

PUBLIC PERCEPTION OF FOOD ALLERGIES

NEWLY EMERGING ENVIRONMENTAL HEALTH RISKS IN A RISK SOCIETY: A
CASE STUDY OF THE PUBLIC PERCEPTION OF FOOD ALLERGIES

BY

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ABSTRACT

Pre-modern societies were subjected to natural hazards that could be attributed to fate (e.g. natural disasters), and human-made hazards that were considered manageable. However, late-modern society is increasingly exposed to emerging environmental health risks that are products of the modernization process itself (e.g. “mad cow disease,” genetically modified organisms, use of Bisphenol-A in plastics). These risks result from broad changes in the environment and/or human activity and may not be circumscribed spatially or temporally. Some of these provoke high public perceptions of risk, while others do not. Often without scientific knowledge about these risks, governments, institutions and communities must respond to those perceived to be important by the general public.

This dissertation focuses on characterizing, and exploring the determinants of the perceived risks of food allergies – a recent addition to the environmental risk landscape. To achieve these ends, a recently assembled national database on the prevalence and risk of food allergies was analyzed using multivariate logistic regression ($n=3,462$). In parallel, a media analysis of nine years of Canadian newspaper coverage of food allergy issues ($n = 598$ articles) explored the role of a primary source of risk communication in the development of the perception of risk around this issue.

Results revealed a number of important determinants at the individual-level (e.g. age, gender, income), as well as a number of experiential (e.g. exposure to food allergy-related information, having multiple allergies in the home) and attitudinal covariates (e.g. worry about environmental health risks in general, fatalist worldviews). The political

ABSTRACT (continued)

environment, as defined by school-based allergy policies, was also implicated as an important modifying factor for risk perceptions. The media analysis revealed how food allergies are being constructed by different social actors through the news media, with substantial implications for public understanding. The dissertation concludes with a description of a conceptual framework for characterizing public response to emerging environmental health risks that explicitly incorporates a role for the place-based contexts in which risk is experienced. This tool may prove crucial for increasing the understanding of the links between people, perceptions, and places as new environmental risks continue to emerge on the landscape.

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PREFACE

STUDENT'S CONTRIBUTION TO THE PAPERS IN THIS THESIS

For all papers included in this thesis, Daniel Harrington conceptualized the research methodology, analyzed the data presented in the papers, and wrote the manuscripts. Dan was part of an interdisciplinary team that designed and administered the national telephone survey (SCAAALAR), supervised the administration of the survey (results of which are presented in Chapter 2), and was central to designing the sections of the survey related to environmental health risk perception. With regards to the media analysis (Chapter 3), Dan designed the data collection strategy and supervised the collection, but coded and analyzed all data independently. In all cases, the additional authors on the papers provided comments and feedback on paper drafts. Susan Elliott, as the primary thesis supervisor was most involved in drafting the manuscripts by providing significant editorial assistance.

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CHAPTER ONE INTRODUCTION

1.0. Background

Risk society theory, developed independently by Beck (1992) and Giddens (1990), outlines how the social experience of threats to human health has changed through the transition from industrial society to the modern era. Through this transition, hazards have evolved from knowable (i.e. calculable, manageable) entities to widespread side effects of the modernization process itself that may not be circumscribed spatially or temporally (Holloway, 2004). Concomitantly, the general population has become increasingly cognizant of these potential threats to health, and has become in large part organized around the idea of securing future safety from risk (Giddens, 1990). As current society is faced with prospects of widespread environmental changes (e.g. climate change, increasing international migration, global terrorism, the proliferation of genetically modified foods) it has become increasingly necessary to anticipate and react to associated health hazards as they emerge.

Risk is a hybrid construct that reflects the dualism between nature and culture. That is, risk is a real, objectively determined threat, as well as a socially constructed concept subjectively experienced at individual and collective levels (Zinn, 2008). For example, in a communication-rich environment, information about real and perceived threats spreads quickly through informal social networks, mass media and the internet (Chriss, 2004), and increasingly so through social media channels (e.g. Facebook). The meanings of risk and hazard are mediated through such channels, and related messages

are interpreted by individuals living in particular places at particular times. Through these and other processes, risk is constructed, and while some (calculated, objectively defined) small risks are amplified, and capture the public's attention, other more substantial risks do not (Slovic, 2000; Kasperton et al., 1988).

Emerging environmental health risks are identified as such because they are previously unknown, previously unrecognized as risks, or new manifestations of known risks (e.g. H1N1 influenza) that emerge primarily through human-environment interaction. For example, human pressures on the environment (e.g. atmospheric concentration of greenhouse gases) are changing the world's physical and ecological systems (McMichael, Woodruff & Hales, 2006). Projected health risks of such changes include, but are not limited to, increasing extreme weather events, microbial proliferation, altered crop and livestock yields, environmental displacement of populations, and (re)emerging infectious diseases (Weiss & McMichael, 2004; Fauci, Touchette & Folders, 2005). Such emerging risks are characterized by scientific uncertainty and are vulnerable to the contention between different social groups with respect to best management practices. In this context, societies, institutions and communities must respond to risks perceived to be important by the general public, often without knowing the consequences of their actions. Public perceptions of risk represent legitimate concerns that have real impacts on political and research agendas (Gierlach et al., 2010). The implications for risk management and risk communication clearly underscore the importance for characterizing and anticipating public perceptions of emerging environmental health risks.

1.1. Theoretical Context

Theoretically, three dominant paradigms have proven useful for understanding the perception of some risks (e.g. nuclear power), though they have been relatively limited for anticipating public perception of emerging environmental risks. The *psychometric paradigm* (Slovic, 1987) is rooted in the field of psychology, and centres on the individual demographic and cognitive characteristics that determine perceived risk. Specifically, the paradigm focuses on quantitatively measuring the qualitative characteristics of hazards as factors that shape risk perceptions. These characteristics have been used to develop a taxonomy related to *dread* risk and *unknown* risk whereby catastrophic potential (e.g. fatal consequences, inequitable distribution, not easily mitigated, involuntary) and perceived level of control (e.g. unobservable, unknown to those exposed, new risk, unknown to science) combine to heighten or mitigate public perceptions. The two-factor model has enjoyed success in predicting some hazards (Slovic, 1987), though the reductionist and individualist nature of the approach has received some criticism. In particular, some authors have raised the positivistic nature of the model and the socio-cultural independence of the theory as key critiques (Zinn, 2008; Marris, Lagford & O’Riordan, 1998; Sjoberg, 1996).

The Cultural Theory paradigm recognizes that particular groups select particular hazards as risky in order to sustain and strengthen social relations and cultural values (Douglas & Wildavsky, 1982). These groups develop particular orienting dispositions, based on the conditions in which they live their lives. These then guide their responses to hazards and potential risks (Dake, 1991; Slovic, 2000). These perspectives are defined as

worldviews that typically fall in to the broadly defined categories: fatalism, hierarchical, individualism and egalitarianism. Groups that are associated with these categories often differ in their level of perceived risk, and risk acceptance. Egalitarian groups, for example, have a preference for power and wealth to be distributed equally in society and thus have higher perceived risks of a number of hazards, and particularly those that have inequalities in their exposures (e.g. nuclear power) (Peters & Slovic, 1996). Comparatively, those who prefer and trust experts and authorities to assume control of risks (i.e. hierarchical worldviews) have much more favourable attitudes towards nuclear power. Worldviews are developed in the context of particular social, political, economic, and cultural environments, and as such, differences in risk perceptions are discernible between populations (Baxter & Greenlaw, 2005). For example, Gierlach and colleagues (2010) recently found that Japanese groups have higher perceptions of terrorist events compared to North American and Argentinean groups.

A third theoretical approach to risk perception, the *social amplification of risk framework (SARF)*, binds insights of the previously mentioned paradigms of risk, and suggests that the public experience of risk must also reflect how informational processes, institutional structures, social group behaviour, and individual responses shape the experience of risk (Kasperson et al., 1988). SARF is based on theories of communication, and its central thesis posits that uncertainties about risk and amplification/attenuation of particular risks can occur at various stages in the risk perception process. Risk information (and by implication, the mass media) is given an influential role in the development of risk perceptions in this framework. The theory

suggests that the interpretation of a risk message by an individual depends on the nature of the message, as well as the relevance of the message to that person, situated in a particular sociocultural context (Kasperson et al., 1988; Slovic, 2000; Masuda & Garvin, 2006). Through interpretations of risk messages by individuals and communication channels, a risk event is given meaning, and experienced – a process that may outweigh the objective assessment of that risk.

Existing paradigms for understanding perceived risk can explain only about 30% of the variation in risk perceptions at best (Sjoberg, 2000). It follows that there remains an attendant need to continue to develop theoretical approaches for understanding the perception of emerging environmental health. Research in this vein is especially important in a society defined by the ubiquity of risk (Beck, 1992). It has been argued that knowledge of risk perceptions can be extended by understanding the places in which risk is experienced (Baxter, 2009; Masuda & Garvin, 2006; Baxter & Greenlaw, 2005). This dissertation aims to contribute to the understanding of place as a currently understudied determinant of risk perceptions using food allergies as an example of an emerging environmental health hazard.

1.2. ‘Placing’ risk perceptions

Both space (referring to position or location) and place (referring to the occupation and experience of that location by its inhabitants) are important and fundamental overarching themes in the geography of health. Indeed, all research efforts in the field are rooted in these two concepts, though often one perspective is championed over the other in practice (Agnew, 2005). Operationally, for example, spatial analysis is

used to identify spatial patterns and variations in data (or health outcomes) using graphical/visual methods (e.g. mapping) and the use of robust quantitative techniques (Maheswaran & Craglia, 2004). The focus of the spatial tradition emphasizes distance, form, direction, and position of particular phenomena represented as locational points or areas (Agnew, 2005; Meade & Earickson, 2002). In contrast, a place-based analysis focuses on the characteristics of the spaces in which people live their lives, and the impacts of these characteristics on the experiences of people in those spaces. That is, place-based analysis focuses on the ways in which social, cultural, economic, and physical environments shape the health of individuals and populations. Through this lens, place becomes an “operational ‘living’ construct which ‘matters’” (Kearns & Moon, 2002, p. 609) to the development of health, as opposed to a construct that health occurs within.

Spatial relations and place-based effects on health are viewed as representing differing views of the world (Agnew, 2005), and the use and usefulness of these perspectives in health geography, is and should be dependent on the nature of the research question under study (Elliott, 1999). Exploratory spatial analysis can be most useful in visualizing and determining where particular phenomena are located, as well as generating and testing hypotheses of possible associations (Cromley & McLafferty, 2002). Traditional medical geography, and more specifically spatial analysis, is rooted in a positivist perspective, with strong relationships with epidemiological traditions and locational modeling. Thus, they are most concerned with describing *where* disease or illness is occurring, and characterizing *who* is experiencing these outcomes (Litva &

Eyles, 1995). Specific to health research, this approach has been useful in the visualization, and understanding of variations in health, and can provide useful knowledge about the effects of these on particular populations (Gatrell & Elliott, 2009). However, there is a tendency to focus on the spatial organization of health with other social or environmental phenomena, reducing the geography of health to spatial co-occurrences of health outcomes and their correlates (Litva & Eyles, 1995).

Recent theoretical developments in the field of medical geography, or more appropriately the geography of health, argue that human behaviour (and health by implication) can be, and is indeed influenced by social, economic, and political aspects of places (Litva & Eyles, 1995). From the environmental health risk literature, it is argued that risk, and perceived risk are similarly constructed (Eyles, 1993). A place-based analysis, suggests that in order to understand health, the contexts within which health is experienced must be interrogated to explore *how* and *why* various and differential aspects of place work to shape the experiences of individuals or groups of individuals (Gatrell & Elliott, 2009). With the intention of advancing knowledge around the role of place as a currently understudied determinant of risk perception, this dissertation adopts a place-based analysis to explore the relationship between context and perception of emerging environmental health risks.

1.2.1. Risk perception in Canada

This research follows the completion of two nationally representative surveys of health risk perceptions of Canadians (Health Canada, 1993; Krewski et al., 2006). These surveys collected data on the ratings of perceived risk of specific hazards to the Canadian

population, as well as data on sources of information about health issues and risk, confidence in those sources, and general attitudes towards risk in general. The studies, conducted by Health Canada (1993) and Krewski and colleagues (2006), are based upon large-scale national surveys of public perception of health risks ($n=1506$ and 1504, respectively). Both samples were weighted to produce a matched sample to the Canadian population in terms of household size, community size, age, and gender (Health Canada, 1993). These studies yielded important data with respect to differences in risk perceptions by age, gender, education, but also found regional variation in risk perception. For example, while variation existed among all regions (Ontario, Quebec, Atlantic provinces, Prairie provinces, British Columbia), residents of Quebec were especially more likely to rate risks as high, particularly for perceived individual and family risks such as alcohol and pregnancy, AIDS, nuclear waste and street drugs (Health Canada, 1993). The study by Krewski and colleagues (2006) found similar results, and hypothesized that these differences could be a result of environmental factors such as the physical distance to the hazard, sociopolitical climate, and sources of information between regions. Similar studies of various environmental risks propose similar hypotheses (e.g. Dosman et al., 2001, Flynn, Slovic & Mertz, 1994).

Though facets of individual personality, and characteristics of hazards have received the most attention in the risk perception literature (Chauvin et al., 2007; Slovic, 2000), it is becoming increasingly apparent that differences in risk perceptions between and within individuals, and between lay and expert people, are also modified by broader social, cultural, and political contexts (Bickerstaff, 2004). This overarching theory has

guided the rationale for adopting place-based analyses of emerging environmental health risks, proposed by this dissertation. The following section will outline food allergies as an appropriate case study of the influence of place on the perception of emerging environmental health risks.

1.3. Food allergies

The incidence of life-threatening allergic reactions is increasing, and especially so in children (Lin et al., 2009). Foods are the primary cause of these reactions as well as associated hospitalizations (Liew et al., 2009). Food allergies are hypersensitive responses to food proteins where the immune system, through the production of specific IgE antibodies, activates mast cells to release histamine (Kagan, 2003). Histamine is a chemical that can affect the respiratory and cardiovascular systems, the gastrointestinal tract, and the skin with varying severity. Symptoms range from swelling of the lips, rash, and hives to diarrhoea, vomiting, and difficulty breathing. Anaphylaxis is a life-threatening allergic reaction that affects more than one organ system (e.g. cardiovascular) and can be fatal.

Eight foods are responsible for more than 90% of food allergies, and while some (egg, wheat, soy, and milk) resolve in childhood, allergies to peanut, tree nut, shellfish and fish are typically lifelong (Al-Muhesen et al., 2003). There is currently no cure for food allergies, so allergic individuals rely on a strict avoidance diet, as well as symptomatic treatment of reactions (e.g. with the use of an epinephrine auto-injector). Psychosocial impacts including lower quality of life compound the risk of physical harm for food allergy sufferers and their caregivers (Uguz et al., 2005; Primeau et al., 2000).

There is evidence that indicates the prevalence of food allergy, and peanut allergy more specifically, has increased over the past two decades in the western world (Branum & Lukacs, 2008; Sicherer et al., 2003; Grundy et al., 2002). However, there is some debate regarding the true incidence of food allergies and anaphylaxis (e.g. Ben-Shoshan et al., 2009; Lieberman, 2008). Competing views arise due to the difficulties of establishing prevalence and incidence estimates using various methodologies – from self-reported allergy to the diagnostic gold standard for food allergy, the double-blind placebo-controlled food challenge (Dunn Galvin, 2006). Depending upon the criteria used, estimates of the prevalence of food allergy range up to 30 – 40% in some populations (based on self-report) to less than 1% in studies using more stringent diagnoses (Keil, 2007).

While genetic predisposition is a necessary condition for governing susceptibility to allergies, there has been a global increase in all allergic conditions (e.g. asthma, hay fever), which occurred over a timeline too short to be explained by genetic mutation (Bloomfield et al., 2006). This points to environmental and lifestyle factors, which are able to change over shorter periods of time, interacting with genetically predisposed individuals as the underlying cause(s) of the increase in allergy. For example, the hygiene hypothesis, posits that cleanliness in the home environment plays a role in the etiology of allergic conditions by eliminating background exposure to protective microbes that protect the immune system (Bloomfield et al., 2006; Bjorksten, 2004). Thus, though expressed genetically, theories of gene-environment interaction suggest that

allergic conditions, including food allergies, can be classified as environmental health risks.

Despite the debate regarding true incidence of food allergies, potential increases represent significant concerns as relatively new, and potentially increasing environmental health risks. As a result of the (perceived) prevalence, and lack of scientific consensus regarding etiology (Ben-Shoshan et al., 2009; Venter et al., 2010), food allergies are gaining increasing interest in the media, policy, and commercial sectors (Nettleton et al., 2009). Food allergies have become a central fixture on the regulatory agenda, particularly in Canada, the United States, New Zealand, Australia and the United Kingdom. Perceived increases have prompted various responses from decision-makers, most of which have been implemented at the school-level in an effort to keep allergic children safe in this environment, in which they spend a large portion of their day outside the home.

Overall the school policy environment is incredibly varied with respect to anaphylaxis risk management policy. In Canada, for example, the province of Ontario enacted a law in 2006 for all publicly funded schools. Bill 3 (or *Sabrina's Law*, named for the 13 year old who died in her school cafeteria from an anaphylactic reaction) is an act to protect anaphylactic pupils and is designed to ensure that schools are accountable for training and education of staff, and overall management of pupils with anaphylactic allergies. Policies in other provinces range widely, often with school boards and/or individual schools developing their own management responses to the issue. The resulting random and varied policy response to this emerging health risk is the case

elsewhere in the developed world (Schneider Chafen et al., 2010), and creates distinct political environments within which the risks of food allergies are evaluated by the general population.

Despite their well-meaning nature, these policies have been debated in the scientific literature (e.g. Christakis, 2008), and in the mass media (e.g. Pearson, 2009). Non-allergic individuals and/or parents of non-allergic children often oppose “allergen-free” environments (e.g. nut-free schools) due to their perception of severely limited food choices. An appropriate response to food allergies must protect the allergic population, while simultaneously accommodating the needs of the non-allergic population. In this context, this dissertation explores the perceived risks of food allergies in order to inform risk communication and risk management policy around emerging environmental health risks in general, and food allergies and anaphylaxis in particular.

1.4. Objectives

Broadly, the goal of this dissertation is to gain a better understanding of risk perceptions of emerging environmental health risks, by applying existing theoretical paradigms of risk to a particular case study. More specifically, the aim is to understand the risk perception of food allergies, and understand what role places of experience may play in the development of risk perceptions. To these ends, three specific objectives guided the research:

1. To describe the existence, intensity, and determinants of food allergy risk perception in the context of other environmental health risks facing the Canadian population
2. To explore the influence of living in differing policy environments on perception of risk

3. To investigate the role of the news media in the social construction of the food allergies, and potential influences on public understanding of the associated risks

These objectives were met by establishing a national cross-sectional data set collected as part of the *Surveying Canadians to Assess the Prevalence of Common Food Allergies and Attitudes towards Food Labelling and Risk* (SCAAALAR) survey (Appendix A), funded by AllerGen NCE, in partnership with Health Canada. The SCAAALAR data provide a rich platform upon which to explore the prevalence of food allergies in Canada, as well as the perceived risks posed to Canadians by food allergies and anaphylaxis from the perspective of the general population (i.e. allergic and non-allergic). A media content analysis was subsequently used to explore the role of the daily news media in shaping the public understanding of the risks of food allergies.

1.5. Dissertation Outline

This dissertation is organized as a collection of papers. Though there is some overlap in the literature reviewed for each, the methods and focus of each paper are unique. Chapter 2 primarily addresses the first two research objectives, and uses the SCAAALAR data to explore the determinants of the (perceived) risks of food allergies as they emerge on the health risk landscape. Chapter 3 addresses the third research objective, and presents the findings from a media content analysis that focused on how the risks of food allergy are constructed through the mass media. Chapter 4 presents the main theoretical contribution of this dissertation; a framework for analyzing and understanding the perception of emerging environmental health risks, that outlines an explicit and important role for place-based determinants. Chapter 5 summarizes the

findings across the three papers, discusses the substantive, methodological, and theoretical contributions of the dissertation, and concludes with recommendations for policy and future research.

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CHAPTER TWO

ONE PERSON'S PEANUT IS ANOTHER'S POISON: EXPLORING THE DETERMINANTS OF THE PERCEIVED RISKS OF FOOD ALLERGIES IN CANADA

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2.0. Abstract

Food allergies are newly emerging health risks in much of the western world, and there is some evidence to suggest that the prevalence is increasing. Despite a lack of scientific consensus with respect to prevalence, diagnosis, and management of allergies, policies and regulations are being implemented, most in an effort to protect allergic individuals in public spaces. These policies have been criticized as extreme in the scientific literature, as well as the mass media, reflecting opposition to these measures from the non-allergic population. This backlash appears to be resulting from differences in the perceived risks of food allergy between different groups. In this context, this paper uses a recently assembled national data set collected via telephone interviews ($n = 3,462$) to explore how Canadian citizens perceive the risks associated with food allergy. Analyses revealed that almost 20% would self-report as having an allergic person in the household, while the average respondent estimated the prevalence of food allergies in Canada to be 30%. Both of these measures almost certainly overestimate the true clinically-defined prevalence (8-10%), indicating that the public understanding of food allergies differs greatly from those established by confirmatory testing. Further, 70% reported food allergies to be high risk to the broader Canadian population. Multivariate logistic regression models revealed important determinants of risk perception including demographic (e.g. age, sex), experience-based (e.g. multiple allergies in the home), attitudinal, and regional predictors (i.e. province of residence). These results are discussed in terms of their contribution for understanding emerging health risks in the post-industrial era, and implications for policy and population-based risk communication.

2.1. Introduction

Food allergies (e.g. peanut, shellfish) are an emerging and important public health issue, affecting up to 4% of adults, and up to 6% of children; and there is some evidence that these rates are increasing (Grundy et al., 2002; Sicherer et al., 2003). Allergic reactions to foods range in severity from swelling of the lips, rash and hives to difficulty breathing, asthma, nausea and diarrhea. The most severe form of allergic reaction, anaphylaxis, is life-threatening and affects the cardiovascular, respiratory and gastrointestinal systems simultaneously. Due to a lack of curative therapies, allergic individuals must rely on strict avoidance of allergens, and symptomatic treatment of reactions (Kagan et al., 2003). However, accidental exposures are frequent (Bock et al., 2001), and fear of exposure can have significant psychosocial impacts on allergic individuals and their families (Uguz et al., 2005; Primeau et al., 2007), particularly in interactions with the world outside the home (e.g. schools, airplanes, restaurants).

The emergence of food allergies as health risks has been relatively recent, and its etiology remains unknown. The result has been growing interest from the mass media, science and the commercial sector, particularly as policy makers attempt to respond to the demands of affected individuals (Nettleton et al., 2009). There is also a perception among the general population that food allergies are much more prevalent than systematic estimates suggest, with lay estimates of prevalence often exceeding 30% (Rona et al., 2007). This inflated perception of risk has resulted in important policy debates related to protection versus rights, particularly around those developed in response to the disproportionate burden of food allergies in children. If the rates of food

allergies are indeed increasing, it will be necessary to develop and integrate appropriate risk management strategies in a wide variety of settings. Understanding the perception of the risks of food allergies from the perspective of those directly and indirectly affected can inform emerging and future policy initiatives.

Food allergies are one of a number *emerging* health risks defined as such because they are: (1) previously unknown (e.g. genetically modified organisms [GMOs]); (2) previously unrecognized (e.g. use of Bisphenol A in baby bottles); (3) new manifestations of existing risks (e.g. H1N1 flu virus); or (4) due to changes in public perception over time (e.g. lowered tolerance of pollution from heavy industry in post-industrial society (Beck, 1992)). Investigations of the determinants of risk perceptions within the dominant econometric and psychometric approaches to risk perception have focused primarily on either demographic factors and/or characteristics of the hazard itself (e.g. catastrophic potential, knowledge about the risk, equitable distribution) (Slovic, 2000). Alternative theories argue that risk perceptions are rooted in social and cultural contexts, and that individuals and social groups collectively select the risks to be concerned about based on threats to their worldviews or ways of life (Douglas & Wildavsky, 1982). These approaches have contributed in important ways to understanding the perception of some risks (e.g. nuclear power), and the risk communication process (e.g. Kasperson et al., 1988). However, they have been limited in anticipating public response to *emerging* health risks (Sjoberg, 2000), despite the fact that these have been recognized as requiring a unique risk management approach (Radandt & Renn, 2008). This paper seizes on a

unique opportunity, using a recently assembled national data set, to explore the determinants of the (perceived) risks of food allergies as they emerge.

