Exploration of the Consumption, Awareness, Understanding and Motivating Factors Related to Functional Foods in Older Adults

by

Meagan Vella

A Thesis
presented to
The University of Guelph

In partial fulfillment of requirements
for the degree of
Master of Science
in
Human Health and Nutritional Sciences

Guelph, Ontario, Canada

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EXPLORATION OF THE CONSUMPTION, AWARENESS, UNDERSTANDING AND MOTIVATING FACTORS RELATED TO FUNCTIONAL FOODS IN OLDER ADULTS

Meagan N. Vella
University of Guelph, 2012

Advisor: Alison M. Duncan

The functional food industry has expanded yet research into consumer perceptions of functional foods is limited. Among consumers, older adults could benefit from functional foods due to age-related health concerns. This thesis aimed to generate information about the consumption of functional foods among community-dwelling older adults (≥60 years old, n=200) using a researcher-administered questionnaire. Prevalence of functional food consumption was 93.0% and yogurt with probiotics (56.0%) was the top product consumed. The primary functional food matrix consumed was yogurt (51.5%) and dietary fibre was the primary functional food bioactive consumed (79.5%). Most participants (86.2%) consume functional foods to improve health and osteoporosis/bone health (67.5%), heart disease (61.0%) and arthritis (55.0%) were the primary health areas identified. Participants wanted more information about functional foods (63.5%) with preferred sources being newspapers/magazines/books (68.5%) and food labels (66.1%). These results inform stakeholders regarding the potential of functional foods to promote improved health among older adults.
ACKNOWLEDGEMENTS

Firstly, I would like to extend my deepest gratitude to my advisor, Dr. Alison Duncan. My graduate experience has been overwhelmingly positive and I truly believe that you are the main reason for this. It is difficult to put into words how thankful I am for your endless guidance and encouragement. Your dedication and passion for nutrition and the research process is inspiring and I can only hope to continue to interact with you as I advance through my journey in the field of nutrition.

I am also grateful to my advisory committee members Dr. Judy Sheeshka and Dr. Amanda Wright. Thank you for your continued insight and guidance in advancing this project.

I had the opportunity to work with many inspiring and dedicated graduate and undergraduate students throughout this experience. In particular, I would like to thank Laura Stratton for her invaluable contributions to this project, but most importantly, for her friendship. I could not imagine this experience without you. Thank you for the countless laughs and your unwavering support. I would also like to extend my appreciation to the faculty, staff and students in the department of Human Health and Nutritional Sciences. It was truly a delight to be a part of the HHNS family!

I would also like to thank the Canadian Foundation for Dietetic Research for their financial support, as well as the Human Nutraceutical Research Unit for their provision of data collection facilities. Additionally, this research would not have been possible without the eager involvement of the 200 older adults who participated in the study. I
enjoyed interacting with each participant and am grateful for their contributions to my graduate experience.

I am incredibly lucky to have the most wonderful family and friends who have provided ongoing encouragement throughout my undergraduate and graduate experience. In particular, I would like to thank Ben Halyk who has truly been my best friend and my rock throughout this process. I cannot begin to thank you enough for your endless encouragement and support. Finally, I am especially grateful for my parents, Barb and John Vella, and my sister, Chelsea Vella for their unwavering support and belief in my success. I owe this accomplishment to each of you.
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<th>Abbreviation</th>
<th>Full Form</th>
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<tbody>
<tr>
<td>ADA</td>
<td>American Dietetic Association</td>
</tr>
<tr>
<td>CHD</td>
<td>Coronary heart disease</td>
</tr>
<tr>
<td>CIHI</td>
<td>Canadian Institute for Health Information</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>FDA</td>
<td>Food and Drugs Act</td>
</tr>
<tr>
<td>FFFNHP</td>
<td>Functional foods and natural health products</td>
</tr>
<tr>
<td>FOSHU</td>
<td>Foods for Specified Health Uses</td>
</tr>
<tr>
<td>HNRU</td>
<td>Human Nutraceutical Research Unit</td>
</tr>
<tr>
<td>MHW</td>
<td>Japanese Ministry of Health and Welfare</td>
</tr>
<tr>
<td>NHP</td>
<td>Natural health product</td>
</tr>
<tr>
<td>PHAC</td>
<td>Public Health Agency of Canada</td>
</tr>
<tr>
<td>REB</td>
<td>Research Ethics Board</td>
</tr>
</tbody>
</table>
I. INTRODUCTION

The relation of nutrition to health and disease has transformed over the past century. Focus has shifted from the ability of nutrients to prevent deficiency diseases to the role of nutrients in the prevention of chronic disease and optimization of health (Childs, 1999; Hasler, 2000; Hasler, 2002; Paulionis, 2008). The identification of physiologically active compounds in foods that have potential to reduce the risk of chronic disease and promote optimal health, along with increased consumer interest in self-care, advances in food regulations and innovation in food technology have allowed for the introduction of health-promoting food products (Childs, 1999; Hasler, 2000; Hasler, 2002; Arvanitoyannis et al., 2005). Functional foods exemplify this transformation in food and health as they are foods that have been demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions (Health Canada, 1998a).

As a result of the increased scientific and consumer interest in the role of nutrition in the prevention of chronic disease and optimization of health, the functional food industry is experiencing rapid economic and innovative expansion within the Canadian marketplace (Cinnamon, 2009). However, the long-term marketplace success of functional foods is dependent on consumer acceptance, attitudes and perceptions related to these products (Childs, 1997; Verbeke, 2005; Ares et al., 2008a). To date, research regarding consumer acceptability of functional foods has been limited, particularly with respect to the older adult consumer segment (Paulionis, 2008). Among Canadian consumers, the older adult segment (≥65 years of age) is the most rapidly growing (Health Canada, 2002; Turcotte et al., 2007) and arguably can benefit the most from the
incorporation of functional foods into their diets due to age-related health issues that could be mitigated through nutritional strategies (Paulionis, 2008). Nutrition is recognized as an important modifiable risk factor for health in aging that could curtail escalating health care costs (Payette et al., 2000; World Health Organization, 2004). Hence functional foods may be a strategy in the prevention of chronic diseases of aging (Hasler, 2000). The older adult segment of the population also interacts frequently with health care providers (Turcotte et al., 2007) which introduces the need for an understanding of older adults’ awareness and perceptions of functional foods to allow dietitians and other healthcare professionals to advise this consumer segment with regards to incorporating functional food products into their diets.

The aim of this thesis is to explore factors related to functional food consumption among community-dwelling older adults through an examination of current consumption patterns, motivating factors for functional food consumption, information sources for functional foods, food matrices, bioactive ingredients and health areas as they relate to functional foods, perceived risks related to functional food consumption and perceptions of health claims on functional food products.
II. BACKGROUND

1. Functional Foods

1.1. Functional Food Definition and Regulations

Functional foods have gained considerable attention in recent years from a multitude of stakeholders including the scientific community, healthcare professionals, the food industry and consumers. The concept of functional foods as a category of products was first conceived in Japan in the early 1980’s by the Japanese Ministry of Health and Welfare (MHW) as a strategy to address Japan’s rapidly aging population and associated escalating health care costs (Hasler, 2002; Menrad, 2003; Shortt, 2003; Ares et al., 2008a). Under the Nutrition Improvement Law of 1991, the MHW initiated a specific regulatory process to approve foods with recognized health benefits and a new food category entitled Foods for Specified Health Uses (FOSHU) was established (Hasler, 2002; Shortt, 2003). This legislation also specified regulations for health claims on FOSHU products and food products regulated under this new category were then eligible to bear a seal of approval from the MHW (Shortt, 2003; Arvanitoyannis et al., 2005).

Although functional foods have been established as a distinct food category in Japan and the term “functional food” is used worldwide, there is no universally accepted definition (Hasler, 2002; Arvanitoyannis et al., 2005). The absence of an official, universal definition of functional foods can make it challenging to differentiate between functional foods and conventional foods and therefore to clearly establish which foods are included in this category (McConnon et al., 2002; Niva, 2007). However, functional foods are generally considered to be foods that provide a physiological or health benefit
beyond that of basic nutrition due to the presence of a biologically active substance, or “bioactive” (Hasler, 2000; Roberfroid, 2002; Paulionis, 2008). A bioactive ingredient may be naturally occurring in the food or added to the food after isolation or extraction from another source (Arvanitoyannis et al., 2005; Paulionis, 2008). Functional food definitions have been proposed by a number of national authorities and organizations and are listed in Table 1.

