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Am I in Danger? : Predictors and Behavioral Outcomes of Public Perception of Risk Associated with Food Hazards

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AM I IN DANGER? : PREDICTORS AND BEHAVIORAL OUTCOMES OF PUBLIC PERCEPTION OF RISK ASSOCIATED WITH FOOD HAZARDS

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To my loving parents, Yong-Keun Oh and Soon-Kyu Lim

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ABSTRACT

Using secondary data collected in South Korea, this study explores possible factors that may affect the way the public perceives risks of food hazards. The present study incorporates scientific knowledge, socio-demographic factors, trust in information sources, news media use, and engaging in interpersonal communication as the possible factors. This study also examines how two levels of risk perception–*personal* and *societal* – are related with preventive behaviors concerning food safety. More specifically, the current study examines whether personal-level risk perception correlates more closely than societal-level risk perception with one's intention to engage in preventive behaviors.

Findings show that personal-level risk perception was significantly associated with the intention to take preventive actions. Societal-level risk perception, however, did not show such a significant relationship. To increase personal-level risk perception, findings suggests that risk communication practitioners and policy makers need to consider the role of word-of-mouth and Internet-based communication, socio-demographic characteristics, and trust in information sources when they convey food risk information.

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CHAPTER 1

INTRODUCTION

Food safety issues have gained increasing attention in the arenas of public health, the media, and public policy over the last 20 years (Cope et al., 2010; Smille & Blissett, 2010; R. Kim, 2012). Food safety has emerged as a prominent public health issue due to the frequent occurrence of cross-national food safety crises in recent years, such as H1N1 flu, swine fever, bovine spongiform encephalopathy (BSE, or "mad cow disease"), and radioactive contamination (De Jonge, Van Kleef, Frewer, & Renn, 2007a; Koskan, Foster, Karlis, Rose, & Tanner, 2012). The worldwide food safety crises have eroded public confidence in the healthiness of food items (Kher et al., 2013).

Changes in food production practices also have increased consumer's concerns associated with food safety (Dickson-Spillmann, Siegrist, Keller, & Wormuth, 2009; Kher et al., 2013; Wilcock, Pun, Khanona, & Aung, 2004). As many chemicals have been used to massively increase agricultural production, people may be more exposed to numerous chemicals hazards than ever from eating foods (Marvin et al., 2009; Shim & Lee, 2013). Chemical contaminants, such as pesticide residue, antibiotics in foods, and food additives, may pose a hazard to consumers (Kher et al., 2013; Marvin et al., 2009). Technological advances in producing foods, such as genetically modified (GM) foods and food irradiation, have produced a significant amount of controversy due to their potential risks to human health and the environment (Kuttschrenter, 2006; Wilcock et al., 2004).

As ordinary citizens are becoming significantly concerned about food safety risks, risk communication researchers have noted the increasing importance of effective risk communication (Cope et al., 2010; Lofstedt, 2006; R. Kim, 2012). Safety is one of the features utilized by customers when they make a decision about food choices (Grunet, 2005; R. Kim, 2012). The safety of food products is hard for members of the public to identify on their own (Fife-Schaw & Rowe, 1996; Hansen, Holm, Frewer, Robinson, & Sandøe, 2003). The general public needs information to determine how to respond and whether to avoid the consumption of potentially hazardous food products (Kuttschrenter, 2006). The purpose of food risk communication is to provide individuals with necessary information so that they can shape an appropriate level of risk perception. In turn, they can decide whether to engage in preventive behaviors for risk mitigation (Miles & Frewer, 2003; Trautman, 2001; Verbeke, 2005). Effective food risk communication, however, is hard to achieve (Smillie & Blissett, 2010; Trautman, 2001).

Difficulties in food risk communication mainly arise from a gap in risk perception between experts and the general public (Kher et al., 2013; Hansen et al., 2003; Slovic, 1987). From the technical side, *risk* refers to an *unbiased* and *value-free* judgment of the possibility of negative outcomes (Sapp, 2003). Previous literature has found that experts tend to make judgments on food safety risks based on scientific estimates (e.g., the annual fatality) (Hansen et al., 2003). The knowledge-deficit model assumes that ordinary citizens arrive at their irrational risk judgments because they lack knowledge or understanding of the risk, which experts possess (Einsiedel, 2000; Wynne & Irwin, 1996). In line with this reasoning, policy-makers or scientists emphasize the importance of conveying scientific knowledge of a hazard for the public to correct its misperception and

to achieve effective risk management (Hansen et al., 2003).

The manner in which the general public perceives risks, however, is a complicated psychological process Researchers have observed that, however, for the general public, perceiving risks is a more complicated psychological process (Sandman, 1989; Slovic, 1987; Smillie & Blissett, 2010). The general public's worries regarding food safety, for example, are not always based on scientific assessments (Hansen et al., 2003; Miles & Frewer, 2003; Smillie & Blissett, 2010). The general public sometimes dismisses scientific risk information, overestimating some hazards, while underestimating others (Hansen et al., 2003; Siegrist, Keller, & Kiers, 2005; Verbeke, Frewer, Scholderer, & De Brabander, 2007). People sometimes show excessively fearful responses toward food safety hazards. This overreaction results in huge financial and psychological losses, as well as political conflicts, even though the possibility that they will expose to the hazards is infinitesimal (De Jonge, Trijp, Rense, & Frewer, 2007b; Lofstedt, 2006). For example, the fear of being exposed to mad cow disease has severely eroded the confidence of ordinary citizens in the safety of beef, as well as in the food industry in many European and Asian countries (Van Kleef et al., 2009; Wilcock et al., 2004). On the contrary, individuals sometimes are inattentive to potential risks of food hazards even when there's a high likelihood that they will be impacted by the risk (Miles & Scaife, 2003; Reymond & Griffith, 2004).

Studies have reported that effective food risk communication practice is not dependent upon simply providing accurate scientific probability information associated with the hazard (Hansen et al., 2003; Van Kleef et al., 2009). Factors that are not considered in scientific risk assessments such as trust in information sources, levels of

income, and talking with others may affect individuals' perception of food safety risks (R. Kim, 2012). A greater understanding of the way the general public perceives risks will provide risk communication professionals with insights into what the public's responses to food safety risks are likely to be (Smillie & Blissett, 2010). Researchers suggest that members of the public attend to and process food risk information only when the information addresses what they are worried about (R. Kim, 2012; Verbeke, 2005). In other words, food risk communication practices that do not consider factors that may affect the way the general public perceives risks are likely to fail to achieve the purpose, which is to shape an appropriate level of risk perception (Verbeket et al., 2007).

According to the psychometric paradigm (Slovic, Fischhoff, & Lichtenstein, 1980; Slovic, 1987), risk is essentially subjective and public risk perception is widely believed to be socially and psychologically constructed (Jenkin, 2006; Slovic, 1987). In this regard, risk communication researchers suggest that risk perception needs to be understood as a *subjective* and *value-laden* judgment of the probability of a negative consequence (Slovic, 1987). A failure to incorporate factors that affect the general public's risk perception into risk analysis procedures can lead to the failure of risk communication practices (Houghton et al., 2008; R. Kim, 2012). Despite increased public concerns about food safety risks today, however, little attempt has been made to identify the factors that may affect ordinary citizens' judgments about risks of a variety of food safety hazards and to verify the most predictive factors of the perceived risks (De Jonge et al., 2007a; Smillie & Blissett, 2010; Shim & Lee, 2013). The purpose of this study, therefore, is to identify the factors that affect ordinary citizens' perceived risks of food hazards and to examine which factors are more influential in shaping people's perception

of food risks. This study analyzes secondary survey data collected in South Korea to explore possible factors that may affect the way the public perceives food risks.

Previous literature has proposed a number of factors that may have an impact on public risk perception. This study will incorporate the possible factors into a single study and investigate whether they have correlations with perceived risks of food hazards. If so, this study will then evaluate which factors are more predictive. Specifically, this study will examine whether there are individual differences in perceiving risks according to socio-demographic factors, such as age, gender, education level, income level, and political orientation. These socio-demographic factors have been considered significant factors that may affect individuals' perceptions of risks (Slovic, 1999; Dosman, Adamowicz, & Hrudey, 2001). Women, for example, have been found to perceive the same hazards as more serious than men do (Ho, Scheufele, & Corley, 2011; Johnson, 2002). It has been suggested that individuals with higher education, higher income, and conservative political views tend to perceive the same hazards less serious than their counterparts (Johnson, 2002; Nayga, 1997; Rivers, Arivai, & Slovic, 2010). This study will examine whether people with different social and economic status differ in their perception of risks of food hazards.

Second, in recent years, the role of trust in information sources, including mediated and interpersonal sources, also has received a significant amount of attention in understanding public risk perception (De Jonge et al., 2010; Van Kleef et al., 2009). Even though scientific estimations indicate a given hazard is likely to be accepted, if members of the public do not believe institutions providing the scientific information, their concerns might be increased (Brewer & Ley, 2013; Lobb, 2005). Despite that the

importance of trust in information sources has been increasingly emphasized in risk communication literature (e.g., Brewer & Ley, 2013; Wachinger, Renn, Begg, & Kuhlicke, 2013), little effort has been made to empirically examine whether and how trust in information sources affects the way an individual perceives risks of food hazards (Houghton, Van Kleef, Rowe, & Frewer, 2006; R. Kim, 2012; Kornelis, De Jonge, Frewer, & Dagevos, 2007). This study will offer overall analysis of what role trust in information sources plays in shaping public risk perception of food hazards.

Third, communication through mass media or interpersonal channels is also considered one of the determining factors that influence people's risk perceptions (Cho, Lee, & Lee, 2013; Han, Zhang, Chu, & Shen, 2013; Morton & Duck, 2001; Snyder & Rouse, 1995). Given that the media and interpersonal channels are two of the most frequently used information sources for food safety issues (De Jonge et al., 2010; Shim & Lee, 2013), it is surprising that there has been relatively little study exploring the relationship between media use and risk perception of food hazards and the relationship between interpersonal communication and perceived risks of food hazards. This study will provide comprehensive understanding of the relationships between communication through mediated and interpersonal networks and perceived risks of food hazards.

Lastly, this study also examines the role of scientific knowledge in shaping perception of risk. The role of scientific knowledge in shaping public risk perception has been debated in previous literature (Van Kleef et al., 2009; Smillie & Blissett, 2010). While some researchers argue that people's level of scientific knowledge does not necessarily related to perceived risks (e.g., S. Ho, Brossard, & Scheufele, 2008; Marris, Langford, Saunderson, & Riordan, 1997; Siegrist et al., 2005), others argue that high

levels of scientific knowledge can lead to people to perceive less risks of health and environmental hazards (Allum, Sturgis, Tabourazi, & Brunton-Smith, 2008). It will be worthwhile to examine whether scientific knowledge can play a role in shaping public perception, and if so, to investigate the extent to which scientific knowledge affects perceptions of food risks (Hansen et al., 2003; Kjærnes, 2010; Sandman, 1989).

Taken together, the components of this study incorporate scientific knowledge, socio-demographic factors, trust in information sources, mass media use, and interpersonal communication as possible factors that may affect public risk perception of food hazards, and examine the impacts of the possible factors. Knowing what factors are the best predictors of individuals' risk perceptions can help risk communication professionals develop effective communication strategies that can resonate with the general public's information needs and achieve the purpose of the risk communication practices (Guidotti, 2013; R. Kim, 2012).

In addition, this study explores how risk perception is linked to preventive behaviors. Risk perception has been one of the key concepts of health and risk communication research, because it is believed to promote healthy behaviors (Brewer et al., 2007; Borrelli, Hayes, Dunsiger, & Fava, 2010; Dillard, Ferrer, Ubel, & Faferlin, 2012). As Wilcocks and colleagues (2004) point out, the willingness to engage in preventive behaviors is decided by one's perceptions that he or she may be affected by the risk of a hazard. In other words, if individuals do not perceive themselves at risk, they may be less likely to engage in preventive behaviors recommended by experts (Reymond & Griffith, 2004; Wilcock et al., 2004).

Previous research, however, has reported somewhat inconsistent findings. Some have showed a positive association between risk perception and preventive behaviors, while others have reported a non-significant or negative relationship (Brewer et al., 2007; Turner, Rimal, Morrison, & Kim, 2006; Weinstein et al., 2007). Researchers have attributed the inconsistent findings to the lack of consistency in defining and operationalizing risk perception in previous studies (Brewer et al., 2007; Sjöberg, 2003; Wahlberg & Sjöberg, 2000).

People tend to evaluate a health risk at two different levels: risk for themselves (*personal-level risk perception*) and risk for other people (*societal-level risk perception*) (Sjöberg, 2003; Tyler, 1980). While societal-level risk perception entails a person seeing something as a serious risk to other people (Tyler & Cook, 1984), personal-level risk perception entails a person seeing something as a risk to him/herself (Snyder & Rouse, 1995; Tyler & Cook, 1984). Researchers argue that personal-level risk perception may directly increase preventive behaviors, while societal-level risk perception may not have such a direct influence (Sjöberg, 2003; Snyder & Rouse, 1995). In many studies, however, researchers did not make a distinction – either conceptually or operationally – between the personal- and societal- level of risk perceptions (e.g., Ibuka, Chapman, Meyers, Li, & Galvani, 2010; Sadique et al., 2007). This study will add to body of knowledge in the field by investigating risk perception at personal- and societal-levels to examine how preventive behaviors are influenced by different levels of risk perception. The analysis will provide the precise mechanism in which risk perception is linked to preventive behaviors.

Overall, the purpose of the current study is to identify predictors that may influence public risk perception of food hazards. This study aims to integrate possible predictors working together in shaping an individual's risk perception and to examine whether they affect an individual's risk perception. The present study then links the respondents' risk perception to their intention to engage in preventive behaviors in order to see whether increased risk perception can promote preventive behaviors. In particular, this study examines risk perception at personal- and societal-levels. Specifically, this study will examine whether personal-level risk perception correlates more closely than societal-level risk perception with one's intention to engage in preventive behaviors pertaining to food hazards.

To explore the research questions addressed, this study analyzes secondary data collected in South Korea.[1] In measuring the public's risk perception of food hazards, this study incorporates a number of food safety issues, including genetically modified (GM) foods, pesticide residues, radioactive contamination, antibiotics in food, foot-and-mouth disease, and mad cow disease, all of which have been prominent in South Korea in recent years.