2.2. Research Context

The incidence of life-threatening allergic reactions is increasing, especially in children (Lin et al., 2009). Foods are the primary cause of these reactions as well as associated hospitalizations (Liew et al., 2009). Food allergies are hypersensitive responses to food proteins where the immune system, through the production of specific IgE antibodies against these proteins, activates mast cells to release histamine (Kagan, 2003). Histamine can affect the respiratory and cardiovascular systems, the gastrointestinal tract, and the skin with varying severity (Health Canada, 2009). Though they typically develop during childhood, allergies may develop at any time during the lifespan, and symptoms range from swelling of the lips, rash, and hives to diarrhea, vomiting, and difficulty breathing. Eight foods are responsible for more than 90% of food allergies, and while some (egg, wheat, soy, and milk) resolve in childhood, allergies to peanut, tree nut, shellfish and fish are typically lifelong (Al-Muhsen et al., 2003). Anaphylaxis is a life-threatening allergic reaction that affects more than one biological system and can be fatal (Anaphylaxis Canada, 2009). Currently, there is no cure for food allergies, and allergic individuals must rely on a strict avoidance diet, as well as symptomatic treatment of reactions (e.g. with the use of an epinephrine auto-injector). Psychosocial impacts including lower quality of life compound the risk of physical harm for food allergy sufferers and their caregivers (Uguz et al., 2005; Primeau et al., 2000).

Current estimates indicate that food allergies affect a substantial proportion of the Canadian population, with prevalence estimated to be up to 6% for children, and 1 – 3% for adults, with 1 – 2% of these individuals living with the potential risk of a fatal anaphylactic reaction (Health Canada, 2009). These estimates are comparable to those in the United States (4-8% for children, 2% adults) and the United Kingdom (2-5% overall prevalence) (Centers for Disease Control and Prevention, 2009; Mills et al., 2007). However, estimates of prevalence are dependent on the methodologies used for diagnosis. For example, population-based studies using self-reported measures tend to overestimate allergy prevalence (in comparison with more objective diagnostic tools) in some cases by up to 30% (Rona et al., 2007). This overestimate is due to the propensity for individuals to classify all forms of eating discomfort (e.g. a food intolerance) as a food ‘allergy.’ Though establishing precise population based estimates has its difficulties, several time-series studies using rigorous diagnostic tests indicate that food allergies have become increasingly prevalent over the past few decades, and particularly in the western world (Madsen, 2005; Sicherer et al., 2003; Grundy et al., 2002). The recent and apparently substantial rise in the prevalence of food allergy has scientists perplexed about their etiology. Increases have occurred over too short a timeline to be explained by any genetic shift in the population (Bloomfield et al., 2006). This suggests that environmental factors, broadly defined, are interacting in some way with genetic susceptibility to produce the rising prevalence, however, investigations into establishing a causal pathway are ongoing (e.g. Subbaro, Mandhane & Sears, 2009).

As a result of (perceived) increases in prevalence and lack of scientific consensus regarding etiology (Ben-Shoshan et al., 2009; Venter et al., 2010), food allergies are gaining increasing interest in the media, political, and commercial sectors (Nettleton et al., 2009). Food allergies have become a central fixture on the regulatory agenda, particularly in Canada, the United States, New Zealand, Australia and the United Kingdom (Schnieder Chafen et al., 2010). Perceived increases have prompted various responses from decision-makers, despite a lack of science-based management guidelines. This has resulted in inconsistent risk management strategies (e.g. precautionary statements on packaged foods, allergen bans in public space) that are often developed on an individual, case-by-case basis (Madsen et al., 2010). In particular, the school policy environment is incredibly varied with respect to anaphylaxis risk management policy. In Canada, each province and territory has independent governance for schools, and each have approached food allergies and anaphylaxis differently. For example, the province of Ontario enacted a law in 2006 for all publicly funded schools. Known as Bill 3 (or *Sabrina's Law*, named for the 13 year old who died in her school cafeteria from an anaphylactic reaction), this is designed to ensure that all schools are accountable for training and education of staff, and overall management of pupils with anaphylactic allergies. Policies in other provinces range widely, (some have no policy whatsoever), and often with school boards or individual schools developing their own management strategy. Despite the well-meaning nature of these policies, there has been tremendous backlash from the non-allergic population. Non-allergic individuals and/or parents of non-allergic children often oppose “allergen-free” environments (e.g. nut-free schools)

due to their perception of severely limited food choices. In the case of peanut allergies in particular, banning peanut butter raises issues of equity for low-income populations, as peanut butter represents an accessible, affordable source of protein.

In recent decades, the politics around food have shifted from issues of access and nutrition, to issues of risk due to a number of key debates (e.g. use of genetically modified foods), and food-borne disease outbreaks (e.g. BSE) (Blue, 2010, Pollan, 2008). Such food-related hazards have resulted in increased and deserved involvement by the public in food risk governance (Krom & Mol, 2010). Food allergies represent a new food-related risk that is altering the political landscape, and those responsible for regulation and manufacturing of foods need to incorporate the public's perspective in their decisions. Madsen and colleagues (2010) have taken important steps towards developing a consensus on acceptable risk from a number of stakeholders in the food allergy debate. However, they exclude the general population due to lack of knowledge regarding how they perceive food allergy risk. In this paper, we argue that as decisions continue to be made, the perspective of the general population also needs to be understood and addressed to ensure successful uptake and long-term sustainability.

Though the non-allergic population is unaffected in terms of physical risk, they are indirectly affected by these decisions as general consumers, and should be considered important actors in the debate around food allergies (Shaw, 2002). Therefore, this paper aims to establish a knowledge base for risk management policy by endeavouring to answer the following questions:

1. How does the general Canadian population perceive the risks of food allergies, relative to other environmental hazards?

2. What are the demographic, experiential and attitudinal determinants of food allergy risk perception?
3. Is there a potential role for the policy environment as a determinant of the perception of food allergy risk?

2.3. Methods

The data used to answer the research questions posed by this paper were collected as part of the *Surveying Canadians to Assess the Prevalence of Common Food Allergies and Attitudes Towards Food Labeling and Risk* (SCAAALAR) survey, funded by a Canadian research network (AllerGen NCE) in collaboration with Health Canada. The survey had three overarching objectives: (1) to assess the prevalence of food allergies in Canada, (2) to assess societal attitudes towards allergen precautionary statements on packaged foods, and (3) to explore the perception of food allergy and anaphylaxis risk. This paper is informed primarily by the data collected for the third SCAAALAR objective, but also uses self-reported prevalence of food allergies collected as part of the prevalence section of the survey, and demographic data.

The survey was administered in the ten Canadian provinces between June 2008 and March 2009. Households were selected randomly from the electronic White Pages, and surveys were conducted in both official languages (French, English) using Computer Assisted Telephone Interviewing. Prior to first contact, letters of information were sent to each household. Of 10,596 households where contact was made, 3666 households responded resulting in an overall response rate of 35%. Recent trends indicate a general decline in survey response rates and current literature indicates that lower response rates do not necessarily indicate non-response bias (Lee et al., 2009). That is, while decreasing

non-response rates reduces the risk of bias, it does not necessarily reduce the bias itself (Groves, 2006). Potential bias related to self-selection in this research has been minimized by the random sampling strategy, and with the large sample size the relationships reported are internally valid.

Allergic household status was measured within the survey in several ways: self report, convincing history, physician diagnosis, and confirmatory follow-up with a physician (See Ben-Shoshan et al., 2010). Given the focus in this paper on the role of risk perception, as well as the documented similarities between possible and probable food allergies (Ben-Shoshan et al., 2010), self-report was an appropriate metric to use in this analysis for defining *directly affected* households. Respondents with no allergies in the household were further classified as being *indirectly affected*, if they had ever served, prepared, or bought food for an allergic person or an allergen-controlled environment.

To address the third objective of SCAALAR, the survey collected attitudinal data about health risks from the general to the specific. For example, to begin the risk portion of the survey, respondents were asked to provide up to three open-ended responses about the greatest problems currently facing the Canadian population. Respondents were also asked about current health risks posed to themselves, their families, and the general Canadian public. In the interest of efficiency and data reduction, six of these eight survey items were used to construct a *Health Risk Perception Scale* which had a Cronbach alpha value of 0.74 indicating good inter-item correlation (Table 1).

Table 1. Health risk perception scale survey items by frequency of response

Statement/Question	Mean	Std. Deviation
The environment is a major concern for Canadians. ^a	4.00	1.03
The environment should be a major concern for Canadians. ^a	4.39	0.72
Environmental impacts on health are a major concern for Canadians. ^a	3.93	1.10
Environmental impacts on health should be a major concern for Canadians. ^a	4.37	0.70
How worried are you that the environment can impact your health? ^b	3.99	1.24
How worried are you that the environment can impact the health of your family? ^b	4.16	1.14

^a Scale ranged from (1) “Strongly Disagree” to (5) “Strongly Agree.”

^b Scale ranged from (1) “Not Worried at All” to (5) “Very Worried.”

The survey also measured level of agreement with seven statements measuring five worldviews thought to be important for risk perception: fatalism, hierarchy, individualism, egalitarianism, and technological enthusiasm. These statements have been used previously to evaluate worldviews in a study of Canadians’ health risk perceptions (Health Canada, 1993). Questions about food allergies specifically were designed to assess respondents’ perception of the prevalence of food allergy, general knowledge, as well as related symptoms, triggers, and risks. Indicators of self-rated concern about food allergies, and recall of food allergy-related information received in the past six months were also collected.

Respondents were also asked to rate the degree of health risk for 27 hazards, as level of risk to the Canadian public as a whole. These *hazard ratings* were measured on a

5-point Likert scale ranging from ‘No risk at all’ to ‘High risk.’ Items cover a range of hazards including technological (e.g. nuclear power), social (e.g. crime & violence), environmental (e.g. air quality) and lifestyle-related (e.g. stress). Most items were retained from previous work (Health Canada, 1993; Krewski et al., 2006) while others with particular topical interest, including food allergies, anaphylaxis, and lead in paint were added. Hazard ratings for risks were recoded to represent *high risk* (i.e. ‘High’ and ‘Moderate’), versus *low risk* (i.e. ‘Slight’, ‘Almost No’, and ‘No’). Respondents with no opinion were collapsed into the low risk category. Demographic characteristics were collected at the end of the survey.

Logistic regression was used to explore the determinants of food allergy risk perception. Wald statistics and likelihood ratio tests were used to test the significance of each variable to the overall fit of the model, and insignificant variables were removed. This model was verified using backward stepwise model selection. Interaction terms based on all possible pairs of variables were added to the main effects model one at a time. Overall model fit was assessed using the rho-squared statistic and the Hosmer-Lemeshow goodness-of-fit test.

2.4. Results

Compared to the structure of the 2006 Canadian population, the SCAAALAR sample had a higher proportion of females (65.1%), older respondents, and Canadian-born respondents (85.6%) (Table 2). It is also clear that respondents with lower levels of socioeconomic status (SES), as measured by education and household income, were underrepresented. For example, 9.3% of the sample had less than secondary school as

their highest level of education, compared to 23.8% of the Canadian population.

Respondents from Quebec (39.3%) made up a greater proportion of the sample relative to the national population (24.3%).

Of 5638 total open-ended responses to '*What are the greatest concerns facing Canadians today?*', environmental concerns (e.g. climate change, air/water pollution, garbage/waste) were overwhelmingly represented, comprising 27% of the total response sample. This was followed by economic issues related to the 2008/09 economic downturn (10%), and issues associated with overweight and obesity (e.g. diet, physical activity) (8% of all mentions). Issues related to allergy and asthma were the seventh most frequently mentioned problem (3.5%), behind health care (6.9%), energy costs (4.0%), and cost of living (3.7%). Due to the potential role of the environment in the etiology of food allergies, respondents were asked questions about the impact of the environment on their health. Worry and concern about environmental impacts on health were consistently expressed by the majority of respondents. For example, 40.9% of respondents were very worried about environmental impact on their health while 41.0% were somewhat worried.

Twenty percent of survey respondents ($n = 688$) reported having at least one food allergy in the household. Of these, 131 reported having allergic children in the household, and 112 reported having multiple allergic individuals. Over 50% of the sample reported being at least indirectly affected by food allergies (688 directly [19.9%], 1061 indirectly [30.7%]). 44% of respondents recalled hearing or receiving some

Table 2. SCAAALAR sample characteristics (n=3462) compared to the 2006 Canadian population

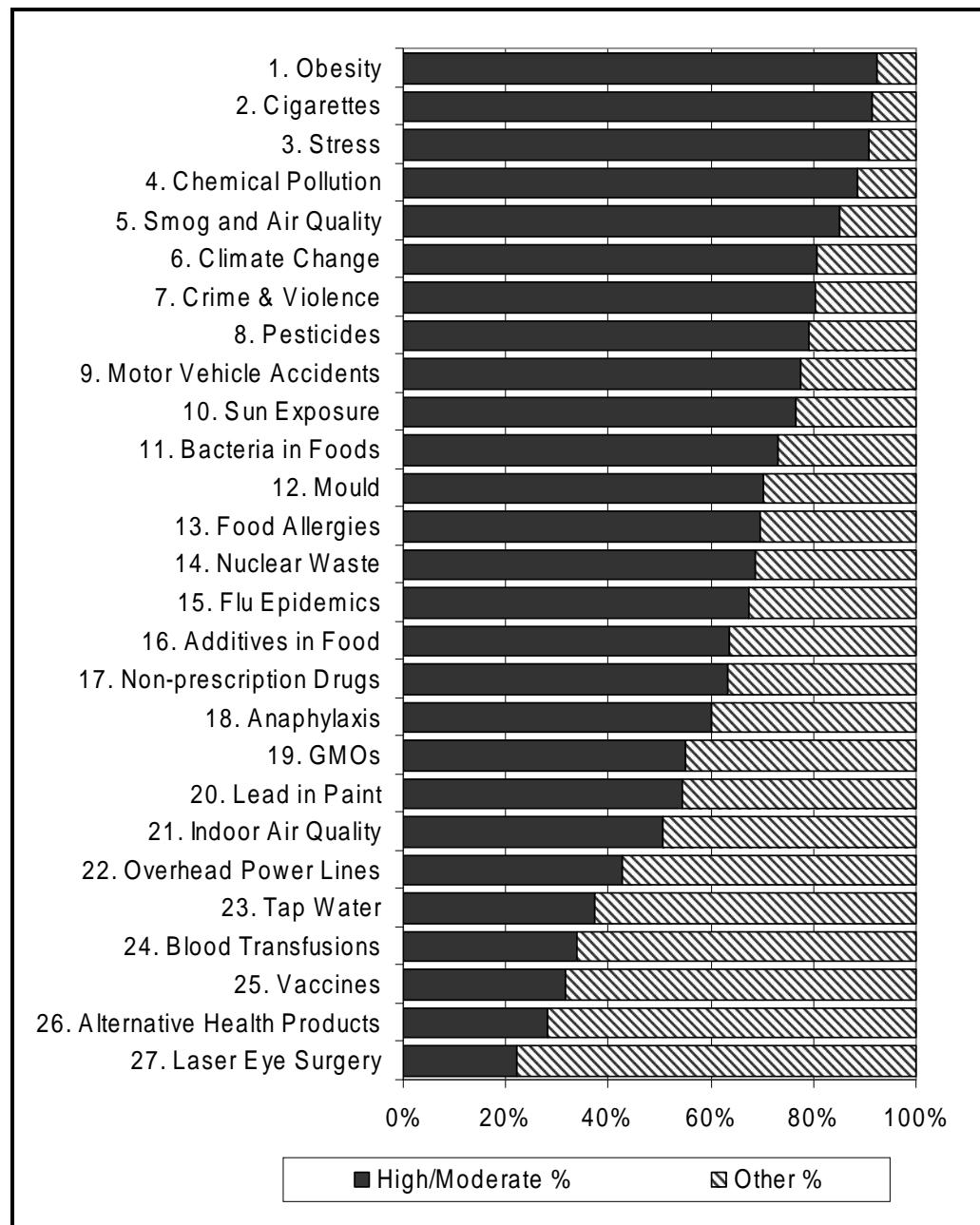
	<i>Respondents (%)</i>	<i>Canada (%)^a</i>
Gender		
Male	34.9	48.3
Female	65.1	51.7
Age (Mean = 51.6, Std. Deviation = 15.1)		
18-29	8.4	19.8
30-39	14.7	17.1
40-49	20.5	21.2
50-59	25.2	18.0
60-69	18.8	11.4
70+	12.3	12.5
Education		
Less than Secondary School	9.3	23.8
Secondary School/Some College or University	30.2	42.7
College or University	47.6	28.9
Master's/Ph.D./Professional Degree	12.9	4.6
Immigrant status		
Born in Canada	85.6	80.0
Immigrant	14.4	20.0
Marital Status		
Married	57.2	47.9
Separated/Divorced	9.4	11.0
Widowed	5.9	6.2
Living with a Partner/Never Married	27.6	34.9
Household Income		
Under \$20,000	4.6	6.9
\$20,000 - \$49,999	24.1	27.9
\$50,000 - \$99,999	43.1	39.9
Over \$100,000	28.1	25.3
Region of Residence		
British Columbia	10.3	13.3
Prairie (Alberta, Saskatchewan, Manitoba)	12.0	16.7
Ontario	32.9	38.3
Quebec	39.3	24.3
Atlantic (Nova Scotia, New Brunswick, Newfoundland, Prince Edward Island)	5.4	7.4

^aSource: Statistics Canada, 2009

information about food allergies in the previous six months, and 1433 (41.4%) reported being more concerned about the risks associated with food allergy compared to others. In terms of knowledge about food allergies, almost all respondents (95%) knew that even a tiny amount of allergen could cause a reaction, and 42% thought that reactions to allergens were easily treatable. Respondents' estimates of the percentage of Canadians affected by food allergies ranged from 0% to 100%, with a mean value of 30.6% (median 25.0%), indicating an inflated perception of prevalence compared to current systematic estimates.

To illustrate how the general population perceives the risks of food allergy and anaphylaxis relative to other environmental health risks in Canada, Figure 1 shows the perceived levels of risk for the 27 environmental hazards. The top five risks were obesity (92.3% rated as high), cigarettes (91.4%), stress (90.9%), chemical pollution (88.7%), and smog and air quality (85.0%). The lowest three risks were laser eye surgery (22.1%), alternative health products (28.1%), and vaccines (31.7%). Food allergies and anaphylaxis risk were rated approximately in the middle range of the hazards, rated highly by 69.6% and 60.1% respectively, among hazards such as: bacteria in foods, nuclear waste, flu epidemics, and genetically modified organisms.

Logistic regression analysis was conducted to characterize the perception of risk around food allergy. Coefficients are presented here as estimates of the log-odds, as well as odds ratios [ORs] with 95% confidence intervals [CIs]. With the exception of the risk perception scale, odds ratios for each variable can be interpreted as the odds of a respondent to rate the risk of food allergy as high, relative to the reference category of the

Figure 1. Perceived level of risk to the Canadian public for 27 health hazards.

variable, while controlling for all other variables in the model. The regression model (Table 3) achieved a rho-square of 0.15 with 67.9% of cases correctly classified, based on a cut-off calculated as the mean fitted value.

Males were about half as likely to rate the risks of food allergy (OR: 0.59, 95%CI: [0.50-0.69]) as high. Adults aged 30 and above consistently rated the risks as higher than respondents aged 18-29 (reference category), though those aged 30-39 and 40-49 were not significantly different. Immigration status of the respondents was significant, and displayed an interesting relationship with risk perception. In particular, immigrants who had lived in Canada for less than 10 years were more likely than non-immigrants to rate the risks of food allergy as high (OR: 2.51, 95% CI: [1.48, 4.47]). This relationship was then inverted for immigrants whom had lived in Canada for at least 10 years (OR: 0.80, 95% CI: [0.62, 1.04]). Indicators of household composition suggested that respondents from homes with more residents rated the risks of food allergy higher. There was a particularly strong effect for respondents living with children under 18 years of age (minors). Respondents with more than one adult and at least one minor in the home were 1.3 times as likely to rate the risks as high (95% CI: [1.04, 1.53]), and respondents from single-adult homes with at least one minor were almost twice as likely to rate the risks as high (OR: 1.99, 95% CI: [1.17, 3.51]). Total household income from the previous tax year (2008) was also significant. Compared to respondents with household incomes of less than \$20,000, those from households with higher incomes were consistently less likely to rate food allergies as high risks to the Canadian public.

Table 3. Logistic regression results: Perceived food allergy risk.

<i>Explanatory variables</i>	<i>Adjusted Odds Ratio</i>	<i>95% Confidence Interval</i>	<i>Signif.^a</i>
Socio-Demographics			
Gender: Male	0.59	(0.50, 0.69)	***
Age: 50-59	1.39	(1.11, 1.74)	**
Age: 60-69	1.43	(1.09, 1.89)	*
Age: 70-79	1.60	(1.15, 2.23)	**
Household: >1 Adult & Minor(s)	1.26	(1.04, 1.53)	*
Household: Lone Adult & Minor(s)	1.99	(1.17, 3.51)	*
Immigrant Status: Less than 10 years	2.51	(1.48, 4.47)	**
Immigrant Status: 10 or more years	0.80	(0.62, 1.04)	
Household Income: \$20,000 – 59,999	0.67	(0.42, 1.04)	
Household Income: \$60,000 – 99,999	0.61	(0.38, 0.96)	*
Household Income: \$100,000+	0.62	(0.38, 0.97)	*
Risk Profile			
Risk Perception Scale	1.07	(1.05, 1.09)	***
There are risks where I live: Agree	1.21	(1.02, 1.43)	*
A Risk-free country is a possible goal: Agree	1.45	(1.21, 1.73)	***
Worldview: Fatalist	1.27	(1.05, 1.55)	*
Worldview: Egalitarian	1.44	(1.21, 1.72)	***
Knowledge/Experience with Food Allergy			
Education Completed: Masters/PhD/Prof.	0.62	(0.49, 0.79)	***
Multiple Allergies in Household	2.77	(1.56, 5.27)	***
Recalled reading/hearing information about food allergies in the past 6 months	1.69	(1.37, 2.09)	***
Compared to other people, more concerned about food allergies	2.42	(2.02, 2.92)	***
Food allergies are easily treatable: Disagree	1.44	(1.21, 1.72)	***
Region			
Atlantic	1.54	(1.06, 2.28)	*
Quebec	2.07	(1.63, 2.63)	***
Interaction Terms			
Quebec*Food allergy information	0.63	(0.45, 0.89)	**
Model Fit			
Rho-square: 0.15			
67.9% correctly classified (cut-off = 0.72)			

^a Significance: p<0.001 = ‘***’; p<0.01 = ‘**’; p<0.05 = ‘*’

A number of variables related to health risk perception emerged as important in the model. The health risk perception scale was highly significant, and odds ratios indicate that for each increase by one in the scale, the likelihood that a respondent would rate the risks of food allergy as high increased by 7.1%. Respondents who agreed that there were health risks where they lived were more likely to rate the risks of food allergy as high (OR: 1.21, 95% CI: [1.02, 1.43]), as were respondents who believed that a risk-free country was a possible goal (OR: 1.45, 95% CI: [1.21, 1.73]). Fatalist and egalitarian worldviews were the only two worldviews found to be important. Respondents who agreed with statements measuring fatalism were more likely to rate the risks as high (OR: 1.27, 95% CI: [1.05, 1.55]). This effect was similar for those who agreed with statements measuring egalitarian worldviews (OR: 1.44, 95% CI: [1.21, 1.72]).

In terms of the variables measuring experience with, and knowledge about the food allergies and the related risks, respondents with the highest levels of education (Master's degree, Ph.D., professional degree) were significantly less likely to rate the risks of food allergy (OR: 0.62, 95% CI: [0.49, 0.79]) as high. Direct experience with food allergy (respondents from allergic households) was a significant predictor, but only for respondents who reported multiple allergies in the home. These respondents were much more likely to rate the risks of food allergy as high compared to those with a single household allergy, or the general population (OR: 2.77, 95% CI: [1.56, 5.27]). Respondents who reported receiving some information about food allergies in the past six months were more likely than those who did not to rate the risks as high (OR: 1.69, 95%

CI: [1.37, 2.09]); as were those who reported being more concerned about the risks associated with food allergies (OR: 2.42, 95% CI: [2.02, 2.92]). Finally, those who disagreed that food allergies were easily treatable perceived the risks of food allergy (OR: 1.44, 95% CI: [1.21, 1.72]) as high risks to the Canadian public.