Table 1. Summary of functional food definitions outlined by national authorities and other organizations.

<table>
<thead>
<tr>
<th>Organization / Regulatory Body</th>
<th>Date</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese Ministry of Health and Welfare</td>
<td>1991</td>
<td>Foods for Specified Health Uses (FOSHU) refers to foods containing ingredients with functions for health and officially approved to claim its physiological effects on the human body. FOSHU is intended to be consumed for the maintenance/promotion of health or special health uses by people who wish to control health conditions.</td>
</tr>
<tr>
<td>Health Canada</td>
<td>1998</td>
<td>A functional food is similar in appearance, or may be, a conventional food, consumed as part of a usual diet, and is demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions.</td>
</tr>
<tr>
<td>European Commission-Concerted Action on Functional Food Science in Europe</td>
<td>1999</td>
<td>A food can be regarded as functional if it is satisfactorily demonstrated to affect beneficially one or more target functions in the body, beyond adequate nutritional effects, in a way that is relevant to either an improved state of health and well-being and/or reduction of risk of disease. It is</td>
</tr>
</tbody>
</table>
consumed as part of a normal food pattern. It is not a pill, a capsule or any form of dietary supplement.

<table>
<thead>
<tr>
<th>Organization</th>
<th>Year</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food and Agricultural Organization (FAO) of the United Nations</td>
<td>2007</td>
<td>Functional foods should be a food similar in appearance to a conventional food (beverage, food matrix), consumed as part of the usual diet which contains biologically active components with demonstrated physiological benefits and offers the potential of reducing the risk of chronic disease beyond basic nutritional functions.</td>
</tr>
<tr>
<td>American Dietetic Association (ADA) (now Academy of Nutrition and Dietetics)</td>
<td>2009</td>
<td>All foods are functional at some physiological level, but it is the position of the ADA that functional foods that include whole foods and fortified, enriched, or enhanced foods have a potentially beneficial effect on health when consumed as part of a varied diet on a regular basis, at effective levels.</td>
</tr>
<tr>
<td>Dietitians of Canada</td>
<td>2010</td>
<td>Functional foods are foods that offer unique health benefits that go beyond simply meeting basic nutrient needs. Many also help to reduce the risk of chronic disease. Functional foods contain bioactive compounds, or naturally occurring chemicals that act on our bodies. It is these bioactive compounds that offer the health and wellness benefits that have been linked to functional foods.</td>
</tr>
</tbody>
</table>

While the functional food definitions proposed by various national authorities and organizations differ, there are common components. Firstly, functional foods are generally described as foods that are consumed as a part of a usual diet or food pattern and therefore demonstrate their effects in amounts that can be reached through the diet (Health Canada, 1998a; Arvanitoyannis et al., 2005; European Commission, 2010).
Functional foods also exist in food forms, or are typically described as similar in appearance to conventional foods (Health Canada, 1998a; Food and Agriculture Organization, 2007). These features distinguish functional foods from nutraceuticals and/or natural health products (NHPs) which are demonstrated to have physiological benefits or provide protection against chronic disease, but are isolated or purified from foods and generally sold in medicinal forms to be taken in a specific dosage (Health Canada, 1998a). Finally, functional foods contain an ingredient or bioactive which provides a physiological health benefit and/or reduces the risk of disease beyond basic nutritional needs (Japanese Ministry of Health and Welfare, 1991; Health Canada, 1998a; Food and Agriculture Organization, 2007; American Dietetic Association, 2009; Dietitians of Canada, 2010; European Commission, 2010).

As functional foods exist at the interface between food and drugs, the development of a regulatory framework for functional food products is challenging (Health Canada, 1998a; Arvanitoyannis et al., 2005). From a Canadian perspective, foods and NHPs are regulated by the Health Protection and Foods Branch of Health Canada and are legislated under the *Food and Drugs Act (FDA)*. NHPs are specifically regulated under the *Natural Health Products Regulations* of the FDA; however, there is no separate category for functional foods and hence they are regulated as foods under the *Food and Drug Regulations* of the FDA (Health Canada, 1998a). The lack of a specific regulatory framework for functional food products poses challenges to the rapidly expanding functional food industry as the FDA precludes the advertisement of any food as a treatment, preventative or cure for a number of specific diseases including arthritis,
cancer, diabetes and hypertension (Health Canada, 2010a), limiting the claims that can be made on functional foods in relation to health.

As a result of the lack of consistency in the definition and regulation of functional foods, the definition of a functional food used in previous studies exploring consumption and perceptions related to these products varies greatly. Overall, it is important to note that there is no official consensus among countries or researchers as to what constitutes a functional food product, which hinders comparability between studies.

1.2. Functional Foods as an Evolution in Food and Health

The role of nutrition in health and disease has evolved considerably in the past century. In the early 1900’s, food was primarily viewed as a means to satisfy hunger and to obtain the essential elements of nutrition including water, protein, carbohydrate, fat, vitamins and minerals (Hasler, 2000). Scientific focus was centred on the ability of nutrients to prevent deficiency diseases and to provide the essential building blocks of nutrition for the maintenance and repair of body tissue (Hasler, 2000). However, during the later part of the 20th century, interest shifted towards the role of nutrients in health promotion and the prevention of chronic disease (Hasler, 2000; Paulionis, 2008). Scientists began to identify physiologically active compounds in foods that had the potential to reduce the risk of various chronic diseases and promote optimal health (Hasler, 2002). An abundance of scientific evidence has since accumulated that establishes the role of specific dietary components in the prevention of chronic diseases including cardiovascular disease, diabetes, osteoporosis, some cancers, age-related macular degeneration and inflammatory diseases such as arthritis (Hasler, 2000; Arvanitoyannis et al., 2005). This transformation in the relation of nutrition to health and
disease allowed for the introduction of health-promoting food products including functional foods.

The advent of functional food products was further supported by a growing consumer phenomenon referred to as “self-care” (Hasler, 2000; Hasler, 2002). Increasing numbers of consumers are taking personal responsibility for the maintenance of their own health and well-being and may utilize nutrition as a means to do so. This self-care phenomenon is expected to continue to grow as the baby boom segment of the population ages (Hasler, 2000; Hasler, 2002). These factors, coupled with advancements in food regulations and innovation in food technology, have created a lucrative market for functional food products (Hasler, 2000; Arvanitoyannis et al., 2005).

1.3. Functional Foods in the Canadian Marketplace

As a result of the increased interest in the role of nutrition in the prevention of chronic disease and optimization of health, the functional foods industry is advancing rapidly in the Canadian marketplace. According to the Functional Foods and Natural Health Products Survey conducted by Statistics Canada in 2007, the Canadian functional foods industry experienced a 28% increase in revenue from 2004 to 2007 and sales from functional foods and natural health products (FFNHP) firms in Canada totalled $21.5 billion in 2007 (Cinnamon, 2009). As reported by the 2007 survey, a total of 689 firms were active in the field of FFNHP, employing 100,353 individuals. Research and development within FFNHP firms has also expanded, as evidenced by the 98% increase in expenditure on these activities between 2004 and 2007, which amounted to $209 million total from all firms in 2007 (Cinnamon, 2009).
The functional food industry is also expanding on a global scale. While the exact size of markets for functional foods is difficult to measure due to varying definitions of this category of products, it is estimated that the global functional food market is growing at an annual rate of 8 to 14% and is worth anywhere from $7 billion to upwards of $167 billion (Agriculture and Agri-Food Canada, 2009). In 2007, Canadian firms exported $732 million worth of FFNHP products, the bulk of which were exported to the United States, Europe, China and Japan, evidencing Canada’s role in the global FFNHP marketplace (Cinnamon, 2009).