South Koreans are becoming increasingly concerned about food safety risks due to various food safety related incidents (Lee, 2008; Shim & Lee, 2013). A number of recent food safety incidents involving chemical substances, such as pesticide residues,

[1] The secondary survey data analyzed for this study were collected by the research team at Korea University in South Korea, funded by the Korean Food and Drug administration. The principal investigator, Professor Shim, Jae Chul, who is a Professor in the School of Media and Communication at the Korea University, allowed me to analyze the data for my dissertation. I would like to acknowledge his generosity in making the data available for my study.

antibiotics in foods, and food additives, have produced concerns among the public about chemical hazards in food (Shim & Lee, 2013; Shim et al., 2011). South Koreans' concerns about mad cow disease also significantly increased following the government's decision to import US beef in April 2008, especially after news reports revealed that there might be a potential link between eating US beef and an outbreak of a human equivalent of mad cow disease (Choi, Kim, & Joo, 2009; Chung & Yun, 2013). GM foods also have become a national issue in South Korea recently (Kim, Kim, & Besley, 2012). While the public was not previously concerned about GM foods, massive imports of GM food products since 2008 have focused attention on this issue (Kim et al., 2012; Oh & Kim, 2011). A serious, nationwide outbreak of foot-and-mouth disease occurred from November 2010 to April 2011, resulting in huge economic losses of more than 1 billion dollars (Centers for Disease Control and Prevention, 2013). During that period, about 32.8% of South Koreans said they would not eat any kind of meat until the spread of the disease could be stopped, even though the disease is not contagious among humans (Jang & Shim, 2013). There has been also growing public concerns about radiation-contaminated foods because of the 2011 Fukushima nuclear disaster in Japan (Lee, 2011). The Korean public is worried about imported food items from Japan because of possible radioactive contamination.

Food safety risk, therefore, is seen as one of the most serious social problems facing the Korean government today. Despite increased concerns about food safety risks among the public, the current risk management system in the country has failed to effectively manage the food safety crisis (Chung & Yun, 2013). As the government has implemented policies associated with food risks, government policy makers have been

perceived as being insensitive to ordinary citizens' concerns and information needs (Chung & Yun, 2013; Kwon, 2014). The failure of the government to communicate food risks effectively to the public seems to be attributed to misunderstanding of how the public perceives risks of food hazards. The government has provided information focusing on scientific estimations alone (Kwon, 2014), and little effort has been made to identify influential predictors of the public's perceptions of food hazard risks (R. Kim, 2012; Shim & Lee, 2013). This study will offer an important analysis that can help policy-makers and risk communication professionals to develop appropriate risk communication and management strategies for food safety risks.

While the potential links among the possible predictors, risk perception, and preventive behaviors can be applied to citizens worldwide, they have been tested mostly in Western countries. South Korea offers an opportunity to examine whether the previous findings and theorizing about risk perception and communication that have been established and tested in the United States and other Western countries can be applied to another country with different cultural and political traditions. An additional goal of this study is to enhance intercultural validity of previous theorizing by looking at how different political and economic contexts can interact with the formation of risk perception.

CHAPTER 2

LITERATURE REVIEW

This chapter starts with a review of the literature on public risk perception. It also reviews literature on possible predictors of public risk perception, including socio-demographic factors, trust in information sources, and communication channels. Next, this chapter presents literature on the differential impacts of personal- and societal-levels of risk perception on behavioral outcomes. Finally, this chapter provides the research questions and hypotheses this study seeks to answer.

2.1 Public Risk Perception: Two Levels of Risk Perception

Individuals tend to estimate a health risk at two separate levels: risk for themselves (*personal-level risk perception*) and risk for other people (*societal-level risk perception*) (Sjöberg, 2003; Tyler, 1980). While societal-level risk perception involves one's recognition of a health hazard as serious for other people, personal-level risk perception involves one's consideration of something as a risk to him- or herself (Snyder & Rouse, 1995; Tyler & Cook, 1984). Researchers suggest that societal- and personal-level risk perceptions are independent; the argument is that people may not perceive a health risk as serious to themselves even though they recognize the risk as dangerous to other people in society (Han et al., 2013; So et al., 2011).

Self-other differences in risk perception have been recognized primarily in social psychology literature since Furstenberg (1971)'s study of crime victimization (Han et al.,

2013). Furstenberg (1971) first proposed the distinction between personal-level risk perception (one's fear of violent crime) and societal-level risk perception (concerns about crime in society). Tyler (1980) empirically supported the idea by demonstrating that people estimated risk of violent crime at the separate personal- and societal-levels.

Several factors have been suggested as significant factors that may affect the way the public perceives risk at societal- and personal-levels (Han et al., 2013). Psychologically, *optimistic bias* has been attributed to the reason why there is difference in perceiving risk for the self and others (Weinstein, 1980; 1987). Optimistic bias refers to as an individual's belief that he or she is less likely to experience a negative health problem compared to others (Weinstein, 1987). Weinstein (1980) revealed that college students tend to evaluate their own possibilities of having negative events (e.g., experiencing a drinking issue, getting fired) as less than others. Optimistic bias has been found across a variety of health issues, including lung cancer (Dillard, McCaul, & Klein, 2006), smoking-related diseases (Reppucci, Revenson, Aber, & Reppucci, 1991), heart attack (Westein & Klein, 1995), and H1N1 flu (Cho et al., 2013).

Researchers point out that personal-level risk perception may directly encourage preventive behaviors, while societal-level risk perception may not have such a direct impact (Sjöberg, 2003; Snyder & Rouse, 1995). In prior studies, however, researchers did not separate – either conceptually or operationally –the personal- and societal- level of risk perceptions (e.g., Ibuka et al., 2010; Sadique et al., 2007). This study, therefore, is to make a distinction between societal- and personal-level risk perceptions and to see how the potential predictors suggested in this study are associated with the two levels of risk perception. Further, this study investigates if personal-level risk perception is more

closely correlated than societal-level risk perception with the intention to engage in preventive behaviors.

2.2 The *Knowledge-Deficit Model*: The Role of Scientific Knowledge

The *knowledge-deficit model* (Einsiedel, 2000; Wynne & Irwin, 1996) assumes that people make judgments about a hazard based on scientific estimates. The basic assumption is that one's perception of risk is conditioned by the person's level of scientific knowledge (S. Ho et al., 2008; Wildavsky & Dake, 1990). According to the knowledge-deficit model, greater science knowledge produces an appropriate level of risk judgment (Sturgis & Allum, 2004; Wynne & Irwin, 1996).

Previous literature has found that experts, such as scientists or policy makers, tend to make judgments about a hazard based on scientific estimates (e.g., the annual fatality) (Hansen et al., 2003). The general public, however, often overestimates some hazards, while underestimating others, regardless of scientific risk assessments of the hazards (Hansen et al., 2003; Siegrist et al., 2005). The difference in risk perception between experts and the general public is often attributed to a *knowledge deficit* among the public (Hansen et al., 2003). The knowledge-deficit model suggests that ordinary citizens may arrive at irrational judgments about a hazard because they lack experts' knowledge and understanding of the hazard (Frewer, Howard, & Shepherd, 1996; Sturgis & Allum, 2004). It is believed that lack of knowledge leads people to develop irrational judgments about technological innovations or sudden life-threatening incidents/diseases (Wagner-Egger et al., 2011). For example, Sjoberg and Sjoberg (1991) found that people with less knowledge about radiation were more likely to perceive greater risk of it. According to the model, the purpose of risk communication is to inform individuals with

scientific knowledge to correct their misperception of risk (Hansen et al., 2003; Kahlor & Rosenthal, 2009).

Previous research exploring the relationship between scientific knowledge and risk perception has reported mixed results. Some studies show that individuals with greater scientific knowledge are less likely to perceive risks (e.g., Cardello, Schutz, & Lesher, 2007; Des Jarlais , Galea, Tracy, Tross, & Vlahov, 2006; Gaskell et al., 2004; Raude & Setbon, 2009). Gaskell and colleagues (2004), for example, found that respondents with less scientific knowledge are more likely to perceive greater risks of GM foods. Des Jarlais and colleagues (2006) found that respondents who had more knowledge were less worried about AIDS and SARS. Others, however, have demonstrated that scientific knowledge is not necessarily related to risk perception (e.g., Bauer, Allum, & Miller, 2007; Marris et al., 1997; Siegrist et al., 2005). Hansen and colleagues (2003) argue that public risk perception of food hazards is not dependent upon people's level of scientific knowledge.

Because of these mixed results, there are no conclusive answers about the relationship between scientific knowledge and risk perception. Further, questions remain about the role of scientific knowledge in producing the discrepancy in risk perception between societal- and personal-levels. This research, therefore, proposes the following question regarding the relationship between scientific knowledge and two levels of risk perception of food hazards:

> RQ1: What are the relationships between the level of scientific knowledge and the two levels of risk perception (personal- and societal-level risk perception) regarding food hazards?

Besides scientific knowledge, what may affect public risk perceptions? Studies have suggested that *heuristic cues, such* as political orientation (e.g., Besely & Oh, 2013; Nisbet, 2005) and trust in information sources (e.g., Brewer & Ley, 2013; Kuttschreuter, 2006; Trumbo & McComas, 2003), as well as communication through mass media or interpersonal communication (e.g., Ho et al., 2011), may have stronger influence on the public's risk perception than scientific knowledge. Socio-demographic factors, such as gender, income, and education have also been found to be determining factors in shaping risk perception (e.g., Dosman et al, 2001; Rivers et al., 2010; Slovic, 1999). Research exploring the relationships between demographic factors and risk perception suggests that certain populations may perceive higher or lower risks than others. The next section provides a review of literature on the influence of socio-demographic factors on risk perception. The roles of such heuristic cues as trust in information, media use, and interpersonal communication will be then reviewed respectively.

2.3 The White Male Effect Hypothesis

Previous literature has suggested that white males tend to perceive lower risk than women and ethnic minorities, a phenomenon known as the *white male effect* (Finucance, Slovic, Mertz, Flynn, & Satterfield, 2000; Kahan, Braman, Gastil, Slovic, & Mertz, 2007; Slovic, 1999; Rivers et al., 2010). Beyond their skin color, this subgroup of men possesses several distinguishing characteristics that make them different from other demographic groups. They are generally well educated, politically conservative, and make a higher-than-average level of household income. This group of men also tends to place greater trust in industry and government officials (Kahan et al., 2007; Rivers et al., 2010). These socio-demographic characteristics have been used to explain the white male

effect (Dosman et al., 2001; Olofsson & Rashid, 2011). Women and ethnic minorities, for example, generally possess lower levels of education and income than white men in the United States and are therefore assumed to have lower levels of personal power and control over public affairs (Olofsson & Rashid, 2011; Rivers et al., 2010). Some researcher has suggested that the difference in power between the genders and among ethnic groups may be the reason why women and ethnic minorities tend to judge risk higher than white men (Dosman et al., 2001; Flynn et al., 1994; Olofsson & Rashid, 2011).

Among the socio-demographic factors, gender has been considered the most influential in affecting the way people perceive risks (Ho et al., 2011; M. Ho, Shaw, Lin, & Chiu, 2008; Slovic, 1999). Prior studies have found that women are more likely to perceive greater risks of health and environmental hazards than men (Bord & O'Connor 1997; Davidson & Freudenburg 1996; Dosman et al., 2001; Ho et al., 2011; Johnson, 2002; Dietz, Kalof, & Stern, 2002; Rhodes & Pivik, 2011). Further, as related to food hazards, women have appeared to perceive higher risk than men (e.g., Rollin, Kennedy, & Wills, 2013; Williams & Hammitt, 2001). Women, for example, appeared to be more likely than men to believe that the use of chemical substances can cause serious health hazards (Dickson-Spillmann et al., 2009; Ott & Maligaya, 1989).

An individual's education level also has been found to be a factor that influences his or her risk perception. Previous studies have reported that respondents with a higher level of education are less likely to perceive food risks than their less-educated counterparts (Buchler, Smith, & Lawrence, 2010; Lobb, Mazzocchi, & Traill, 2007). The education effect on risk perception is not unique to while males. The effect, for example,

was also found among African Americans: African Americans who possess higher levels of education perceive lower risks across various hazards (Grandy, 2001; River et al., 2010).

Political orientation also has been found to have an influence on risk perception. People who have conservative political views have been found to have lower risk perception than people with more liberal views (Flynne et al., 1994; Johnson, 2002). Some research has suggested that conservatives are less likely than liberals to perceive risks and are more likely to support technological innovations (Besely & Oh, 2013; Dake, 1991). As many food safety issues involve technological advances (e.g., GM foods, food irritation) or production innovations (e.g., the use of chemical substances), not surprisingly, liberals with green environmentalist beliefs tend to perceive food hazards as more serious (Breakwell, 2000).

As also described in the studies on the white male effect, individuals with higher income tend to perceive less food risks than people with lower income (e.g., Buchler et al., 2010; Lobb et al., 2007). However, in some studies, respondents from more affluent circumstances were more likely to judge risk as higher (e.g., Hamiltion, 1985; Moss & Sills, 1981; Schroeder, Tonsor, Mintert, & Pennings, 2010). According to a report about beef risk perceptions, for example, Mexican consumers with higher household income were found to be more concerned about beef food safety (Schroeder et al., 2010). Hamiltion (1985) reported that individuals with higher income were more likely to be concerned about water-pollution crisis in their residential area.

In addition to the aforementioned socio-demographic factors, age has also been thought to have a significant influence on risk perception. However, the direction of

influence on perception of risk has not been consistent; while some studies have reported people perceive greater risks as they get older (e.g., Kellen, Zaalberg, Neutens, Vanneuville, & Maeyer, 2011; Lindell & Hwang, 2008; Morton & Duck, 2006; Williams & Hammitt, 2001), other studies have suggested older people are less likely to perceive risks (e.g., Lobb et al., 2007; Millstein & Halpern-Felsher, 2002; Rhodes & Pivik, 2011). On the other hand, other studies have reported that age does not have a significant relationship with perception of risk (e.g., Johnson, 2002; Lee, Scheufele, & Lewnestein, 2005; Slovic, 1999).

The white male effect hypothesis has clear implications in that most policy makers or experts primarily fall into the subset of men described in the white male effect (Dosman et al., 2001; Rivers et al., 2010). This hypothesis helps to explain why policy makers or experts tend to judge risks of various health and environmental hazards differently from ordinary citizens (Palmer, 2003; Rivers et al., 2010). To date, a significant amount of research has confirmed that white males perceive lower risk than women and members of different ethnic groups (Bord & O'Connor 1997; Davidson & Freudenburg, 1996; Johnson, 2002; Dietz et al. 2002). The white male effect hypothesis, however, has been tested mostly in the United States since it was first proposed (Flynn et al., 1994; Olofsson & Rashid, 2011; River et al., 2010; Slovic, 1999). With few exceptions (e.g., Olofsson & Rashid, 2011; Zhang, He, Mol, & Lu, 2013), little effort has been made to investigate whether there exist individual differences in perceiving risks in similar subgroups within other ethnic groups (Rivers et al., 2010). It will be worthwhile to explore if the white male effect hypothesis is applicable to other ethnic groups with different cultural and political backgrounds. One of the purposes of this study, therefore,

is to explore the extent to which differences among South Koreans, with regard to social-demographic factors suggested by prior research on the white male effect, affect their risk perception of food hazards. The specific research question is proposed as follows:

> RQ2: What are the relationships between socio-demographic factors (age, gender, levels of education, levels of income, and political orientation) and the two levels of risk perception (personal- and societal-level risk perceptions)?