Reported province of residence was used to situate each respondent in a particular region of Canada. Living in Atlantic Canada (Nova Scotia, New Brunswick, Newfoundland, or Prince Edward Island) was associated with a higher propensity to rate the risks as high (OR: 1.58, 95% CI: [1.05, 2.28]), as was living in the province of Quebec (OR: 2.07, 95% CI: [1.63, 2.63]). An interaction term between residents from the province of Quebec, and receiving food allergy information in the past six months also emerged as important. The coefficient suggests that, while receiving food allergy information was associated with a higher likelihood of rating the risks of food allergy as high, not receiving any information did not have the same attenuating effect on residents' perceptions in Quebec as it did in other provinces.

2.5. Discussion

To inform policy around emerging health risks, it is essential to understand how the general population perceives these risks, and to identify the associated determinants of perceptions. The results of this study demonstrate the extent to which the general population views the risks of food allergy as risks to the Canadian population. Extended by simple extrapolation, over 15 million Canadians (50.6%) would report being either directly or indirectly affected by food allergies, and over 6 million (18.7%) would report having a food allergic person in the household. Further, the average respondent

estimated the number of Canadians affected by food allergies to be 30%. These estimates greatly overestimate the confirmed prevalence estimates determined by alternative methods from the SCAAALAR data, published elsewhere (see Ben-Shoshan et al., 2010). This reinforces the fact that there are different understandings of the prevalence, and associated risks, of food allergy between the general public and scientists (Altman & Chiaramonte, 1997; Shepherd, 2006), a phenomenon that consistently arises in investigations of risk perception (Slovic, 2000).

Multivariate analysis revealed that older respondents, women, those with lower levels of education and income, and new immigrants perceived the risks of food allergy higher than younger respondents, men, those with relatively higher levels of education and income, and Canadian-born respondents. The relationship between gender and perceived risk are highly consistent with results reported elsewhere (e.g. Flynn et al., 1994; Dosman et al., 2001; Krewski et al., 2006). Though the reasons for the gender difference are still unclear, they are thought to result from a combination of biological and social differences. In the case of food allergies, for example, increased perceived risk may be partially determined by the socialization of women as primary family nurturers and caregivers (Flynn et al., 1994), thus being more sensitive to an issue that disproportionately affects children.

The influence of age has been hypothesized to reflect familiarity with risk, differential levels of exposure to risk, or sociopolitical opinions related to time period or birth cohort effects (Krewski et al., 2006; Dosman et al., 2001). However, the relationship with risk perception is equivocal, and appears to depend on the risk in

question (Riechard & Peterson, 1998). Results of this study indicate that respondents in their parental and grand-parental years were more likely to rate the risks of food allergy as high compared to younger respondents. There are two related explanations for this finding. Firstly, heightened perception of risk may be related to a relative lack of familiarity with food allergies in comparison with younger respondents. In the span of only two to three decades, food allergies have gone from rare conditions to significant public health issues. The risks of food allergy, then, are particularly new and unfamiliar risks for many older individuals, and the recency of their emergence may be provoking the higher risk perceptions reported here. Secondly, older adults have consistently been shown in the literature to feel a responsibility to protect children from health risks (Slovic, 2000; Sjoberg, 1998). Higher perceived risks by older respondents may be reflecting this assumed responsibility, as children are currently experiencing a disproportionate burden of food allergy, and peanut allergy in particular (Ben-Shoshan et al., 2010; Rona et al., 2007).

Income is a well-recognized determinant of mental and physical health; however, the relationship with risk perception has been less thoroughly explored. In this study, respondents from households reporting the lowest levels of household income also reported the highest perceived risks of food allergy. This relationship may be explained by feelings of inequality specific to control over and personal choices about risks and their risk management (Lemyre et al., 2006). However, as alluded to previously in this paper, the practice of banning particular allergens (e.g. peanut butter) in public spaces also raises important issues of equity for lower income populations. Higher perceived

risks within this population may reflect the difficulties associated with finding affordable substitutes to these proteins that comply with regulations. This issue is one that must be considered as policies are developed to address the emergence and potential increases in food allergy.

Income is also highly positively related to level of educational attainment, and the relationships presented here with respect to education echo those found for income. That is, those with the highest levels of education were least likely to perceive the risks of food allergy as high. This relationship has primarily been theorized as being related to understanding risks, and how they may be controlled (Dosman et al., 2001). This understanding may be especially important in the context of emerging health risks which are often characterized by uncertainty and contention. This is certainly the case for food allergies, around which debates about etiology, diagnosis and management are ongoing (Schnieder Chafen et al., 2010).

Results revealed a strong relationship between perceived risk and time since immigration. Respondents who had lived in Canada for less than 10 years rated the risks of food allergy much higher than Canadian-born respondents, while those who had been in Canada for more than 10 years rated the risks similarly to Canadian-born respondents. We recognize that this could be explained by a cohort effect related to time since immigration; however, it is interesting to note the parallel with the healthy immigrant effect (Asanin Dean & Wilson, 2010; Newbold, 2005). That is, when immigrants arrive to a developed host country, they typically exhibit better health than the native born population with respect to self-rated health, and chronic disease. However, over time,

and particularly at the ten-year mark, immigrant health tends to decline to levels equal to or even worse than that of the host country (Newbold, 2005). Theories argue that this relationship may be a reflection of the acculturation process, which would include increased exposure to issues around food allergies – predominantly conditions of the western world (Rona et al., 2007; Madsen, 2005). Food allergies may represent an especially new risk for the population of recent immigrants; however, given the speculative nature of the parallel with the healthy immigrant effect, further investigation is warranted.

Differences in perceived risks between respondents from different household compositions were observed in this analysis. Respondents from households with minors reported higher perceived risks of food allergies, an effect that was amplified if there was only one adult living in the household. As discussed previously, most policies and regulations around food allergies have been implemented at the school-level in Canada, and thus, households with minors are more frequently exposed to issues around allergy-related policy. Frequent exposure may subsequently influence risk perceptions in this population (Slovic, 2000). It is also possible that higher perceived risks stem from the lack of certainty about the etiology of food allergies in the scientific community. Parents, and mothers in particular, cope with competing information about what to eat and avoid during pregnancy, and how and when to introduce certain foods into their child's diet in order to avoid the development of potentially life-threatening food allergies. The popular perception that food allergies are increasing, coupled with the stress of making these

presumably important decisions in an atmosphere of uncertainty, may be provoking higher risk perceptions in households with minors.

The health risk perception scale indicating general attitudes toward individual, familial, and societal risk tolerance was strongly related to food allergy risk perception. Previous studies of risk perception have evaluated the influence of belief statements reflecting environmental and social concern (Krewski et al., 2008; Kuhn, 2000). Though the statements used to construct the scale evaluated here differ from those previously used, the results certainly resonate with previous findings. That is, perception of new risks (e.g. food allergy), are positively correlated with indicators of broader concerns about environmental and social risks. Individuals rely on previous knowledge of health risks and experiences with risk in general, to form opinions about isolated emerging risks, with which they may be unfamiliar (Slovic, 2000; Krewski, 2008).

Worldviews have likewise been found to be correlated significantly with risk perceptions previously (Dake, 1991; Dake & Wildavsky, 1993). Those who agreed with fatalist and egalitarian worldview statements had higher perceived risks of food allergy. These relationships follow those found by others who have reported, for example, that egalitarians are likely to be adverse to societal or population-level risks (Dake & Wildavsky, 1993). Similarly, fatalism has been reported in a previous Canadian study to be positively associated with risk perceptions of food- or bacteria-related hazards (Health Canada, 1993). These findings reinforce the notion that perceptions of risk are partially based on threats to individual and societal ways of life (Douglas & Wildavsky, 1982). This is indeed the case with respect to this newly emerging health risk which is affecting

the lives of those directly affected (e.g. with respect to food choices as well as social and recreational venues considered safe) as well as those indirectly affected (e.g. restrictive policies in schools, air planes and other ‘public’ places).

In terms of direct experience, having multiple food allergies in the household was the only significant predictor of high risk perception. This result was unexpected, due to the lack of effect for those reporting a single allergy in the home. This may be explained by increased familiarity with the risk (Dosman et al., 2001), and/or knowledge about the level of control possible, and may also be dependent on who is allergic (adult versus child). Alternatively, respondents from households with one allergic resident may view the risks of food allergy as an individual problem, rather than a threat to society. It is clear, however, that there is a threshold to the relationship with experience, as respondents from households with multiple allergic individuals were much more likely to rate the risks as high.

Having received or read some information about food allergies in the past six months was an important predictor of perceived risk. We know that in order to inform risk perceptions, the general population relies on the media and informal social relationships, particularly when the hazard is new and unfamiliar (Kasperson et al., 1988; Slovic, 2000). Though this study was limited to only one question about food allergy risk information, we know from previous studies of risk that Canadians rely on the mass media for the majority of their risk information (Health Canada, 1993; Krewski et al., 2006). Findings here indicate that the perceived risks of food allergy are being amplified through these outlets in some way. For example, this effect may be partially explained

by the availability heuristic (Tversky & Kahneman, 1973). That is, those who had received information about food allergies in the six months prior to the survey may more easily recall food allergy as risks, and be more likely to rate the societal risks as high. However, it is impossible to elucidate here whether the relationship between information and perceived risk is mediated by increased awareness, or amplification of stress.

Finally, in addressing the third research question posed by this paper, regional differences in risk perception were observed in this survey, particularly marked differences were found between the province of Quebec and the rest of Canada. Quebec has a unique political environment, in that there is currently no provincial policy related to food allergies. The efficacy of risk management policies around food allergies is beyond the scope of this paper; however, a key indication from these findings is that differential risk perceptions are provoked in differing political environments. The sociopolitical climate has previously been hypothesized as an influence on differences between perceived risks of other environmental health hazards between Quebec and the rest of Canada (Krewski et al., 2006). Further, recent work in the food allergy and risk literature found different patterns of coping between parents of allergic children from Quebec and Ontario, primarily due to perceptions of management procedures in school environments (Fenton et al., In Press). These findings point directly to the role of the policy environment as a determinant of perceptions for *affected* individuals. However, results of this study suggest that the socio-political climate may be a modifying factor for the perception of emerging risks in the general population. Further exploration of the nature of this relationship will help to tease out these relationships.

2.6. Future Research & Limitations

There are some limitations to this analysis. Firstly, the sampling strategy excluded households having cellular telephone service only (8% of households), and those without telephones (2%) (Statistics Canada, 2008). Further, approximately 7% of all numbers are unpublished, and unavailable to Info-Direct (Chang, 2011). This is a potential source for bias, and should be considered when interpreting results reported here. Secondly, approximately 33% of household incomes were not reported in the survey. In order to include these cases in final analyses, these data ($n = 1210$) were imputed using an approximate Bayesian bootstrap hot-decking approach. This approach has been used extensively by the United States Census Bureau (Allison, 2002), and sample characteristics with respect to the distribution of household income were maintained; however, risk of misclassification is possible. Thirdly, while respondents from across Canada were represented by a wide variety of demographic backgrounds in the survey, it is evident that certain populations were underrepresented (e.g. low socioeconomic status). Potential bias was addressed by weighting the sample by age and sex to the 2006 Canadian population. In order to provide a more comprehensive picture of prevalence and risk, an extension of the survey will attempt to reach these populations using different methodologies. Finally, there was a relatively low level of explanation achieved for the regression model (rho-squared value = 0.15). However, the goal of this research was to explore the correlates of risk perception associated with this newly emerging health risk (as opposed to predict) and we were successful in uncovering numerous statistically significant effects.

These results also provide guidance for future research. Given that SCAAALAR was a large scale telephone survey, the resulting sample underrepresented some key sectors of the Canadian population. Though households were selected randomly, particular demographic groups were more likely to respond. As such, the resulting sample was not proportionally representative of households of low socioeconomic status, new Canadians living in the country for less than ten years, or those living in the territories. This highlights a significant gap in knowledge, and an extension of the SCAAALAR survey is currently ongoing to reach population groups underrepresented here. Secondly, this research indicated that food allergy information plays a significant role in the perception of food allergies. While there is a much research regarding the communication of food hazard risks through the media in general, to our knowledge, there is only one study regarding the communication of food allergy risks (Harrington et al., 2011). Further investigations are needed to fully understand the role of risk communication as a determinant of food allergy risk perceptions. Finally, further study into the nuances of the relationships identified through this research, including those using qualitative inquiry, will be vital for achieving a comprehensive understanding of the perception of food allergies as emerging health risks.

2.7. Conclusions

The risks of food allergies differ from those of other food-borne hazards such as chemical or biological contamination that can affect whole populations (Madsen et al., 2010). They affect a small proportion of the population (particularly children), and even within that group, may affect individuals with differing severity (Schnieder Chafen et al.,

2010). Despite the fundamental differences, food allergies are increasingly permeating our everyday discourses (Nettleton et al., 2009; Shepherd, 2006), and our everyday lives through policy change (i.e. food labelling, school policy). Debates over best management practices can be found in the scientific literature (e.g. Christakis, 2008; Munoz-Furlong, 2004) as well as the mass media (Harrington et al., 2011; Pearson, 2009). In order to respond appropriately to the (potentially) growing prevalence of food allergies, decision makers must protect the affected population, while accommodating the general public. Understanding the general population's perception of food allergies takes a step in this direction.

This paper has provided support for the apparent high level of public perception of the risks associated with food allergies, providing some validation for their prominence on the public agenda. Identifying a role played by demographic, attitudinal, experiential and contextual factors, the research has established a strong evidence base for risk management policy around food allergies. For example, food allergy risk communications can be informed by these perceptions. An effective approach would necessarily tailor towards particular segments of the population and people living in particular areas. Secondly, results indicated that policy decisions made in a particular environment may act as a modifying determinant of risk perceptions, particularly if no policy exists. As future regulatory decisions are made to address this important health risk, it will be important for those responsible be informed by the public's risk perceptions to limit backlash to emerging decisions, and facilitate their integration.

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CHAPTER THREE

FRAMES, CLAIMS AND AUDIENCES: CONSTRUCTION OF FOOD ALLERGIES IN THE CANADIAN MEDIA

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3.0. Abstract

Food allergies are newly emerging health risks, and some evidence indicates that prevalence is increasing. Public perception, however, is that the prevalence of food allergies is much greater than systematic estimates suggest. As food allergies increasingly permeate everyday life, this paper explores how associated risks are constructed through the mass media. In particular, nine years of media coverage of food allergies are analyzed through the lens of issue framing and claims-making. Results show that advocates and affected individuals dominate discussions around policy action, while researchers and health professionals are diagnosing the causes of food allergy. Results also suggest that there is competition over the definition of food allergies, which may, in turn, be shaping public understanding of the related risks. There is also an indication that the framing of food allergies is evolving over time, and that the discussion is becoming increasingly one-sided with affected individuals leading the charge.

Keywords

Emerging health risk; food allergy; media; claims-making; issue framing; risk perception

3.1. Introduction

*“Allergy Triggers Lurk in Loot Bags: Tips on safe Trick-or-Treating”
(Montreal Gazette – October 25, 2006)*

*“Assault With a Deadly Weapon: Forget stealing your lunch money.
Now bullies are using peanut butter to threaten kids with severe allergies”
(Globe & Mail – April 29, 2008)*

“Food Allergies Make Dining on the Road a Daily Minefield” (Vancouver Sun – December 8, 2007)

“Does That Communion Wafer Come in Soy? Allergy concerns have churches tweaking customs” (Montreal Gazette – January 12, 2008)

“When Death Hides in a Snack Bowl” (Toronto Star – November 21, 2008)

“Nutty Smooch Proves Fatal for Girl, 15” (Calgary Sun – November 26, 2005)

These headlines highlight examples of how food allergies have been framed in the Canadian media over the past decade. More and more they are recognized as risks or – perhaps more appropriately – dangers that permeate our everyday environments (e.g. churches, holidays, schools) and activities (e.g. dining out and smooching) (Nettleton et al., 2009). Food allergies are now topics of children’s books (e.g. The Princess and the Peanut Allergy, (McClure, 2009)) and there is an abundance of available coping resources for parents of allergic children (e.g. Doctor Mom’s Prescription for Managing Food Allergies, (Malhotra-Kuczabski, 2008)). Other notable publications include a recent book documenting the self-described *epidemic* of peanut allergy we are currently experiencing (Fraser, 2010). In the Canadian context, a national advocacy group dedicated to helping people live with deadly allergies was instrumental in having May declared “Food Allergy Awareness Month” by the Federal Government in the spring of

2010. Each of the above examples illustrates how food allergies have emerged as increasingly important public health risks.

Estimates vary, but the most recently established prevalence rates indicate that food allergies affect 2-5% of adults and 4-8% of children in the western world (Ben-Shoshan et al., 2010; CDC, 2009; Mills et al., 2007). They typically develop in early childhood, and reactions range from mild (e.g. itchy throat, hives) to potentially fatal anaphylactic reactions that affect the respiratory and cardiovascular systems (Health Canada, 2009). The causes of food allergy remain a mystery, (Schneider Chafen et al., 2010), and there is some strong evidence to suggest that incidence is increasing, particularly so in children (Grundy et al., 2002; Sicherer et al., 2003). However, apparent increases are the object of some debate in the growing scientific literature related to food allergy (e.g. Ben-Shoshan et al. 2009). Previous work on the public understanding of the risks associated with food allergies has found that *perceived* prevalence rates often exceed 30%, far surpassing systematic estimates (Harrington et al., 2010; Rona et al., 2007).

Despite a lack of consensus with respect to prevalence, perceptions of risk associated with food allergy have prompted varied management responses, and these too have been the subject of debate both in the literature (e.g. Christakis, 2008) and the popular press (e.g. Pearson, 2009). Solutions have most often been implemented in an effort to protect allergic children in environments outside the home, primarily by focusing on improving ingredient labelling, and providing safe school environments. In Canada, for example, the provincial government in Ontario enacted a precedent-setting

law in 2006 requiring all publicly funded schools to establish and maintain strategies for managing life threatening allergies. This law was championed by Sara Shannon, the mother of a thirteen-year old student who died of anaphylactic shock in her school's cafeteria.¹ Sabrina Shannon was an advocate for anaphylaxis education, and two years prior to her death, created a nationally aired radio documentary, "A Nutty Tale," which described her experiences living with food allergies.

Under Sabrina's Law, most schools have adopted precautionary banning of particular allergens from the schools altogether (peanuts in particular). These bans have been implemented despite a lack of consensus in the literature with respect to best management practices (Schneider Chafen, 2010; Young et al., 2009; Munoz-Furlong, 2004). The efficacy of school-wide bans for preventing reactions are still unknown, but some authors suggest that they may lead to other adverse outcomes such as stigmatization, bullying, and a false sense of security (Young et al., 2009). More extreme criticisms have suggested that such bans may even be fuelling the (potential) increases in allergy prevalence through a feedback process. That is, banning allergens means all children in that school would be practicing avoidance. This could result in sensitization to the allergen and contribute to the increasing prevalence of food allergies we appear to be experiencing (Christakis, 2008). "Allergen-free" environments (e.g. nut-free schools) have also raised some ire from the non-allergic population who believe they infringe on their rights to eat/carry any foods they wish.

¹ The law is alternatively known as "Sabrina's Law" in Sabrina's honour

It is important to contextualize this debate by recognizing the broader shift in the politics of food over the past several decades from issues of access and nutritional value, to issues of risk (e.g. toxins in foods, GMOs, feeding practices) (Blue, 2010; Pollan, 2008). Food allergies represent a new food-related risk, and as policymakers respond, the rules around eating are changing (i.e. what is and is not allowed). Food-related risk is a unique area of inquiry in that scientists, policymakers and lay publics all engage in discussions about risk and their consequences (Shaw, 2002). Policies that exhibit control over food are often contentious because of the engagement of all these actors (Blue, 2010). Voices from these groups may use different strategies to persuade and shape beliefs about the risks of food allergy, leading to contesting claims and counterclaims that are at once complex and emotional. In this way, there is a “wrangle in the marketplace,” whereby the ideas of different voices compete to construct the risks and consequences of food allergy (Heath, 2009). Much public debate occurs in the news media, and as such this paper analyses media coverage of food allergies towards an understanding of their recent emergence on the public health risk landscape.

In his theories on the ‘world risk society,’ Ulrich Beck gives prominence to the mass media as privileged sites for social definition and construction of risks and their consequences (Cottle, 1998; Beck, 1992). In particular, Beck highlights the central role of the media as fora for claims-making and contestation about risk. When emerging risks are characterized by limited, uncertain, or competing scientific information (e.g. food allergies, climate change), the media can play an especially important role in shaping people’s perception of that risk (Augoustinos et al., 2010; Kasperson et al., 1988).

Quality news sources have been recognized as being trusted sources of health risk information for the general public (Krewski et al., 2006; Major & Atwood, 2004; Frewer et al., 1996). By exploring how food allergies are represented in the news media, we aim to reveal why they have become so visible in the contemporary risk society defined by the ubiquity of risk (Beck, 1992).

3.2. Risk communication, risk perception, and the media

Primarily, the media confer legitimacy to emerging risk issues (Powell et al., 2007), and have in some cases been found to influence public health policy decisions (Bomlitz & Brezis, 2008; Driedger, 2007). For example, Wilson et al. (2004), describe how media reports of the theoretical risks of contracting Creutzfeldt-Jakob disease through blood resulted in a voluntary recall of blood products by the Red Cross in Canada in 1995 despite substantial economic impacts. That risks are legitimized through representation in the mass media, however, does not imply a completely decisive role in determining risk perceptions. Though this has been advocated by some (e.g. Koné & Mullet, 1994; Combs & Slovic, 1979), the general consensus is that individual/societal perceptions cannot be solely attributed to the media (Augoustinos et al., 2010; Powell et al., 2007; Wählberg & Sjöberg, 2000). The *Social Amplification of Risk Framework* suggests that amplification and/or attenuation of risk perceptions occurs at various stages of the communication process, of which the media represent a part (Kasperson et al., 1988). That is, the meaning of a message is not universal, but dependent on socio-cultural context, social group behaviours, and the interpretation by individual audience members (Driedger & Eyles, 2001).

As a main conduit of risk information between experts and the public (Major & Atwood, 2004), several factors have been conceptualized as influencing public risk perceptions through this role: volume of coverage, accuracy of reporting and how claims-making and issue framing are used to (re)construct risks. Regarding volume of coverage, Wählberg and Sjöberg (2000) found that media are diverse in their content surrounding risk events, and often not as biased as commonly thought. Alternatively, they report that risk perceptions are more strongly influenced by the amount of media coverage an issue receives. Indeed, number of media reports has been shown to be associated with amplified perceived risk in the general population (Young et al., 2009; Koné & Mullet, 1994; Combs & Slovic, 1979). This phenomenon aligns with the availability heuristic, a theory which suggests that increased exposure to an issue can facilitate risk recall, which inflates related perceptions (Tversky & Kahneman, 1973).

Despite the responsibility as an informal risk communicator, the media are often charged as problematic in this role given that their mandate is based on increasing readership (Wakefield & Elliott, 2003). With this end goal, media coverage may focus on the *newsworthy* qualities of an issue. Newsworthy stories about risk focus on the rarity or the exceptional nature of a hazard, or because media professionals see the risks as emotionally arousing due to their economic, political or cultural relevance (e.g. children with potentially fatal food allergies) (McCarthy et al., 2008). Some research has shown that journalists may even inject unnecessary uncertainty or controversy into a story to make a story more newsworthy, which may amplify perceived risk in the general population (Combs & Slovic, 1979).

Finally, Trumbo (1996) outlines two fundamental issues around the construction of emerging risks through the media. The first of these resonates with Beck's idea of the media as a forum for claims-making, and the second is related to what aspects are presented to the public as being the most important. Due to a lack of expertise in certain subject areas, journalists will often rely on information from sources representing various stakeholder groups (Wakefield & Elliott, 2003). Through this process, these sources are afforded a voice in constructing the issues around risks (Wilson et al., 2004; Wählberg & Sjöberg, 2000). As these voices make claims about risks and their consequences, the meanings of risks are continually re-formed (Major & Atwood, 2004). Those sources that receive strong representation in the media have a greater chance of getting the audience to accept their message (Driedger & Eyles, 2001).