Although the functional food industry is experiencing rapid economic and innovative expansion, research into consumer acceptability of functional foods has not kept pace with such advancements (Paulionis, 2008). Markets for functional food products show intense competition, with new products being launched continuously (Menrad, 2003) and hence an understanding of consumer acceptance and attitudes toward these food products is critical (Agriculture and Agri-Food Canada, 2009). Among consumers, the attitudes and perceptions of older adults with respect to new food developments are particularly under-researched (Paulionis, 2008), yet it is the older adult consumer segment that is poised to benefit from the health promoting and disease preventing properties of functional foods with respect to healthy aging.
2. Older Adults

2.1. Canada’s Aging Demographic

Among Canadian consumers, it is arguably the older adult population that can benefit most from the incorporation of functional foods into their diets for a multitude of reasons, the first of which relates to Canada’s aging demographic. Canada’s population is aging as a result of lower fertility rates, longer life expectancy and the impact of the baby boom generation (Turcotte et al., 2007). This population aging is expected to accelerate over the next three decades as individuals from the baby boom generation, Canada’s largest birth cohort, begin turning 65 (Turcotte et al., 2007). As a result, both the number and the proportion of older adults in the population will increase and the growth of the older adult segment of the population will account for close to half of the growth of the overall Canadian population in the coming decades (Health Canada, 2002). It is projected that the number of older adults in Canada will increase from 4.2 to 9.8 million between 2005 and 2036, with the proportion of older adults within the population increasing from 13.2 to 24.5% (Turcotte et al., 2007; Canadian Institute for Health Information, 2011). Between 2036 and 2056, it is estimated that Canada’s population will continue to age at a slower pace, with the number of older adults in Canada increasing to 11.5 million and comprising 27.2% of the population by 2056 (Turcotte et al., 2007). The increases and projected increases in the proportion of the Canadian population comprised by older adults ≥ 65 years old over time (between 1921 and 2041) is shown in Figure 1.
With the continued increase in the average age of the population, chronic diseases related to aging such as cardiovascular disease, cancer, osteoporosis and macular degeneration are also likely to increase in incidence (Hasler, 2002; Health Canada, 2002; Christensen et al., 2009). Functional foods may be a potential strategy for older adults to not only address their elevated disease risk, but also compensate for age-related physiological changes that challenge adequate nutrient intake (Inouye et al., 2007; Keller, 2007; de Morais et al., 2010).

2.2. Nutritional Challenges Related to Aging

Nutrition is recognized as a primary determinant of healthy aging (Payette et al., 2000; Keller, 2007) as a poor diet can contribute to frailty, loss of muscle mass, metabolic abnormalities, diminished immunity and lead to an overall decrease in independence and quality of life in older adults (Payette et al., 2005; Public Health...
Agency of Canada, 2006; Keller, 2007). However, older adults experience various physiological, medical, environmental and psychosocial factors related to aging that challenge adequate food and nutrient intake (Payette et al., 2005; de Morais et al., 2010).

Specifically, the physiological regulation of appetite and hydration is altered with age and as a result, older adults experience less hunger, earlier satiety and reduced thirst, all of which affect food intake and nutritional status (Kuczmarski et al., 2005; Payette et al., 2005; Paulionis, 2008). Food intake and appetite can also be negatively influenced by changes in the olfactory system affecting smell and taste, difficulties with chewing and swallowing, reduced manual dexterity and impairments in the digestion, absorption and transport of nutrients (Kuczmarski et al., 2005; Payette et al., 2005). Older adults may also experience increased difficulty in obtaining and preparing food (Payette et al., 2005).

This reduction in food intake that may occur among older adults is problematic as although energy needs decline with age, the recommended intakes for micronutrients generally remain the same or are increased (Payette et al., 2005; Lichtenstein et al., 2008). Older adults are specifically at risk for not meeting the recommended dietary allowance or adequate intake values for calcium, vitamins D, E and K, potassium and dietary fibre (Lichtenstein et al., 2008).

Functional foods are a promising strategy to address the multitude of nutritional challenges faced by older adults. As functional foods are nutrient dense, they have the potential to compensate for reductions in food intake which challenge adequate nutrient intake among older adults. Furthermore, the incorporation of bioactive ingredients into a variety of functional food matrices allows for greater choice of convenient food sources of nutrients (Paulionis, 2008). Overall, functional foods possess great potential to
support adequate nutrient intake and promote healthy aging among the older adult population in Canada.

2.3. Aging and Increased Risk of Chronic Disease

As Canada’s population continues to age at a rapid rate, consideration of the health and well-being of the older adult population segment is crucial. In parallel with the continued increase in the overall age of the population, chronic diseases related to aging will also increase in incidence (Hasler, 2002; Turcotte et al., 2007; Christensen et al., 2009). The prevalence of chronic disease among older adults is elevated, as evidenced by a 2008 survey conducted by the Canadian Institute for Health Information (CIHI) in which 76% of older adults aged ≥65 years old reported having at least 1 of 11 chronic conditions and 24% of respondents reported being diagnosed with three or more chronic conditions (Canadian Institute for Health Information, 2011). The most common chronic conditions among Canadian older adults have been reported as arthritis, high blood pressure and eye-related conditions and the main causes of death include cancer and heart disease (Turcotte et al., 2007). Specifically, the prevalence of cancer, cardiovascular disease (CVD) and type 2 diabetes is projected to increase as the Canadian population ages, the statistics of which are summarized in Table 2.
Table 2. Canadian statistics for rates of cancer, cardiovascular disease and type 2 diabetes related to aging.

<table>
<thead>
<tr>
<th>Chronic Disease/Condition</th>
<th>Source</th>
<th>Canadian Population Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>Canadian Cancer Society, 2011</td>
<td>• Risk of cancer increases with age, with 28% of new cancer cases and 23% of all cancer deaths occurring among those aged 60-69 years.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• 42% of new cancer cases and 59% of cancer deaths occur in Canadians aged ≥70 years.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cancer incidence and mortality rates increases with age for both males and females.</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>Public Health Agency of Canada, 2009a</td>
<td>• In 2009, 14.8% of Canadians between the ages of 65-74 had heart disease, and the statistic increased to 25.5% for those over the age of 75.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• High blood pressure, a key risk factor for CVD, was reported by 56% of Canadians ≥65 years of age.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The Public Health Agency of Canada (PHAC) predicted that CVD rates will only increase with Canada’s aging population and parallel the observed increased rates of hypertension and diabetes.</td>
</tr>
<tr>
<td>Type 2 Diabetes</td>
<td>Public Health Agency of Canada, 2009b</td>
<td>• Based on data from 2006 to 2007, PHAC reported 15.7% of Canadians between the ages of 60-64 had diabetes, rising to 19.5% for those 65-69 years old, and 22.2% for those 70-74 years old.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Although these values include type 1 and                                                                -----------------------------------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
type 2 diabetes, it is noteworthy that type 2 represents 90-95% of cases.

Canada’s aging population and the corresponding increase in the prevalence of chronic disease has the potential to cause significant strain on the Canadian healthcare system, which will be increasingly burdened with a higher demand for services (Turcotte et al., 2007). Chronic diseases pose a substantial economic burden not only with respect to healthcare costs but also indirect costs attributed to premature death and disability (Health Canada, 1998b). Coinciding with their increased risk of chronic disease, older adults are frequent users of the healthcare system, costing more than any other segment of the population (Canadian Institute for Health Information, 2011). While Canadians ≥65 years of age encompass approximately 14% of the population, this segment utilizes 40% of hospital services in Canada and accounts for 45% of all provincial and territorial government health spending (Canadian Institute for Health Information, 2011).

Nutrition is recognized as an important modifiable risk factor for health in aging that could curtail escalating healthcare costs (Payette et al., 2000; World Health Organization, 2004). According to Health Canada, the economic burden of unhealthy eating in Canada is estimated at approximately $6.6 billion (Health Canada, 2003). Functional foods, with their bioactive constituents, may pose a potential strategy to mitigate the increased risk of chronic disease among older adults and consequently reduce healthcare expenditures (Hasler, 2000). This potential was explored in a cost-of-illness analysis conducted by Gyles et al. (2010) which investigated the procurable
reduction in healthcare expenditures on coronary heart disease (CHD) if Canadians consumed functional foods containing plant sterols. It was determined that in an “ideal” scenario, in which the most positive assumptions are used to calculate the greatest possible economic benefit, the annual healthcare savings related CHD may total $2.45 billion. Alternatively, when considering the “very pessimistic” scenario, which determines the impact on cost estimations under a worst-case scenario, the annual healthcare savings related to CHD total $38 million (Gyles et al., 2010). Although this investigation focused on functional foods containing plant sterols, it provides support for the potential economic benefit that functional food consumption can have on healthcare expenditures in Canada.