2.4 Trust in Information Sources and Risk Perception

Trust in an information source can be referred to as one's perceived credibility of the communicator who provides information (Gass & Seiter, 2007). According Renn and Levine (1991), it can be defined as an individual's expectation of communicators to be credible and accurate in conveying information. The importance of trust in information sources has been increasingly emphasized in risk communication literature (Brewer & Ley, 2013; Kjærnes, 2010; Van Kleef el al., 2009; Wachinger et al., 2013). People first judge a message not primarily by its content but by its source (Calman, Bennett, & Corns, 1999). In other words, if individuals do not believe the messenger, they do not believe the message (Slovic, 1999). In this regard, where trust is absent, merely providing scientific information is not an effective risk communication strategy (Brewer & Ley, 2013; Van Kleef el al., 2009). Trust in information sources is a prerequisite for successful risk communication (Kjærnes, 2010).

The theoretical foundation of trust in information sources is rooted in social psychology persuasion and attitude change models (Brewer & Ley, 2013; Frewer & Miles, 2003). For example, the *Elaboration Likelihood Model* (Petty & Cacioppo, 1986) postulates that individuals perceive and process persuasive messages through two

different cognitive routes; *central* and *peripheral* routes. In the central route, on the one hand, message recipients are more likely to evaluate the messages critically through their effortful cognitive activity, which is often called *elaborative processing* (Gass & Seiter, 2007; Hansen et al., 2003). People use this central route when they perceive the messages as relevant to themselves (Petty & Cacioppo, 1986). On the other hand, individuals often use the *peripheral* route when the messages are perceived as irrelevant to them (Petty & Cacioppo, 1986). When people have limited ability or less motivation to process and evaluate the messages (e.g., lack of knowledge, or lack of interest), the peripheral route is used. In such circumstances, individuals employ other available heuristic cues, such as trust in the communicator who provides the messages, to decide whether they accept the messages without deliberate cognitive processing (De Jonge et al., 2007a; Hansen et al., 2003; Miles & Frewer, 2003; Van Kleef el al., 2009).

Researchers suggest that trust in the information source can be a stronger determining factor than the content of risk information itself when people perceive risks of health and environmental hazards (Brewer & Ley, 2013; Gass & Seiter, 2007; Hansen et al., 2003; Lobb, 2005; Renn, 2005). Since ordinary citizens, in general, lack necessary knowledge, motivation, and ability to make informed judgment about a health or environmental hazard, trust in information sources can be used as a heuristic cue or information shortcut, as it can reduce the complexities and uncertainty involved in making scientific judgment (Brewer & Ley, 2013; Chryssochoidis, Strada, & Krystallis 2009; Van Kleef el al., 2009). Public risk perception can be formed and changed depending upon people's trust in a particular information source (Lobb et al., 2007; Wachinger et al., 2013). For example, if scientists are believed to be knowledgeable or

capable of controlling a given hazard, the public tends to rely on information provided by scientists to make a judgment about the hazard (Slovic, 1993; 1999; Zinn, 2008). Instead of engaging in an informed and extensive evaluation, trust in scientists or trust in medical sources can function as an important heuristic cue when evaluating potential risks associated with a certain health and environmental hazards (Huurne & Gutteling, 2008; Lang & Hallman, 2005).

In the same vein, trust in government officials in regulatory bodies can play a significant role in shaping public risk perception associated with public health. Government agencies as regulatory bodies have a responsibility to oversee potential threats to public safety, health, and well-being (De Jonge et al., 2010; Peters, Lang, Sawicka, & Hallman, 2007; Siegrist & Cvetkovich, 2000). It is likely that people with greater trust in government tend to perceive less risk, as they believe that regulatory agencies will protect them from potential harms (De Jonge et al., 2010; Lang & Hallman, 2005; Poortinga & Pidgeon, 2005). On the contrary, it has been suggested that trust in citizen groups can lead to perception of risks of environmental and health hazards as serious (Liu & Priest, 2009; Stampfli, Siegrist, & Kastenholz, 2010).

The rationale for the role of trust in information sources can be also applied to the context of food hazards. Members of the public generally do not have sufficient knowledge or ability to make informed judgments about food safety on their own (De Jonge et al., 2007a). Thus, people tend to rely on advisory groups that can scrutinize or provide risk information in a credible way to evaluate the risk (Frewer et al., 1996; Kjærnes, 2010). It is possible that if individuals have trust in the government, which is believed to oversee the safety of foods, they may be less likely to perceive risk

(Kuttschreuter, 2006; Peters et al., 2007). On the contrary, people may perceive greater risk of food hazards when they receive information associated with the hazard from distrusted information sources (Hansen et al., 2003). People's distrust in the food industry and distrust in government have been found to increase their perception of risk of food hazards (Frewer & Miles, 2003; Poortinga & Pidgeon, 2005; Stampfli et al., 2010).

In situations in which a food safety hazard appears to gain the general public's attention, various specialized information sources, such as government agencies, the food industry, external experts, and citizen groups, provide information associated with the issue (Smillie & Blissett, 2010). Individuals also can obtain information as they talk with their family, friends, and peers about the issue (Kornelis et al, 2007). The media are one of the most readily accessible information sources from which the public can get information about food hazards (De Jonege et al., 2010). These information sources have different levels of ability to control, evaluate, and convey potential risks of food hazards (Frewer& Miles, 2003; Kornelis et al., 2007). It is possible that the available information sources may convey different, or even conflicting, information about the risks (Powell, Dunwoody, Griffin, & Neuwirth, 2007). Thus, people may choose to believe particular sources over others when they make judgments about the hazards (Frewer et al., 1996; Hansen et al., 2003; Kornelis et al., 2007).

Risk communication researchers have attempted to identify whether trust varies among different information sources and, if so, which information sources are more trusted than others (e.g., De Jonge et al., 2007a; Miles & Frewer, 2003; Kim, 2009). What has been consistently found is that health professionals and consumer organizations are more trusted, while government agencies and industry sources are less trusted.

Kurrschreuter (2006), for example, showed that consumer organizations were the most trusted, while government agencies were not trusted at all in the context of food hazards. Miles and Frewer (2003) reported that health professionals were highly trusted, while government agencies were less trusted. Slovic (1999) found that medical sources were trusted, while government agencies and industry sources lack public trust. Frewer and colleagues (1996) also found that medical doctors and consumer organizations were highly trusted, while government agencies and the food industry were not trusted. Medical sources, citizen organizations, environmental organizations have consistently appeared to have higher levels of trust of the public than private companies (Frewer et al., 1996; Marris et al., 1997).

To develop effective food risk communication strategies, it is important to know which information sources members of the public believe and which one they do not believe. Trust in different information sources can vary across different political and cultural contexts and with time (Frewer & Miles, 2003). In South Korea, people's perceptions of the credibility of food risk information sources may differ from other those in other countries. Accordingly, one of the aims of this study is to identify which information sources are more trusted and less trusted in terms of food safety issues in South Korea. The following research question is proposed:

RQ3: What information sources are more trusted than others regarding food hazards?

While research has suggested that trust in information sources likely plays a significant role in shaping risk perception (Stampfli et al., 2010; Tulloch & Zinn, 2011; Wachinger et al., 2013), with only a few exceptions (e.g., Frewer & Miles, 2003), there

has been little empirical research to investigate the relationship between trust in information sources and risk perception with respect to food safety issues (Brewer & Ley, 2013; Lobb et al., 2007). Given that the media are one of the most frequently used information sources for food safety information (De Jonege et al., 2010), it is somewhat surprising that few studies have examined the influence of an individual's trust in the media on his/her risk perception of food hazards.

People may also receive important information about food hazards from their significant others or acquaintances (Kornelis et al., 2007). As Fife-Shaw and Rowe (1996) point out, individuals tend to be influenced largely by significant others in shaping their perceived risk of food hazards and their subsequent food purchasing decisions. There have been few studies, however, investigating whether and how trust in interpersonal channels affects the way an individual perceives risk of food hazards (Kornelis et al., 2007).

To understand how individuals arrive at their judgment about the risk of food hazards, it is important to know the role of information sources in shaping risk perception. This study, therefore, examines the role trust in different information sources plays in forming risk perceptions. While research has rarely examined the relationship between trust in information sources and two levels of risk perception, based on previous findings, the present study puts forth the following hypotheses:

H1a: Trust in the government, the food industry, and experts will be negatively associated with personal-level risk perception.

H1b: Trust in the government, the food industry, and experts will be negatively associated with societal-level risk perception.

H1c: Trust in citizen groups will be positively associated with personal-level risk perception.

H1d: Trust in citizen groups will be positively associated with societal-level risk perception.

In terms of the relationships between trust in communication channels and risk perceptions, this study opts to propose a research question instead of hypothesizing either a positive or negative relationship:

RQ4: What are the relationships between trust in communication channels (mass media and interpersonal networks) and risk perceptions (personal- and societal-level risk perceptions)?

2.5 Mass media use and Risk Perception

Mass media have often been considered as an important source of the public's risk perception (Coleman, 1993; Morton & Duck, 2001). Previous studies, however, have provided mixed support for this specific role of the media in shaping risk perception. Some studies demonstrated that media use for health hazard information was positively and significantly associated with risk perception (e.g., Renn, 2005; Snyder & Rouse, 1995; Verbeke, 2008), while others reported non-insignificant relationships (e.g., Tyler & Cook, 1984; Morton & Duck, 2001). These inconsistent findings may be due in part to the research design that examined the relationship between media use and risk perception without making a distinction between personal- and societal-level risk perceptions.

According to the *impersonal-impact* hypothesis (Tyler, 1980; Tyler & Cook, 1984), the media contribute to increasing – rather than decreasing – the gap between one's personal- and societal- level risk perceptions. When mass media report a risk,

according to this hypothesis, individuals tend to perceive it as a problem applied largely to other people that they do not find similar to themselves (Cho et al., 2013). It is also likely that people tend to perceive themselves as less vulnerable than others to the risk presented in the media. Therefore, it is hypothesized that the media tend to increase societal-level risk perception, while having a smaller impact on personal-level perception, which in turn can result in an increasing gap in risk perception between the societal and personal levels.

Empirical evidence has provided support for the impersonal-impact hypothesis (e.g., Cha, 2010; Morton & Duck, 2001; Tyler & Cook, 1984). Tyler and Cook (1984), for example, found that while exposure to the media was significantly related with societal-level perceived risks of drunken driving, fires, and tornadoes, the same exposure measure did not show such a significant relationship with personal-level risk perception. Morton and Duck (2001) found that reading newspaper articles about skin cancer was more closely correlated with societal-level risk perception than with personal-level perception. Cha (2010) also demonstrated that media use regarding H1N1 flu in South Korea was positively related with societal-level risk perception, while it was largely unrelated with personal-level risk perception.

Other studies, however, have reported that the media can significantly increase not only societal- but also personal-level risk perception under certain conditions, such as presenting a risk in a dramatized format (e.g., Basil & Brown, 1997; Snyder & Rouse, 1995; So, Cho, & Lee, 2011) or presenting it with vivid images (e.g., Snyder & Rouse, 1995). Snyder and Rouse (1995) argued that mass media were not monolithic, and the effects would be different depending upon the formats of the content presented in the

media. This *differential-impact* hypothesis posits that mass media have differential effects on risk perception depending upon the formats in which messages are delivered. For example, according to the theorization, news media are more likely to affect risk perception at the societal-level, while entertainment media tend to influence rather the personal-level risk perception given their image-oriented and dramatic presentations of stories. It is also likely that television news, in comparison to newspapers, tends to elicit greater emotional responses, and as a consequence is more likely to affect personal-level risk perception, given its tendency to present stories in an episodic frame as well as with such technological features as video graphics and live sound (Cho et al., 2013). Supporting this argument, Coleman (1993) found that television news viewing was significantly and positively associated with perceptions of personal risk.

Given the inconsistent findings regarding the relationship between exposure to news media use and risk perceptions, it will be worthwhile to examine what role of news media plays in one's risk perceptions. Therefore, one of the aims of the current study is to examine the role of news media in shaping people's risk perception.

2.6 Food Hazards News in South Korea

Studies in South Korea have reported that news media are one of the primary sources of information about food safety in the country (Park, 2006). Shim and Lee (2013) investigated which communication channels were the most frequently used as the source of food-safety information in South Korea and found that more than 65% of the respondents obtained food-related hazards information from mass media sources, such as newspapers, television, and the Internet.

Even though a comprehensive study of Korean media's portrayals of food-safety

issues does not exist, findings from a few related studies suggest that use of news media in South Korea may increase personal- as well as societal-level risk perceptions, given the way news is presented in the media. South Koreans' concern about mad cow disease, for example, has increased significantly since 2008 when television news reports revealed that there might be a potential link between eating US beef and an outbreak of a human equivalent of mad cow disease (Choi, Kim, & Joo, 2009). The images in news coverage of mad cow disease were highly vivid and sensational (Chung & Yun, 2013), and it is reasonable to hypothesize that use of news media might have increased personal- as well as societal-level risk perceptions. In a content analysis of news coverage of parasite eggs found in Chinese Kimchi, Lee and Park (2006) also found that South Korean newspapers covered the case largely in episodic frames, focusing on average people's fearful reactions and presenting stories in vivid and dramatic images. It is therefore likely that exposure to the news coverage in newspapers or on television might have increased not only the societal- but also the personal-level risk perceptions.

According to a survey in South Korea, about 84% of the respondents answered that they used the Internet for health-related information (Lee & Kim, 2009). Lee (2008) also found that the Internet was one of the most frequently used sources for food hazard information in South Korea. Nevertheless, little effort has been made in South Korea to examine whether use of Internet news can affect personal- and societal-level risk perceptions (Cha, 2010). The Internet is a medium that incorporates diverse technological features such as video, audio, graphics into the textual messages (Cho et al., 2013; Kim, 2008). In addition to the episodic presentation of the information, these diverse technological features can allow the Internet to present the message with vivid and

dramatic images, which in turn can increase not only societal- but also personal-level risk perceptions. Based on the reviews of previous literature and news coverage of food hazards in South Korea, this study put forth the following hypotheses in terms of the relationships between news media use and two levels of risk perception:

H2a: News media use (newspapers, television news, and Internet news) will be positively associated with personal-level risk perception in South Korea.

H2b: News media use (newspapers, television news, and Internet news) will be positively associated with societal-level risk perception in South Korea.