Reliance on particular sources can also result in a reporting bias towards the qualities of issues that resonate with the sources' particular values or philosophies (Wählberg & Sjöberg, 2000). Particular aspects of a perceived reality may be selected by these claims-makers, and presented as more important. This frames the risk in a particular way, which can subsequently influence its social definition (Augoustinos et al., 2010; Rock, 2005; Driedger & Eyles, 2001). Previous explorations of health issues in the media have highlighted the impacts of framing on public perception. For example, Musso and Wakefield (2009) reported that framing of cancer in the media unfairly stigmatized the disease by adopting an overarching frame of 'blaming the victim'. Similar findings have been reported with respect to obesity (Hilbert & Reid, 2009). Emerging risks are characterized by scientific uncertainty and contention between

different social groups. In this context, their social construction is especially malleable through claims-making activities, and framing.

As a contentious emerging health risk, recent appeals in the allergy literature have called for more sociological understandings of the way people think about the risks of food allergy (Nettleton et al., 2009; Shepherd, 2005). We hypothesize that the volume of coverage in the news media has increased over the past several decades, which may partially explain, and perhaps be echoing perceived increases in the public perception of food allergy risk (Harrington et al., 2010). Further, this paper will argue that stakeholder claims-making, and issue framing are central to the construction of food allergy risk, and will aim to tease out the relationships between these concepts.

That is, this paper explores *who* is saying *what* about food allergies (Lasswell, 1948), by endeavouring to answer the following research questions:

1. Is the frequency of food allergy-related news items time dependent?
2. What aspects of food allergy issues are presented as the most salient?
3. Are claims-makers represented in the media with different frequencies?
4. What is the relationship between issue framing and claims-maker representation?

The following section of the paper presents the methods employed to answer these.

3.3. Methods

A content analysis of 18 daily newspapers from across Canada was conducted for a nine year period between January 1, 2000 and December 31, 2008, inclusive.

Newspapers were chosen as the medium for several reasons, including their known role as an agenda-setting medium in Canada, and their previously reported usefulness in exploring the coverage of emerging risks (Hayes et al., 2007; Dreidger, 2007). Print

news articles have also been used as proxies for news coverage through all media (e.g. television) (Bomlitz & Brezis, 2008; Dreidger, 2007).

Newspapers were selected based on a number of criteria. Following a recent media analysis of newspaper coverage of major determinants of health in Canada (Hayes et al., 2007), the sample reflects: a mix of corporate ownership, publication in both official languages (English and French), and both broadsheet and tabloid outlets. The final sample included the two national English language papers (*Globe & Mail*, *National Post*) and 16 papers representing regional markets in Calgary (*Calgary Herald*, *Calgary Sun*), Halifax (*The Chronicle-Herald*), Edmonton (*The Edmonton Journal*), London (*London Free Press*), Montreal (*The Gazette*, *La Presse Canadienne*, *Le Devoir*), Ottawa/Hull (*The Ottawa Citizen*, *Le Droit*), Quebec City (*Le Soleil*), Saskatoon (*The StarPhoenix*), Toronto (*Toronto Star*, *Toronto Sun*), Vancouver (*Vancouver Sun*), and Winnipeg (*Winnipeg Free Press*). All Canadian provinces are represented by this sample except for Newfoundland, New Brunswick and Prince Edward Island. However, the *Halifax Chronicle Herald* has the highest level of circulation from the Atlantic region, which includes these provinces. Combined market share of the selected papers as a proportion of the total national daily newspaper circulation is 60% (Canadian Newspaper Association, 2010).

Three on-line textual databases were used to draw the sample: LexisNexis Academic, Canadian Newsstand, and Eureka. All newspaper stories featuring the key search terms ‘food allergy’, ‘peanut allergy’, ‘allergy free’, ‘nut allergy’, ‘peanut free’, and ‘anaphylaxis’, or variations of these terms (e.g. food allergic, food allergies) were

included in a preliminary sample of stories. Though we were interested in press related to all food allergies, peanut was searched explicitly because peanuts are among the most common food allergies, and most likely to cause anaphylactic reactions. As such, they are most often the target of policies (e.g. nut bans in schools) and appear to be at the centre of most debate in the popular press. This strategy yielded 747 stories. Recipes (n=7), advice columns (n=12), book/movie reviews (n=2) and food recalls (n=96) were removed from the database, as were articles that mentioned food allergies in passing (n=32) (e.g. asthma-related articles with mention of food allergy as a similar condition). The final sample consisted of 598 articles.

Each article was coded for simple publication details as well as presence of a prevalence estimate of food allergies, assigned a unique identification number, and stored in a database. French language articles were translated using an online machine translator (Google translator) before coding. Since the goal was to perform more of a manifest content analysis versus a latent content analysis, the translated versions of the articles were sufficient, and the mechanical translator used has been recognized as an efficient tool for translating French to English (Callison-Burch, 2009).

3.3.1. Frames & Claims-makers

Frames were defined as the primary themes or ideas presented in a particular article (see Appendix B for details). The article's primary frame was most often defined by the headline and opening paragraph, and identified as the most salient aspect of the story. If the story began with an anecdote, or human interest piece, further reading may have been necessary to identify the primary frame. According to Entman (1993), the

purpose of framing is to promote problem definitions, diagnose causes, make moral judgements about actions, or suggest remedies. Table 1 presents the coding scheme for frames based on Entman's theory. All articles were assigned a primary frame.

Table 1: Framing coding scheme

Define Problems	Diagnose Causes	Make Moral Judgements	Suggest Remedies
Included stories discussed:	Included stories discussed:	Included stories discussed:	Included stories discussed:
(a) General Statements of risk (b) Incidence/ Prevalence (c) Death or hospitalization due to exposure (d) Familial or Individual coping (e) Dangers of food allergy (f) Awareness of food allergies (g) Clinical diagnosis of food allergies	(a) Theories of cause (b) Existing treatments or therapies (c) New, ongoing, or proposed research (d) Evidence of cause or cure	(a) Call for action (b) Support for a particular solution (c) Opposition to a particular solution	(a) Implemented solutions (b) Cancellation or removal of a solution (c) Proposed solution

Claims-makers were defined as the sources of information referenced in the articles (see Appendix B for details). Such sources were either individuals who had been interviewed by the journalist, or referenced material from reports, manuscripts, or

statements from organizations or groups. Referenced materials most often came from advocacy groups, the food industry, academic journals, and government. Individuals were classified as advocates, affected individuals, health professionals, researchers, government representatives, and school officials. Advocates were individuals affiliated with an established advocacy group, though these individuals were often directly affected by allergies themselves, or indirectly through their children. Affected individuals were allergic adults, adolescents and children, as well as parents or relatives of allergic children. Government representatives were from government agencies, or were policymakers at municipal, provincial, or federal levels. Allergists, dieticians, and other health professionals were coded as health professionals. School officials were coded separately because of their central role in the issues or regulations surrounding provision of safe environments for allergic children. Over 90% of the groups referenced and individuals quoted were coded according to this scheme. The information for each article was appended to the database with the physical publication details and unique identifiers. The resulting database was analysed quantitatively using R v. 2.9.0. Chi-square tests were used to answer the research questions as outlined previously.

3.4. Results

Of the 598 articles, 87 (14.5%) were written in French. There were no significant differences in how stories were framed depending on language of publication ($\chi^2 = 2.66$, $p = 0.44$), so French and English articles were analysed jointly. The mean length of all articles was 458.2 words, with a minimum of 36, and a maximum length of 2948 words. 197 articles (33%) were from news sections of the newspapers, and 413 articles (69%)

were classified as news items, versus 185 editorial stories. Editorials encompassed human interest stories (n=56), personal experience stories (n=19), or other opinion-based items including letters to the editor (n=110). The majority of stories were written by staff writers (n=270, 45.2%) or copied from wire services (n=167, 27.9%).

The prevalence of food allergy was reported in 39.8% of the articles; however, 50% of these estimates were not reported in reference to an information source. Stories that did provide some reference for their prevalence estimates cited advocacy groups/advocates and affected individuals (n=40, 17%), research groups/researcher and published reports (n=40, 17%), and government websites (n=13, 5%) most frequently. Slightly more than 80% of the articles (n=484) had some reference to at least one source of information. Of these, 70% quoted at least one individual, 30% (n=178) referenced a group or organization (e.g. advocacy group, research group), while 9% (n=53) referenced a government source. As individuals were overwhelmingly used as sources, they were the focus of the analysis.

3.4.1. Coverage over time

Media coverage in terms of the distribution of articles over the collection period is depicted in Figure 1, stratified by article type (e.g. News versus Editorial). Chi-square tests indicated that the frequencies of news articles ($\chi^2 = 16.3$, $p = 0.04$) and editorial articles ($\chi^2 = 24.8$, $p = 0.0017$) were both dependent on the year of publication. The frequency of news articles increased across the time period, starting with 16 articles in 2000, and peaking in 2008 with 76 articles. Years with increased editorial activity

typically corresponded with policy or regulatory change, a relationship that will be revisited in the discussion section of the paper.

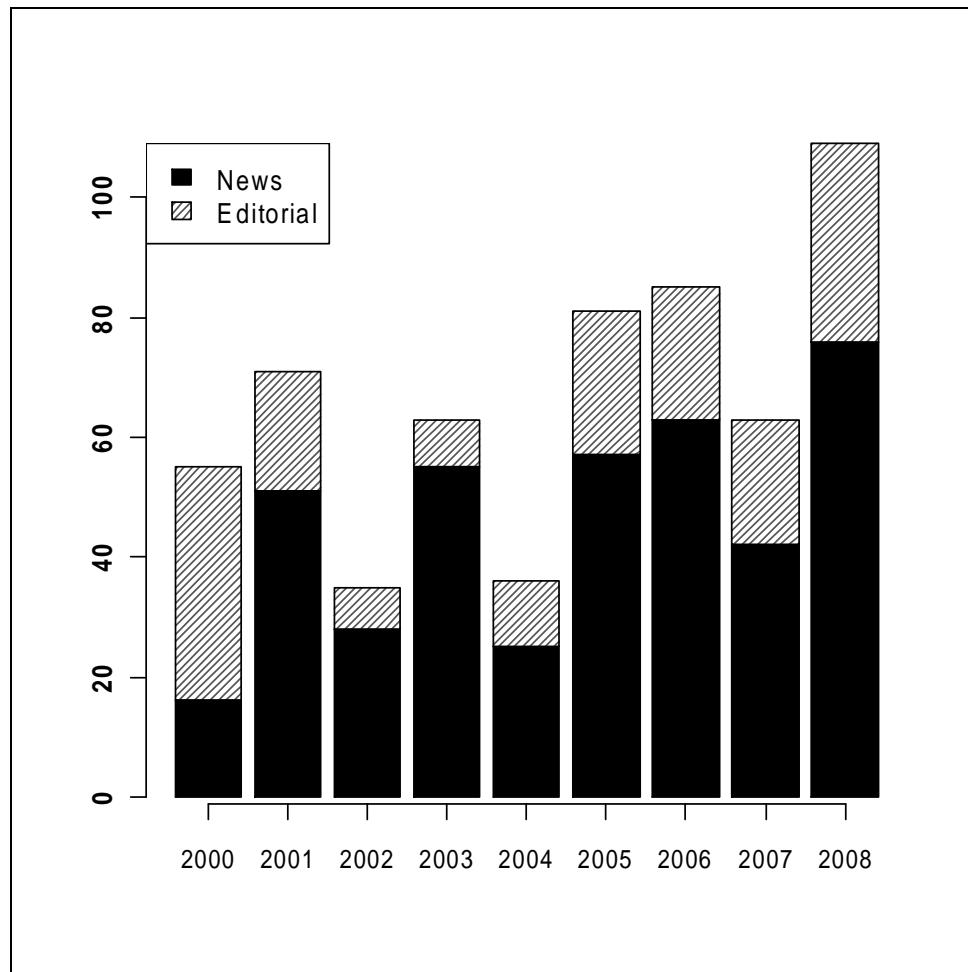


Figure 1. Publication frequency 2000-2008 by article type

3.4.2. *Framing*

Allergy issues were found to be framed with different frequencies at a significant level ($\chi^2 = 18.1$, $p < 0.001$). According to the coding scheme (Table 1), 221 articles (37%) were identified as stories framed as defining food allergies as a problem. 195 (32.6%) stories were classified as suggesting remedies, followed by 124 (20.7%) framed

to diagnose the causes of food allergy. Stories that primarily made moral judgements about actions and issues around food allergy were relatively less frequent ($n=58$, 9.7%).

These results are particularly interesting when changes in the proportion of story frames are examined over the collection period (Figure 2). That is, stories defining food allergies as a problem have been decreasing as a proportion of the total food allergy stories since 2004. This decrease is in contrast to the growing proportion of stories focused on remedies ($\chi^2 = 33.7$, $p < 0.001$). We will note here that the year 2004 has significance for food allergies in the Canadian context and discuss the relevance in further detail in the following section of the paper.

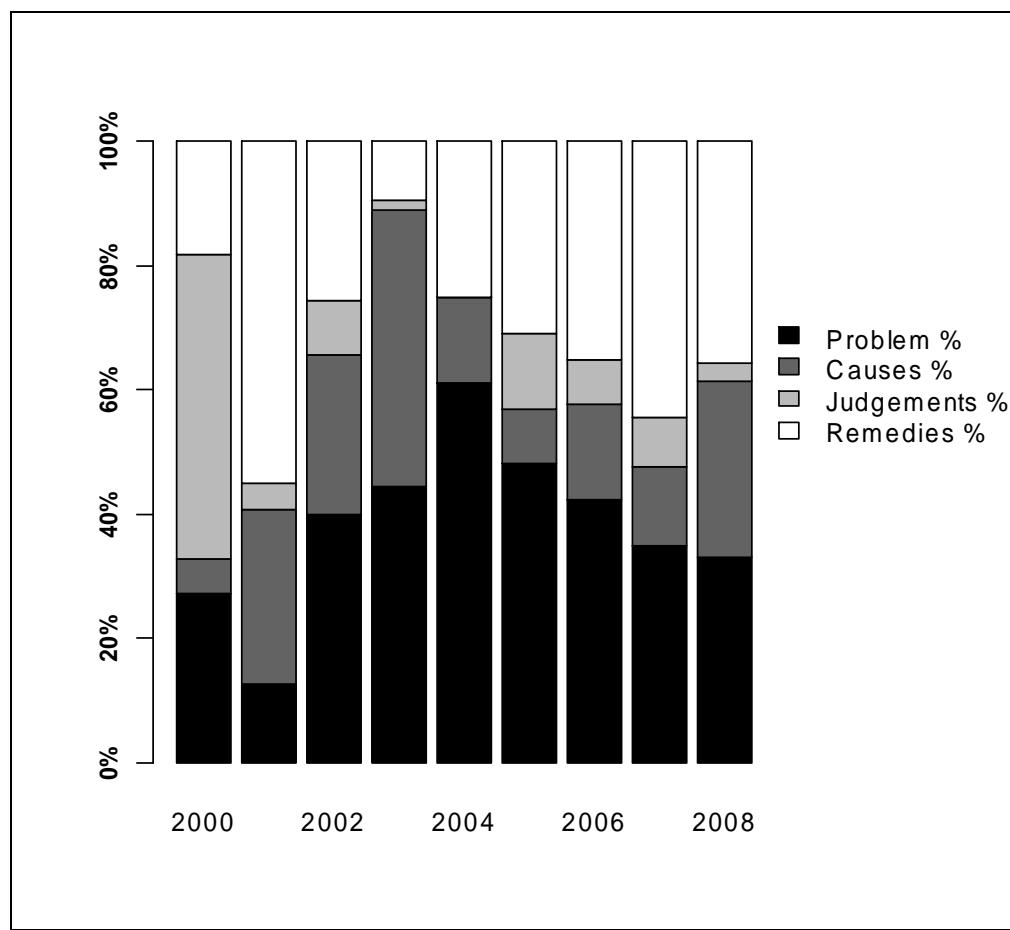


Figure 2. Proportion of Primary Frames by Year, 2000-2008

3.4.3. *Claims-makers*

In total, 760 individuals were quoted in the 598 total articles (Table 2). Thirty percent of the articles (n=177) did not include any quoted source and 421 quoted at least one individual (mean = 1.8 individuals quoted per article). The most quoted individuals in an article were five, and this occurred twelve times (2%).

Table 2: Claims-makers

Individual Referenced	Count	Percentage
Advocate	109	14.3
Affected Individual	216 [†]	28.4
Health Professional	96	12.6
Government	42	5.5
Researcher	209	27.5
School Official	23	3.0
Other	65	8.6
TOTAL	760	100%

[†] 69% of affected individuals were identified as parents of allergic children

Claims-makers were referenced with significantly different frequencies in the articles ($\chi^2 = 42.9$, $p < 0.001$). Affected individuals and researchers were referenced most often, representing 28.4% and 27.5% of all references, respectively. It should be noted that of the 216 affected individuals, 149 (69%) were parents of allergic children. Advocates represented 14.3% of all quoted sources, followed by health professionals (12.6%), government representatives (5.5%) and school officials (3.0%).

3.4.4. *Claims-makers & Framing*

Contingency tables were used to visualize these relationships (Figure 3), and chi-square tests indicated that the article's primary frame was indeed dependent on the presence of the claims-maker referenced in the article. This was true for articles organized around defining problems ($\chi^2 = 44.2$, $p < 0.001$), diagnosing causes ($\chi^2 =$

193.8, $p < 0.001$), making moral judgements ($\chi^2 = 196.7$, $p < 0.001$) and suggesting remedies ($\chi^2 = 47.1$, $p < 0.001$). The most obvious relationships show that advocates and affected individuals are represented in the majority of articles framed to make moral judgements (68%) and suggest remedies (53%). Second, health professionals and researchers are most strongly represented in stories diagnosing the causes of food allergy, representing 79% of all quoted sources. Results also indicate that there are a variety of interests represented in stories framed to define food allergies as a problem. Advocates

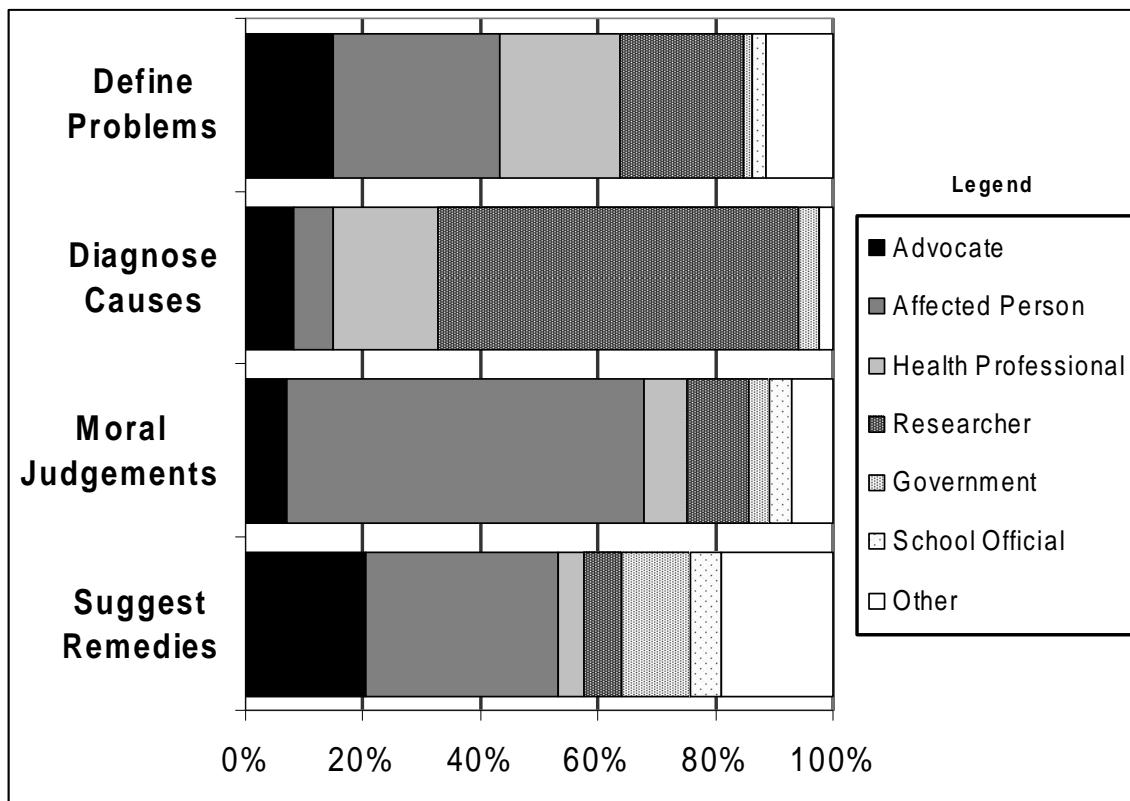


Figure 3. Primary frames by represented claims-makers

are represented in 15% of these stories, affected individuals in 28.5%, health professionals in 20%, and researchers in 21%. These findings, in combination with those from Figure 2, suggest that the themes around food allergy are shifting from problem

definition to suggesting remedies. It follows that along with this shift, advocates and affected individuals are proportionally gaining more representation in the news.

3.5. Discussion

A prominent result from the analysis relates to the overall increasing trend of articles across the collection period. Within the literature on food allergies, there is a growing perception that food allergies are a growing problem in the western world (Shepherd, 2005; Madsen, 2005). This is certainly the perception of the general population, which often greatly overestimates prevalence, and ascribes a substantial level of risk to food allergies. For example, it has been reported previously that almost 70% of the general population would rank food allergies as high or moderate risks to the Canadian public (Harrington et al., 2010). Though the media can build and set policy agendas by selecting which issues get attention (Driedger, 2007), they also reflect issues of contemporary interest (Nettleton et al., 2009). The nature of this relationship is unclear in this research, though it is likely a combination of the two roles. That is, the increasing coverage of food allergies could be both echoing the increasing public interest in the issue, and amplifying public perceptions of food allergy risk through the availability heuristic (Tversky & Kahneman, 1973).

Those years with a larger proportion of editorial articles published on the topic were typical during times of contention around regulatory action or change. For example, in 2001, Nestle Incorporated announced that they would be closing their lone Canadian peanut-free facility which produced many packaged foods that allergic individuals had grown to recognize as safe for consumption. Following the

announcement, newspapers were flooded with letters to the editor and other articles from parents of allergic children, allergic individuals, doctors, and teachers scolding Nestle for ignoring the needs of the allergic population to adjust to the market demand for more nut-and peanut-based products. For example, concerning the decision to discontinue production in a nut-free facility:

As a parent of a young child with life-threatening food allergies, I find that these products represent a degree of normalcy in our little girl's life, which is otherwise far from normal... The sadness and disappointment my family felt, especially my daughter, upon hearing the announcement by Nestle Canada cannot be fully understood. Our options are limited and our need to provide a safe, yet somehow normal, life for our child is paramount.

[Affected Individual], (The Ottawa Citizen, May 3, 2001)

Isn't it time for people to become more compassionate, especially given the fact that this allergy is on the increase? Grocery shopping is a nightmare. Wouldn't it be more practical for Nestle and other companies to expand their nut-free lines? [Affected Individual] (Calgary Herald, Apr. 25, 2001)

The backlash from the affected population gained significant media attention, and within a month Nestle reversed its decision and maintained the nut-free facility, despite increased financial costs to the company.

At a cursory glance, the majority of the stories were framed to define food allergies as a problem (37.0%), followed by those suggesting remedies (32.6%), diagnosing causes (20.7%), and finally making moral judgements (9.7%). However, exploring the proportion of frames over the collection period revealed a more complex relationship. In particular, since 2004 the proportion of stories framed to define problems has decreased, while the proportion of stories suggesting remedies has increased. As prefaced in the introduction to this paper, this point in time was a watershed moment for

food allergies in the Canadian context. September of 2003 marked the death of Sabrina Shannon, which received much exposure in the news media, and eventually led to the legislation of “Sabrina’s Law.” This law was the first of its kind in Canada, and since it was enacted, there has been a variety of regulatory responses to food allergies. In this context, the trajectory of frames makes intuitive sense. In particular, the discussion in the media changed trajectory in 2004 from stories concerned with defining food allergies as a problem, to stories suggesting remedies; stories that include reports of implemented policies, or proposed solutions. Temporal shifts in framing risks in the media have been reported elsewhere. For example, Trumbo (1996) discusses climate change in terms of an issue-attention cycle, finding that presentations of risk issues align with particular phases in the lifecourse of an issue. In particular, the focus evolves from problem definitions and diagnosing causes towards solutions and remedies for social problems (e.g. risks) over time.