3. Research Investigating Factors Related to Functional Food Consumption and Perceptions

The functional food industry has experienced substantial economic and innovative growth since the introduction of functional food products in Japan in the early 1980’s (Agriculture and Agri-Food Canada, 2009). However, consumer acceptance, attitudes and perceptions related to functional food products have been identified as key determinants of the long-term marketplace success of functional foods (Childs, 1997; Verbeke, 2005; Ares et al., 2008a). As markets for functional foods are intensely competitive, an understanding of consumer perceptions of functional food products is essential to allow for the development of products that appeal to consumer preferences (Menrad, 2003; Ares et al., 2008a). Additionally, in order for the full potential of functional foods to be realized with respect to the promotion of optimal health and the prevention of chronic disease, it is necessary to explore consumer reactions to functional
foods (Paulionis, 2008). Hence, a number of studies have been realized to investigate factors influencing consumer acceptance of functional foods. This section will detail the previous research that has explored consumer attitudes towards functional foods, motivating factors and factors that impede functional food consumption, the influence of food matrices and bioactive ingredients on perceptions of functional foods and the impact of nutrition and health information, including health claims, on functional food consumption.

3.1. Consumer Attitudes Towards Functional Foods

Although consumer acceptance has been referred to as a key factor in the success of functional foods and a priority for research (Childs, 1997), there has been minimal investigation into the consumption, awareness and perceptions of functional foods, particularly among the older adult population segment. Previous questionnaire studies conducted in a number of different countries and in a wider consumer demographic have found that consumers are largely unfamiliar with the concept of functional foods (Wansink et al., 2005; Badrie et al., 2007; Ares et al., 2008a; Markovina et al., 2011). For example, the results of a questionnaire-based investigation of perceptions related to functional foods in a sample of 1035 high school and university students in Croatia revealed that 39.4% of the participants were familiar with the term “functional food” (Markovina et al., 2011). Similarly, 34.3% of the 120 Trinidadian adults surveyed in an examination of exercise enthusiasts’ perceptions and beliefs related to functional foods were familiar with the term “functional food” (Badrie et al., 2007). In addition, a mail survey exploring the relationship between consumer nutritional knowledge and acceptance and consumption of functional foods revealed that 21.9% of the 1302 North
American participants reported being familiar with the term “functional food” (Wansink et al., 2005). Among previous consumer studies, reported awareness of the term “functional food” was the lowest in a sample of 200 Uruguayan adults in which only 12.5% of participants had previously heard the term (Ares et al., 2008a).

Previous research investigating consumer attitudes towards functional foods has also shown that consumers are unsure as to what products are encompassed by the functional food category and how they are distinct from conventional foods, nutraceuticals and dietary supplements (Niva, 2007; Landstrom et al., 2009). This is exemplified in a focus group study that explored perceptions of functional foods and healthy eating in a sample of 45 Finnish adults in which participants demonstrated confusion regarding the definition and boundaries of the functional food category (Niva, 2007). Participants of this focus group study argued that all foods could be considered “functional” because all foods have an impact on health (Niva, 2007). This consumer confusion regarding the distinction between functional foods and natural or conventional foods was also exhibited by participants of another focus group study that examined attitudes towards functional foods among 46 Swedish adults (Landstrom et al., 2009). Among participants in this focus group, the distinction between functional foods and health foods, such as nutraceuticals and dietary supplements, was also unclear and some participants perceived functional foods to be foods that are only meant to be consumed by individuals in poor health (Landstrom et al., 2009). Hence, there is evidence of consumer confusion with regards to the target demographic for functional food products (Landstrom et al., 2009).
As functional foods are generally processed foods, some research has demonstrated that consumers view them as unnatural and therefore unhealthy (Niva, 2007; Landstrom et al., 2009; Grunert, 2010). This is evidenced in the previously mentioned focus group conducted in Finnish adults in which healthy foods were described as “natural”, “pure”, “basic”, “home-made” and “unprocessed” by participants and therefore products marketed as “functional” were considered less healthy (Niva, 2007). Similarly, participants of the Swedish focus group study conducted by Landstrom et al. (2009) considered functional foods to be artificial versions of natural foods and categorized foods that are processed and contain additives as unnatural. Consumer reservations regarding the processing involved in the manufacturing of functional food products may therefore influence consumer attitudes and acceptance of functional foods, despite the potential health benefits of these products (Grunert, 2010).

Consumer attitudes and perceptions towards functional foods have been shown to vary depending on the country examined (Bech-Larsen et al., 2003; Labrecque et al., 2006; Dean et al., 2007). Finnish consumers were found to demonstrate more positive attitudes towards functional foods compared with American and Danish consumers in an interview-based examination of the impact of cultural differences on functional food acceptance (Bech-Larsen et al., 2003). Furthermore, a questionnaire study examining differences in the perceived healthiness of various functional grain products concluded that British consumers perceive greater health benefits associated with functional products compared to other European populations (Dean et al., 2007). An additional consumer study utilized a self-administered questionnaire to evaluate acceptance of functional foods in a sample of French Canadian, American and French college and
university students (Labrecque et al., 2006). It was revealed that French Canadian students expressed a more favourable attitude and associated higher health benefits with functional foods compared with French students and no significant differences were observed in relation to the American students (Labrecque et al., 2006). These variations in attitudes towards functional foods observed among consumers in different countries may be related to variations in functional food markets and available products among countries, as well as cultural differences pertaining to healthy eating (Bech-Larsen et al., 2003).

Overall, previous research examining attitudes towards functional foods has demonstrated that consumers are largely unfamiliar with the term “functional foods” and display confusion with respect to categorization of these products. Given that consumer attitudes towards functional foods vary depending on the consumer demographic examined, an exploration of the awareness and attitudes towards functional foods among older adults in Canada is warranted.

3.2. Motivating Factors and Barriers to Functional Food Consumption

Factors that motivate consumers to purchase and consume functional food products has been another focus of numerous previous studies, as the identification of such factors enables stakeholders to develop strategies to further promote functional food consumption. A number of factors that drive consumers to choose functional foods over conventional foods have been revealed and motivations pertaining to health have been commonly reported. For example, the results of a 2006 survey examining Canadians’ receptivity of functional foods determined that motivations related to health and well-being were among the main drivers of functional food and nutraceutical consumption
reported by participants (Herath et al., 2008). Similarly, health was mentioned as a reason for consuming functional foods, although only by 37.5% of participants in a questionnaire study conducted in a sample of 120 Trinidadian exercise enthusiasts (Badrie et al., 2007). Furthermore, consumers’ beliefs about the health benefits of functional foods, as well as having an interest in health have been shown to predict acceptance and consumption of functional foods (Verbeke, 2005; Niva, 2006; Landstrom et al., 2007). For example, the results of a 2005 questionnaire study exploring socio-demographic, cognitive and attitudinal determinants of functional food acceptance and consumption in a sample of 215 Belgian adults demonstrated that belief in the health benefits of functional foods correlated positively with functional food acceptance ($r=0.272; \ p<0.01$) (Verbeke, 2005). These findings were further supported by a questionnaire study examining attitudes towards functional foods and predictors of functional food consumption among a sample of 972 Swedish adults which found that participants’ motivations to consume functional foods were centred around their belief in the health benefits of functional foods (Landstrom et al., 2007). Furthermore, participants that were health-conscious and had a high interest in health in general exhibited more positive attitudes towards functional foods compared to participants with a lower general health interest (Landstrom et al., 2007). This finding is consistent with the results of a questionnaire study that explored functional food consumption in a sample of 1210 Finnish adults, as it was demonstrated that consumption of functional foods was significantly associated with practices of maintaining health and the most likely users of functional foods were those participants that placed a high importance on healthy eating (Niva, 2006).
Personal experience with a health issue or the presence of an ill family member or peer have also been shown to increase functional food acceptance in multiple studies, including the aforementioned Belgian (Verbeke, 2005) and Swedish (Landstrom et al., 2007) questionnaire studies. Additionally, a questionnaire-based investigation conducted by Krutulyte et al. (2011) that examined motivating factors related to purchasing functional foods in a sample of 959 Danish adults found that participants with a greater number of health concerns were more likely to purchase functional food products. Based on these findings, it has been suggested that older adult consumers may be more receptive towards functional foods as a result of their increased health concerns, risk for developing chronic disease and a greater likelihood that they have witnessed chronic illness among their peers (Verbeke, 2005; Herath et al., 2008; Sabbe et al., 2009). Hence, an exploration of motivating factors for functional food consumption among older adults, particularly factors related to health, is warranted.