2.7 Interpersonal Communication and Risk Perception

Besides news media, researchers have reported that interpersonal communication can also play an important role in shaping individuals' two levels of risk perceptions (Cho et al., 2012; Han et al., 2013; Snyder & Rouse, 1995). Prior studies on the influence of interpersonal communication on risk perceptions, however, have provided mixed evidence. On one hand, it has been suggested that engaging in interpersonal communication does have an impact on personal-level risk perception (Rimal, 2001; Snyder & Rouse, 1995). Morton and Duck (2001), for example, found that those who had discussions about skin cancer with others more often were more likely to perceive themselves to be personally vulnerable to skin cancer. Snyder and Rouse (1995) also reported that talking with others (e.g., peers, professionals, and parents) was positively associated with the increase of personal-level perceived risks of AIDS. The possible reason for the significant influence is that when individuals obtain information from significant others, they may find themselves more self-relevant to the information (Cho et al., 2013; Liberman, Trope, & Stephan, 2007).

Recent studies in South Korea that examine whether engaging in interpersonal communications can affect personal- and societal-level risk perceptions report that participating in interpersonal communication with significant others can increase personal-level risk perception. Cha (2010), for example, found that conversations with the family, relatives, and medical professionals about H1N1 flu could increase risk perception at the personal level but not at the societal level. Kim (2011) also showed that engaging in interpersonal communications about nuclear energy had an influence on personal-level risk perception. These findings suggest that interpersonal conversations can effectively lead individuals to consider risks as their own.

On the other hand, some studies suggest that interpersonal communication can only increase societal-level risk perception. Coleman (1993), for example, found that having discussions with others about a range of health issues was associated with only societal-level risk perception. Mazur and Hall (1990) also showed that conversational interaction had an impact only on societal-level risk perception in terms of household radon. It may be that interpersonal discussion can help individuals to differentiate themselves from other people, who can be considered as being influenced by risks (Cho et al., 2012; Han et al., 2013).

In addition, there have been studies that show interpersonal discussions have an influence on both societal- and personal-level risk perceptions. Weaver, Zhu, and Willnat (1992), for example, found that having communication with other people about negative outcomes of drug abuse increased both personal- and societal-level risk perceptions. More recently, Han and colleagues (2013) demonstrated that interpersonal

communication could significantly influence one's judgments about the risks of H1N1 flu at both societal- and personal-levels.

Taken together, previous studies suggest that a positive relationship may exist between interpersonal communications and both personal- and societal-level risk perceptions. Based on the previous literature, the following hypotheses are proposed:

H3a: Engaging in interpersonal communications will be positively associated with personal-level risk perception.

H3b: Engaging in interpersonal communications will be positively associated with societal-level risk perception.

Given that news media use and engaging in interpersonal communication can significantly affect personal- and societal- level risk perceptions, it is also important to explore which communication channels are more influential in shaping both types of risk perception. Some researchers have found that interpersonal communication is the most influential information source that increases perceived personal risk, compared with mass media channels such as newspaper reading and television viewing (e.g., Cha, 2010; Morton & Duck, 2001). Others, however, have reported that mass media also play an important role in increasing personal risk perception of health problems (e.g., Coleman, 1993; Snyder & Rouse, 1995). One of the aims of this study, therefore, is to examine which communication channels are more influential in shaping both levels of risk perception. The following research question is proposed:

RQ5: What communication channels are more influential in shaping risk perceptions (societal- and personal-levels)?

2.8 Behavioral Outcome of Two levels of Risk Perception

Risk perception has been one of the key concepts of health and risk communication research, designed to promote healthy behaviors (Brewer et al., 2007; Borrelli et al., 2010; Wahlberg & Sjöberg, 2000). A number of health behavior models, such as *Health Belief Model* (Hochbaum, 1958; Rosenstock, 1974), *Protection Motivation Theory* (Rogers, 1975), and *Precaution Adaption Process Model* (Weinstein, 1987) have theorized that one's perceived risk of a particular health hazard motivates the person to engage in preventive behaviors as a way to reduce the risk (for an overview, see Van der Pligt, 1996).

Previous research, however, has reported somewhat inconsistent findings. Some have showed a positive association between risk perception and preventive behaviors, while others have reported a non-significant or negative relationship (Brewer et al., 2007; Turner et al., 2006). Researchers have attributed the inconsistent findings to the lack of consistency in defining and operationalizing risk perception in previous studies (Brewer et al., 2007; Dillard et al., 2012; Sjöberg, 2003; Wahlberg & Sjöberg, 2000).

Researchers suggest that perceiving one's own vulnerability to a risk is more likely than perceiving the society's or other peoples' vulnerability to promote preventive behaviors (Van der Pligt, 1996; Weinstein, 1987). Sjöberg (2003) has pointed out that failure to make a distinction between personal- and societal-level risks may lead to misunderstanding the relationship between risk perception and preventive behaviors because these two levels of risk perception can result in different outcomes. Snyder and Rouse (1995), for example, found that personal-level risk perception had a positive correlation with AIDS-related preventive behaviors, while societal-level risk perception did not have a direct correlation. These findings suggest that people would not engage in

a preventive behavior even when the risk is socially prominent, as long as they do not believe that they themselves are particularly vulnerable. Researchers also argue that if individuals underestimate their own personal risks, then they would pay little attention to or disregard information regarding preventive practices, assuming that the information is directed at others (Frewer, Shepherd, & Sparks, 1994). Using the issue of food safety, the last hypothesis examines whether personal-level risk perception correlates more closely than societal-level risk perception with preventive behaviors:

H4: Personal-level risk perception will have a stronger correlation with the intention to engage in food safety practices than societal-level risk perception.

2.9 Chapter 2 Summary

Based on the literature reviewed, the current study suggests a number of research questions and hypotheses (see Figure 2.1). The first part of the research questions and hypotheses seeks to examine the impacts of scientific knowledge and socio-demographic factors on an individual's perceived risks of food hazards. The following two research questions were developed:

RQ1: What are the relationships between the level of scientific knowledge and the two levels of risk perception (personal- and societal-level risk perception)?

RQ2: What are the relationships between socio-demographic factors (age, gender, levels of education, levels of income, and political orientation) and the two levels of risk perception (personal- and societal-level risk perception)?

The next set of research questions and hypotheses seeks to examine the influence of trust in various information sources on personal- and societal-level risk perceptions. First, this study explores which information sources are more trusted than others. The following research question was developed:

RQ3: What information sources are more trusted than others regarding food

hazards?

Then, the following hypotheses and research question were developed:

H1a: Trust in the government, the food industry, and experts will be negatively associated with personal-level risk perception.

H1b: Trust in the government, the food industry, and experts will be negatively associated with societal-level risk perception.

H1c: Trust in citizen groups will be positively associated with personal-level risk perception.

H1d: Trust in citizen groups will be positively associated with societal-level risk perception.

RQ4: What are the relationships between trust in communication channels (mass media and interpersonal networks) and risk perceptions (personal- and societal-level risk perceptions)?

With regard to the impact of each communication channel on risk perception, the following hypotheses were proposed:

H2a: News media use (newspapers, television news, and Internet news) will be positively associated with personal-level risk perception.

H2b: News media use (newspapers, television news, and Internet news) will be positively associated with societal-level risk perception.

H3a: Engaging in interpersonal communication will be positively associated with personal-level risk perception.

H3b: Engaging in interpersonal communication will be positively associated with societal-level risk perception.

Given that people get food hazards information from a variety communication channels, this study explores what communication channels are more frequently used with the following research question:

RQ5: What communication channels are more influential in shaping risk perceptions (societal- and personal-levels)?

Lastly, this study looks at how two levels of risk perception affect preventive

behaviors. With respect to the relationships between two levels of risk perception and behavioral intention, this study proposed the following hypothesis:

> *H4*: Personal-level risk perception will have a stronger correlation with the intention to engage in food safety practices than societal-level risk perception.

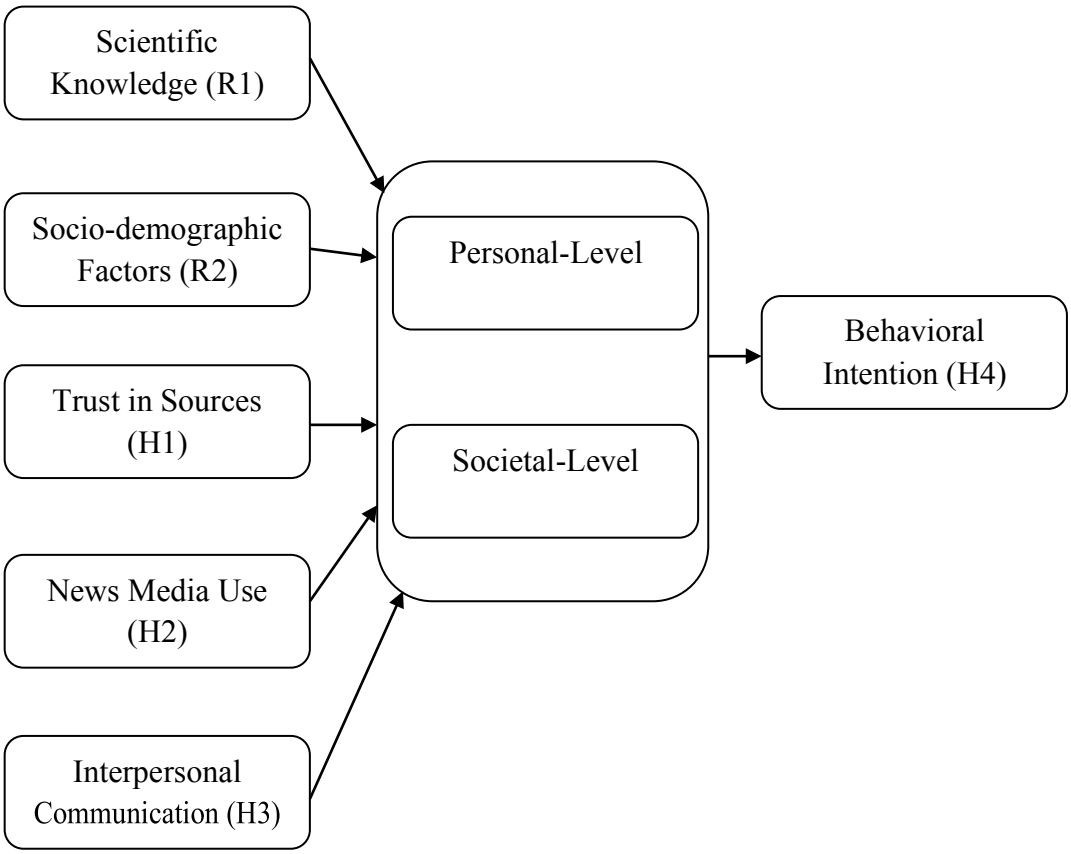

Figure 2.1 Conceptual Framework of the Study.

CHAPTER 3

METHODS

This chapter first describes secondary survey data analyzed for this study to answer research questions and test hypotheses described in Chapter 2. Next, this chapter presents operational definition of each measurement employed in this dissertation. Finally, this chapter provides a list of analyses for each research question and hypothesis

3.1 Data

Data for this dissertation were collected in South Korea in August 2011 as a part of the Korean Food and Drug Administration's project on the public's perceptions about a variety of health issues.[2] The questionnaire was originally developed by the research team in the School of Media and Communication at the Korea University under grant support from the Korean Food and Drug Administration. Participants were recruited through a nationwide online survey firm (KDN; Korea Data Network) from a panel of about 650,000 potential participants. Non-probability quota sampling was used to include diverse demographic subgroups of the population. Because of the use of non-probability sampling, response rate was not calculated. The sample of the survey consisted of residents aged 20 years or older living in seven major metropolitan cities in South Korea.

[2] The original survey included a total of 25 health issues that have been prominent in South Korea for the last 10 years.

The final sample size was 1001.

As of 2010, the total population in South Korea was 47,990, 761.[3] The ratio of gender is almost evenly divided: male (n = 23, 840, 836, 49.7%) and female (n = 24,149,865, 50.3%) (Korean Statistical Information Service, 2011). The proportion of male (49.9%) and female (50.1%) in the sample used for this study was almost the same as the ratio in the whole population (see Table 3.1). When excluding the population of people below age 20 and above age 70, the proportion of the subgroups according to their age in the sample was also comparable to that of the whole population (see Table 3.1). It can be concluded that the sample for this study well represents the population.

3.2 Measures

The current study explores possible factors that may influence the way South Koreans perceive food safety risks. This study also examines the relationships between risk perception and behavioral intention. Respondents' perceived risks and behavioral intention served as dependent variables. Independent variables include scientific knowledge, socio-demographic factors, trust in information sources, news media use, and interpersonal communication. Personal- and societal-level risk perceptions also served as independent variables when examining the relationship to preventive behavioral intention.

The original questionnaire items included the following socio-demographic variables: age, gender, income, education and political orientation. Table 3.1 summarizes means and standard deviations for the variables. In order to assess respondents' level of scientific knowledge, eight items were selected from the original questionnaire. The eight

[3] This was based on the nation's census survey, which is conducted every 5 years. The next census survey will be conducted in 2015.

items were adapted from the index of *civic scientific literacy*.[4] The item wordings for scientific knowledge and a correct response rate on each item are presented in Table 3.2. Every item for other measures was explored in terms of means, standard deviations, and alphas before items were summed into a single index for further analyses. These indices were then used to explore research questions and test hypotheses: trust in information sources (15 questions), news media use (6 questions), interpersonal communication (5 questions), personal-level risk perception (6 questions), societal-level risk perception (6 questions), and preventive behavioral intention (3 questions). Table 3.2 demonstrates descriptive statistics for the items and indices with exact question wordings from the original survey questionnaire.

Socio-demographic factors. Age, gender, education, income, and political orientation served as *socio-demographic factors. Age* was measured as a continuous variable (ranged from 20 to 69, $M = 41.49$, $SD = 13.02$). *Gender* was a dichotomous variable with male coded as "1" and female coded as "2" (49.9 % males). *Education* was an ordinal variable measured with five categories. The categories ranged from "middle school degree" (coded as "1") to "graduate degree" (coded as "5"). The sample median was "4," indicating "Bachelor's degree" ($SD = .98$). *Income* was also an ordinal variable measured with nine categories. The sample median was "4," indicating monthly household income fell into the range of 3-4 million Korean Won; equivalent to approximately 2,801-3,700 dollars ($SD = 1.95$). For *political orientation*, respondents were asked whether they were conservatives (15.4%), moderates (67.4%), or liberals

[4] *Civic science literacy* is defined as "a level of understanding of scientific terms and constructs sufficient to daily newspapers or magazine and to understand the essence of competing arguments on a given dispute or controversy" (Miller, 1998, p.208).

(17.2%).