It is consistently reported in the literature that journalists rely on expert testimony, primarily due to a lack of expertise in an area, but also because the constraints of journalism demand increasingly up-to-the-minute information (Wilson et al., 2004). This was echoed by the results of this research. Seventy percent of the articles in this study relied on individuals with various interests in the construction of food allergy for information. Affected individuals, and particularly the parents of allergic children, received the majority of this representation. Advocates, who were frequently affected individuals as well, were also well represented, quoted third most after researchers.

Those with direct experience with risks can play an important journalistic role by framing an issue in an emotionally arousing, or personalized way (Wählberg & Sjöberg, 2000).

To these ends, many articles began with anecdotes or experiences with food allergies as told from the perspective of these individuals, for example:

"Last May, Derek suffered a severe allergic reaction at his private elementary school...Derek's father, typical of most parents who have raced to the hospital with their child in their arms, describes the anxiety he now feels."After you see how fast it can happen, it becomes a constant scare," [he] said."To me, a kid who comes to school with a chocolate is worse than a kid who comes to school with a gun." (The Gazette, Aug. 25, 2001, p. A1)

This journalistic strategy aligns with the concept of newsworthiness, which ultimately translates into readership – the main objective of the news media sources (Major & Atwood, 2004; Wakefield & Elliott, 2003). However, affected individuals and advocates also have a keen interest in being represented in the media, particularly around issues of regulation and policy, and particularly so when these apply to their children:

As an advocate, I know more can be done to prevent anaphylactic reactions -- from awareness and education to medical research and food safety. But as a parent, if the proposed changes to Canada's food labelling policy are enacted, at least I can worry a little less. [Advocate] (Winnipeg Free Press, Jul. 27, 2008, p. B4)

As a parent of a six-year-old boy who has a life-threatening peanut allergy...I think there's something more dangerous and insidious than the anxiety that banning nuts in schools is propagating. It's the false sense of security. [Affected Individual] (Vancouver Sun, Dec. 19, 2008, p. A.16)

Therefore, it could be that media representation is sought out by these groups in order to promote their own understanding of the issue. The nature of the relationship between purposeful media representation by these groups and journalistic strategy is unclear from the analysis. Despite not knowing how these interests gain media representation, our

findings show that there is certainly a substantial role being played in the definition and construction of food allergies by those who are directly affected.

An interesting result from this analysis was the distribution of claims-making groups or ‘voices’ in stories framed as defining problems. While stories framed in other ways privileged certain groups, stories defining food allergies as problems appear to be the most likely site for contesting claims and counter-claims (Beck, 1992). In particular, advocates, affected individuals, health professionals and researchers received approximately equal representation. This could represent a potential source of confusion and uncertainty for the general population, as the values of these groups differ greatly (Major & Atwood, 2004), and each group could represent a unique idea about the risks of food allergies. However, it is interesting that this particular result resonates with Gross’ (1994) contextual model of public understanding. That is, the knowledge of science (e.g. researcher, health professionals) is not being privileged over the knowledge of the public (i.e. advocates, allergic individuals). Rather, science appears to be interacting with “local knowledge” (Cottle, 1998, p. 13) to cooperatively construct a social definition of food allergies. Such competition may ultimately provide a more robust public discourse of the related risks.

Stories organized around diagnosing the causes of food allergy, were dominated by researchers and health professionals, comprising almost 80% of total quoted sources (Figure 3). Stories framed in this way were reporting treatments for food allergy, other new research in the area of food allergies, or theories of the cause of food allergy. Wilson et al. (2004) suggest journalists may defer to experts in the sciences due to a

relative lack of scientific literacy, particularly when issues are wrought with scientific uncertainties. This would be especially true in stories framed to diagnose causes, where discussions were focused on complex methodologies for assessing or diagnosing food allergies, and theoretical relationships between genes and the environment.

Advocates and affected individuals dominated the discussions on solutions and moral judgements. These particular groups have vested interest in how policies are implemented and enforced, as they would be directly affected by such action, and this is reflected by their disproportionate representation in related discussions. The non-allergic population did voice some criticism about policy decisions in these stories as well, particularly around peanut bans, citing the “tyranny of the teeny-tiny minority” (Toronto Sun, May 6, 2000, p.15). These groups most often focused on how a small group is “wielding authority over the masses” (London Free Press, May 8, 2000, p. A9), and voiced worry about infringements on their rights to choose what they want to eat, and about what foods would be targeted next (e.g. dairy, soy). However, the “volume” of their voice in policy debates measured by their representation is muted by the voice of the allergic population. The shift in story frames also factors in to this relationship. A growing focus on remedies since 2004 and a decreasing number of stories defining problems and causes appears to be providing a stronger voice to advocates and affected individuals. The implication here is that other groups (e.g. health professionals, researchers) are not being proportionally represented, and that discussions of solutions are gradually becoming one-sided.

We would like to offer two perspectives on increasing reliance on advocates and affected individuals. On one hand, this could be problematic, in that the more the discussion around solutions is controlled by one group, the greater the backlash from other groups could become. There is already a contingent of the non-allergic population that has voiced their displeasure with policy decisions, and criticism of existing solutions has also been asserted in the literature (e.g. Christakis, 2008). On the other hand, the reasons why the other groups are relatively absent from discussions around solutions are unknown. We offer that it may be partially a function of the lack of scientific consensus regarding prevalence, diagnostics, and best management practices for food allergies (Schneider Chafen, 2010). Despite a full understanding from scientific “experts,” however, society and policymakers must respond to and accommodate this emerging health risk, and require information to do so. In this context and at this time, affected individuals and advocates *are* valuable experts with privileged knowledge of food allergy risks. This idea could potentially be why they are sought out by journalists, or why they pursue media access to suggest solutions to a greater degree than other groups.

3.6. Future Research & Limitations

Our analysis was limited to the Canadian media. This decision was made primarily to follow up previous research that has reported a high level of perceived risk in the general Canadian population (Harrington et al., 2010). Secondly, Canada’s political environment related to food allergies is also unique in that Sabrina’s Law (Ontario) represents the first piece of legislation to regulate the school environment for children with severe allergies, though other provinces have more recently followed suit.

Extension of this work to other political contexts could provide insight into the role of claims-making in shaping discourses about food allergies.

Secondly, this study was designed to be a manifest content analysis, which is consistent with survey research in terms of its goals (Nuendorf, 2002). Such an analysis is concerned with recording and measuring physically present elements in an article, and producing summaries of articles as coded by an a priori coding scheme. As mentioned previously, this analysis found that groups are ‘competing’ to define food allergies, under a contextual model of public understanding, rhetoric and rhetorical analysis are recognized as playing significant roles (Gross, 1994). Evident in even the small sample of quotes provided in our discussion, it is clear that claims-makers from different groups often use strong metaphors, and emotionally-charged language to persuade the public to accept their claims. As such, more rhetorical analyses of these texts could shed some light on how these groups specifically frame their arguments to shape the definition of food allergies.

Finally, while we know that there is a high level of perceived risk of food allergy in the general population, it is still unclear what the public understand about food allergies. Though this research has provided some insight into how the media may play a role in this understanding, further investigation into how the messages are interpreted is necessary. This will be crucial to understanding if increasing media coverage is echoing the legitimate concerns of the public, or amplifying public concern.

3.7. Conclusion

Attribution of a message to a source, as well as the way in which that message is framed can provide critical insight into how a health risk is constructed (McCarthy et al., 2008). Indeed, this process matters for public perception, as representation of a risk issue influences whether the general population understands, attends to, or acts upon risk information. In an era defined by the emergence of new risks in an increasingly information mediated environment (Beck, 1992), stories in the media are vulnerable to claims-making, and often issues are framed to resonate with the public. The literature in and around food allergies is recognizing that various social actors and interests are involved in the social construction of definitions of food allergy, as evidenced by differences in lay and expert understandings. This is certainly reflected in media representations of food allergies, and the results of this paper can extend this contention. While many voices compete to define the risks of food allergies, discussions of causes and solutions are relatively one-sided, with potential consequences for public understanding. As food allergies and other new risks continue to be constructed and reconstructed through claims-making and framing in the media, it is of great interest to acknowledge who is saying what.

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CHAPTER FOUR

TOWARDS A HEURISTIC FOR UNDERSTANDING EMERGING ENVIRONMENTAL HEALTH RISKS

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4.0. Abstract

Pre-modern societies were subjected to natural hazards that could be attributed to fate (e.g. natural disasters), and human-made hazards that were considered manageable. However, late-modern society is increasingly exposed to environmental health risks that are products of the modernization process itself. These risks emerge from broad changes in human-environment interactions and may not be circumscribed spatially or temporally. Often without scientific knowledge about these risks, governments, institutions and communities must respond to those perceived to be important by the general public. Thus, understanding and anticipating public perceptions of emerging risks has clear implications from risk management and risk communication perspectives. This paper will describe the development and application of a conceptual framework for characterizing public response to emerging environmental health risks. Building on existing theories of risk perception, the framework explicitly incorporates a determining role for the places in which risk is experienced. It appears to be most valuable for identifying the major factors operating in the arena of risk perception, and offers a concrete foundation for conceptualizing how these factors interact. The framework is a product of a comprehensive research project focused on the public perception of the risks associated with food allergies, an emerging environmental health risk in much of the western industrialized world.

4.1. Introduction

Environmental threats to human health are pervasive. These are most readily apparent in cases of large scale natural disasters, or industrial catastrophes related to technological development (e.g. the accidental explosion at the Chernobyl Nuclear Power Plant, or the 1984 gas explosion in Bhopal, India). However, human-environment interactions have also given rise to widespread environmental changes (e.g. climate change, agricultural practices, increasing international migration and travel) with associated risks including the outbreak and diffusion of disease (e.g. H1N1, Bovine Spongiform Encephalopathy, SARS). Through the industrial revolution to modern society environmental hazards have increasingly become side effects of the modernization process in and of itself (Beck, 1992, Douglas & Wildavsky, 1982). These differ from traditional environmental hazards that were considered “knowable” and thus manageable in that exposures and effects may not be calculable, nor may they be spatially or temporally constrained (Holloway, 2004). For example, human pressures on the environment (e.g. greenhouse gases) are projected to give rise to, among other risks, increasing extreme weather events, microbial proliferation, environmental displacement of populations, and (re)emerging infectious disease (McMichael, Woodruff & Hales, 2006; Fauci, Touchette & Folders, 2005; Weiss & McMichael, 2004). Due to their unfamiliarity, there is often insufficient scientific knowledge regarding the consequences, causes, or probabilities of such *emerging environmental health risks* to respond through classic risk management strategies (Radandt & Renn, 2008; Zinn, 2008). In this context, decision-makers must respond to risks perceived to be important by the general public

(Gierlach et al., 2010), often without having full information or knowing the consequences of their actions.

Classical risk assessment techniques rely on objective quantification of the probability of risk and the magnitude of the consequences (Zinn, 2008). Alternatively, the general public relies on intuition, knowledge and experience to define risk (Slovic, 2000). These diametrical conceptions of risk as an objectively determined threat as well as a subjective risk experience deviate systematically from one another. Further, groups of different actors (e.g. scientific experts, lay publics, interest groups) experience and perceive threats from hazards differently (Baxter, 2009). It is necessary to continue to understand biases in public perception of risk to improve risk communication strategies and contribute to a base of knowledge for anticipating public response to emerging hazards (Slovic, 1987). While much attention has been paid to hazard characteristics as a determinant of risk perceptions (e.g. Slovic et al., 2000), relatively less has been paid to the socio-cultural influences that comprise the various places where risk is experienced. As contextual-level social, cultural and political factors gain recognition as important determinants of public risk perception for both local (Masuda & Garvin, 2006) and more global (Bickerstaff, 2007) environmental risks, there is a need for a heuristic that will allow conceptualization of the interdependence among people, perceptions and places so that decision makers can respond. The aim of this paper is to develop such a tool by building upon existing theories of risk perception and piloting the tool using the empirical example of a widespread, emerging environmental health risk: food allergies.

The paper is organized into five sections. Section 2 reviews the theoretical literature on risk perception, and situates the framework within the three most dominant paradigms. Section 3 presents the key elements of the framework, followed by an application of the framework to our case study in Section 4. The final section reflects on the value of the framework, its implications for anticipating public response to emerging environmental hazards, and future directions.

4.2. Risk perception paradigms

The framework presented in the following section is informed by elements of three existing paradigms of risk perception, each of which will be discussed in turn. These have proven useful for understanding the perception of some risks (i.e. nuclear technologies), though they have been relatively limited for anticipating public perception of newly emerging environmental risks. The *psychometric paradigm* (Slovic, 1987) is rooted in the field of psychology, and research centred in this paradigm has focused on the individual demographic and cognitive characteristics that determine perceived risk. Specifically, the paradigm focuses on the qualitative characteristics of the hazard itself as factors that shape risk perceptions. These characteristics have been used to develop a taxonomy related to *dread* risk and *unknown* risk whereby catastrophic potential (e.g. fatal consequences, inequitable distribution, not easily mitigated, involuntary) and perceived level of control (e.g. unobservable, unknown to those exposed, new risk, unknown to science) combine to heighten or mitigate public perceptions. The two-factor model has been successful in predicting risk of a number of hazards (Slovic, 1987), though the individualistic nature of the psychometric paradigm has received some

criticism. In particular, some authors have raised the positivistic nature of the model and the socio-cultural independence of the theory as key critiques (Zinn, 2008; Marris, Lagford & O’Riordan, 1998; Sjoberg, 1996).

The cultural theory paradigm of risk perception recognizes that particular groups select particular hazards as risky in order to sustain and strengthen social relations and cultural values (Douglas & Wildavsky, 1982). These groups develop particular orienting dispositions, based on the conditions in which they live their lives that guide their responses to hazards and potential risks (Dake, 1991; Slovic, 2000). These perspectives are termed *worldviews*, and the crux of the argument for cultural theory is that these vary systematically according to cultural biases (e.g. fatalism, hierarchical, individualism and egalitarianism) which are apparent in different societies, groups and by extension, places (Bickerstaff, 2007). Groups associated with these categories often differ in their level of perceived risk, and risk acceptance towards particular hazards. For example, Peters and Slovic (1996) found that egalitarian groups, whom have a preference for power and wealth to be distributed equally in society, had higher perceived risks of a number of hazards, and nuclear power in particular. Comparatively, those who preferred and trusted experts and authorities to assume control of risks (i.e. hierarchical worldviews) had much more favourable attitudes towards nuclear power. Worldviews are developed in the context of particular social, political, economic, and cultural environments, and as such, differences in risk perceptions can be geographically defined (Baxter & Greenlaw, 2005). For example, Gierlach and colleagues (2010) recently found that Japanese groups have

high perceptions of natural disasters and terrorist events, and that North American and Argentinean groups had low perceived risk of terrorist events.

A third theoretical approach to risk perception, the *social amplification of risk framework (SARF)*, binds insights of the previously mentioned paradigms of risk, and suggests that the public experience of risk must also reflect how informational processes, institutional structures, social group behaviour, and individual responses shape the experience of risk (Kasperson et al., 1988). SARF is based on theories of communication, and its central thesis posits that uncertainties about risk and amplification/attenuation of particular risks can occur at various stages in the risk perception process. Risk information (and by implication, the mass media) is given an influential role in the development of risk perceptions in this framework. The theory suggests that the interpretation of a risk message by an individual depends on the nature of the message, as well as the relevance of the message to that person, situated in a particular sociocultural context (Kasperson et al., 1988; Slovic, 2000; Masuda & Garvin, 2006).

Though each of these theoretical frameworks provides a perspective on risk perception, it has been argued that existing paradigms for understanding perceived risk explain only about 30% of the variation in risk perceptions at best (Sjöberg, 2000). As such, continued development and refinement of conceptual frameworks for understanding is necessary. Research in this vein is especially important to respond to the widespread, new hazards that emerge on the post-industrial environmental health risk landscape. The remainder of this paper will describe the development and piloting of a framework that

blends existing perspectives on risk, and contributes to the conceptualization of place as a currently understudied factor.

4.3. Development of the framework

4.3.1. A structural framework

There is an inherent spatiality to the risk construct that emphasizes distance, direction, position, and co-location of hazards with other social or physical phenomena (Agnew, 2005). The concept of *places*, however, extends the notion of spatiality to include the characteristics and meanings of these spaces. A place-based approach focuses on the various environmental influences existing in a particular place, and the ways in which these shape and determine the perceptions of individuals and populations. Place is a construct that shapes *how* risk is experienced, rather than just a spatial boundary representing *where* risk perception happens (Kearns & Moon, 2002). In particular, this idea draws from other research, namely from health geography, that has recognized the value in situating risk perceptions of industrial and technical hazards within a particular local context (e.g. Baxter, 2009; Masuda & Garvin, 2006; Bickerstaff & Walker, 2001; Elliott et al., 1999; Litva & Eyles, 1995; Eyles et al., 1993).

Figure 1 depicts a structural version of the framework, which purposefully presents a simplified model of the risk perception system. Structural frameworks are useful for framing issues more broadly (Knol et al., 2010), and in this instance, the framework is used to conceptualize the risk perception “system” as being situated within the important place-based contextual factors. Place, it should be noted, has purposefully not been limited to a particular scale. This ambiguity is intentional in order to highlight

the usefulness of the framework for application to a range of scales (i.e. from micro- to meso- to macro-levels), depending on the research question.

Research on the geographies of risk has a strong tradition exploring the experience of living near industrial sources of pollution. Though these studies are situated in particular localities, their findings make the role of social, economic, and political context explicit. For example, in a study of an eco-industrial development proposal near Edmonton, Alberta, Masuda and Garvin (2006) examined the relationships between culture, place and the social construction of risk. This research focused on the communication of risks to the public that occurs during the planning of an industrial land use as a determinant of perceived risk. The authors argue that risk communication is a cultural process that occurs in place, and can explain the differential impacts that risk communication can have for local communities. The overall theme from this literature is that risk perception outcomes and processes are thoroughly embedded in place-based issues (Bickerstaff, 2007). Though many emerging environmental health risks are widespread, even global risks (e.g. climate change), there is strong evidence to support that despite the democratization of such risks, the meanings ascribed to them remain highly local (e.g. Bush et al., 2002; Burningham & O'Brien, 1994).

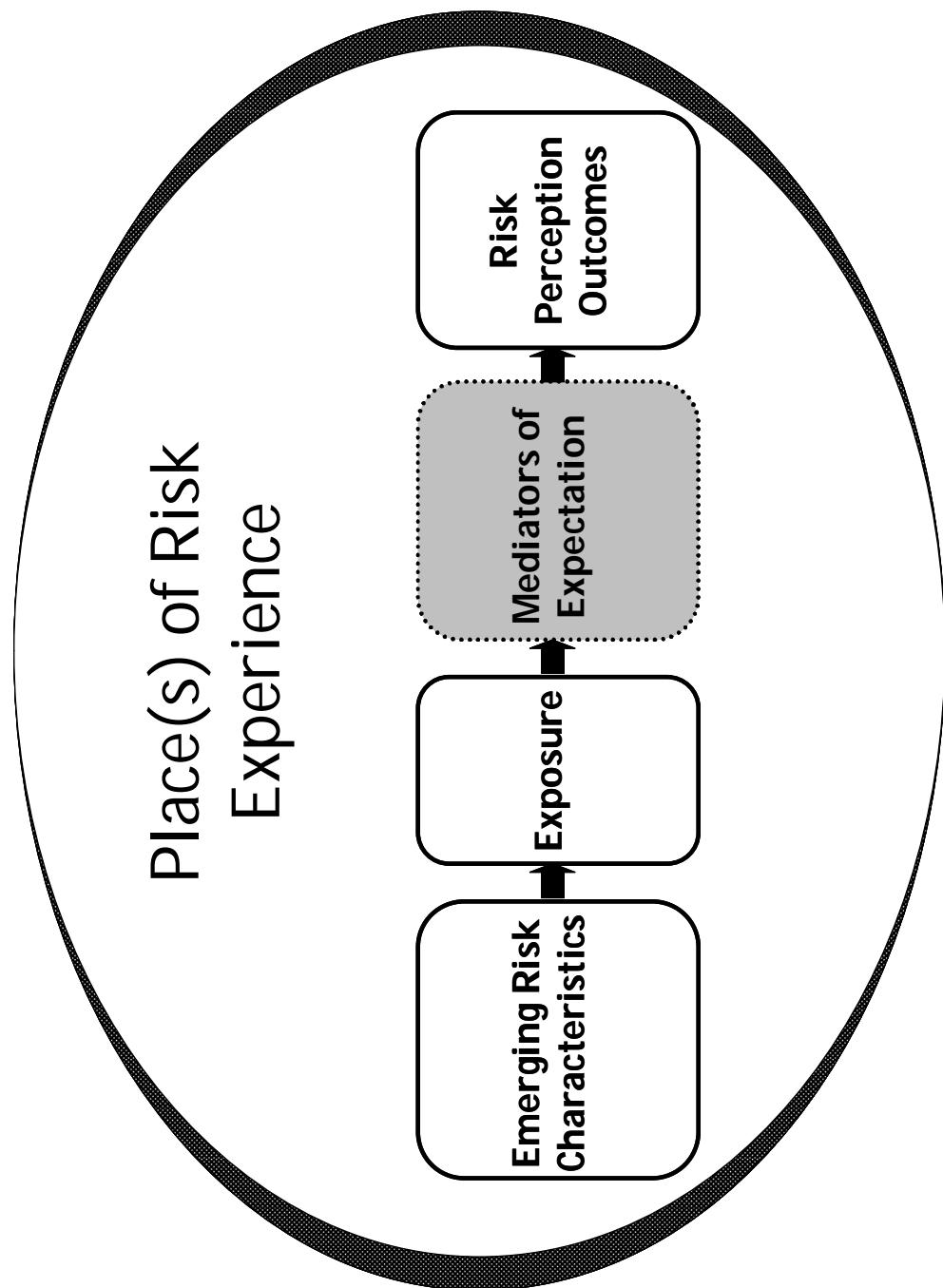


Figure 1: Structural framework of the public experience of risk

4.3.2. Dissecting the Framework

Based on the structural framework (Figure 1), place represents the backdrop against which the public experiences emerging environmental risks, and represents an important determinant of each of the internal components of the risk perception system. These are defined as: risk characteristics, exposure, mediators of expectation, and outcomes. Figure 1a magnifies the framework and outlines how these important concepts are functionally linked. To allow for operationalization of contextual-level influences, we have adopted Swinburn and colleagues' (1999) categorization of environment into four types: the physical, economic, political, and sociocultural. We acknowledge that places are substantially more dynamic than reification into these seemingly concrete categories, and that there exist other interrelated contextual influences that shape perceptions. However, with an intention to deductively test the framework at the population level, this categorization is useful for conceptualizing the potential role played by the natural or built environment (**physical**), political rules and regulations (**political**), economic costs (**economic**), and collective attitudes and beliefs (**sociocultural**) in the development of risk perceptions. Table 1 presents examples of some of the measurable environmental concepts that may be associated with each environmental type, using air pollution as an example risk.

4.3.2.1. Emerging Risk Characteristics

Despite critiques of the psychometric paradigm as a definitive model of risk perception, it is clear that the characteristics of a hazard are deterministic of perceptions to some degree. As mentioned in the previous section, the two factors found to be most

relevant are dread risk, and unknown risk (Slovic, 1987). We maintain that these characteristics are salient for risk perception; however, we likewise acknowledge that the social construction of these characteristics and therefore the meaning of these risks to the general public is contingent upon

Table 1: Examples of contextual influences on risk perceptions

<i>Environmental Type</i>	<i>Example Influence</i>
Physical Environment	Distance to source of pollution Prevailing winds Visibility of smog
Economic Environment	Dependence on industry for employment Location of industrial polluter in marginalized or poor communities
Sociocultural Environment	Attachment to place Stigmatization of a place as “dirty” or “polluter-friendly” Social capital/networks Automobile dependence
Political Environment	Smog advisories Regulations regarding production/output Regulatory institution in charge

other important processes. Thus the characteristics of the risk have been included in the framework as a point of embarkation.