Factors that impede functional food consumption and therefore serve as barriers have also been identified in studies. Cost has frequently been recognized in consumer surveys and focus groups as a barrier to functional food consumption (Patch et al., 2005a; Niva, 2006; Badrie et al., 2007; Landstrom et al., 2009). This is evidenced in a 2007 questionnaire study which explored the perceptions and beliefs related to functional foods among a sample of 120 Trinidadian adults as 47.4% of participants perceived functional foods to be expensive (Badrie et al., 2007). Cost was also reported to be a barrier to functional food consumption among participants of a Finnish questionnaire study; however other reported barriers included a lack of interest in or knowledge about functional foods and not seeing any reason to use functional food products (Niva, 2006).
Furthermore, participants of focus groups conducted in Australia (Patch et al., 2005a) and Sweden (Landstrom et al., 2009) considered the price differential between functional foods and their conventional counterparts to be unjustified unless the prices mirrored the differences between functional foods and conventional foods with respect to their physiological and health benefits.

Taste has also been identified in numerous consumer studies as a primary factor influencing functional food consumption. This is evidenced in previous focus group research that has evaluated consumer beliefs, motivations and attitudes towards functional foods in samples of 35 Australian adults (Bhaskaran et al., 2002) and 35 Irish women (Lalor et al., 2011), as taste was prominently mentioned as an important attribute influencing functional food consumption in both focus groups. In addition, taste was one of the most frequently reported factors influencing functional food choice in an interview-based investigation of reasons for functional food consumption in a sample of 50 Finnish adults (Urala et al., 2003b). Familiarity, convenience and sensory quality were other frequently mentioned attributes (Urala et al., 2003b). From a Canadian perspective, an investigation of the self-reported knowledge, attitudes and behaviours of the adult Canadian population with respect to food and nutrition revealed that 98% of respondents consider taste at least somewhat important when choosing foods, with 76% of respondents reporting that taste is very important (Canadian Council of Food and Nutrition, 2008). Comparatively, 50% of respondents reported that nutrition was very important when choosing food products (Canadian Council of Food and Nutrition, 2008). Among participants of a focus group study exploring perceptions of functional foods among Swedish adults, functional foods were perceived to taste worse, more artificial and
more medicine-like than natural or conventional foods (Landstrom et al., 2009). Furthermore, the results of a focus group study conducted in a sample of 42 overweight Australian adults revealed that participants were not willing to compromise on taste for the potential added health benefits of functional foods containing omega-3 fatty acids and if the functional foods did not taste as good as comparable products, they would not purchase them (Patch et al., 2005a). However, a Belgian study that examined the extent to which health information influences consumers’ response to and acceptance of a functional beverage found that participants that were more health-oriented were more likely to compromise on the taste of the functional beverage for the added nutritional and health benefits (Sabbe et al., 2009). In addition, the results of a Belgian questionnaire study that explored the socio-demographic and attitudinal determinants of consumer willingness to compromise on the taste of functional foods demonstrated that female consumers, older consumers and consumers with a high general health interest are more likely to compromise on the taste for the perceived health benefits of functional foods (Verbeke, 2006). Hence, there is evidence that older adult consumers may be less likely to perceive taste as a barrier to functional food consumption.

While cost and taste are the predominant barriers to functional food consumption reported in previous consumer studies, other factors have also been shown to hinder functional food acceptance and consumption. The risk of adverse or negative effects of functional foods has been identified as a barrier to functional food consumption in focus group studies conducted in Australian (Patch et al., 2005a), Finnish (Niva, 2007) and Swedish (Landstrom et al., 2009) adults. The primary adverse effect perceived by Australian focus group participants was the risk of over-exposure to bioactive ingredients
in functional foods (Patch et al., 2005a). Similarly, participants of the Swedish focus group perceived the additives in functional food products to be hazardous and expressed concern that some consumers may “over-dose” by consuming high amounts of a particular bioactive ingredient (Landstrom et al., 2009). Uncertainty regarding the long-term effects of functional foods was expressed by participants of the Finnish focus group study, as they considered functional foods to be a relatively new field of food research and therefore potential adverse effects may have not yet been observed (Niva, 2007).

In summary, numerous factors have been identified in previous consumer research that both promote and impede functional food consumption, with the most frequently reported being beliefs about the health benefits of functional foods, cost, price and risk of adverse effects. As the majority of this previous research has been conducted in European and Australian populations, there is a need to explore potential motivating factors and barriers to functional food consumption among older adults. The identification of such factors would inform the development of strategies to promote greater incorporation of functional food products into the diets of older adults, ultimately as a means to support healthy aging.

3.3. Food Matrices and Bioactive Ingredients in Relation to Functional Foods

Consumer perceptions of the food matrices and bioactive ingredients that comprise a functional food product have been reported as critical in determining consumers’ acceptance of these products. The functional food matrix refers to the form or vehicle into which bioactive ingredients can be incorporated such as beverages, bread, cereal, margarine and eggs. Functional food matrices are in a format and serving size consistent with food use, as opposed to medicinal use such as a pill, tablet or capsule.
Functional food bioactives are ingredients that may be found naturally in a food matrix and their levels are enhanced to produce a functional food, or are derived from a plant, animal or marine source and are added to the food matrix to produce a functional food (Agriculture and Agri-Food Canada, 2009). It is the bioactive ingredients that impart health promoting or disease preventing properties to a functional food product (Agriculture and Agri-Food Canada, 2009). There are many different types of bioactive ingredients including antioxidants, dietary fibre, omega-3 fatty acids, plant sterols, prebiotics and probiotics.

Numerous consumer studies have attempted to elucidate the impact of different functional food matrices, bioactive ingredients and specific combinations of food matrices and bioactives, on consumer acceptance and attitudes towards functional foods. Some previous research has shown that the functional food matrix has the greatest effect on consumer acceptance of functional food products (Ares et al., 2007; Hailu et al., 2009). This is evidenced in a 2007 questionnaire study of the effect of different food matrices and bioactive ingredients on consumers’ perceived healthiness and willingness to try functional foods in a sample of 200 Uruguayan adults in which the food matrix was shown to have the largest effect on perceived healthiness and willingness to try functional foods (Ares et al., 2007). Furthermore, a questionnaire study exploring consumer preferences pertaining to probiotic functional food products in a sample of 267 Canadian adults found that participants considered the food matrix to be the most important product attribute when evaluating functional foods (Hailu et al., 2009).

The perceived healthiness of functional food matrices has also been extensively studied as a factor influencing functional food acceptance. Multiple focus group and
questionnaire studies have demonstrated that food matrices that are intrinsically healthy are perceived to be better carriers for bioactive ingredients and result in a more positive evaluation of functional food products (Patch et al., 2005a; van Kleef et al., 2005; Ares et al., 2007; Hailu et al., 2009). Participants of an Australian focus group study that investigated overweight consumers’ beliefs with respect to omega-3 fatty acid-enriched functional foods generally perceived unhealthy food matrices, such as chocolate or soft drinks, to be inappropriate carriers for omega-3 fatty acids (Patch et al., 2005a). Similar results were observed in a questionnaire study conducted in 50 Dutch adults in which margarine and yogurt were found to be more attractive food matrices for functional foods compared with indulgence-type products such as chewing gum, ice cream or chocolate (van Kleef et al., 2005). Similarly, a questionnaire study conducted in 267 Canadian adults, Hailu et al. (2009) found that participants placed a higher value on yogurt as a food matrix for probiotics compared with ice cream. Additionally, results of the previously mentioned questionnaire study conducted in a sample of 200 Uruguayan adults revealed that participants perceived yogurt to be the healthiest matrix for functional foods compared with honey, soup, dulce de leche and marmalade (Ares et al., 2007). Hence, food matrices that are already perceived by consumers to be healthy are also considered to be more credible carriers for bioactive ingredients (Ares et al., 2007). However, contrasting results were found in an examination of factors affecting consumers’ perceived healthiness of functional foods conducted in a sample of Danish, Finnish and American adults in which yogurt, juice and spread were evaluated as food matrices for the addition of omega-3 fatty acids and oligosaccharides (Bech-Larsen et al., 2003). Participants in this study responded positively only to the addition of the
bioactives to the spread, leading researchers to suggest that consumers may depreciate the enrichment of healthy food matrices because they are already healthy and therefore greater benefit is perceived in the enrichment of unhealthy food matrices (Bech-Larsen et al., 2003). Ultimately, further research is need to elucidate the food matrices preferred by consumers as it is evident that consumer perceptions of functional food matrices influences overall acceptance and consumption of functional food products.