Scientific Knowledge. *Scientific knowledge* for this study was an additive index of the following eight dichotomous items (1 = True, 2 = False): 1) "The Sun goes around the Earth" (False); 2) "Radioactive milk can be made safe by boiling it" (False); 3) "It is the mother's gene that decides whether the baby is a boy or a girl" (False); 4) "The earliest human beings lived at the same time as the dinosaurs" (False); 5) "Antibiotics kill viruses as well as bacteria" (False); 6) "Lasers work by focusing sound waves" (False); 7) "All radioactivity is man-made" (False); and 8) "The Earth goes around the Sun once each month" (False). For each item, the correct answer was recoded into "1," and the incorrect one was recoded into "0." The scores for the eight items were combined into a single index, representing the level of an individual's scientific knowledge. Higher scores indicate greater levels of factual scientific knowledge ($M = 5.37$, $SD = 1.79$, *KR-20* = .59).

Trust in information sources. Respondents were asked to indicate how much (1 = *not at all*, 5 = *very much*) they trust the following information sources for food safety issues: 1) government officials, 2) food manufacturers, 3) food distributors, 4) food companies, 5) scientists, 6) citizen interest groups, 7) medical professionals, 8) consumer advocacy groups, 9) human rights groups, 10) newspapers, 11) television news, 12) the Internet, 11) family, 13) neighbors, and 14) peers. *Trust in government* was measured using a single-item measure ($M = 2.61$, $SD = .89$). Trust in scientists and trust in medical professionals were averaged to create a single index, representing *trust in experts* ($M = 3.31$, $SD = .77$, $r = .53$, $p < .001$). *Trust in citizen groups* was measured by averaging the three items: trust in citizen interest groups, trust in consumer advocacy groups, and trust in human rights groups ($M = 3.34$, $SD = .73$, $\alpha = .80$). Trust in food manufacturers, trust

in food distributors, and trust in food companies were combined into a single variable and labeled as *trust in the food industry* ($M = 2.33$, $SD = .71$, $\alpha = .75$). *Trust in the media* was measured using three items: trust in newspapers, trust in television, and trust in the Internet, with higher scores indicating greater levels of *trust in the media* ($M = 3.04$, $SD = .72$, $\alpha = .83$). Trust in family, trust in peers, and trust in neighbors were averaged to create *trust in interpersonal networks* ($M = 3.55$, $SD = .68$, $\alpha = .83$).

News media use. The amount of news media use was measured in terms of both exposure and attention. Respondents were asked to rate a) how often (0 = not at all; 10 = always) they read or view news stories about food safety, and b) how much attention (0 = not at all; 10 = very close attention) they paid to food safety stories in a) newspapers, on b) television news, and c) online news. The exposure and attention measures of each medium were combined into a single index: *newspaper reading* ($M = 5.56$, $SD = 1.96$, $r = .72$, $p < .001$), *television news viewing* ($M = 6.72$, $SD = 1.64$, $r = .73$, $p < .001$), and *online news reading* ($M = 6.44$, $SD = 1.96$, $r = .76$, $p < .001$).

Interpersonal communication. *Interpersonal communication* was measured with five items. On a seven-point scale (1 = not at all; 7 = a great deal), respondents were asked how much they had discussed the following food safety issues: a) radioactive contamination, b) antibiotics in foods, c) GM foods, d) foot-and-mouth disease, and e) mad cow disease. These five items were combined into a single index ($M = 4.45$, $SD = 1.14$, $\alpha = .83$).

Risk Perception. Risk perception was operationalized at two different levels: personal and societal. *Personal-level risk perception* was measured with 6 items, asking the respondents how likely (1 = not at all likely; 7 = very likely) they would perceive

themselves to be affected by the following risks: a) genetically modified (GM) foods, b) pesticide residues, c) radioactive contamination, d) antibiotics in foods, f) foot-and-mouth disease, and g) mad cow disease. Responses on these six items were combined and averaged into a composite measure (M = 5.08, SD = 1.02, α = .85), with higher scores indicating perceptions of greater personal risk. The items used to measure perceived personal risks were reworded to measure perceived risks for others (societal-level risks). Respondents were asked to assess how likely it is that other people would be affected by the same six risks. A composite index of *societal-level risk perception* was constructed by averaging the six items (M = 5.27, SD = .96, α = .87).

Preventive behavioral intention. Respondents were asked the extent to which they agree or disagree with the following statements: 1) "In the case of a food safety accident, I will purchase foods after checking ingredients in the foods carefully," 2) "Even if there is an outbreak of foot-and-mouth disease, I will eat pork," and 3) "Although people are concerned about BSE, I will eat beef.". These items were measured on 7-point scale, from 1 = *not at all willing to* to 7 = *strongly willing to.* The latter two items were recoded (e.g., value of 1 was recoded into 7, and value of 7 was recoded 1, etc.). The three items were averaged to create a single index, with higher scores indicating higher levels of *preventive behavioral intention* (M = 5.11, SD = .92, α = .63).

3.3 Analytic Strategy

SPSS 21.0 was used to analyze the data. Ordinary Least Squares (OLS) regression models were used to test research questions (RQ1-RQ2; RQ4-RQ5) and hypotheses (H1-H4) suggested in this study. OLS regression enables researchers to test the unique variance explained by each predictor with hierarchical blocks entered in steps (Cohen,

Cohen, & West, Aiken, 2003). The blocking strategy allows the incremental assessment of R^2 of each predictor, as well as comparison of beta coefficients across models (Leech, Barrett, & Morgan, 2012).

Before running regressions, preliminary analyses were conducted to ensure there were no violations of the assumptions of normality and multicollinearity. The Normal Probability Plots and Scatter Plots revealed no outliners. Multicollinearity tests revealed that tolerance values were all above zero and VIF values were all below the conventional cut-off value of 10, indicating assumptions of multicollinearity were not violated (Cohen et al., 2003).[5]

Three sets of regression analyses were conducted for the following dependent variables: 1) personal-level risk perception, 2) societal-level risk perception, and 3) preventive behavioral intention. First, for the regression model with personal-level risk perception as the dependent variable (RQ1-RQ2; RQ4-RQ5; H1a; H1c; H2a; H3a), socio-demographic factor variables were entered first (Block 1), followed by scientific knowledge (Block 2), trust in information sources variables (Block 3), news media use (Block 4), and interpersonal communication (Block 5). The same regression model was used to predict societal-level risk perception as the dependent variable (RQ1-RQ2; RQ4-RQ5; H1b; H1d; H2b; H3b). In order to test whether personal-level risk perception would have a greater impact than societal-level risk perception on behavioral intention (H4*)*, the same regression model was also used, with the addition of a sixth block, in which risk perception variables were entered together.

[5] Before performing multicollinearity tests, correlations were yielded to examine relationships among variables. Appendix A shows the zero-order correlation matrix of all variables used for this study.

RQ3 asked, “what information sources are more trusted than others regarding food hazards?” To answer this research question, the mean scores for trust in each information source were used.

The analyses were performed to reveal what factors may influence the way respondents perceive risks of food hazards and respondents’ preventive behavioral intention. These analyses also were used to reveal what factors are more influential than others in shaping risk perception. The next chapter reports the findings in detail.

Table 3.1 Descriptive Statistics for Socio-demographic Factors and Scientific Knowledge (N = 1,001)

Socio-demographic factors		
Age (*M* = 41.49, *SD* = 13.02)	Sample	Population
20-29	21.2% (212)	20.1%
30-39	23.4% (234)	23.8%
40-49	24.0% (240)	24.0%
50-59	19.9% (199)	20.0%
60-69	11.6% (116)	12.2%
Gender	Sample	Population
Female	50.1% (502)	50.3%
Male	49.9% (499)	49.7%
Education (*M* = 3.45, *SD* = .98)	Sample	
No school or middle school	1.8% (18)	
High school	23.0% (230)	
Some college or technical school	11.2% (112)	
Bachelor's degree	56.7% (568)	
Graduate or professional degree	7.3% (73)	
Monthly Income (*M* = 4.68, *SD* = 1.95)	Sample	
0-990,000 won (0-900 dollars)	1.8% (18)	
1,000,000-1,990,000 won (901-1800 dollars)	9.8% (98)	
2,000,000-2,990,000 won (1801-2800 dollars)	19.3% (193)	
3,000,000-3,990,000 won (2801-3700 dollars)	20.1% (201)	
4,000,000-4,990,000 won (3701-4600 dollars)	20.7% (207)	

5,000,000-5,990,000 won (4601-5600 dollars)	10.9% (109)
6,000,000-6,990,000 won (5601-6500 dollars)	6.7% (67)
7,000,000-7,990,000 won (6501-7400 dollars)	4.7% (47)
8,000,000-8,990,000 won (7401-8400 dollars)	6.1% (61)
Political Orientation	Sample
Conservatives	15.4% (154)
Moderates	67.4% (675)
Liberals	17.2% (172)
Scientific Knowledge (M = 5.37, SD = 1.79, KR-20 = .59)	
The Sun goes around the Earth.	68.5% (686)[a]
Radioactive milk can be made safe by boiling it.	94.4% (945)[a]
It is the mother's gene that decides whether the baby is a boy or a girl.	75.8% (759) [a]
The earliest human beings lived at the same time as the dinosaurs.	56.9% (570) [a]
Antibiotics kill viruses as well as bacteria.	69.3% (694) [a]
Lasers work by focusing sound waves.	35.7% (357) [a]
All radioactivity is man-made.	75.1% (752) [a]
The Earth goes around the Sun once each month.	61.4% (615) [a]

Note. [a] The percent of a correct answer on each item (The number of individuals answering the item correctly).

Table 3.2 Descriptive Statistics for Key Variables (N = 1,001)

Variable	Question	M	SD	Reliability
Trust in Information Sources	"How much (1 = *not at all*, 5 = *very much*) do you trust _____ as an information source for food safety issues?"			
Trust in the government		2.61	.89	
	Government officials			
Trust in experts		3.31	.77	$r = .53^{***}$
	Scientists	3.35	.84	
	Medical professionals	3.28	.92	
Trust in citizen groups		3.34	.73	$\alpha = .80$
	Citizen interest groups	3.35	.89	
	Consumer advocacy groups	3.46	.83	
	Human rights groups	3.22	.89	
Trust in the food industry		2.33	.71	$\alpha = .75$
	Food manufacturers	2.34	.91	
	Food distributors	2.27	.83	
	Food companies	2.40	.86	
Trust in the media		3.04	.72	$\alpha = .83$
	Newspapers	2.92	.86	
	Television	3.04	.85	
	The Internet	3.16	.83	
Trust in interpersonal networks		3.55	.68	$\alpha = .83$
	Family	4.01	.89	

	Peers	3.35	.73	
	Neighbors	3.31	.74	
News Media Use				
Newspapers		5.56	1.96	$r = .72^{***}$
	"How often (0 = not at all; 10 = always) have you read news stories about food safety in newspapers?"	5.43	2.08	
	"How much attention (0 = not at all; 10 = very close attention) have you paid to food safety stories in newspapers?"	5.70	2.15	
Television news		6.72	1.64	$r = .73^{***}$
	"How often (0 = not at all; 10 = always) have you viewed news stories about food safety on television?"	6.75	1.74	
	"How much attention (0 = not at all; 10 = very close attention) have you paid to food safety stories on television?"	6.69	1.78	
Online news		6.44	1.96	$r = .76^{***}$
	"How often (0 = not at all; 10 = always) have you read news stories about food safety on the Internet?"	6.47	2.10	
	"How much attention (0 = not at all; 10 = very close attention) have you paid to food safety stories on the Internet?"	6.41	2.07	
Interpersonal Communication	"How much (1 = not at all; 7 = a great deal) have you discussed the following food safety issues?"	4.45	1.14	$\alpha = .83$
	Radioactive contamination	4.32	1.54	
	Antibiotics in foods	2.63	.96	
	GM foods	4.03	1.53	
	Foot-and-mouth disease	5.12	1.35	
	Mad cow disease	5.15	1.39	

Risk Perception				
Personal-level		5.08	1.02	α = .85
	Pesticide residues on foods	5.19	1.12	
	Food contamination by radioactivity	5.50	1.37	
	Antibiotics in foods	5.12	1.21	
	GM foods	5.05	1.26	
	Foot-and-mouth disease	4.60	1.53	
	Mad cow disease	5.04	1.61	
Societal-level		5.27	.96	α = .87
	Pesticide residues on foods	5.24	1.12	
	Food contamination by radioactivity	5.57	1.28	
	Antibiotics in foods	5.21	1.13	
	GM foods	5.22	1.17	
	Foot-and-mouth disease	5.08	1.29	
	Mad cow disease	5.32	1.36	
Behavioral Intention	(1 = *not at all willing to;* 7 = *strongly willing to)*	5.11	.92	α = .63
	"In the case of a food safety accident, I will purchase foods after checking ingredients in the foods carefully."	5.70	1.27	
	"Even if there is an outbreak of foot-and-mouth disease, I will still pork."[a]	4.24	1.52	
	"Although people are concerned about BSE, I will eat beef."[a]	4.68	1.61	

$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Note. [a] These two items were recoded (e.g., value of 1 was recoded into 7, and value of 7 was recoded into 1).

CHAPTER 4

FINDINGS

This chapter begins reporting the findings from the analyses related to mean comparisons between personal- and societal-level risk perceptions. This chapter then presents results of testing empirical models predicting personal- and societal-level risk perceptions, as well as preventive behavioral intention. Lastly, findings related to each research question and hypothesis are reported.

4.1 Preliminary Tests

Before answering research questions and hypotheses of this study, a series of paired *t*-test were conducted in order to examine if there was a significant difference between personal- and societal-level risk perceptions. Table 4.1 shows that respondents' perceived societal-level risk ($M = 5.27$, $SD = .96$) was greater than their perceived personal-level risk ($M = 5.08$, $SD = 1.02$), and the difference was statistically significant ($t = -4.96$, $p = .000$) (see Table 4.1). More specifically, Table 4.1 presents that the respondents' perceived societal-level risk was greater than personal-level risk across foot-and-mouth disease ($t = -14.72$, $p = .000$), mad cow disease ($t = -8.96$, $p = .000$), GM foods ($t = -5.26$, $p = .000$), antibiotics in food ($t = -3.19$, $p = .001$), and food contamination by radioactivity ($t = -2.54$, $p = .011$). Regarding pesticide residues in food, the respondents' personal-level risk perception was marginally lower than their societal-level risk perception ($t = -1.72$, $p = .086$).

4.2 Results for Empirical Model Tests

A series of hierarchical ordinary least squares (OLS) regressions was used to explore research questions and hypotheses suggested in the current study. The research questions and hypotheses of this study were developed to test which factors were influential in shaping personal-level risk perception (regression 1) and societal-level risk perception (regression 2). The impacts of the two levels of risk perception on preventive behavioral intention were also explored (regression 3).