4.3.2.2. Exposure

The second process outlined in Figure 1a reflects the experience of risk, that reflects direct personal exposure to risk as well as indirect exposure through informal information channels (e.g. the media, other people) (Kasperson et al. 1988). Direct experience has a complex interaction with risk perception, in that it may act to intensify, or abate risk perceptions. In the case of driving automobiles, for example, repeated experiences can attenuate the perceived risk of automobile accidents, which remain a leading cause of death, particularly for young people (Statistics Canada, 2011). Conversely, direct experience with natural disasters or infectious diseases can cause increased alarm about future events, thereby heightening risk perceptions (Slovic, 2000). This relationship is partly determined by the risk characteristics (dread, unknown), though the interaction also differs between and within social experiences and social groups (Gierlach et al., 2010).

Due to the recency of many emerging risks, they may not be directly experienced by everyone. In lieu of direct experience with risk, the general population requires information about risks in order to form a response. The flow of information occurs most often through the news media and informal social networks (Slovic, 2000; Kasperson et al., 1988). The news media in particular are recognized as key in the transmission of risk information to the population in a form they can understand, digest, and act upon

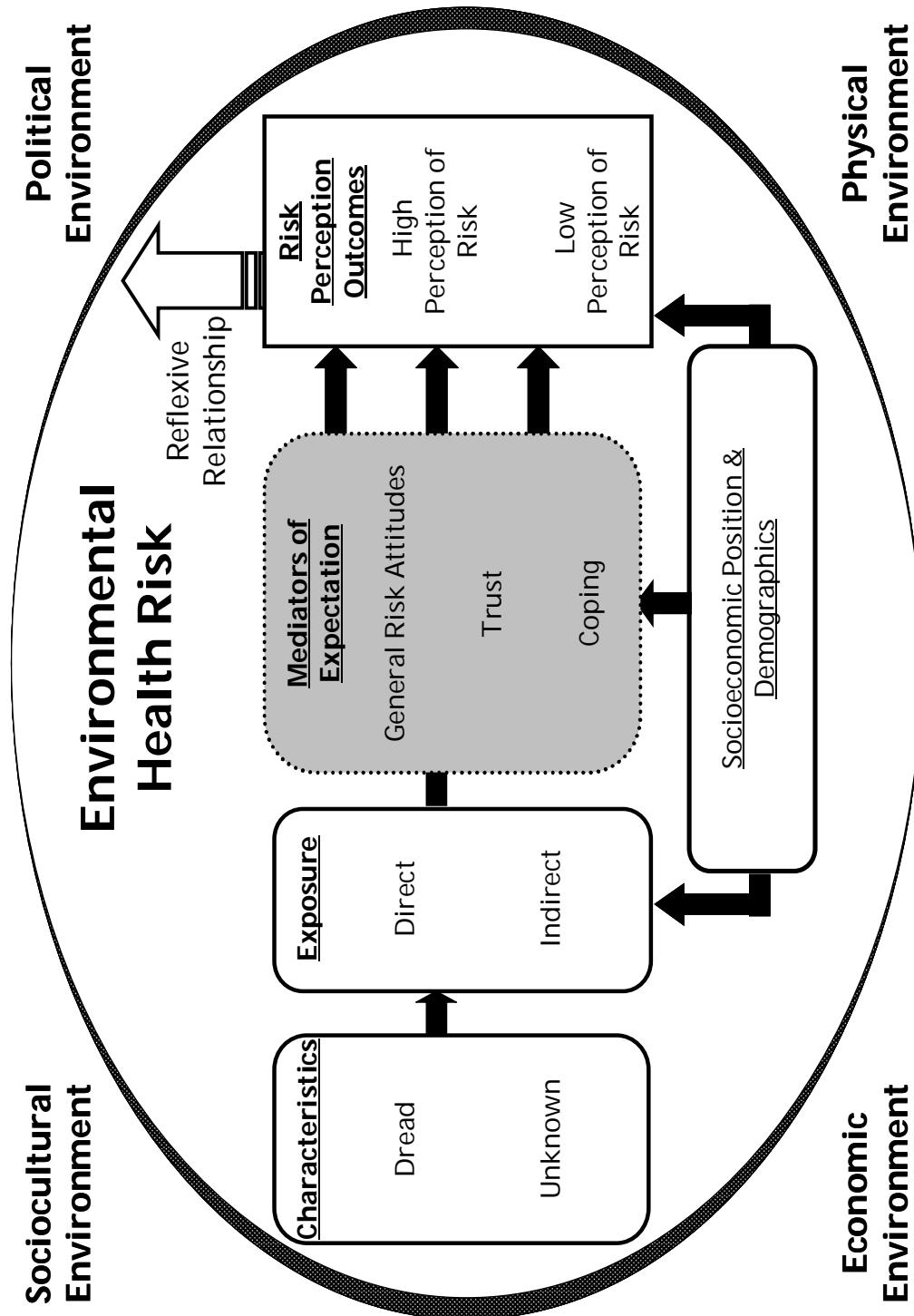


Figure 1a: Relational framework of risk perception with individual- and contextual-level influences

(McCarthy et al., 2008). However, media coverage of a risk is often unrelated to the seriousness of that risk, and may focus on the exceptional nature, or emotionally provocative aspects of a risk issue, thereby amplifying the perception of that risk (Slovic, 2000; Kasperson et al., 1988). Several factors have been conceptualized as influencing public risk perceptions through this role, primarily the volume of coverage a hazard receives (Wählberg & Sjöberg, 2000; Young et al., 2009; Koné & Mullet, 1994) and accuracy of reporting (McCarthy et al., 2008; Wakefield & Elliott, 2003).

4.3.2.3. Mediators of Expectation

Previous knowledge and past experiences are mediating factors for what one considers risky, and expects from new risks (Zinn, 2008). We see as three key concepts comprising this cloud of mediating factors: attitudes towards risk, trust, and coping. Among others, Sjöberg (1996) has argued for attitudes towards risk as an important explanatory factor for risk perceptions. The central thesis is that attitudes towards risks, both personal and general, will guide perceptions of specific risks; namely nuclear power. Worldviews (Dake, 1991; Wildavsky & Douglas, 1982) are one example of general risk attitudes. These attitudes are developed as an individual takes stock of the environments in which they live their lives (Slovic, 2000), and forms an orienting disposition towards risk. Thus, these attitudes are formed through first hand experiences of individuals in place.

Trust in the framework refers to trust in those responsible for risk management (politicians, authorities, science) and trust in the sources of risk information based on perceived competence and honesty of the source (Bickerstaff, 2007; Frewer, 1999). Trust

in such authorities has emerged in the risk perception literature as an important determinant of risk perception, particularly when personal knowledge is lacking (Slovic, 2000; Siegrist & Cvetkovich, 2000). Viklund (2003), for example, found social trust to be a significant explanatory factor in models of risk perception both between and within four European countries, indicating that social trust is constructed in a particular cultural, or place-based context.

In the case of complex and uncertain emerging environmental health risk, trust is particularly salient. This is evidenced most strongly by the Bovine Spongiform Encephalopathy (BSE)-Creutzfeldt-Jacob Disease (CJD) crisis in Britain in the decade spanning the mid-1980s to mid-1990s. During the time of the BSE-CJD crisis, public trust in authorities with regards to safety of the food supply was extremely low (Jacob & Hellström, 2000). Thus, when the announcement was made that British beef was unsafe, following nearly a decade of reassurance to the contrary, there was a strong public response to the threats to human health (Jacob & Hellström, 2000; Powell & Weiss, 1997). The lack of trust in British government by its public in this case was a precursor to this intensified response.

The final element mediating expectations is the ability to cope with emerging risks, or adaptive capacity. While the act of adopting a coping response typically follows perceived threats, the capacity to cope with risk is framed as a mediating factor in the framework. The mere *belief* that risks can be minimized through coping strategies has been found to be sufficient for mitigating perceived risks (Grothman & Reuswig, 2006). The capacity to adapt to (perceived) risks requires resources that may be financially-

based (at individual or collective levels), but may also be related to feelings of social capital and social support (Wilkinson & Marmot, 2003).

4.3.2.4. The reflexive relationship

As place determines risk perceptions, these perceptions can also work to shape the very places in which they are experienced. This reciprocal relationship is represented by the arrow emerging from the risk perception outcomes (Figure 1a). The reflexive relationship is akin to Kasperson and colleagues' (1988) description of secondary impacts from the amplification of risk, encompassing the development of stigma, changing political and educational practices, and changes in social order. Accordingly, the framework views the relationship between perceived risk and place as being mutually constitutive over time.

4.3.2.5. Socioeconomic position & demographics

We note here that socioeconomic position and demographics are implicit determinants of exposure, expectation, and risk perception outcomes. The relationships with gender, ethnicity and socioeconomic status are well-developed in the risk perception literature (e.g. the so-called ‘white male effect’ (Flynn et al., 1994)). With respect to exposure, any number of examples from the environmental justice literature can provide further support to this claim. The environmental justice literature is based on a large volume of research that demonstrates that vulnerable populations, such as visible minorities or persons of low-income, are disproportionately exposed to environmental hazards (Bowen, 2002). These hazards include exposures to toxic waste, polluted air and water, as well as more social hazards such as unsafe and hazardous employment, crime

and violence, and lax environmental policies/laws (Anand, 2004). This disproportionate burden is also evident at different spatial scales, from the community (e.g. Buzzelli et al., 2003) to the country level (Anand, 2004). Since socioeconomic and demographic relationships are so pervasive in the literature, they have been included in the framework as important determinants of risk perception outcomes.

4.4. Operationalizing the framework: food allergies

4.4.1 Food allergies as emerging environmental health risks

Food allergies are abnormal responses by the body to specific proteins in foods. In particular, the immune system recognizes a protein as harmful to the body, and releases chemicals that adversely impact the respiratory and cardiovascular systems, as well as the gastrointestinal tract, and the skin with varying severity from mild to life-threatening (i.e. anaphylactic reactions) (Lieberman, 2008). Peanuts, tree nuts, seafood, eggs, milk, wheat, soy, sesame, and sulphites are responsible for more than 90% of food allergies, though the first three are most commonly related to anaphylaxis, and are also the least likely to resolve during an individual's lifetime (Al-Muhesen et al., 2003). In addition to risk of physical harm, living with the potential of suffering an allergic or anaphylactic reaction has adverse psychological impacts for allergic individuals and their caregivers (Uguz et al., 2005; Primeau et al., 2000). Fenton and colleagues (2010), for example, reported a substantial emotional burden for anaphylactic adolescents and children when negotiating environments where there is a potential for exposure to an allergen. The burden of managing and coping with risk is shared, in particular, by the parents and families of younger children (Fenton et al., 2010).

Living with food allergies appears to be becoming a reality for a growing number of families globally, though primarily in more affluent countries (Branum & Lukacs, 2008; Sicherer et al., 2003; Grundy 2002), though scientific evidence of an increase remains contested (Ben-Shoshan et al., 2009). The emergence of food allergies has been relatively recent, and as such, there has been increasing interest from the mass media, science and the commercial sectors (Harrington et al., 2011; Nettleton et al., 2009). This increased attention has been paralleled by inflated perceptions of the associated risk of food allergies in the general population. For example, lay estimates of the prevalence of food allergies often amplify systematic estimates by three-fold or more (Harrington et al., 2010; Rona, 2007). As affected people learn to cope, and decision-makers attempt to respond to the (perceived) increases in prevalence, the rules around food and eating are changing in terms of what is, and is not, allowed in particular environments. For example, the provincial government in Ontario, Canada enacted a precedent-setting law in 2006 requiring all publicly funded schools to establish and maintain strategies for managing life threatening allergies. Under Sabrina's Law – named after a thirteen-year old student who died of an anaphylactic reaction in her school in 2003 – most schools have adopted precautionary banning of primary allergens altogether (peanuts in particular). These changes have generated important debates related to protection versus rights (of the non-allergic population), particularly around school-based policies (Young et al., 2009; Christakis, 2008). Policies in other provinces range widely, often with school boards and/or individual schools developing their own risk management

responses. The resulting varied policy response to this emerging health risk is also the case elsewhere in the developed world (Schneider Chafen et al., 2010).

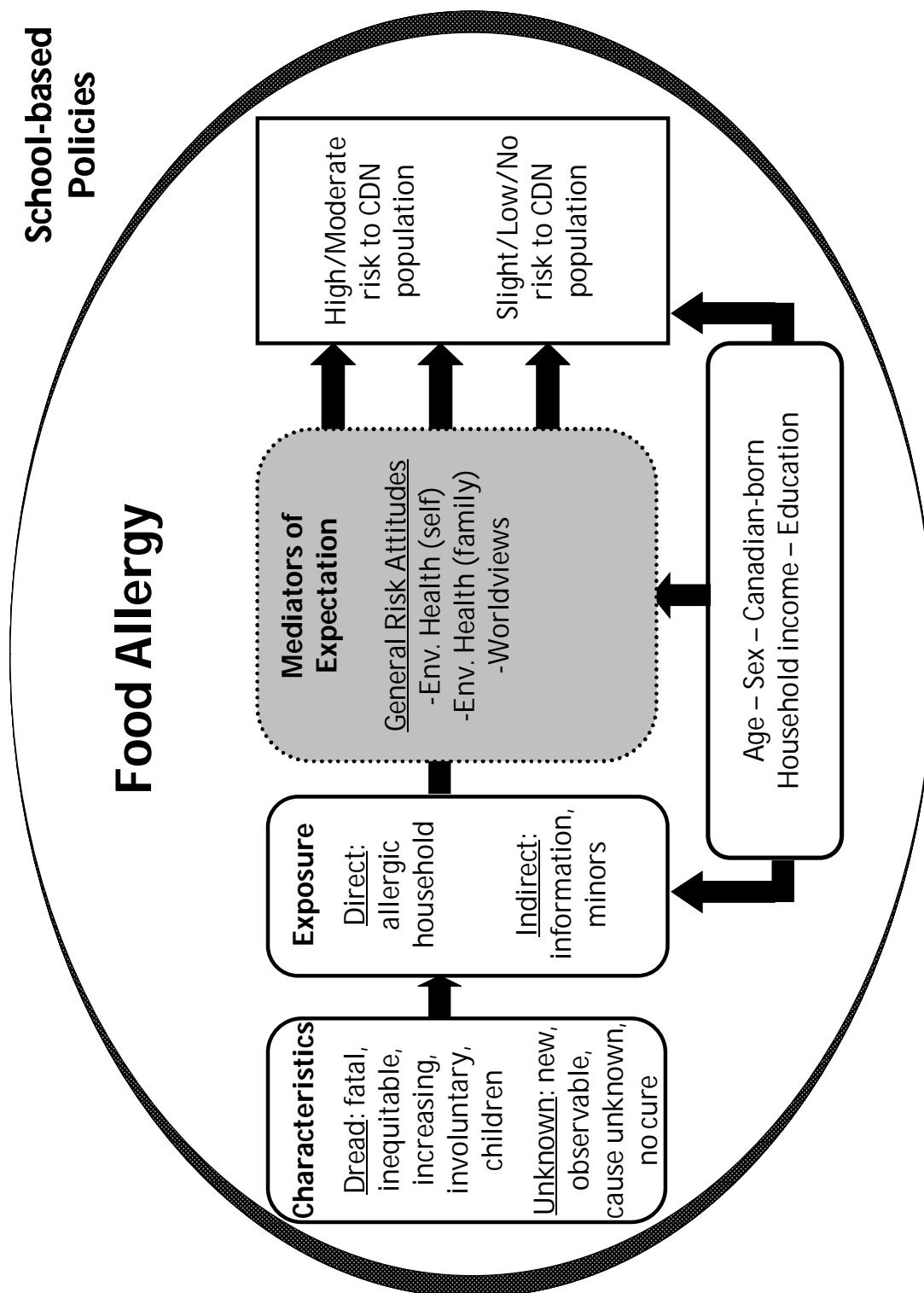
While genetic predisposition governs individual susceptibility to allergies, the supposed rise in allergic conditions has occurred over a timeline too short to be explained by genetic changes in the population (Bloomfield et al., 2006). This implicates environment and lifestyle factors, which can change over shorter periods of time, interacting with genetically predisposed individuals as the underlying cause(s) of the increase in allergy. For example, the hygiene hypothesis is a dominant theory of cause in the allergy literature. This hypothesis posits that children exposed to westernized lifestyles, are protected from the traditional infectious burdens of early life that those in developing and underdeveloped countries continue to experience. Eliminating background environmental exposure to protective microbes is necessary for immune system development, and as such, these children develop increased risks of allergies and other conditions related to hypersensitive immune systems (e.g. eczema) (Bloomfield et al., 2006; Bjorksten, 2004). Thus, though food allergies are expressed genetically at the individual level, the gene-environment interaction component indicates that food allergies are emerging *environmental* health risks.

4.4.2 Applying the framework

Having established the importance of food allergies as an emerging environmental threat to health, we piloted the framework using a recently assembled national data set, collected as part of the *Surveying Canadians to Assess the Prevalence of Common Food Allergies and Attitudes Towards Food Labelling and Risk* (SCAAALAR) survey. The

survey had three overarching objectives: (1) to assess the prevalence of food allergies in Canada, (2) to assess societal attitudes towards allergen precautionary statements on packaged foods, and (3) to explore the perception of food allergy and anaphylaxis risk. Administered to a representative sample of the ten Canadian provinces, the survey collected data from 3666 households. The main finding with respect to risk perception was that despite the relatively low prevalence (Ben-Shoshan et al., 2010) of food allergies (7.5% reported being allergic to any food) almost 70% of the sample ranked the risks of food allergies as high or moderate risks to the Canadian population, indicating that food allergies were a serious concern (Harrington et al., 2010). Application of the framework to these data provides unique opportunities to (1) explore the perception of a widespread, newly emerging environmental health risk, and to (2) investigate differences in perceptions between and within places. The framework was used to organize the survey data collection, and subsequent logistic regression analysis (see Chapter 2) to predict respondents who would rank risks as high/moderate (the rightmost box in Figure 2). In particular, we were interested in the potential role of the political environment, as defined by provincial school-based policies. Figure 2 presents the framework as populated by relevant data from the questionnaire. What follows is a brief summary of the key elements of each concept within the framework, and how they interconnected.

Due to the nature of large-scale population-based surveys, some elements of the framework were not able to be populated. For example, no data were collected from respondents regarding the perceived dread or uncertainty related to food allergies. Realizing this limitation, the characteristics outlined in the leftmost box of Figure 2 are

**Figure 2:** Application of the framework to the SCAAALAR data

based on assumptions about food allergies, informed by the relevant literature and the central tenets of the psychometric paradigm (see Madsen et al., 2010). We assume a high level of dread risk due to the potentially fatal consequences of food allergy, the inequitable distribution (i.e. disproportionately affecting children), the fact that food allergies are involuntary risks, and the evidence to suggest that food allergies are (potentially) increasing. Likewise, we assume that due to the lack of curative therapies, and the uncertainty regarding etiology and incidence that food allergies are relatively unknown risks. These characteristics are shared by many emerging environmental hazards that are new to the risk landscape.

The middle two boxes (i.e. Exposure and Mediators of Expectation) were populated using self-reported prevalence data, and data regarding indirect exposure to food allergies through the news media. In terms of direct exposure to food allergies, only households reporting multiple food allergies were likely to have amplified risk perceptions. This result was somewhat unexpected due to the lack of effect for those reporting a single allergy in the home. This finding suggests that exposure to a risk may not be as important as other determinants of perception. Interestingly, *indirect* exposure to food allergies via recalling reading or hearing information about food allergies in the past six months was a more important predictor of perceived risk. We know that in order to inform risk perceptions, the general population relies on the media and informal social relationships, particularly when the hazard is new and unfamiliar (Kasperson et al., 1988; Slovic, 2000). A concurrent media analysis of food allergy messages in the Canadian media over the past decade (Harrington, Elliott & Clarke, 2011) indicates that

disproportionate media representation of actors from particular social groups (namely affected individuals and advocates) may be echoing and potentially amplifying the public understanding of food allergy risk. Presence of minors in the household was also included as a measure of indirect exposure, due to the increasing exposure of all children and their families to issues of allergy and allergy-controlled environments, particularly in schools.

General risk attitudes included worry about the impact of environmental risks on the respondent (self) or their families, along with indicators of worldviews (i.e. fatalist, hierarchical, egalitarian etc.). These concepts, along with socioeconomic and demographic predictors were used to characterize the heterogeneity of the people situated in differing policy environments, and these supported some well established relationships with risk perceptions. For example, females and older individuals were most likely to express concern about the societal risks of food allergies. As well, those with higher socioeconomic positions defined by level of education and household income were less likely to be concerned about the risks of food allergies.

After characterizing the SCAAALAR respondents, we were able to explore differences between households living in differing political environment (defined by school-based risk management strategy) using postal codes. Controlling for individual-level characteristics, broad provincial differences were found, particularly in Quebec, a province that at the time of collection had no provincial school-based policy related to food allergies. In particular, Quebecers were more than twice as likely to perceive the risks of food allergies as high/moderate than respondents from other provinces. Based on

our conceptualization, the political environment appears to have some overarching influence on risk perception, beyond reported exposure to the risk (in terms of having an allergic individual in the household, or indirectly hearing/reading food allergy information in the past six months). This finding further supports the theoretical basis of the socio-cultural perspective of risk, namely that perceptions of and responses to environmental risks are situated in and partially determined by social, cultural and political contexts.

There are potential policy implications that flow from this particular application of the framework. If there is indeed increasing incidence of food allergies, it will be necessary to develop and integrate sustainable risk management strategies in a variety of settings – particularly as the (potentially growing) number of allergic children of today begin operating as young adults in the social, economic and political spheres of tomorrow. Given that the policy solutions implemented by each province vary so widely - on a continuum from nothing to full legislation - we anticipated at the outset of the study that there would be substantial variation in risk perceptions between regions. However, only Québec stood out as being significantly different. The lack of variation in this instance may be indicating that differences in risk perceptions should be explored at smaller, more homogeneous levels of geography (e.g. municipalities, neighbourhoods). Indeed, others have found that perceptions of widespread environmental risks to be highly local (Bickerstaff, 2007; Bush et al., 2002). Despite this limitation, we argue that processes at broad macro-level scales (e.g. province) do have some modifying influence

on risk perceptions in the general population, and application of the framework to food allergies has proven useful for conceptualizing this relationship.

4.5. Conclusion

Knowledge of the public experience of new risks is necessary for effective risk management. Public perception of risk, however, is inherently complex, and founded on psychological constructs, as well as issues of power, values and trust (Bickerstaff, 2007). Over the past several decades, disciplines such as geography, anthropology and sociology have increasingly contributed to our understanding of the broad social, cultural and political factors that influence perceptions of and responses to risk. Typically, these efforts have contrasted with traditional approaches to risk perception by grounding public understanding of environmental risk in the social, cultural and political *places* where risk is experienced. As developments continue in this arena, it is clear that there is a need for an organizational framework that explicitly incorporates existing theories of risk perception, and affords context an explicit and privileged role in the process. We have proposed such a conceptual framework in this paper to begin to understand how the different types of environment (i.e. physical, sociocultural, economic and political) produce and are influenced by public perception of risk.

It is important to note that the framework is not meant to replace the existing perspectives for understanding the social experience of emerging risks, and is likely destined for further refinement. As the framework was tested deductively using an exploratory national survey of risk perceptions, there are certainly some limitations to this application, including a lack of direct attribution from perceptions to the political

environment. The empirical value of the framework will depend on future testing (currently ongoing) using different hazards, in different contexts, at different scales, with different populations, and using different ways of knowing (e.g. qualitative inquiry).

We recognize, as mentioned previously, that the relationship between perceptions and places is more complex than the categories presented in our framework. However, the framework contributes to the relevant literature by developing a model for deductively testing the complex relationships between hazards, exposures, communications, and place. If its merit is confirmed through future empirical testing, the framework may become an important guide for informing risk management and risk communication efforts. This would prove crucial for risk management and risk communication as new and increasingly complex technological and environmental risks emerge on the landscape.