Consumers have also demonstrated preferences with respect to the bioactive ingredients incorporated into functional food products. It has been shown that consumers demonstrate a more positive attitude towards functional foods in which the bioactive ingredient is inherent in the original product (Ares et al., 2008a; Krutulyte et al., 2011). This is evident in the results of a questionnaire study that evaluated the perceived fit of different combinations of food matrices and bioactive ingredients in a sample of 959 Danish adults as it was revealed that participants considered fish balls and tuna salad to be the most attractive food matrices for the addition of fish oil and omega-3 fatty acids, as opposed to yogurt, muesli bars, rye bread and bacon liver pâté (Krutulyte et al., 2011). Additionally, a questionnaire study that examined consumer perceptions of functional foods in a sample of 200 Uruguayan adults found that the combination of yogurt and added calcium resulted in the highest perceived healthiness and willingness to try among participants compared to yogurt with added fibre, antioxidants, or iron (Ares et al., 2008a). Based on these results, it has been hypothesized that consumers are more accepting of functional foods in which the bioactive ingredient is inherent in the food matrix because such combinations are perceived to be more natural and there is less potential for off-flavours (Grunert, 2010; Krutulyte et al., 2011). A further explanation
for the high perceived healthiness and willingness to try observed for yogurt with added calcium in the Uruguayan questionnaire study was that Uruguayan consumers are more familiar with the health benefits of calcium and not as aware of the benefits of consuming fibre and antioxidants (Ares et al., 2008a). Hence, consumers may be more accepting of functional food products that contain bioactive ingredients with which they are familiar.

In summary, it is evident that characteristics of the functional food matrices and bioactive ingredients that comprise a functional food influence consumer attitudes and acceptance of functional food products. The identification of functional food matrices and bioactives that are preferred among older adult consumers will allow food industry stakeholders to develop specific functional food products that may be successful among the older adult consumer demographic.

3.4. Nutrition Information and Sources of Information in Relation to Functional Foods

Nutrition and health information pertaining to functional food products and the sources of this information, are important considerations in the exploration of factors related to functional food consumption and acceptance. Nutrition and health information can be communicated in a number of forms including educational programs, food packaging and labelling and information provided through the media, friends, family and healthcare professionals. In particular, nutrition information on food labels has emerged as a major policy tool for the promotion of healthy eating as it allows consumers to make informed decisions when comparing and purchasing food products (Williams, 2005; Wills et al., 2009; Campos et al., 2011). From a Canadian perspective, the Canadian Food and Drug Regulations of the Food and Drugs Act were amended in December of
in order to make nutrition labelling mandatory on most food products and to permit
the use of diet-related health claims on foods (Health Canada, 2012a). Canadians are
now able to make better-informed purchase decisions by utilizing the numerous guidance
tools present on multiple food packaging guidance tools including the list of ingredients,
nutrition facts table, nutrient content claims, health claims and front-of-package labelling
(Canadian Food Inspection Agency, 2010).

An exploration of consumer use and understanding of nutrition and health
information on functional food products is essential as the effective provision of nutrition
and health information can impact consumer attitudes towards a food product and can
influence food choice and dietary behaviour (Verbeke, 2008). Given that previous
questionnaire studies have identified beliefs in the health benefits of functional foods to
be a primary motivator driving functional food acceptance and consumption (Verbeke,
2005; Landstrom et al., 2007), the health benefits of choosing functional food products
over conventional products must be effectively communicated to consumers. This is
demonstrated in a questionnaire study that examined the impact of nutritional knowledge
on functional food consumption in a sample of 606 American adults, as it was revealed
that participants who possessed knowledge about the attributes and specific health
benefits of soy indicated that they were more likely to consume functional soy products
(Wansink et al., 2005). The influence of nutrition information on intention to consume
functional foods was also evaluated in an American study conducted by Pelletier et al.
(2002) in which educational kits that included video and written information pertaining to
functional foods and health were given to Registered Dietitians to present to their clients.
Prior to the educational intervention, only a small percentage of the 530 study

30
participants reported consuming efficacious levels of the functional foods considered (Pelletier, 2002). However, following the educational intervention, 52% of men and 79% of women expressed intentions to increase their consumption of functional foods, which highlights the value of nutrition and health information in influencing purchase intentions of functional foods (Pelletier, 2002). Furthermore, the impact of nutrition and health information on consumer intention to purchase a functional juice containing açai was investigated in a sample of 86 Belgian adults, in which it was revealed that providing health information for the functional juice increased participants’ overall liking, perceived healthiness, perceived nutritional value and purchase intention (Sabbe et al., 2009). An additional study conducted in a sample of 327 Spanish adults explored the effect of health benefit information on attitudes and intention to purchase a fibre-enriched fish product and found that participants who received information about the product’s ingredients and the health benefits of consuming fibre displayed more favourable attitudes towards the functional food product compared with participants who did not receive nutrition or health information (Tudoran et al., 2009). However, the provision of nutrition and health information for the fibre-added fish product did not influence purchase intention among participants (Tudoran et al., 2009).

Related to nutrition and health information, consumer confidence and trust in the source of information are also core factors that influence acceptance of functional foods (Frewer et al., 2003; Urala et al., 2003a; Hailu et al., 2009). In a questionnaire study conducted in a sample of 972 Swedish adults, Landstrom et al. (2007) found that the most common sources of information for functional foods reported by participants were television advertisements (57%), advertisements in newspapers or magazines (48%) and
food packaging (47%). The recommendation of a functional food product by healthcare professionals was associated with a higher likeliness to buy functional foods in this study, however only 2.5% of participants reported that they receive information about functional foods from healthcare professionals (Landstrom et al., 2007). Health professionals, including physicians and dietitians, have been identified as credible sources of information pertaining to nutrition and health in previous focus group studies which examined consumer attitudes and beliefs towards functional foods conducted in Australian (Bhaskaran et al., 2002; Patch et al., 2005a), Swedish (Landstrom et al., 2009), Irish (Lalor et al., 2011), British and Danish (Korzen-Bohr et al., 2006) adults. Family members and friends have also been identified by consumers to be trusted sources of nutrition and health information in the Australian (Bhaskaran et al., 2002; Patch et al., 2005a), Irish (Lalor et al., 2011) and Danish and British (Korzen-Bohr et al., 2006) focus group studies.

Overall, it is of value to establish the preferred sources of information and perceived need for more information regarding functional foods among older adult consumers, as nutrition and health information has the potential to influence consumer acceptance and attitudes towards functional food products. Furthermore, there is substantial heterogeneity among consumers in terms of their needs, interests and perceptions related to nutrition and health information (Williams, 2005; Herath et al., 2008; Verbeke, 2008), yet the current research regarding consumer perceptions has not been sufficiently targeted in this regard. Hence, the current study advances this area of knowledge.
3.5. Health Claims as They Relate to Functional Foods

Nutrition information sources on food labels, particularly health claims, are a valuable consumer educational tool available at the point of purchase that could influence acceptance of functional foods (Frewer et al., 2003; Verbeke, 2008). According to Health Canada, a health claim is any representation in labeling or advertising that states, suggests, or implies that a relationship exists between the consumption of foods or food constituents and health (Health Canada, 2007). In Canada, health claims are further categorized as function claims, disease risk reduction claims and therapeutic claims (Canadian Food Inspection Agency, 2010). In addition to health claims, food products may also bear nutrient content claims (Canadian Food Inspection Agency, 2010). Nutrient content and health claims permissible on food products in Canada are summarized in Table 3.
Table 3. Definitions and examples of nutrient content claims and health claims permissible on food labels in Canada (Canadian Food Inspection Agency, 2010).