Table 4.2 highlights the results from the hierarchical OLS regression analyses predicting personal- and societal-level risk perceptions. A comparison of unique variance (incremental R^2 change) explained by each predictor with hierarchical blocks shows that socio-demographic factors (6.1%, $p < .001$) and participating in interpersonal communication (6.0%, $p < .001$) contributed the most to personal-level risk perception, followed by trust in information sources (3.4%, $p < .001$) and news media use (2.8%, $p < .001$). Scientific knowledge contributed the least to personal-level risk perception (0.6%, $p < .01$). The overall explanatory variance of the above predictors was 18.9% ($p < .001$).

When it comes to societal-level analyses, having interpersonal discussion contributed the most to risk perception (5.0%, $p < .001$), followed by socio-demographic factors (4.4%, $p < .001$) and trust in information sources (4.3%, $p < .001$). News media use accounted for 2.5% of the variance of societal-level risk perception ($p < .001$). Scientific knowledge explained 0.6% additional variance ($p < .05$). Overall, the above predictors together accounted for 16.8% variance of societal-level risk perception ($p < .000$).

Findings in Table 4.3 demonstrate the model that predicts respondents' intention to engage in preventive behaviors. Findings show risk perception contributed the most to predicting preventive behavioral intention (4.6%, $p < .001$), followed by socio-demographic factors (4.0%, $p < .001$). Among socio-demographic factors, gender had a significant and negative correlation with behavioral intention ($\beta = -.13$, $p < .001$), indicating males are less likely to engage in preventive behaviors. Table 4.3 also shows that age was positively related to behavioral intention, although the relationship was statistically marginal ($\beta = .06$, $p = .06$). This result suggests that older Koreans are more likely to engage in preventive behaviors. Participating in interpersonal communication explained an additional 0.8% variance of behavioral intention ($p < .01$). Scientific knowledge, trust in information sources, and news media use were not significant in this regression model. However, findings show that trust in the food industry had a negative association with behavioral intention ($\beta = -.11$, $p < .01$), suggesting that if respondents do not trust what for-profit organizations in the food industry say, they are more likely to engage in preventive behaviors for food safety. The above predictors together accounted for 12.3% variance of behavioral intension ($p < .001$).

4.3 Results for Each Research Question and Hypothesis

The first research question (**R1**) explored the relationship between scientific knowledge and the two levels of risk perception (personal- and societal-level risk perceptions). Findings demonstrate that respondents' scientific knowledge was negatively related to both personal- ($\beta = -.06$, $p < .05$) and societal-level risk perceptions ($\beta = -.06$, $p < .05$). These results suggest that people with greater scientific knowledge are less likely to perceive risk of food hazards at personal and societal levels.

The second research question (**RQ2**) focused on the relationship between socio-demographic factors (age, gender, levels of education, levels of income, and political orientation) and the two levels of risk perception (personal- and societal-levels risk perception). Results show that age had a significant and positive correlation with personal-level risk perception ($\beta = .10$, $p < .01$). Age also showed a positive correlation with societal-level risk perception, although the relationship was statistically marginal ($\beta = .06$, $p = .059$). These findings indicate that older Koreans are more likely than their younger counterparts to perceive risks of food hazards. Being male also had significant correlations with personal- ($\beta = -.14$, $p < .001$) and societal-level risk perceptions ($\beta = -.14$, $p < .001$), suggesting that females are more likely to perceive risks than males. Income had a significant and positive association with personal-level risk perception ($\beta = .07$, $p < .05$), indicating that people with greater income are more likely to perceive their own risk. However, neither political orientation nor education level showed significant correlations with either personal- or societal-level risk perceptions.

RQ3 asked what information sources were more trusted than others regarding food hazards. Findings indicate that respondents had the greatest trust in interpersonal networks ($M = 3.55$, $SD = .68$) among various information sources, followed by citizen groups ($M = 3.34$, $SD = .73$), experts ($M = 3.31$, $SD = .77$), and the media ($M = 3.04$, $SD = .72$) (see Table 3.2). The least trusted information source was the food industry ($M = 2.33$, $SD = .71$), followed by the government ($M = 2.61$, $SD = .89$).

The first four hypotheses predicted that respondents' trust in various information sources would have significant relationships with risk perception. More specifically, the first two hypotheses predicted that trust in the government, trust in the food industry, and

trust in experts would be negatively associated with personal- (**H1a**) and societal-level (**H1b**) risk perceptions. Table 4.2 shows that trust in experts (scientists and medical doctors) had a negative association with personal-level risk perception (β = -.08, p < .05), indicating that individuals with greater trust in experts are less likely to perceive their own risk of food hazards. This result suggests that information from experts can play an important role in shaping South Koreans' risk perception of food hazards. Findings, however, did not demonstrate a significant and negative relationship between trust in the government and personal-level risk perception. Also, there was no significant relationship between trust in the food industry and personal-level risk perception. H1a was partially supported.

With regard to H1b, findings demonstrate that trust in experts was negatively related to societal-level risk perception (β = -.09, p < .05). This result indicates that people who believe experts as information sources are less likely to perceive risk of food hazards for other people. Both trust in the government and trust in food industry had no significant relationships with societal-level risk perception. H1b was partially supported.

The next hypothesis anticipated that trust in citizen groups would be positively associated with personal-level risk perception (**H1c**). Findings show that trust in citizen groups has a positive correlation with personal-level risk perception (β = .12, p < .001), suggesting that respondents who believe what citizen groups say about food hazards are more likely to have greater personal-level risk perception. H1c was supported.

H1d stated that trust in citizen groups would be positively associated with societal-level risk. Table 4.2 demonstrates that there is a significant and positive relationship between trust in citizen groups and societal-level risk perception (β = .11, p

< .05). This finding indicates that information from citizen groups can play a significant role in shaping risk perception for other people. H1d was supported.

RQ4 focused on the relationships between trust in communication channels (mass media and interpersonal networks) and risk perceptions (personal- and societal-levels risk perception). Results indicate that individuals who had greater trust in interpersonal networks were more likely to perceive greater risk among other people. However, trust in mass media and interpersonal networks did not show significant relationships with personal-level risk perception.

H2 anticipated that news media use would be positively related to personal- (**H2a**) and societal-level risk perception (**H2b**). Table 4.2 shows that reading news on the Internet regarding food hazards was positively and significantly associated with both personal- ($\beta = .08$, $p < .05$) and societal-level risk perceptions ($\beta = .09$, $p < .05$). Reading newspapers and watching television news, however, did not show such a significant relationship with either personal- or societal-level risk perceptions. These findings partially supported H2a and H2b, suggesting reading news articles about food hazards online can lead to greater risk perception at both personal- and societal-levels.

H3a and **H3b** examined whether interpersonal communication had a positive association with personal- and societal-level risk perceptions (see Table 4.2). Supporting H3a and H3b, having discussions with other people was positively and significantly related to both perceived personal- ($\beta = .28$, $p < .001$) and societal-level risks ($\beta = .25$, $p < .001$). These findings indicate that talking about food safety with other people can increase one's perceived risks at both personal- and societal-levels.

RQ5 asked what communication channels were more influential in shaping risk

perceptions. Findings showed that interpersonal communication had greater correlations than newspaper reading, television viewing, and online news reading with both personal- and societal-levels of risk perception.

H4 anticipated that personal-level risk perception would have a stronger association than societal-level risk perception with behavioral intention. The results demonstrate that personal-level perception had a positive and significant association with behavioral intention ($\beta = .19$, $p = .002$), suggesting that perceived personal-level risk can lead to preventive behaviors. Societal-level risk perception, however, was largely unrelated to behavioral intention ($\beta = .06$, $p = .29$). Supporting H4, these findings indicate that personal-level risk perception correlates more closely than societal-level risk perception with the intention to engage in preventive behaviors.

Table 4.1 Mean Comparisons between Personal- and Societal-level Risk Perceptions (N=1,001)

Food Safety Issue	Risk Perception	Mean	SD	t	Sig.
Pesticide residues on food	Personal	5.19	1.12	-1.72	.086
	Societal	5.24	1.12		
Food contamination by radioactivity	Personal	5.50	1.37	-2.54	.011
	Societal	5.57	1.28		
Antibiotics in food	Personal	5.12	1.21	-3.19	.001
	Societal	5.21	1.13		
GM foods	Personal	5.05	1.26	-5.26	.000
	Societal	5.21	1.17		
Foot-and-mouth disease	Personal	4.60	1.53	-14.72	.000
	Societal	5.08	1.29		
Mad cow disease	Personal	5.04	1.61	-8.96	.000
	Societal	5.32	1.36		
Overall	Personal	5.08	1.02	-4.96	.000
	Societal	5.27	.96		

Table 4.2 Summary of Ordinary Least Squares Regression Analysis Predicting Personal- and Societal-level risk perceptions (N = 1,001)

	Risk Perception	
	Personal-level (β)	Societal-level (β)
Social-demographic factors		
Age	.10**	.06#
Male	-.14***	-.14***
Income	.07*	.05
Education	.00	.02
Conservatism	-.05	-.01
R^2 Change (%)	**6.1***	**4.4***
Scientific Knowledge	-.06*	-.06#
R^2 Change (%)	**0.6****	**0.6***
Trust in information sources		
Government	-.02	-.02
Industry	-.02	.02
Experts	-.08*	-.09*
Citizen Groups	.12***	.11**
The media	.00	-.03
Interpersonal networks	.02	.08*
R^2 Change (%)	**3.4***	**4.3***
The media		
Newspapers	.03	.01
Television	-.00	-.01

Internet news	.08*	.09*
R^2 Change (%)	**2.8*****	**2.5*****
Interpersonal discussion	.28***	.25***
R^2 Change (%)	**6.0*****	**5.0*****
Total R^2 (%)	**18.9*****	**16.8*****

Note: Entries are standardized regression coefficients (β **)**.
$^{\#}p \leq .10$. $^{*}p \leq .05$. $^{**}p \leq .01$. $^{***}p \leq .001$.

Table 4.3 Summary of Ordinary Least Squares Regression Analysis Predicting Preventive Behavioral Intention (N = 1,001)

	Behavioral Intention
Socio-demographic factors	
Age	.06#
Male	-.13***
Income	-.05
Education	.05
Conservatism	-.01
R^2 Change (%)	**4.0*** **
Scientific Knowledge	.02
R^2 Change (%)	**.00**
Trust in information sources	
Government	-.01
Industry	-.11**
Experts	-.01
Citizen Groups	.03
The media	.03
Interpersonal networks	.01
R^2 Change (%)	**2.4*** **
The media	
Newspapers	-.02
Television	.05
Internet news	.00

R^2 Change (%)	**0.5**
Interpersonal discussion	.03
R^2 Change (%)	**0.8****
Risk Perception	
Personal-level	.19**
Societal-level	.06
R^2 Change (%)	**4.6*****
Total R^2 (%)	**12.3*****

Note: Entries are standardized regression coefficients (β **)**.
$^{\#}p \leq .10$. $^{*}p \leq .05$. $^{**}p \leq .01$. $^{***}p \leq .001$.

CHAPTER 5

DISCUSSION

The current study was designed to shed light on the following important and overarching question: what is the basis for people's risk perception? Previous literature suggests that public risk perception is not shaped based on scientific estimations alone (Cope et al., 2010; Smillie & Blissett, 2010). Rather, it is argued that risk is perceived in a social, psychological, and communication context (S. Ho et al., 2008; Kher et al., 2013). This study is the first of its kind to integrate possible factors that may affect public risk perception of food hazards and examine the role of each factor. This study then investigated how increased risk perception was linked to preventive behaviors. Analyses of secondary data collected in South Korea revealed findings that deserve further discussion in terms of implications for practical and theoretical applications. This chapter first reviews key findings of this study and then discusses theoretical and practical implications. Lastly, this chapter presents a discussion of this study's limitations and directions for future research.

5.1 Key Findings

This study aimed to answer the question of how an individual perceive food risks differently from other people. The present study examined the relationships between possible predictors and risk perceptions of food hazards. This study looked at scientific knowledge, socio-demographic factors, trust in information sources, news media use, and

participation in interpersonal communication as possible predictors that work together in shaping an individual's risk perceptions. This study investigated whether each of the possible predictors was significantly related to risk perceptions, and, if so, which of the predictors was the most influential. In particular, this study examined risk perception at personal- and societal-levels to see which level of risk perception was more closely linked to preventive behavioral intention. The study revealed several important findings.

First, the factors examined as possible predictors in this study all had significant relationships with both personal- and societal-level risk perceptions. The knowledge-deficit model proposes that individuals make judgments about risks of a health and/or environmental hazard based on scientific assessments (Einsiedel, 2000; Wynne & Irwin, 1996). The findings of this study support the idea that public risk perception of food hazards is a product of a combination of various social, psychological, and communication factors with scientific knowledge (Hansen et al., 2003; Smillie & Blissett, 2010). The current study indicates that one's risk perception is shaped by his or her trust in information sources, interpersonal communication, news media use, and socio-economic status, and scientific knowledge. The findings are in consistent with previous findings in terms of the impacts of socio-economic status (Dosman et al., 2001; Rivers et al., 2010), trust in information sources (Brewer & Ley, 2013; S. Ho et al., 2008), mass media use (Cha, 2010; So et al., 2012), and interpersonal communication (Cho et al., 2013; Han et al., 2013) on risk perception.

When it comes to the relationships between the two levels of risk perception and preventive behavioral intention, findings showed that personal-level risk perception was significantly associated with the intention to engage in preventive behaviors. Societal-

level risk perception, however, did not show a significant relationship. The findings of this study suggest that the inconsistencies in previous literature regarding the relationship between risk perception and preventive behaviors can be attributed to the inconsistency in operationalizing risk perception (Brewer et al., 2007; Sjöberg, 2003; Wahlberg & Sjöberg, 2000). In some studies (e.g., Han, Moser, & Klein, 2006; Rimal & Juon, 2010), risk perception was operationalized at the personal level, while other studies operationalized risk perception in terms of societal risk (e.g., Kristiansen, Halvorsen, & Gyrd-Hansen, 2007). Some studies have used a combination of the two, combining personal and societal risks into a measure of perceived risk (e.g., Ibuka et al., 2010; Sadique et al., 2007). The current study made a distinction between personal- and societal-level risk perceptions to explore the precise theoretical mechanism through which risk perception is linked to preventive behaviors. Findings of this study support the idea that individuals may not engage in preventive behavior as long as they do not perceive themselves to be personally vulnerable to the hazard, even when they recognize the hazard as socially prominent.

If personal-level risk perception can play such a significant role in leading people to engage in preventive behaviors, it is important to identify how people initially develop their perception of their own vulnerability. Given the findings of this study, which demonstrates the significant roles of various factors in shaping risk perception, it is important to note what factors are more influential than others. Among the factors investigated in this study, interpersonal communication appeared to the most influential predictor of both personal- and societal-level risk perceptions, followed by socio-demographic factors; trust in information sources; news media use; and scientific

knowledge.