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CHAPTER FIVE DISCUSSION & CONCLUSION

5.0. Introduction

In the context of a (perceived) increase in the prevalence of food allergies, the goal of this dissertation was to gain a better understanding of how the general population perceived the related risks, explore potential determinants of these perceptions, and offer some directions for policy and further research. Towards characterizing the societal response to this newly emerging environmental health risk, this research used a triangulation of data sources to address the following broad research objectives:

1. To describe the existence, intensity, and determinants of food allergy risk perception in the context of other environmental health risks facing the Canadian population
2. To explore the influence of living in differing policy environments on perception of risk
3. To investigate the role of the news media in the social construction of the food allergies, and potential influences on public understanding of the associated risks

This chapter of the dissertation presents a summary of key findings, and identifies the main substantive, methodological and theoretical contributions of the research. The chapter concludes with implications for policy and future research.

5.1. Summary of Key Findings

Data from the recently assembled *Surveying Canadians to Assess the Prevalence of Common Food Allergies and Attitudes towards Food Labelling and Risk* (SCAAALAR, n=3666) survey were used to address the first two research objectives. Food allergies are relatively new to the environmental health risk landscape, and have therefore been receiving growing attention from the media, industry, science and the

general population (Nettleton et al., 2009). As such, it was a specific goal of this research to measure the public perception of food allergy risk, and provide some context to this by situating food allergies among the perceptions of other environmental hazards.

Ultimately the SCAAALAR data provided strong support for high public perception of the risks of food allergies. In particular, twenty percent of the respondents ($n = 688$) reported having at least one allergic individual in the household. This likely overestimated the true prevalence of food allergies in the SCAAALAR sample, which was established using a diagnostic algorithm to be 7.5% (Ben-Shoshan et al., 2010). This overestimation echoes findings from other population-based studies based on self-report, and likely reflects a propensity for individuals to attribute any discomfort after eating as a food allergy (Duxbury, 1993). Further, Canadians estimated that on average, approximately 30.6% of the population are affected by food allergies (min = 0%, max = 100%, median = 25.0%). Departures between public estimates and scientifically established estimates may be reflecting an increased perception of risk in the general population.

Additionally, respondents were asked to rank the level of risk that a variety of environmental health hazards posed to the general Canadian population, including food allergies and anaphylaxis (rated as: High, Moderate, Slight, Almost No Risk, and No Risk). In particular, 69.6% of the sample ranked the risks of food allergy as being high or moderate risks (34.5% high), while 60.1% ranked the risks of anaphylaxis as high or

moderate (29.2% high)². Focusing on food allergy risk in particular, this result indicated that the general population view food allergies as being risks to the Canadian public comparable with the risks of flu epidemics (67.3% ranked high/moderate), nuclear waste (68.7%), mould (70.4%), and bacteria in foods (73.2%). That is, these data further support a high level of public perception of food allergy risk.

After determining the level of risk ascribed to food allergies by the general public, multivariate logistic regression revealed a number of demographic, socioeconomic, attitudinal, and experiential factors to be significant explanatory factors. As expected, variables related to age and gender were both found to be highly significant. Specifically, females reported being more likely to rank the risks of food allergy as high, as were respondents in parental and grand-parental years (over the age of 30). The result with respect to gender is pervasive in the risk literature (e.g. Flynn et al., 1994; Slovic, 2000; Dosman et al., 2001). The relationship with age may reflect both unfamiliarity with food allergies due to their recent emergence, or feelings of protection for future generations as children currently bear the greatest burden of risk, with indications that this burden is increasing (Branum & Lukacs, 2008; Sicherer, 2003; Grundy, 2002). The logistic regression also suggested that respondents with higher socioeconomic positions (as measured by household income and highest level of educational attainment) were less likely to perceive the risks of food allergies as high. Though this may be linked to a deeper understanding of risk issues in general (Dosman et al., 2001), it may also be

² It is interesting that anaphylaxis (severe allergic reactions) were ranked lower than food allergies in general. This is likely due to the high number of respondents who answered ‘Don’t Know’ to anaphylaxis risk (13%) compared to allergy risk (4%). Thus, the logistic regression analysis focused on food allergy risk as the primary dependent variable.

reflecting feelings of control and a decreased capacity for coping with risk (Grothman & Reusswig, 2006). Finally, the relationship with time since immigration exhibited a unique relationship in that living in Canada for less than 10 years predicted higher perceived risks of food allergies than Canadian-born respondents and longer term immigrants. As discussed in Chapter 2, this may be a function of the acculturation process, and the exposure to issues related to food allergies for those moving from developing and underdeveloped countries, that tend to have much lower prevalence or lower awareness.

Both direct and indirect experiences with food allergies were found to be important predictors of high risk perception. Presence of minors in the home predicted higher perceived risk, likely due to increasing exposure of school-aged children and adolescents to issues of risk around food allergies through education and awareness efforts. Similarly, those who reported reading or hearing food allergy information in the six months previous to being surveyed were also more likely to perceive the risks as high. Interestingly, only those respondents reporting multiple allergies in the home were more likely to rank the risks of food allergies as high. This relationship with direct experience was unexpected, and suggests that experience with a risk may not be as important for perception as other determinants. However, experience with multiple allergic individuals in the home does increase perception of risk, indicating that there may be a threshold to this relationship.

The literature suggests that general dispositions toward risk may guide attitudes towards particular risks (Krewski et al., 2008). This research attempted to measure these

general attitudes in several ways, many of which emerged as important for perception of food allergy risk. For example, aligning with a statement designed to measure egalitarian worldviews had higher perceived risks of food allergies. This result echoes findings from previous research, which suggests that egalitarians are likely to be averse to societal or population-level risks (Health Canada, 1993; Dake & Wildavsky, 1993). Similar relationships were found between indicators of worry about the impact of the environment on individual and familial health. These findings suggest that individuals rely on previous knowledge and experience with risk to guide responses to individual risks, with which they may not be particularly familiar.

Addressing the second broad objective of this research, postal codes were used to place each respondent within a respective political environment, differentiated by the province of residence and measured as school-based allergy risk management policies. Analysis of the SCAAALAR data found marked regional differences in food allergy risk perception, particularly for Québec. Previous studies in Canada have reported differences in perceptions of other environmental hazards between Québec and the rest of Canada, and socio-political factors have been identified as the most likely determinants of these differences (Krewski et al., 2006). At the time of data collection, Québec was one of two provinces (Saskatchewan) with no established policy or regulations regarding management of severe allergies in the school environment. The results of this research indicate that this political context may be contributing to higher perceived risks of food allergies in the general Québec population.

The overall performance of the multivariate logistic regression model in terms of the proportion of variation explained by the independent variables was relatively low (adjusted rho-square = 0.15), though 67.9% of the cases were correctly classified. However, as an exploratory model with the intention to explain determinants of risk, as opposed to predict outcomes, the model uncovered numerous robust relationships with statistically significant effects.

Results from the regression provided two indications that information about food allergies may be playing a role in shaping the public understanding of food allergy risk. Firstly, there was a major disconnect demonstrated between lay and expert estimates of the prevalence of food allergies. Such inflated perceptions directed the research towards the role of the media in the social construction of food allergies. Indeed, the social amplification of risk framework outlines how the flow of information from such informal risk communicators is fundamental to the development of risk perceptions, especially if direct experience with a particular hazard has not occurred (Kasperson et al., 1988). Secondly, those respondents who reported reading/hearing information about food allergies in the previous six months were almost 70% more likely to perceive the risks of food allergies as high compared to those who did not. In the Canadian context, two consecutive cross-sectional studies of risk perception substantiate the role of the media as a major source of health information – particularly from newspapers, followed by television, and the internet (Krewski et al., 2006; Health Canada, 1993). Consequently, the second phase of this research was a media analysis of Canadian newspaper coverage

of food allergies extending over nine years in order to understand how the related risks are being presented to the general population.

A number of important findings stemmed from the media analysis. Firstly, there was a general increasing trend in the number of news articles across the time period, from 16 in 2000 to 76 in 2008. This particular result offers two potential perspectives on the nature of the relationship between media coverage and public perception of risk: *echoing* and *amplifying*. In the case of echoing, the increasing trend could be mirroring the perception of the public that food allergies are a growing problem, and as such deserve increasing attention from the media. That is, journalists may be reacting to a particular issue that is gaining steam on the public agenda. However, increasing the volume of coverage of a particular issue is also known to actively amplify public perceptions of risk through the availability heuristic (Tversky & Kahneman, 1973). It is unclear precisely which role is being played by the media with respect to food allergy coverage, though there is likely both echoing and amplifying occurring to some degree.

The central goal of the media analysis was to explore how the news around food allergies is being framed for public consumption, and to determine which social actors gained the majority of media representation. Specifically, the research was concerned with attributing different types of messages about food allergies to particular individuals or groups who may have a vested interest in constructing the associated risks, or weighing in on important policy decisions. Results indicated that stories that focused on defining food allergies had representation from various groups of claimsmakers, particularly affected individuals (28.5%), researchers (20.9%), health professionals

(20.4%), and members of advocacy groups (14.9%). Thus, problem definition appeared to be the most likely site for contestation about food allergies and the related risks. This could be a potential source for confusion and uncertainty for the general public. However, representation of many voices in problem definition can also ultimately provide a more complete construction of risk, as no groups' perspectives become privileged over the others (Gross, 1994).

In stories framed to diagnose the causes of food allergies, discussions were more one-sided. Most often researchers and allergists (or other health professionals) represented the main sources of information (79.2% of all sources in stories diagnosing causes). This finding makes intuitive sense, as the stories coded in this way often discussed new or ongoing research, treatments or (potential) cures for food allergy, or theories in the causes of food allergies. Stories coded as either *suggesting remedies* or *making moral judgements* were news items concerned with developments around policy solutions (e.g. food labelling, school nut bans). Those making moral judgement needed to have taken a definitive stance for or against a particular policy development, while stories framed as suggesting remedies were more balanced. Advocates and affected individuals (69% of whom were parents of allergic children) were the predominant claimsmakers represented in both types of article. Further, in terms of proportional coverage per year, news items in general have shifted from issues of defining food allergies as a problem to stories around policy solutions, resulting in increased reliance on these two particular groups. As discussed previously in Chapter 3, this may be either a result of these groups seeking out representation, but also a function of the lack of

scientific consensus regarding cause, prevalence, and best management practices (Schnieder Chafen et al., 2010). In this context, those who are directly affected by food allergies may represent the groups with the most “expert” knowledge of how they should be managed through policy. The asymmetrical coverage does, however, have the potential to increase the backlash from other groups whose voices are being muted.

5.2. Contributions

5.2.1. Theoretical Contributions

This research has made theoretical, methodological and substantive contributions to the relevant literature. Theoretically the research was informed by several risk perception paradigms, including the psychometric paradigm, cultural theory and the social amplification of risk framework [SARF]. Each of these frameworks is situated in a particular field of academia spanning psychology (psychometric paradigm), communications (SARF), geography, sociology and anthropology (cultural theory), and each offers a unique perspective on risk perception. However, the limitations of each theory have been the topic of much discussion in the literature, and it has been posited that using any one perspective can only explain up to 30% of the variations in risk perception (Sjöberg, 2000). The main theoretical contribution of this study stems from the blending of existing frameworks towards the development of a heuristic device for understanding public perception of *emerging* environmental health risks. Risks that are new to the landscape are generally surrounded by scientific uncertainties, and controversy related to probability, magnitude of consequences, and best management practices

(Radandt & Renn, 2008). However, decision-makers must react to those perceived to be important by the general population.

Towards advancing the understanding of public perception of such risks, the framework (described in detail in Chapter 4) situates hazard characteristics, exposures, and individual-level attitudinal and socio-demographic profiles within the context of social, cultural, economic and political factors. In practice, this tool was particularly useful for conceptualizing how these factors interact to amplify or attenuate perception of risk for the general population. A focus on the role of place in shaping perceptions also contributes to the increasing focus on socio-cultural perspectives of risk observable in research from health geography, sociology, and anthropology over the past two decades (e.g. Baxter, 2009; Masuda & Garvin, 2006; Bickerstaff & Walker, 2001; Elliott et al., 1999; Litva & Eyles, 1995; Eyles et al., 1993).

5.2.2. Methodological Contributions

By using more than one source of data (i.e. survey data, newspaper articles), there was an opportunity for corroboration between data sources regarding the perception of food allergies, adding richness to the inquiry. For example, the survey data were used to situate the perceived risk of food allergy within the context of other environmental hazards, and provided evidence supporting a relatively high perceived risk.

Characterization of the respondents who ranked the risks highly provided some insight into determinants of perceived risk, and indicated that information may be a key factor. The parallel media analysis was able to shed some light on the potential reasons why this relationship was so evident in the survey data. That is, contestation over the definition of

food allergies as a risk, and the one-sided nature of discussions around policy and causes could be influencing how food allergy messages are being interpreted at the individual level in the general population. By approaching the issue through different methodological and analytical lenses, this research resulted in a robust and comprehensive analysis of food allergy risk perception.

A second methodological contribution of this dissertation is related to the way in which French-language newspaper articles were included in the media analysis. French language articles were translated using an online machine translator (Google translator) that has been recognized as an efficient tool for translating French to English (Callison-Burch, 2009). The goal was to perform a manifest content analysis; a method consistent with survey research in terms of its goals and standards (Nuendorf, 2002). In contrast to latent content analysis which aims to uncover the underlying meanings or rhetoric of a communication piece, manifest content analysis is concerned with recording and measuring physically present elements (variables) in an article (e.g. claims-makers) (Babbie, 1992; Bryman & Teevan, 2005). As such, the translated versions of the articles, though not perfect, were sufficient for the purposes of the analysis. By using Google Translator this research provides evidence that online machine translators can provide easily accessible and cost-effective tools for media analyses of newspapers printed in multiple languages depending on the goals of the research.

5.2.3. Substantive Contributions & Policy Implications

This research makes several substantive contributions. Firstly, this study contributes by providing an understanding of the determinants of food allergy risk

perception for affected and indirectly affected populations, as well as the general Canadian public. In particular, this research has substantiated the high perception of food allergy risk in the general population, and identified important roles played by demographic, attitudinal, experiential and contextual factors as determinants of these perceptions³. These findings have important implications for policy. Emerging and existing policies and regulations around food allergies in general, and peanut allergies more specifically, exhibit control over what foods are and are not allowed in particular public spaces. Policies around foods are notoriously contentious, and allergy-related policies have received criticism from both the scientific community (e.g. Christakis, 2008) and members of the general population (e.g. Pearson, 2009; Warner, 2007; Ahmed, 2007). If the prevalence of food allergies is indeed increasing, it will be necessary to develop and integrate such policies in a variety of settings, beyond the school environment. Those who regulate these strategies need to understand the ways in which people think about and respond to risk, and be sensitive to the general population's concerns. This research takes a step towards this understanding. For example, it is clear that low-socioeconomic status households (as measured by income and education) perceive food allergies as posing high risk to the Canadian population compared to other groups. This amplified perception of risk may partially result from issues of equity for low-SES populations, as accessible, affordable sources of protein (e.g. peanut butter, granola bars) are increasingly banned from classrooms and daycare facilities. As future regulatory decisions are made to address this (potentially) increasing health risk, it is

³ These have been summarized previously in this chapter, and are discussed in detail in Chapter 2

important to understand and accommodate the needs of both the affected and general population to ensure their sustainability.

Regional differences in risk perception were observed in this survey, suggesting a role played by provincially-based risk management approaches (i.e. school-based policy). The indication from these findings is that differential risk perceptions are provoked in differing political environments, a finding consistent with previous studies of environmental hazard perceptions (Krewski et al., 2006; Health Canada, 1993). The findings with respect to Québec resonate with other work in the food allergy and risk literature that found different patterns of coping between parents of allergic children from Quebec and Ontario, primarily due to perceptions of management procedures in school environments (Fenton et al., 2010). However, results from this dissertation suggest that that these contextual-level influences may be modifying risk perception outcomes for both the directly affected and indirectly affected populations, as well as the general population.

The analysis of nine years of food allergy stories in the Canadian media focused on how media messages about food allergies were framed, as well as the media representation gained by different social groups (e.g. advocates, affected individuals, researchers etc.). Substantive contributions from this phase of the research have implications for risk communication. Primarily, as the discussion about food allergies shifts away from defining what the risks are to a growing focus on solutions (i.e. policy), members of advocacy groups and affected individuals are gaining more representation in the news media. Where one voice is privileged over others, there is potential for greater

resistance and contestation from other groups (Gross, 1994). Though the increasing representation of directly affected people may be due to scientific “experts” not yet reaching consensus on best management practices, it is known that when knowledge from various groups interact to socially construct a risk, the result is a more comprehensive public understanding (Cottle, 1998). As a primary site for the social definition and construction of risk, journalists and media outlets need to realize the vulnerability of risks to claims-making activities and framing, and make an effort to offer a variety of perspectives towards a contextual model of public understanding (Gross, 1994). This is especially crucial for emerging risks that, by definition, are characterized by limited, uncertain and contested scientific knowledge (Augoustinos et al., 2010).

5.3. Future Research Directions

This study has made a number of significant contributions to the literature as outlined in the previous section. Ultimately, the research has seized upon a unique opportunity to explore the determinants of the (perceived) risks of food allergies as they emerge and increasingly permeate our everyday environments. However, as the research was exploratory in nature, there have also been a number of areas identified where further research is necessary. Firstly, due to the nature of the SCAAALAR study (large-scale telephone survey), the resulting sample underrepresented some key sectors of the Canadian population. Though households were selected randomly, the resulting sample was not proportionally representative of households of low socioeconomic status, new Canadians living in the country for less than ten years, the Aboriginal population, or those living in the territories. This highlights a significant gap in knowledge. In response

to these gaps, an extension of the SCAAALAR study – *Surveying the Prevalence of food Allergy in All Canadian Environments* (SPAACE) – is currently ongoing to involve these groups. In contrast to the SCAAALAR study, SPAACE purposefully targets areas based on the relevant demographic characteristics to administer a version of the original survey that has been adapted to account for social and cultural sensitivities.

Secondly, the media analysis was designed to be a manifest content analysis. Such an analysis is concerned with recording and measuring physically present elements in an article, and producing summaries of articles as coded by an *a priori* coding scheme. From the sample of quotes presented in Chapter 3 from different claims-makers, it is clear that the type of language used by these groups may potentially have an impact on public understandings of food allergy risk. For example, emotionally-charged language was used as a persuasive tool by both affected individuals (e.g. peanuts as weapons) and the non-allergic population (e.g. tiny minority wielding power over the larger group). As such, more latent analyses of media messages using in-depth qualitative methodologies could contribute to a more comprehensive interpretation of how rhetorical devices and metaphors are used by social actors to shape the public's knowledge about food allergies.

Finally, the SCAAALAR survey found that the environment was the number one concern facing Canadians, and there was substantial worry about environmental impacts on individual, familial and societal health. As environmental hazards continue to emerge on the post-industrial health landscape, it will be necessary to understand and respond to those that the public perceives to be important. The framework described in Chapter 4 has taken steps towards developing a heuristic comprised of individual- and contextual-

level influences for anticipating public response to environmental hazards. The framework was not completely populated by the SCAAALAR data (e.g. no data around dread/uncertainty were collected), however, it showed great promise for future analyses. Its empirical value will need to be validated by application to different emerging environmental hazards (e.g. effects of climate change) in different spatial and temporal contexts, with different populations (e.g. marginalized communities). Continued use and refinement of the framework may prove central to advancing the conceptualization of the links between places, people and their perceptions. Increasing our understanding in this area is vital, particularly as new and unknown environmental risks continue to emerge on the landscape.

5.4. References

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APPENDIX A

SURVEY INSTRUMENT: SURVEYING CANADIANS TO ASSESS THE
PREVALENCE OF COMMON FOOD ALLERGIES AND ATTITUDES TOWARDS
FOOD LABELLING AND RISK (SCAAALAR)

SCAAALAR SURVEY SCRIPT

[Greeting A: Initial contact of household]

ENG: Hello my name is _____. I am a university researcher calling about a national study funded by Health Canada on food allergies, food labeling, and the environment. You may remember receiving a letter in the mail recently explaining this study and that we would be calling from McGill or McMaster University. If you have a few minutes I'd like to ask you a few questions. Is it ok if I continue?

INTERVIEWER: IF YES, PRESS " Y KEY TO CONTINUE IF NO, PRESS 'N' KEY

LANG_1) ENG: Do you feel comfortable completing this short survey in French or English?

FRE: Vous sentez-vous plus à l'aise de réaliser cette courte enquête en français ou en anglais?

1=Yes, in English 2=Oui, en Francais 3=No

NOTE TO INTERVIEWER: These are the screener questions

SCREEN_1) Are you over 18 years old or older?

1=Yes 2=No

SCREEN_2) Do you currently live in this household?

1=Yes 2=No

NUM_RES) What is the total number of people that live in this household?

NOTE: If refuses, ENTER -1 and record if there is a reason given.

Number of people in the household: -1 <= NUM_RES <= 25

NUM_MINOR) How many of them are under 18 years old?

NOTE: If refuses, ENTER -1 and record if there is a reason given.

Number of minors in the household: -1 <= NUM_MINOR <= 25

CONSENT_1) Before we begin I want to assure you that all the information you give us will be kept

confidential. Your participation is voluntary, and you do not have to answer any questions that you don't want to. You can stop at any time. And just so you know this call may be monitored (NOT RECORDED) by my supervisor. Is it ok to continue?

1=Yes 2=No

IF_ALLERGY_1

Do you or anyone in your household have a food allergy?

CLARIFICATION: So there's no one in your household has a food allergy?

1=Yes 2=No 3=Refused 4=Don't know

IF_ALLERGY_2) Is there someone else in the household that has more information?

1=Yes 2=No

WHO_ALLERGY_1) Is it you?

1=Yes 2=No

TMP1) Are there any other adults in your household that have food allergies?

1=Yes 2=No 3=Refused 4=Don't know

INTERVIEWER NOTE: Refuses=-1, Don't know=-2

TMP2) How many adults? **0 <= TMP2 <= 2**

TMP3) Are there any children in your household that have food allergies?

1=Yes 2=No 3=Refused 4=Don't know

INTERVIEWER NOTE: Refuses=-1, Don't know=-2

TMP4) How many children? **0 <= TMP4 <= 5**

WHO_ALLERGY4) Are you the best person to speak with about the child(ren) allerg(y/ies)?

1=Yes 2=No 3=Refused 4=Don't know

One of the following questions is asked if there is an allergic adult in the household.

SWITCH_RESP_0) Does the other allergic adult have any of the following allergies:
peanut, treenut, fish, shellfish or sesame?

1=Yes 2=No

One of the following questions is asked when appropriate.

SWITCH_RESP_1) May I now speak to the adult in the household who could answer some questions about the child's food allergies?

May I now speak to the adult who has food allergies?

May I now speak to the other adult in the household who has food allergies?

1=Yes 2=No

SWITCH_RESP_2) Is there a more convenient time that I could call back?

1=Yes 2=No

SWITCH_RESP_3) Do you feel comfortable answering on their behalf?

1=Yes 2=No

Thank you very much. We will have a researcher call back at that time.

Thank you for your time. Good Bye.

Q: WHICH_ALLERGY

Ok, I will now speak to you about your food allergy. Is your allergy to:

FOR INTERVIEWER: Read each and check all that apply. Do not give list of examples unless asked.

1=Peanut	2=Tree Nut	3=Fish	4=Shellfish
5=Sesame	6=Other(please specify)	7=Milk	
8=Eggs	9=Wheat	10=Soy	

PEANUT PREVALENCE (SCRIPTS FOR OTHER ALLERGENS WAS SIMILAR)

Now I am going to ask you a few questions about your experience with peanuts.

PN1_0) Have you ever had a reaction to TOUCHING peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN1_1) Have you ever had a reaction to SMELLING or INHALING peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN1_2) Have you ever had a reaction to EATING peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN1_3) So just to be clear, you have never had an allergic reaction to peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN1_4) Have you ever eaten peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN1_5) So just to be clear, you have never eaten peanuts?

1=No 2=Yes 3=Refused 4=Don't know

FOR INTERVIEWER: If Refused=>-1, Don't know=>-2, Never had a rxn=>-3

PN1_6a) How many allergic reactions have you had to peanuts in your lifetime? **-3 <= PN1_6a <= 99**

PN1_6b) It's important that we try to get an estimate for the number of reactions, can you tell me if it was..