<table>
<thead>
<tr>
<th>Type of Claim</th>
<th>Definition and Examples</th>
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<tbody>
<tr>
<td>Nutrient Content Claims</td>
<td>• Directly, or indirectly, describes the content level of a nutrient in a food or a group of foods.</td>
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<tr>
<td></td>
<td>• Examples include:</td>
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<td></td>
<td>- Very high source of fibre</td>
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<td></td>
<td>- Excellent source of vitamin C</td>
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<td></td>
<td>- Free of trans fatty acids</td>
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<td></td>
<td>- Low sodium</td>
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<td></td>
<td>• Includes quantitative declarations of nutrients made outside of Nutrition Facts Table (e.g. “4 Calories per 250 ml serving”).</td>
</tr>
<tr>
<td></td>
<td>• Includes comparative claims which compare the nutritional properties of two or more foods (e.g. “3x more calcium than most regular yogurts”).</td>
</tr>
<tr>
<td>Disease Risk Reduction Claims</td>
<td>• Categorized as a subset of health claims.</td>
</tr>
<tr>
<td></td>
<td>• Statements that link a food or a constituent of a food to reducing the risk of developing a diet-related disease or condition (e.g. osteoporosis, cancer, hypertension) in the context of the total diet.</td>
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<tr>
<td></td>
<td>• There are currently five permitted disease risk reduction claims in Canada:</td>
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<tr>
<td></td>
<td>- A diet low in sodium and high in potassium and reduced risk of hypertension.</td>
</tr>
<tr>
<td></td>
<td>- A diet adequate in calcium and vitamin D and reduced risk of osteoporosis.</td>
</tr>
<tr>
<td></td>
<td>- A diet low in saturated fat and trans fat and a reduced risk of heart disease.</td>
</tr>
<tr>
<td></td>
<td>- A diet rich in vegetables and fruits and reduced risk of some types of cancer.</td>
</tr>
<tr>
<td></td>
<td>- Maximal fermentable carbohydrates in gum, hard candy or breath-freshening products and reduced risk of dental caries.</td>
</tr>
</tbody>
</table>
Therapeutic Claims

- Categorized as a subset of health claims.
- Claims about the treatment or mitigation of a health-related disease or condition, or restoration, correction or modification of body function.
- There are currently five permitted therapeutic claims in Canada:
  - Plant sterols in foods and blood cholesterol lowering.
  - Oat products and blood cholesterol lowering.
  - Psyllium and blood cholesterol lowering (Health Canada, 2012b)
  - Replacement of saturated fat with mono- and polyunsaturated fat and blood cholesterol lowering (Health Canada, 2012c).
  - Barley products and blood cholesterol lowering (Health Canada, 2012d).
- The above claims were submitted for approval to Health Canada’s Food Directorate in 2007 and 2009 and approved between May 2010 and July 2012 as the first therapeutic claims allowed to be made on foods in Canada.

Function Claims

- Categorized as a subset of health claims.
- Claims about the specific beneficial effects that the consumption of a food or constituent of a food has on normal functions or biological activities in the body. Relates to a positive contribution to health and to the maintenance of a physiological function or to physical or mental performance.
- Examples of acceptable function claims include:
  - Coarse wheat bran and laxation or regularity.
  - Green tea and antioxidant capacity in the blood.
  - Psyllium and laxation or regularity.

Nutrient Function Claims

- Categorized as a subset of function claims.
• Describes the well established roles of energy or known nutrients that are essential for the maintenance of good health or for normal growth and development.

• Examples of acceptable nutrient function claims include:
  - Protein helps build and repair body tissues.
  - Vitamin A aids in the development and maintenance of night vision.
  - Vitamin E is a dietary antioxidant.
  - Calcium aids in the formation and maintenance of bones and teeth.
  - Iron is a factor in red blood cell formation.

Probiotic Claims

• Categorized as a subset of function claims.

• Described as claims about the benefits of probiotic microorganisms.

• Examples of probiotic claims include:
  - Strain-specific claims: Claims about the health benefits or effects of specific strains of probiotics. Currently, no strain-specific claims have been approved by Health Canada.
  - Non-strain-specific claims: Statements about the nature of probiotics (e.g. “Provides live microorganism that contribute to healthy gut flora”).

While health claims may be utilized to market and promote food products, they are ultimately intended to assist consumers in making informed food choices by providing information regarding the health benefits of foods and food ingredients (Arvanitoyannis et al., 2005). In the case of functional food acceptance, health claims may be particularly beneficial as they can convey information to the consumer with respect to the physiological benefits and disease preventing properties of bioactive ingredients (Hailu et al., 2009). Previous consumer studies have attempted to determine
consumer perceptions of health claims on functional food products and how the presence of health claims impacts acceptance and consumption of functional foods. In particular, Urala et al. (2003) conducted a questionnaire study in a sample of 958 Finnish adults in which participants were asked to evaluate whether health claims associated with six different bioactive ingredients were advantageous or disadvantageous. The evaluated bioactive ingredients included fibre, probiotics, conjugated linoleic acid, sitostanol, calcium and xylitol and the strength of the evaluated health claims varied (Uralsa et al., 2003a). At the lowest level, the claim simply stated that the product contained the functional ingredient, whereas at the highest level of strength, the claim made a connection between the functional ingredient and the reduced risk or prevention of an illness or disease (Uralsa et al., 2003a). Ultimately, all of the claims evaluated by participants in this study were perceived to be advantageous or neutral and strengthening the information on the claim with respect to the health benefits of the functional ingredient had a moderate or no effect on the perceived benefit of the claim (Uralsa et al., 2003a).

Positive consumer perceptions towards health claims on food products were also observed in a purchase simulation study conducted by Aschemann-Witzel et al. (2010) in which 210 German adults were asked to choose a product from a selection of five potential products, two of which bore health claims. Results demonstrated that participants preferred products with health claims as these products were chosen more often than the products without health claims (Aschemann-Witzel et al., 2010). Adding to this area of research, Ares et al. (2009) examined the impact of disease risk reduction claims and enhanced function claims on Uruguayan consumers’ perceived healthiness.
and willingness to try functional milk desserts with added fibre or antioxidants. Results demonstrated that both disease risk reduction claims and enhanced function claims had a positive impact on the perceived healthiness and willingness to try the functional milk desserts (Ares et al., 2009). Noteworthy is that “enhanced function claim” is a regulatory term generally used within the European Union to refer to health claims that relate to the consumption of a food or food component that contributes beneficially to health (van Kleef et al., 2005). Hence, enhanced function claims are similar to Canada’s function claims.

In contrast, other questionnaire and focus group research has found that consumers exhibit skepticism towards health claims on functional food products. Skepticism towards health claims was observed in a focus group study examining consumer attitudes and beliefs towards functional foods in a sample of 35 Australian adults in which 80% of participants indicated that they do not trust manufacturer claims and that they had reservations regarding the reliability of such information (Bhaskaran et al., 2002). Participants also reported that they were unaware of legislation regulating health claims on food products and were unsure if manufacturers were policed effectively with respect to the accuracy of claims (Bhaskaran et al., 2002). Similar perceptions of health claims were observed in an Australian focus group study (n=42) that examined overweight consumers’ beliefs regarding omega-3 fatty acid enriched functional foods in which participants expressed distrust of labelling and the legislation controlling health claims on functional food packages (Patch et al., 2005a). Distrust of health claims on functional foods was also reported by participants of a Swedish questionnaire study (n=46) (Landstrom et al., 2007) and a focus group study that evaluated consumer
attitudes towards health claims on functional foods conducted in a sample of 35 Irish women (Lalor et al., 2011). Participants of the focus group study also expressed uncertainty with respect to the amount of scientific evidence available to substantiate health claims on functional food products (Lalor et al., 2011). Overall, it is evident that more research is needed in order to elucidate the impact that health claims do or could have on functional food acceptance and consumption, particularly in the context of a Canadian regulatory environment.

In addition to investigating consumer attitudes and perceptions towards health claims on functional foods, previous studies have explored the type of health claim preferred by consumers. Some questionnaire-based research has shown that health claims relating a functional food product to the reduction of disease risk tend to be preferred by consumers over enhanced function claims (van Kleef et al., 2005; Hailu et al., 2009). This is exemplified in a questionnaire study that explored consumer preferences for varying types of health claims in a sample of 124 Dutch adults, as it was found that disease risk reduction claims had significantly higher purchase intention ratings than enhanced function claims (van Kleef et al., 2005). Participants also considered health claims relating to a personally relevant illness to be more attractive and convincing (van Kleef et al., 2005). Similarly, results of a questionnaire study evaluating consumer perceptions of probiotic functional food products conducted in a sample of 267 Canadian adults revealed that participants placed a higher value on the presence of “health risk threat reduction” claims than “health enhancing function” claims on functional food products (Hailu et al., 2009). Additionally, a questionnaire study that investigated factors influencing consumers’ willingness to buy functional foods in a
sample of 249 Swiss adults found that participants were more willing to buy functional food products that bore claims related to physiological health benefits or the reduction of disease risk compared with functional foods that possessed claims related to psychological benefits, such as reduced tiredness or stress (Siegrist et al., 2008). Results of this study also demonstrated that social trust is an important factor in the acceptance of functional foods, as participants who were trusting of the food industry were more likely to buy functional foods compared with participants who indicated that they did not trust the food industry (Siegrist et al., 2008). To further this area of knowledge, Verbeke et al. (2009) conducted a questionnaire study in a sample of 347 Belgian adults that explored consumer reactions to nutrition claims, health claims and disease risk reduction claims on functional food products which included calcium-enriched fruit juice, omega-3 enriched spread and fibre-enriched cereal. In this study, nutrition claims were described as claims relating to the product’s composition and stating that the product contains particular nutrients in increased proportions. Health claims were described as claims stating a relationship between the food product’s enriched nutrient and health, including mention of the potential physiological function of the nutrient. Disease risk reduction claims were described as claims stating that consumption of the enriched food reduces a risk factor in the development of a human disease. The results of this study revealed that health claims were perceived to be more convincing and attractive than nutrition claims and both were favoured over disease risk reduction claims (Verbeke et al., 2009). Alternatively, the aforementioned questionnaire study conducted by Urala et al. (2003) which examined consumer perceptions of health claims in a sample of 958 Finnish adults found that nutrient content claims stating that the product contains a familiar bioactive ingredient are
perceived by consumers to be as equally advantageous as nutrient function or disease risk reduction claims, as consumers are already aware of the health benefits of the familiar bioactive. Overall, the results of this previous research are inconsistent and ultimately more research is needed to determine the type of health claim preferred by various consumer segments in order to inform food manufacturers and allow for targeted information provision (van Kleef et al., 2005; Verbeke, 2008).