Previous literature has shown that interpersonal communication can play a significant role in increasing an individual's perception of personal vulnerability to a variety of health hazards (e.g., Han et al., 2013; Morton & Duck, 2001; Snyder & Rouse, 1995). However, in some studies, interpersonal communication showed a significant relationship only with societal-level risk perception (e.g., Basil & Brown, 1997; Cho et al., 2013; Coleman, 1993). Some researchers suggested that the reason for the correlation may be that interpersonal communication can help individuals differentiate themselves from others who are identified as vulnerable to potential risks (Cho et al., 2013). Given the current findings that interpersonal communication does have significant correlations with both personal-and societal-levels risk perception, this study supports the idea that sharing risk information with acquaintances can help individuals better understand how average people like themselves can be affected by a certain health hazard (Han et al., 2013; Liberman et al., 2007).

Prior studies have suggested that people can be more influenced by interpersonal communication than mass media in shaping their risk perception (e.g., Van den Putte et al., 2011; Southwell & Yzer, 2009). Given the findings that participating in interpersonal discussions had greater correlations with risk perceptions than did other communication channels, this study supports the idea that interpersonal communication can be the most effective communication channel through which health and risk information can be disseminated.

Among the three types of news media examined, online news reading indicated positive and significant correlations with both personal-and societal-level risk perceptions,

while newspaper reading and television news viewing did not show such significant relationships. The significant role of Internet news can be explained by several different reasons. First, the scope of information available on the Internet can help the users better understand potential risk to themselves. Compared to newspapers or television, the Internet provides a significantly greater amount of information regarding health risks (Huurne & Gutteling, 2008). Also, online news readers can easily access more in-depth information through the hyper linking system of the Web (Glik, 2007). Second, frequent and repeated exposures to updated news on the Internet can also increase the users' perceived prominence of certain food hazards (Lee, 2008). Finally, online news readers are more likely to be self-selective and highly motivated to seek and process information (Eveland, 2003). Individuals turn to the Internet to obtain risk information when the risk has personal relevance and thus process the information more thoroughly (Kahlor, Dunwoody, Griffin, & Neuwirth, 2006). When people process risk information more thoroughly, the information tends to be more powerful in affecting their perceptions of risk (Kahlor et al., 2006; Natter & Berry, 2005).

In the present study, television viewing did not show a significant relationship with risk perceptions even though television was the most frequently used media channel for food safety information. This result can, in part, be attributed to the amount of news contents that the public can encounter through television. Primetime daily news programs in South Korea cover about 30-40 news items in their 1-hour broadcasts, focusing on each item for less than 2 minutes (Kim, 2008). It is therefore unlikely that the amount of information viewers could glean from watching television news would be substantial enough to have an impact.

Besides interpersonal communication, the current study showed that socio-demographic factors had greater correlations with both personal- and societal-level risk perceptions than other factors. Researchers suggest that there exists a certain subgroup of people who perceive lesser risk than their counterparts in the United States; for example, it has been found that white males are less likely to perceive risk than females and other ethnic groups (Kahan et al., 2007; Olofsson & Rashid, 2011). The phenomenon is referred as the white male effect (Finucance et al., 2000; Rivers et al., 2010). Members of this group are generally highly educated, politically conservative, and earn higher incomes. Given that many policy-makers are white men, the white male effect hypothesis suggests this influential group is perceived as being insensitive to public's concerns about various health and environmental hazards (Dosman et al., 2001; Rivers et al., 2010). This study examined whether a similar "white male effect" can be found in South Korea.

Findings of this study demonstrated that women perceived food safety hazards as more risky. This finding is consistent with previous literature (Ho et al., 2011; Slovic, 1999), suggesting respondents' gender is an important determinant of risk perception. One of the possible explanations for the gender difference in risk perception is that women are generally more nurturing than men and can, therefore, be more aware of and sensitive to various health and environmental hazards (Kahan et al., 2007; River et al., 2010). The gender effect may be more prominent when the hazards are related to food safety issues because women, in general, are more likely than men to be responsible for daily food preparations and purchases in the household. As a result, women may feel more vulnerable to food hazards (Govindasamy, DeCongelio, & Bhuyan, 2006).

Findings also showed that older respondents were more likely to judge risk as

higher than younger respondents. This result supports previous findings suggesting that older individuals tend to perceive health and environment risks as higher than younger individuals (De Jonge et al., 2007a). In terms of food hazards, specifically, it has been found that older people are likely to perceive greater risk than their younger counterparts (Kellen et al., 2011; Lindell & Hwang, 2008). This may be because the younger individuals might have not experienced the negative impacts of food hazards and, as a result, are less likely to believe they are at risk (Dosman et al., 2001).

It is also noteworthy that as people's income level increased, so did their personal-level risk perception. Prior studies on the white male effect, however, suggested that individuals with higher income tend to judge food risks as lower than their counterparts (Buchler et al., 2010; Lobb et al., 2007). Findings of this study demonstrated that the opposite could be also true. Previous literature on the white male effect suggested that higher levels of household income might enable individuals to purchase substitutes to minimize their exposure to risks, and, as a result, wealthy people are less likely to perceive that they are at risk (Dosman et al., 2001). It is also possible that higher-earning individuals may become more concerned about, or be more sensitive to, food safety issues because they can make use of their greater finance resources to reduce their exposure to the risks of food hazards. Previous studies suggest that individuals' readiness to pay for food risk reduction does increase with income (Govindasamy, et al., 2006). For example, purchasing organic products is believed to reduce pesticide residue risk and the actual purchasers of organic agriculture often have a higher level of household income (Misra, Huang & Ott, 1991; William & Hannitt, 2001).

The current study also examined the role of trust in information sources as a

heuristic cue that the public may rely on to make judgments of the risks of food hazards. This study provides an overall analysis of which information sources have the public's trust in terms of food safety issues in South Korea and which ones lack public trust. The study also examined what roles trust in various information sources play in shaping the public's risk perceptions. Prior studies conducted in other countries have reported that public trust in governmental policies associated with food risks, as well as public trust in food industries, has decreased over the past decades (De Jonge et al., 2010; Kuttschreuter, 2006). In contrast, citizen groups and experts have emerged as the most trusted sources for information about food safety issues (Lofstedt, 2006). Consistent with the previous literature, this study revealed that interpersonal channels, such as family and friends, were the most trusted information sources among South Koreans, followed by citizen groups and experts. The food industry appeared to be the least trusted source in South Korea, followed by the government. It is important to note that a decline in public trust in industry and government has been in parallel with the increase in public trust in citizen groups in Western society (Laird, 1989; Peter et al., 1997; Trumbo & McComas, 2003). Study findings suggest that the general public's greater trust in citizen groups might be an accompaniment to the lack of the public's trust in the government and the food industry in South Korea. This might because the public believes in citizen groups and expects them to monitor and report faults of government policies and industry that otherwise might be overlooked (M. Kim, 2012).

Trust in information sources has received growing attention from risk communication researchers because it is believed to affect ordinary citizens' responses to risk messages (Brewer & Ley, 2013; Kuttschreuter, 2006). Previous literature has

suggested that perceived trustworthiness of information sources can lead information receivers to believe the messages (Kjærnes, 2006; Gass & Seiter, 2007). However, there has been little attempt to examine the role of trust in information sources in shaping public perception of food safety issues (Brewer & Ley, 2013). According to the findings of this study, trust in citizen groups appeared to be the most influential information source that can affect the public's risk perceptions of food hazards. Trust in citizen groups showed stronger relationships than other information sources with both personal- and societal-level risk perceptions. Those who have greater trust in citizen groups tend to perceive greater risks of food hazards for themselves and for others than those who have lesser trust in citizen group organizations. Trust in experts also indicated significant and negative relationships with both levels of risk perception. It is likely that South Koreans are less likely to perceive food risks when they have trust in experts. These findings support the idea that ordinary citizens can either reduce or increase perceived risks of a hazard as they believe that citizen groups or experts will adequately monitor or control a given hazard and, in turn, will protect the public from potential risks (Lang & Hallman, 2005; Peters et al., 2007).

In terms of the role of scientific knowledge, this study showed that there were small but negative relationships between scientific knowledge and both personal- and societal-level risk perceptions. According to the current study, individuals with greater general textbook science knowledge were less likely to perceive risks of food hazards. The role of scientific knowledge in shaping public risk perception has been debated in previous literature on risk perception (Van Kleef et al., 2009; Smillie & Blissett, 2010). On the one hand, some studies report the role of scientific knowledge is fairly negligible

in forming public risk perception (e.g., S. Ho et al., 2008; Marris et al., 1997; Siegrist et al., 2005). On the other hand, scientific knowledge is believed to lead to more positive attitudes towards science and, as a result, lead people to perceive risks as smaller (Allum et al., 2008). While the significant relationship between scientific knowledge and risk perceptions in this study supported the role of scientific knowledge in shaping risk perception, the role appeared to be least influential compared to other factors. The findings of this study support the idea that effective food risk communication is not dependent upon simply providing accurate scientific probability information.

5.2 Practical Implications

Incorporating theories and findings of previous studies into the context of food hazards in South Korea, the current study provides useful information for practical implications for food risk communication. Findings indicated that perceiving one's own vulnerability is the first step to engaging in preventive behaviors. To increase personal-level risk perception, according to the findings of this study, risk communication practitioners and policy makers need to consider the role of word-of-mouth and Internet-based communication, socio-demographic characteristics, and trust in information sources when they design and convey the messages of food risks.

In terms of communication channels, the findings highlight the role of word-of-mouth in spreading words about food hazards. This study showed that interpersonal discussions about food safety issues were the strongest predictor of risk perceptions. This study also provides compelling empirical evidence that online news reading could contribute to increasing risk perceptions. According to the findings, food risk communication practitioners need to design their campaigns, focusing on spreading a risk

through the Internet and generating word-of-mouth. Further, health educators may also need to utilize new communication technology, such as social networking sites. Given that social networking sites have combined elements of both interpersonal communication (e.g, the ability to provide personalize and tailored messages) and the Internet (e.g., the ability to enhance active information seeking), this study suggests that social media can be an effective communication channel to increase personal-level risk perception, and can result in better behavior changes (Della, Eroglu, Bernhardt, Edgerton, & Nall 2008; Han et al., 2013). Recent research from Pew Research Center (2013) also suggests that the potentials of social media as an effective communication tool for disseminating information. The results show that around two-thirds (72%) of respondents get most news by having conversations with their family or friend—either in person or over the phone. Social networking is now a part of this process as well: 15% of U.S. adults get most of their news from friends and family this way. For this reason, in recent years, a variety of health and environmental advocacy organizations at all levels of government and in the private sector in the United States have been increasing used social media to convey health and risk related information (Briones, Kuch, Liu, & Jin, 2011; Jin, Liu, & Austin, 2011). Little research, however, has been conducted to examine whether social media indeed have an impact on people's risk perception and preventive behaviors (Rutsaert et al., 2013). The findings of this study imply that social media can be effective communication channels in spreading food risk information and leading to preventive behaviors.

This study also revealed that information sources can play an important role in shaping public risk perception of food safety issues. According the findings, risk

information needs to be provided by trusted sources so that ordinary citizens can pay close attention to the hazard communicated, which can lead them to make more educated decisions about the riskiness of the hazard (Van Kleef et al., 2009; Lobb, 2005). Based on the findings, it can be suggested that risk communication professionals and policy makers in South Korea need to consider utilizing trusted information sources, such as citizen groups and experts such as scientists and medical professions, in disseminating food risk information.

Findings also indicate that the government needs to promote greater public trust. Prior studies have suggested that perceived trustworthiness of information sources can lead information receivers to advocate the messages they receive (Frewer & Miles, 2003; Gass & Seiter, 2007). It can be assumed that people will not trust governmental policies or governmental control systems associated with food risks if they lack trust in the government (Kuttschreuter, 2006; Verbeke et al., 2007). In other words, where public trust in the government is absent, policy decisions may not be acceptable to the citizens and, and members of the public are not likely to have trust in the polices (Cope et al., 2010; Frewer & Miles, 2003; Lofstedt, 2006). Chryssochoidis and colleagues (2009), emphasized that "public trust in institutions responsible for risk management and communication may constitute an important factor influencing perception and acceptance of risks, as well as a prerequisite for effective risk communication" (p.138).

To develop and implement governmental policies effectively, it is critical for the government to gain the public's trust. It has been found that expressing concern about public well-being, or having a good track record of conveying information appeared to be associated with trust in an information source (Frewer & Miller, 2003; Tulloch & Zinn,

2011). Thus, government officers and policy makers need to be open and honest about the risks of specific food hazards to develop citizens' trust in the government (Lofstedt, 2006; VanKleef et al., 2009).

Lastly, this study showed differences in risk perception among subgroups of the population. Researchers have suggested the importance of audience segmentation for effective health and risk communication (De Jonge et al., 2007a). However, target groups of many food-related risk communication campaigns have been broadly identified as the ordinary people *as a whole,* an approach that does not take into account socio-demographic differences among people (Abbot, Byrd-Bredbenner, Schaffner, Bruhn & Blalock, 2009; Renn, 2005). Researchers have pointed out that health or risk communication campaigns can have an influence when they are designed to resonate with a target individual's perceptions (Glik, 2007). For example, Noar and colleagues (2007) found that tailored, or customized, health-related messages were an effective strategy for capturing the attention of interested publics and made the subject matter more "personally relevant" (p. 684). Given the findings of this study, socio-demographic characteristics of the populations who perceived higher food risks, such as women, the elderly and higher-earning individuals, can be used to develop better risk food communication strategies and tailor food hazard information to target populations.

5.3 Theoretical Implications

Public risk perception has mainly been explored within a framework of either the knowledge-deficit model or the psychometric paradigm (Tulloch & Zinn, 2011). As Hansen and colleagues (2003) point out, however, neither the knowledge-deficit model nor the psychometric paradigm provides a sufficient theoretical and methodological

foundation for the explanation of why individuals perceive and respond to food safety risks in the way they do (Hansen et al., 2003; Van Kleef et al., 2009). The knowledge-deficit model only emphasizes the role of scientific information in shaping risk perception and disregards other psychological and contextual factors (Hansen et al., 2003). While psychometric paradigm studies acknowledge that risk perception can be shaped by social, psychological, and cultural factors, this line of research does not address how different individuals evaluate the same hazard differently (Marris et al., 1997; Siegrist et al., 2005). The psychometric paradigm research analyzes risk perception in an aggregated way, explaining societal reactions to risk, not individuals' (Siegristet al., 2005). In other words, the psychometric paradigm studies mostly do not address how different individuals evaluate the same hazard differently (Siegrist et al., 2005).

Researchers have suggested that the two theoretical approaches need to be incorporated to understand the mechanism by which the general public develops risk perception (Tulloch & Zinn, 2011). However, integrating the two theoretical approaches has rarely been attempted. Building on the theoretical arguments of the knowledge-deficit model and the psychometric paradigm, the current study is one of the first to investigate the extent to which scientific knowledge and socio-demographic factors play roles in shaping risk perceptions of food hazards.

