in China

A consumer confidence survey suggests Prime Minister John Key will have plenty of work to do to rebuild trust in New Zealand dairy products during his current visit to China.

The survey, conducted by Massey University in the Northwest city of Lanzhou, shows New Zealand food products were regarded as carrying a greater food safety risk than foods from many other countries.

Some 28 per cent of the 531 participants rated New Zealand dairy products 'not very safe'. This is a significantly higher percentage than products from Australia (14.8 per cent), Canada (14.8 per cent), United States, 13.2 per cent) and the European Union (12.5 per cent).

Andrew Morrison
06 356 9099 ext 83078
021 740 414
a.morrison1@massey.ac.nz
news.massey.ac.nz

50 YEARS

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

MEDIA RELEASE

Wednesday, March 19, 2014

New Zealand's fragile food safety reputation in China

A consumer confidence survey suggests Prime Minister John Key will have plenty of work to do to rebuild trust in New Zealand diary products during his current visit to China.

The survey by [Massey University????] in the Northwest city of Lanzhou, shows New Zealand food products were regarded as carrying a greater food safety risk than foods from many other countries.

The New Zealand Herald

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Christopher Adams
Christopher Adams is the Retail, Innovation and Manufacturing reporter for the New Zealand Herald.

🐦 @chrisadamsNZ

Chinese still think NZ dairy less safe

5:30 AM Thursday Mar 20, 2014

| Agriculture | Dairy Industry | NZ Exports | Trade |

☆ f 4 🐦 9 in 0 g+ 0

NZ food facing safety perception problem in China: survey

🗨 Comments 🖨 Print ✉ Mail Large Medium Small

WELLINGTON - Chinese consumers see New Zealand food products as carrying a greater food safety risk than foods imported from many other countries, according to survey results released by New Zealand's Massey University on Wednesday.