1=Only 1 reaction 2=2-5 reactions 3=5-10 reactions
 4=More than 10 reactions 5=Don't know 6=Refused

PN1_7) About how old were you when you had your FIRST allergic reaction to peanuts? **-2 <= PN1_7 <= 99**

PN1_8) It's important that we try to get an estimate...if you're not sure, can you at least tell me if it was...

1=Before you started school 2=In Elementary School 3=In Middle school
 4=In High school 5=After High school

PN2_0) How old were you when you had your MOST SEVERE reaction to peanuts? **-2 <= PN2_0 <= 99**

PN2_1) It's important that we try to get an estimate...if you're not sure, can you at least tell me if it was...

1=Before you started school 2=In Elementary School 3=In Middle school
 4=In High school 5=After High school

PN2_2) Was the most severe reaction caused by eating, touching, or inhaling peanuts?

1=Eating 2=Touching 3=Inhaling 4=Refused 5=Don't know

I am going to read a list of symptoms that may or may not have occurred during the MOST SEVERE reaction, please indicate which one(s) occurred.

PN3_0) Did you have hives (skin rash, welts, urticaria)?

1=No 2=Yes 3=Refused
4=Don't know

PN3_1) Did you have swelling (edema)?

1=No 2=Yes 3=Refused
4=Don't know

PN3_2) Where did you have the swelling? (Click on all that apply)

1=Eyes(eyelids) 5=Refused
2=Tongue 6=Don't know
3=Lips 7=Other(specify): **PN3_2OPN**
4=Face

PN3_3) Did you have nausea or stomach pain?

1=No 2=Yes 3=Refused 4=Don't know

PN3_4) Did you vomit?

1=No 2=Yes 3=Refused 4=Don't know

PN3_5) Did you have diarrhea?

1=No 2=Yes 3=Refused 4=Don't know

PN3_6) Did you start coughing?

1=No 2=Yes 3=Refused 4=Don't know

PN3_7) Did you have trouble breathing?

1=No 2=Yes 3=Refused 4=Don't know

PN3_8) Did you start wheezing?

1=No 2=Yes 3=Refused 4=Don't know

PN3_9) Did you have an itchy mouth?

1=No 2=Yes 3=Refused 4=Don't know

PN3_10) Did you feel any closing or tightening of the throat?

1=No 2=Yes 3=Refused 4=Don't know

PN3_11) Did you feel lightheaded or as if you were going to faint?

1=No 2=Yes 3=Refused 4=Don't know

PN3_12) Did you have any other symptoms?

1=No 2=Yes(specify) 3=Refused 4=Don't know

PN3_13) Now I would like you to think back to your most severe reaction. We would like to know how long it was from when you were exposed to peanut and when your symptoms started?

INTERVIEWER NOTES: Exposed = eat,inhaled,touched

1=Record time(HH:MM:SS) 2=Immediately 3=Refused 4=Don't Know

PN3_14) It's really important that we get an estimate...if you're not sure, can you at least tell me if the symptoms started...

1=In less than an hour 2=More than an hour 3=Refused 4=Don't know

PN3_15) How often have you had an allergic reaction after being exposed to peanuts?
Would you say... **INTERVIEWER:** Please read all the responses

1=Never 2=Less than half the time 3=Half the time or more
4=Always 5=Refused 6=Don't know

PN3_16) Why do you think you can sometimes be exposed to peanuts without having an allergic reaction?

INTERVIEWER NOTE: For example: Does it depend on how well it is cooked? Or did you "outgrow" the allergy?

1=Don't Know 2=Refused 3=Record answer: **PN3_16OPN**

PN4_0) Have you ever used or been treated with a medication for an allergic reaction to peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN4_1) Was it epinephrine, an epipen, Twinjet or adrenaline?

1=No 2=Yes 3=Refused 4=Don't know

PN4_2) Was it an antihistamine, like Benadryl, Reactin, Dimetapp or Atarax ?

1=No 2=Yes 3=Refused 4=Don't know

PN4_3) Was it an inhaled medication such as Ventolin?

1=No 2=Yes 3=Refused 4=Don't know

PN4_4) Was it steroids such as prednisone?

1=No 2=Yes 3=Refused 4=Don't know

PN4_5) Have you ever used or been treated with any other medications for your peanut allergy?

1=No 2=Yes 3=Refused 4=Don't know

PN4_6) Can you tell me more about those treatments? **PN4_6**

Now we would like to talk to you about how your peanut allergy was diagnosed.

PN5_0) Has your allergy to peanuts ever been confirmed by a doctor?

1=No 2=Yes 3=Refused 4=Don't know

PN5_1) Did the doctor do a skin test?

1=No 2=Yes 3=Refused 4=Don't know

PN5_2) Did the skin test show that you are allergic to peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN5_3) Did the doctor do a blood test?

1=No 2=Yes 3=Refused 4=Don't know

PN5_4) Did the blood test show that you are allergic to peanuts?

1=No 2=Yes 3=Refused 4=Don't know

PN5_5) Did the doctor do a food challenge?

1=No 2=Yes 3=Refused 4=Don't know

PN5_6) Did the test show that you are allergic to peanut?

1=No 2=Yes 3=Refused 4=Don't know

PN5_7CONSENT1) Could we contact your doctor to get a copy of the test results?

1=No 2=Yes

PN5_8CONSENT2) In order to get your doctor's information, we will need to send you a consent form in the mail.

Could we have your mailing address now?

1=No 2=Yes(ENTER ADDRESS):

PN5_8MAIL

I am now going to ask you about what you have done AFTER your diagnosis with a peanut allergy

Do you agree with the following statements:

PN6_0) Since my diagnosis, I have stopped eating peanuts completely.

1=No 2=Yes 3=Refused 4=Don't know

PN6_1) Since my diagnosis I continue to eat peanuts occasionally and I do not have a reaction.

1=No 2=Yes 3=Refused 4=Don't know

PN6_2) Since my diagnosis I continue to eat peanuts occasionally and I do have a reaction.

1=No 2=Yes 3=Refused 4=Don't know

PN6_3) Since my diagnosis I sometimes eat foods that are labeled "may contain traces of peanuts"
and I do not have a reaction.

1=No 2=Yes 3=Refused 4=Don't know

PN6_4) Since my diagnosis I sometimes eat foods that are labeled "may contain traces of peanuts"
and I do have a reaction.

1=No 2=Yes 3=Refused 4=Don't know

PN7_0) Do you think you still have a peanut allergy?

1=No 2=Yes 3=Refused 4=Don't know

PN7_1) How do you know that you no longer have a peanut allergy?

1=A doctor told me 2=Another health prof told me 3=Other(ie self-diagnosed):

End of peanut prevalence survey **PRESS ANY KEY TO CONTINUE.**

The following question is only asked after the prevalence, and only if the respondent is allergic to peanut, tree nut, fish, shellfish and/or sesame.

NURSE_CONSENT) Would you allow our research nurse to contact you if we have more questions regarding
the allergies we have discussed?

1=No 2=Yes

FOOD LABELLING SURVEY

Now I'd like to ask you a few short questions about food labelling.

FL1_1a) Have you ever shopped or prepared food for someone with a food allergy?

1=No 2=Yes 3=Refused 4=Don't know

FL1_1b) Have you ever bought or prepared food for a school or daycare with food

restrictions?

(e.g. peanut-free school or daycare to avoid food allergies)

1=No 2=Yes 3=Refused 4=Don't know

FL1_1c) Have you ever bought or prepared food for any social gathering with food restrictions?

(e.g. church function or a birthday party)

1=No 2=Yes 3=Refused 4=Don't know

FL1_2) Now think about labels on packaged foods...have you seen precautionary statements such as

"May contain traces of nuts" on food labels?

1=No 2=Yes 3=Refused 4=Don't know

Now we want to know how often you'd buy a food for someone with a food allergy or for an allergy controlled environment like a daycare or school. Whenever I use the word allergen, I mean a food that causes an allergic reaction.

FL2_0) Think about foods that say "May contain allergen." For example, "may contain peanuts."

How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

FL2_1) Think about foods that say "May contain traces of allergen" For example, "may contain traces of nuts"

How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

FL2_2) Think about foods that say "Manufactured in a facility that also processes allergen" For example, "manufactured in a facility that also processes milk". How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

FL2_3) Think about foods that say "Manufactured on the same equipment as products containing allergen" For example, "manufactured on the same equipment as products containing peanuts. How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

FL2_4) Think about foods that say: "Packaged in a facility that also packages products containing allergen For example, "packaged in a facility that also packages products containing nuts. How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

FL2_5) Think about foods that say "Not suitable for people with a particular allergy" For example, "not suitable for people with a peanut allergy". How often would you buy these foods for someone with a food allergy or for an allergy controlled environment?

1=Never 2=Sometimes 3=Always 4=Don't Know

For the next set of 5 questions, we want to know how you feel about precautionary statements such as: "may contain nuts" found on food labels today.

After I read each statement I would like you to tell me if you AGREE, SOMEWHAT AGREE, DISAGREE, or DON'T KNOW.

FL3_0) Precautionary statements are helpful

1=Agree 2=Somewhat Agree 3=Disagree 4=Don't Know

FL3_1) Companies should only use precautionary statements when there is a real risk to food allergic individuals

1=Agree 2=Somewhat Agree 3=Disagree 4=Don't Know

FL3_2) The current precautionary statements are easy to understand

1=Agree 2=Somewhat Agree 3=Disagree 4=Don't Know

FL3_3) Precautionary statements are used when companies are concerned about protecting themselves

1=Agree 2=Somewhat Agree 3=Disagree 4=Don't Know

FL3_4) Precautionary statements are limiting the food choices for people with food allergies

1=Agree 2=Somewhat Agree 3=Disagree 4=Don't Know

For the next set of questions, I will read you precautionary labels on products, and could you please tell me how often you would buy a product with this label for a person with a food allergy or for an allergy-controlled environment(eg: a school or daycare.) You may answer...NEVER, SOMETIMES, ALWAYS, DON'T KNOW

FL4_0) Would you buy a product that says "allergen-free". For example "peanut-free" for someone with a food allergy or for an allergy controlled environment.

1=Never 2=Sometimes 3=Always 4=Don't Know

FL4_1) Would you buy a product that is manufactured in a facility that is "allergen-free" For example "peanut-free", for someone with a food allergy or for an allergy controlled environment.

1=Never 2=Sometimes 3=Always 4=Don't Know

FL5_0) How important do you feel it is for manufacturers to comply with standard manufacturing guidelines in order to claim a product is free of a specific allergen?

1=Very important 2=Somewhat important 3=Not very important 4=Don't know

ENVIRONMENTAL RISK SURVEY

This final section of the survey includes some questions about issues affecting Canadians.

RSK1_0) What do you think is/are the greatest problems facing Canadians today?

- a) 1st Mention(is there anything else) **RSK1_0aOPN**
- b) 2nd Mention(is there anything else) **RSK1_0bOPN**
- c) 3rd Mention **RSK1_0cOPN**

We would like know more about your views on the environment. I am going to read you some statements one at a time. Please tell me whether you STRONGLY AGREE, AGREE, are NEUTRAL, DISAGREE, or STRONGLY DISAGREE with the statement.

RSK1_1) The environment is a major concern for Canadians.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK1_2) The environment should be a major concern for Canadians.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK1_3) Environmental impacts on health are a major concern for Canadians.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK1_4) Environmental impacts on health should be a major concern for Canadians.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

For the following two statements, please tell me whether you are not worried at all, not that

worried, neutral, somewhat worried, or very worried.

RSK1_5) How worried are you that the environment can impact your health?

1=Very worried 2=Somewhat worried 3=Neutral 4=Not that worried 5=Not worried at all
 6=Don't know 7=Refused

RSK1_6) How worried are you that the environment can impact the health of your family?

1=Very worried 2=Somewhat worried 3=Neutral 4=Not that worried 5=Not worried at all
 6=Don't know 7=Refused

Section 2: Related to Environmental Health Risks

The following two statements are about environmental health risks in your community.
 Please tell me whether you STRONGLY AGREE, AGREE, are NEUTRAL,
 DISAGREE, or STRONGLY DISAGREE with these statements.

RSK2_0) There are environmental health risks where I live

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK2_1) I believe my community is becoming a healthier place to live.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RSK2_2) I am now going to read you a list of specific health hazards. For each of these, please answer yes or no if you think the hazard is a risk to the Canadian public.

RSK2_2a) Do you think cigarette smoking is a risk to the Canadian public?
If Yes, ask how much...

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2b) Do you think climate change is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2c) Do you think stress is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2d) Do you think non-prescription drugs are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2e) Do you think chemical pollution is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2f) Do you think crime & violence is a risk to the Canadian public?
If Yes, ask how much...

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2g) Do you think anaphylaxis is a risk to the Canadian public?

INTERVIEWER NOTE: Anaphylaxis is a life-threatening allergic reaction.

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2h) Do you think obesity is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2i) Do you think lead in paint is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2j) Do you think mould is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2k) Do you think bacteria in foods is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2l) Do you think GMOs (genetically modified foods) are a risk to the Canadian public?

If YES, Ask how much...

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2m) Do you think flu epidemics are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2n) Do you think vaccines are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2o) Do you think laser eye surgery is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2p) Do you think alternative health products are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2q) Do you think motor vehicle accidents are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2r) Do you think nuclear waste is a risk to the Canadian public?

If YES ask how much...

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2s) Do you think pesticides are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2t) Do you think overhead power lines are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2u) Do you think additives in food are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2v) Do you think food allergies are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2w) Do you think smog and air quality are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2x) Do you think tap water is a risk to the Canadian public?
If YES ask how much...

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2y) Do you think indoor air quality is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2z) Do you think blood transfusions are a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk
5=High risk
6=Refused 7=Don't know

RSK2_2z2) Do you think sun exposure is a risk to the Canadian public?

1=No Risk 2=Almost no risk 3=Slight risk 4=Moderate risk

5=High risk
 6=Refused 7=Don't know

Section 3: Risk Profile

This section is about your personal opinions about risk in Canada. I am going to read you some statements.

Please tell me whether you STRONGLY SAGREE, AGREE, are NEUTRAL, DISAGREE, or STRONGLY DISAGREE with them.

RSK3_0) Canadian society is becoming too concerned with small health risks

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK3_1) Canadians should be prepared to accept some risk to their health in order to strengthen the economy

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK3_2) People can offset environmental health risks by making improved lifestyle choices

(e.g being physically active, eating well)

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK3_3) Experts are able to make accurate estimates of environmental health risks

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK3_4) A risk-free country is an achievable goal

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

Section 4: General questions about health risks from food allergies

The next set of questions refers specifically to food allergies and their related risks to the Canadian public.

RSK4_0) I have heard/received some information about food allergies in the past 6 months

1=No 2=Yes 3=Refused 4=Don't know

FOR INTERVIEWER: Refused = -1, Don't know = -2

RSK4_1) What percentage of Canadians do you think are affected by food allergies?

Please indicate whether you STRONGLY AGREE, AGREE, are NEUTRAL, DISAGREE, or STRONGLY DISAGREE with the following statements.

RSK4_2) Even a tiny amount of a food allergen can cause a reaction in an allergic individual.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RSKD4_3) Compared to other people, I am more concerned about the risks associated with food allergies.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RSKD4_4) Reactions to food allergens are easily treatable.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

Section 5: For individuals affected by a food allergy

RISK5_0) If I take care of myself, I can avoid allergic reactions to foods.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RISK5_1) No matter what I do, if I am going to have an allergic reaction, I am going to have an allergic reaction.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RISK5_2) Most food allergic individuals don't realize that they can't control everything in their environment.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RISK5_3) There are so many opportunities for contact with allergens in the world around us, you can never know how or when you may react.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RISK5_4) People's allergic reactions result from their own carelessness.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

RISK5_5) I am directly responsible for my allergic condition.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
6=Don't know 7=Refused

INTERVIEWER NOTE: For individuals directly or indirectly affected by food allergies

RSK5_6) Do you ever try to inform others about the risks of food allergies?

1=No 2=Yes

RSK5_7) How would you describe a typical response from others?

1=Accepting	6=Unresponsive
2=Skeptical	7=Uncaring
3=Supportive	8=Uninterested
4=Interested	9=Other: RSK5_7OPN
5=Knowledgeable	

Section 6: Worldviews on risk

Now we'd like to ask you a few questions about your views on risk. For the next few statements,

please tell me whether you STRONGLY AGREE, AGREE, are NEUTRAL, DISAGREE, or STRONGLY DISAGREE.

Remember, we are just asking for your opinion.

RSK6_0) I feel I have very little control over risks to my health.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree

6=Don't know 7=Refused

RSK6_1) If something is going to harm me, there is nothing I can do about it.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK6_2) Decisions about health risks should be left to the experts.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK6_3) People in positions of authority are not likely to abuse their power.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK6_4) In a fair system, people with more ability should earn more money.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK6_5) If people in this country were treated equally, we'd have fewer problems.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

RSK6_6) A high technology society is important for improving our health and social well-being.

1=Strongly Agree 2=Agree 3=Neutral 4=Disagree 5=Strongly Disagree
 6=Don't know 7=Refused

DEMOGRAPHICS

INTERVIEWER: record gender of the respondent.

DEMO1_0) If you are unsure, please ask "Can I confirm your gender". DO NOT ASK EVERYONE!

1=Male 2=Female

Finally, we would just like to collect some general background information about you. Please be ensured that this information will remain confidential throughout the research

process
and that you have the option of not answering any question.

INTERVIEWER NOTE: Refused = -1, Don't know = -2

DEMO1_1) In what year were you born? **-2<=DEMO1_1<=1990**

DEMO1_2) What is the highest level of education that you completed?

1=Never attended school	9=Some University
2=Some elementary school	10=University with degree
3=Elementary school	11=University with masters
degree	
4=Some secondary school	12=University with doctorate
5=Secondary school	13=Professional degree
6=Trade certificate or diploma	14=Refused
7=Some college	15=Don't Know
8=College with diploma	

DEMO1_3) What is your country of origin? **DEMO1_3**

DEMO1_4) How long have you lived in Canada?

1=Number of years: **DEMO1_4NUM** 2=Refused 3=Don't know

DEMO1_4a) Has it been... (FOR INTERVIEWER: READ THE RESPONSES)

1=More than 5 years 2=More than 10 years 3=More than 20 years

In order to get a better picture of your household, we would like to ask you a couple of questions about each person in your household. This information will allow us to compare different types of households.

DEMO1_5_1) Starting with the oldest person in your household, REMEMBER to include yourself, what is their gender?

DEMO1_5_i) Now for the second oldest person in your household, what is their gender?
..(up to ten times) i→ 1 to 10

1= Male 2=Female 3=Refused 4=Don't know

DEMO1_6) How old is that person? ANS: **-2<=DEMO1_6<=120**

DEMO2_0) At present are you married, living with a partner, widowed, divorced, separated,

or have you never been married?

1=Married married	2=Living with a partner	3=Divorced	4=Widowed	5=Never
6=Refused	7=Don't know	8=Separated		

DEMO2_1) Is your dwelling owned or being bought by you or a member of this household,
or do you rent it?

1=Owned	2=Rented	3=Refused	4=Don't know
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DEMO2_2) May I have your postal code?

1=Postal code	DEMO2_2i	2=No (Ask: Can I just have the first 3 digits?)	DEMO2_2ii
3=Refused		4=Don't know (Ask: What city do you live in?)	

DEMO2_2iii

DEMO2_3) For statistical purposes only, we need to know the total gross household income,
from all sources, for 2007? **-2=<DEMO2_3=<10 000 000**

FOR INTERVIEWER: Refused = -1 and Don't know = -2

DEMO2_3a) We do not need to know your specific household income. Could you please indicate from
the following list, the income range for your household.

1=Under \$10,000	12=Refused
2=\$10,000 - \$19,000	13=Don't know
3=\$20,000 - \$29,000	
4=\$30,000 - \$39,000	
5=\$40,000 - \$49,000	
6=\$50,000 - \$59,000	
7=\$60,000 - \$69,000	
8=\$70,000 - \$79,000	
9=\$80,000 - \$89,000	
10=\$90,000 - \$99,000	
11=More than \$100,000	

DEMO3_0CONSENT) I have one final question. Can we re-contact you about this study or future studies
regarding food allergies and the environment?

1=No	2=Yes
------	-------

DEMO3_1EMAIL) May I have your email address? **DEMO3_1EMAIL**
FOR INTERVIEWER: Refused = -1 and Don't know = -2

Thank you for your time and help with this important study. Good Bye.

APPENDIX B

MEDIA ANALYSIS CODEBOOK FOR CLAIMS-MAKERS AND FRAMING

MEDIA ANALYSIS CODING SCHEME

The table below provides examples of quoted sources for each of the seven main codes used for the media analysis

Table 1: Claims-maker coding

Code	Quoted Source
Advocate	Member of Advocacy group
Affected Individual	Allergic Person – Adult Allergic Person – Adolescent Allergic Person – Child Food Intolerant Person Parent of allergic child Relative of allergic child
Allergist/Health Professional	Allergist Dietician Nutritionist Physician Coroner
Researcher	University Researcher Researcher (other)
Government Representative	Politician Government agency representative
School Official	Principal Superintendent Teacher School board member
Other	Non-allergic individuals Parent of non-allergic children Food industry representative Company representative Other

The table below provides examples of story themes for each of the four codes used to define how stories were framed in the media analysis as per Entman (1993).

Table 2: Framing codes

Code	Quoted Source
Defining Problems	<p>General Statement of risk</p> <ul style="list-style-type: none"> • Facts about allergies • Symptoms <p>Incidence/Prevalence</p> <ul style="list-style-type: none"> • Prevalence • Growing problem • Overestimated prevalence <p>Exposure/Critical Event</p> <ul style="list-style-type: none"> • Report of death • Report of exposure • Report of hospitalization <p>Familial/Individual Burden/Coping</p> <ul style="list-style-type: none"> • Lack of caregiver knowledge/training • Living with food allergies • Parental worry • Resources for information • Allergy management • Strategies for non-allergic people <p>Danger</p> <ul style="list-style-type: none"> • Unsafe environment • Risk of harm/death • Bullying/assault <p>Awareness</p> <ul style="list-style-type: none"> • Risks overblown • Increased awareness of food allergies <p>Diagnosis</p> <ul style="list-style-type: none"> • Allergy vs. Intolerance • Difficulties diagnosing food allergy
Diagnosing Causes	<p>Theories of cause</p> <ul style="list-style-type: none"> • Antacid use • Ceasarean birth • Introduction of food into diet • Food preparation/supply • Hygiene hypothesis

Diagnosing Causes (continued) <ul style="list-style-type: none"> • Mother's diet • Ointments containing peanut oil • Stress during pregnancy • Multiple causes Treatments <ul style="list-style-type: none"> • Existing therapies (e.g. EpiPen) Research <ul style="list-style-type: none"> • Potential cure • Potential new therapy • New diagnostic test Lack of Evidence <ul style="list-style-type: none"> • Related to cause • Related to cure Make Moral Judgements <ul style="list-style-type: none"> • Call for action • Adherence to a solution • Inadequate solution Argument for an implemented solution <ul style="list-style-type: none"> • Awareness/education • School nut ban • Food labelling • Sabrina's law • Other school policy Argument against an implemented solution <ul style="list-style-type: none"> • School nut ban • Sabrina's law • Other school policy Suggest Remedies <ul style="list-style-type: none"> • Implemented Solution • Allergen-free environment • Allergen-free food guide • Allergen-free products • Allergen-free vending machines • Allergy-safe restaurants • Allergy translation cards • Allergy travel guide • Awareness/Education • EpiPen carrying case • Food Labelling • Food testing kits • Medical alert system/bracelet • New health card • Sabrina's law • School nut ban

Suggest Remedies (continued)	<ul style="list-style-type: none"> • Other school policy • T-shirts Debate around solution • School nut ban • Daycare policy • Public place nut ban • School policy Solution Cancelled/Removed • Allergen-free daycare or other environment • Allergen-free products • Anaphylactic Student Protection Act (British Columbia) • Food labelling • Other school policy Proposed Solution • Airline policy • Allergen-free environment • Allergen-free products • Allergen-free restaurants • Anaphylactic Student Protection Act (British Columbia) • Daycare policy • Awareness/Education (e.g. EpiPen training) • Food labelling • Partnership with food industry • School policy • Sabrina's Law in other environments
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