In addition, this study attempted to advance existing knowledge about public risk perceptions by incorporating communication factors--such as trust in information sources, news media use, and interpersonal communication--as significant factors that may affect the way the general public perceives risks of food hazards. Trust in information sources can be used as a heuristic cue that may influence individuals'

perceived risks (Brewer & Ley, 2013; De Jonge et al., 2010). Research has suggested that communication through mediated and interpersonal channels has a significant influence on individuals' perceptions of risks (Cho et al., 2013; Han et al., 2013). As McComas (2006) pointed out, communication factors need to be considered as influences on public risk perception. However, there has been little attempt to empirically examine the role of various communication factors together in shaping public risk perception in the context of food risks. This study shows that communication factors- trust in information sources, news media use, and participating in interpersonal communication- can play a significant role in shaping risk perception of food hazards.

Furthermore, this study offers a theoretical mechanism through which levels of risk perception is linked to preventive behaviors. More specifically, the relationship between risk perception and preventive behavior was examined at two separate levels of risk perception: personal and societal. This distinction between the two levels of risk perception was necessary to examine which level of risk perception could play a significant role in promoting preventive behaviors.

While the relationships among the possible predictors, risk perception, and preventive behaviors have been suggested in research in the U.S. and European countries, the same relationships have been largely unexplored in Asian countries. This study is one of the first attempts to explore these relationships in South Korea. Findings increase the intercultural validity of previous researchers' theorization about these relationships.

This study, in particular, investigated what factors were more influential in shaping risk perception using Ordinary Least Square (OLS) regression models. By using these types of regression models, this study was able to reveal each factor's influence on

an individual's risk perception of food hazards, while keeping the other factors' effects constant. This approach also enables researchers to explore the question of how an individual makes judgments about the same hazards differently from other people, which has rarely been explored in most previous psychometric paradigm research.

5.4 Limitations

Before further discussing findings, it is necessary to mention several limitations of this study. First, the cross-sectional nature of a data set limits the ability to make a strong inference about *causal direction*. For example, even though the findings of this study indicated significant correlations between communication behaviors (online news reading and interpersonal conversation) and risk perceptions, these correlations alone do not establish any direction of influences. As hypothesized, the correlations can be interpreted as indicating that use of the Internet or having discussions with others may increase risk perceptions. At the same time, it is just as plausible that those who perceive greater risk are highly interested in food-safety issues, and thus read Internet news or participate in interpersonal conversations more often. Future research can use an experimental or longitudinal design, which will better demonstrate the causal directions hypothesized in this study. However, after all, it is possible that how individuals perceive risks of a given hazard is highly intertwined with how they receive and seek information of the hazard: in reality, the relationship can be reciprocal.

Another shortcoming of this study is that the findings were based on analyses of a secondary data set. Using a secondary data set can cause measurement issues; it is not always possible to find measurements customized exactly to the concepts under investigation (Boslaugh, 2007; Kim & Shanahan, 2003). The operational definitions of

variables used in the study were limited only to the measurements available in the data set, which raised concerns about their validity (Kim & Shanahan, 2003). For example, this study measured interpersonal discussions about food safety on five issues, including GM foods, radioactive contamination, antibiotics in foods, foot-and-mouth disease, and mad cow disease. The issue of pesticide residues could not be included to measure interpersonal discussion, which was included to measure the respondents' risk perceptions of food hazards in this study. Despite concerns about the validity of measurements, using a secondary data set has been encouraged in academic research because it can enhance generalizability significantly. In general, a secondary data set allows researchers to analyze a large, good-quality data set from a nation-wide sample of the adult population, which may often be limited in access or difficult to collect (Boslaugh, 2007; Brooks-Gunn, Phelps, & Elder, 1991).

It is also important to note that the data set used for this study came from a national *online* survey based on a well-constructed stratified quota sampling. Regardless of the quality of the data, it should be noted that the use of an Internet survey limits the generalizability of the findings. This is particularly so, given that certain subgroups of the population (e.g., the wealthy, the highly educated, urban residents) are more likely than their counterparts to use the Internet, and thus are likely overrepresented in this type of Internet panel. This question, however, misses the point for a couple of reasons. First, while a telephone survey may be a better alternative, "listed" households in South Korea include only about 44% of all households (Woo, Kim, & Moon, 2011). That is, a telephone survey has its own limitations, as well. Second, the number of Internet users in South Korea has increased significantly over the years. According to a recent survey

(Korea Internet & Security Agency, 2012), about 78.4% of the South Korean population used the Internet, and around 99.9% of Koreans aged 10 to 40 used the Internet in 2012.

5.5 Future Research

Despite these shortcomings, the findings of this study suggest directions for future research. First, given the findings that personal-level risk perception is linked to preventive behaviors, it will be important for health educators to focus on increasing personal-level risk perception. Building on the findings of this study that indicate interpersonal communication can be a strong shaper of the public's personal-level risk perception, it will be worthwhile to explore what may lead people to engage in interpersonal communication about health issues. One of the possible factors can be exposure to mass media.[6] Previous literature has suggested media coverage often sets the agenda for people's everyday conversation topics (Snyder & Rouse, 1995). Interpersonal discussions about health and risk issues can be stimulated by media contents about the issues (Dunlop, Wakefield, & Kashima, 2008; Southwell & Yzer, 2009). In particular, it has been suggested that emotionally charged media messages are more likely to be shared

[6] While many of health communication campaign studies have focused on the relative roles of interpersonal and mediated communication (e.g., Cho et al., 2013; Han et al., 2013), individuals are not using entirely one medium source to obtain information of health and environmental issues (Brossard & Nisbet, 2007; Southwell & Yzer, 2009; Tian & Robinson, 2008). Rather, people use them complementarily (Dutta-Bergman, 2004). The correlation analysis of this study revealed interpersonal discussions had significant and positive correlations with newspapers ($r = .29$, $p < .001$), television news ($r = .26$, $p < .001$), and the Internet ($r = .31$, $p < .001$) (see Appendix A). The results seem to support the complementarity hypothesis, theorizing the idea that the public is using various communication channels to gratify the need for health and risk information (Dutta-Bergman, 2004; Tian & Robinson, 2008).

with others (Dunlop et al., 2008; Luminet, Bouts, Delie, Manstead, & Rimé, 2000). It is possible that entertainment media can arouse intense emotional responses through vivid and dramatic depictions, and, in turn, lead people to talk about it in their social networks. It will be interesting, then, to explore the interplay between exposure to entertainment media and interpersonal communication on people's personal-level risk perception.

Second, this study examined how news media use was related to the respondents' personal- and societal-level risk perceptions. News media are one of the most frequently used sources from which the general public obtains health information (Lee, 2008; Shim & Lee, 2013). For this reason, news media have been considered to play an important role in shaping the public's perceptions of risk (Cho et al., 2013; Han et al., 2013). The previous literature, however, has suggested that this important role of news media may be limited to shaping societal-level risk perception, remaining largely unrelated with shaping personal-level risk perception (Snyder & Rouse, 1995; So et al., 2011; Tyler & Cook, 1984). While the impersonal-impact hypothesis (Tyler & Cook, 1984) posits that news media use is largely unrelated to personal-level risk perception, online news reading in this study indicated a significant relationship with personal-level risk perception. While other traditional forms of mass media, including television and newspapers, may not significantly affect perception of personal risk, there seem to be certain attributes of the Internet that lead the users to perceive themselves personally vulnerable to certain risks, and this is an important topic for future research.

Third, this study indicated the significant roles of interpersonal communication and the Internet in shaping personal-level risk perception. Building on the findings, this study suggests that new communication technologies, such as social networking sites that

combine the elements of interpersonal communication and the Internet, can play a significant role in increasing one's perception of his or her own vulnerability. There has been one study, as far as this author knows, that explored the relationship between exposure to social media messages and two levels of risk perception. Han et al. (2013) showed that the use of social media can be a strong predictor for societal-level risk perception, but not for personal-level risk perception in the context of H1N1 flu. Social media can be the most efficient communication tool for risk communication practitioners in disseminating information quickly to large numbers of people simultaneously in times of public health crises (Lenhart & Fox, 2009; Madden, 2010; Rainie, Purcell, & Smith, 2011). Government agencies, for example, have increasingly used social networking sites during food safety crises in recent years (Kuttschreuter, Rutsaert, Hilverda, Regan, Barnett, & Verbeke, 2014; Rutsaert et al., 2013).[7] Risk communication professionals need to learn more about how to strategically use social media (Han et al., 2013; Rutsaert et al., 2013). Future research needs to investigate more systematically what roles social media can play in shaping risk perceptions and what attributes of social media can be influential in the process.

Future research also needs to improve conceptual validity for the measurement of risk perception. This study operationalized risk perception as a cognitive variable: How likely did the respondents perceive themselves to be affected by food hazards. Missing from that conceptualization and operationalization was the affective response to a risk, for example, how worried an individual was about the hazard. Researchers have

[7] The Centers for Disease Control and Prevention (CDC) in the U.S., for example, used social networking sites to provide risk information during the 2009 Salmonella typhimurium outbreak related to peanut butter and peanut-containing products (CDC, 2014; Rutsaert et al., 2013).

suggested that the public's perception of risk is shaped by the interplay between emotional and cognitive responses to risk issues (Coleman, 1993; Dunwoody & Neuwirth, 1991). For example, the affect heuristic perspective postulates that people judge a risk based on "not only how they think about it but also how they feel about it" (Slovic, Finucane, Peters, & MacGregor, 2007, p. 323). One of its key assumptions is that judging risks is essentially an emotional experience (Peters, Burraston, & Mertz, 2004). To gain a more complete picture of how the public develops risk perceptions, researchers will need to investigate how the factors examined in this study are related to emotional components of risk perception and how the emotional responses are linked to preventive behaviors.

5.6 Conclusion

The purpose of food risk management is to protect the general public from potential risks of food hazards by leading them to manage the risks effectively through engaging in appropriate actions (Lofstedt, 2006; Van Kleef et al., 2009). There has been growing attention to finding the most effective way in which to convey information about food hazards and the risks to the public (Cope et al., 2010; Rutsaert et al., 2013). A difficulty of food risk communication in large part arises from differences between the way experts and the public perceive risks (Kher et al., 2013; Hansen et al., 2003). While experts tend to make judgments about the risks based on scientific knowledge, ordinary citizens tend to perceive the risks in a social, psychological, and cultural context (Krystallis et al, 2007; Smillie & Blissett, 2010). Understanding how ordinary citizens develop their risk perception of food hazards is an important step for developing the best way to communicate with the public about food risks (Smillie & Blissett, 2010;Van Kleef et al., 2009).

Previous literature has suggested trust in information sources (Brewer & Ley, 2013; Kuttschreuter, 2006), news media use (Cho et al., 2013; Han et al., 2013), interpersonal communication (Cha, 2010; Han et al., 2013), and individual differences according to socio-demographic factors (Dosman et al., 2001; Williams & Hammitt, 2001) as possible determinants of the general public's risk perception. Prior studies have examined the factors separately when investigating their relationships to perceptions of risk (De Jonge et al., 2007b; Smillie & Blissett, 2010). This study integrated the factors as potential factors of the public's perceptions of food hazards. In addition, this study investigated risk perception at two different levels: societal and personal. This study examined whether personal-level risk perception had a greater correlation than societal-level risk perception to the intention to engage in preventive behaviors. This attempt was to reveal the precise mechanism in which perceived risks are aligned with preventive behaviors.

The current study builds on theoretical foundations and findings from previous research on food safety issues in South Korea and provides useful information for practical applications and theory building for food risk communication. Findings showed that the factors integrated into this study had all significant relationships to the public's risk perceptions. Investigating the potential determinants of the public's risk perception together describes the extent to which each of the factors individually contributes to accounting for public risk perception of food hazards; also, this method explores which factors are most influential in increasing public perception of food risks. Findings also indicated that perceiving one's own vulnerability is the first step to engaging in preventive behaviors. Taken together, this study offers a theoretical mechanism through

which predictors are linked to preventive behaviors and more insight into necessary components for effective food risk communication. Findings of this study will help policy makers and risk communication practitioners find a starting point with respect to how best to communicate food safety issues with the public.

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APPENDIX A: ZERO-ORDER CORRELATION

Table A.1 Zero-Order Correlation Matrix for Key Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1	1																		
2	.02	1																	
3	.09**	.08**	1																
4	-.14***	.21***	.25***	1															
5	.24***	.07*	.06*	-.02	1														
6	-.70*	.17***	.00	.16***	.02	1													
7	.11***	.08**	.05	-.07*	.09**	-.03	1												
8	.07*	-.02	-.01	-.13***	.08**	-.21***	.47***	1											
9	.06*	.09**	.10**	.01	.07*	.07*	.49***	.31***	1										
10	.02	-.04	.03	.04	-.17***	.02	.20***	.11***	.41***	1									
11	.07*	.03	.05	-.04	.09**	-.06*	.43***	.32***	.50***	.40***	1								
12	.15***	.01	.06*	-.02	.06*	-.01	.16***	.11***	.28***	.38***	.33***	1							
13	.14***	.05*	.15***	.10**	.14***	-.01	.22***	.10***	.25***	.08**	.27***	.19***	1						
14	.15***	-.07*	.01	-.08**	.10**	-.03	.13***	.00	.27***	.25***	.33***	.32***	.42***	1					
15	.17***	-.00	.02	.08**	-.08**	.02	-.04	-.02	.15***	.21***	.13***	.23***	.19***	.41***	1				
16	.10**	-.04	.17***	.04	-.02	-.06*	.07*	.02	.16***	.21***	.14***	.24***	.29***	.26***	.31***	1			
17	.11***	-.16***	.11***	-.00	-.06*	-.11***	-.02	-.01	.01	.18***	.06*	.14***	.12***	.15***	.17***	.36***	1		
18	.08**	-.16***	.08**	.00	-.04	-.11***	-.02	.01	.00	.17***	.05	.18***	.10**	.14***	.18***	.33***	.85***	1	
19	.07*	-.17***	-.01	.02	-.04	-.01	-.07*	-.12***	-.02	.09**	.02	.07	.03	.11***	.08**	.14***	.28***	.26***	1

Note: 1. Age; 2. Being male; 3. Income level; 4. Education level; 5. Conservatism; 6. Scientific knowledge level; 7. Trust in the government; 8. Trust in the food industry; 9. Trust in experts; 10. Trust in citizen groups; 11. Trust in the media; 12. Trust in interpersonal networks; 13. Newspaper reading; 14. Television viewing; 15. Online news reading; 16. Interpersonal communication; 17. Personal-level risk perception; 18. Societal-level risk perception; and 19. Preventive behaviors.
*$p \leq .05$. **$p \leq .01$. ***$p \leq .001$.