Based on the current literature it is evident that multiple factors influence consumer acceptance and attitudes towards functional foods, including the consumer’s country of origin, motivating factors related to health, barriers such as taste, cost and the risk of adverse effects, perceptions related to functional food matrices and bioactive ingredients and the presence of nutrition and health information and sources of information. However, research pertaining to functional food acceptance and consumption in Canada is extremely limited. In addition, a comprehensive examination of factors related to the consumption of functional foods among older adults has yet to be conducted, allowing the present study to contribute to this area of research.
III. RESEARCH RATIONALE, PURPOSE and OBJECTIVES

1. Summary of Research Rationale

As a result of the increased scientific and consumer interest in the role of nutrition in the prevention of chronic disease and optimization of health (Hasler, 2000; Paulionis, 2008), the functional food industry has experienced substantial economic and innovative expansion, both on a global scale and in the Canadian marketplace (Cinnamon, 2009). Within Canada, the older adult population is rapidly growing (Turcotte et al., 2007) and poised to benefit from the incorporation of functional foods into their diets due to their increased risk for developing chronic disease (Canadian Institute for Health Information, 2011), as well as other age-related physiological changes that challenge adequate nutrient intake (Payette et al., 2005). However, the potential for functional foods to benefit Canada’s aging population is reliant on the acceptance and perception of functional foods products among older adult consumers. The majority of knowledge gained thus far relating to consumer awareness and perceptions of functional foods has examined a wider age demographic and studies have primarily been conducted in samples of European (Urala et al., 2003a; van Kleef et al., 2005; Landstrom et al., 2007; Siegrist et al., 2008; Landstrom et al., 2009; Lalor et al., 2011), South American (Ares et al., 2008a; Ares et al., 2009) and Australian adults (Bhaskaran et al., 2002; Patch et al., 2005a). Hence, factors relating specifically to the consumption of functional foods among Canadian older adults have yet to be examined. In addition, previous studies have selectively evaluated different aspects of functional food consumption, often with inconsistent and conflicting results. As multiple factors including awareness, motivating factors, perceptions of food matrices and bioactive ingredients, health concerns and information are all relevant to the
study of functional foods, a more comprehensive examination of such factors is warranted. This research is of value to numerous stakeholders including Registered Dietitians, as the results will inform better interaction with their older adult clients with respect to the potential of functional foods to promote health and contribute to healthy aging.

2. Research Purpose and Objectives

The overall purpose of this research was to generate information related to the consumption of functional foods among the older adult population in Canada. The specific objectives of this research were to examine the following in a sample of community-dwelling older adults:

1. Awareness of functional foods.
3. Factors that encourage and discourage functional food consumption.
4. Potential areas of future functional food development through the identification of currently consumed and preferred food matrices and bioactive ingredients for functional foods.
5. Health areas addressed through functional food consumption.
7. Current sources of information and perceived need and sources for further information about functional foods.
8. Awareness, understanding and perceptions of health claims on functional foods.
IV. METHODS

1. Participant Recruitment and Screening

A total of 200 community-dwelling older adults were recruited through multiple methods including study flyers (Appendix A), advertisements in local newspapers and senior community centre newsletters, blog postings on websites targeted to older adults, flyers distributed at lecture sessions attended by older adults, social media, emails circulated to University of Guelph campus departments and tables set up in senior community centres and malls. The study was advertised as a food survey in order to minimize bias in participant recruitment with respect to functional food awareness and consumption. Individuals were included in the study if they were ≥60 years of age and were living independently within the community. Exclusionary criteria included use of any meal-assisted services or any indication of cognitive dysfunction that would interfere with completion of the study questionnaire. Participant eligibility was determined over the phone or via email utilizing an eligibility questionnaire (Appendix B). All participants signed a study consent form (Appendix C) before participating and the research protocol was approved by the University of Guelph Human Research Ethics Board (REB#10SE012) (Appendix D).

2. Data Collection

Participants attended study appointments of approximately one hour in duration at the Human Nutraceutical Research Unit (HNRU) at the University of Guelph. The study appointment included review and completion of the study consent form followed by completion of a comprehensive questionnaire designed to explore functional food
consumption in older adults (Appendix E). Upon completion of the study questionnaire, participants received a Dietitians of Canada cookbook.

The study questionnaire was developed over a period of six months in a process which involved a review of the literature, consultation with colleagues and a pre-test on ten participants to ensure clarity and comprehension. Questions were constructed in order to fulfill the research objectives and to collect a balance of quantitative and qualitative data. The study questionnaire is summarized in Table 4 and included a combination of open- and close-ended questions designed to generate quantitative and qualitative data related to functional food consumption. The study questionnaire included sections of questions that explored the definition of a functional food, functional food consumption, motivations for the consumption of functional foods, information sources for functional foods, food matrices, bioactive ingredients and health areas as they relate to functional foods and perceived risks related to functional food consumption. Health claims on functional foods were explored in terms of the awareness, perceptions and understanding of nutrient content claims, nutrient function claims and disease risk reduction claims. The questionnaire also collected information on participant medical, lifestyle and demographic characteristics.

To ensure that the participant understood and answered each question fully, the study questionnaire was administered by a researcher using an interactive process. Throughout this process, to increase the participant’s awareness and understanding of key concepts related to functional foods, information sheets were presented to describe and establish relevant definitions including functional foods (Appendix F), food matrices
(Appendix G), functional food bioactives (Appendix H) and claims including nutrient content claims, nutrient function claims and disease risk reduction claims (Appendix I).

The definition of a functional food was set in partial accordance with the Health Canada definition of a food that is “similar in appearance to, or may be, a conventional food, is consumed as a part of a usual diet, and is demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions, i.e. they contain a bioactive compound” (Health Canada, 1998a). However, the current study excluded conventional foods to limit the definition of a functional food to foods that have undergone processing or manipulation to add or increase the level of a bioactive.

Functional food matrices were described using an information sheet as food forms into which bioactive ingredients could be incorporated. The information sheet provided numerous examples of functional food matrices including beverages, breads, cereals, cheese, crackers/cookies, eggs, granola bars, margarine, pasta, salad dressing and yogurt/yogurt beverages. Functional food bioactives were described to participants as ingredients that can be added to a food product, or their levels enhanced, to increase the health promoting or disease preventing properties of the product. Examples of functional food bioactive ingredients were depicted on an information sheet and included ingredients such as antioxidants, dietary fibre, omega-3 fatty acids, probiotics, prebiotics and plant sterols.

Finally, information sheets supported the definition of claims including nutrient content, nutrition function and disease risk reduction. Nutrient content claims were described as claims on food packaging that indicate the presence of a specific nutrient, but do not explicitly relate the nutrient to health. Nutrient function claims were described
as health claims on food packaging that link a component of the product to the maintenance of a physiological function or to physical or mental performance, without explicit reference to a disease. Disease risk reduction claims were described as health claims on food packaging that link a component of the product to a reduced risk of a diet-related disease or condition.

Table 4. Summary of questions within each study questionnaire section.

<table>
<thead>
<tr>
<th>Questionnaire Section</th>
<th>Type of Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>I – Definition of Functional Food¹</td>
<td>Awareness of functional foods; perception of the definition of a functional food.</td>
</tr>
<tr>
<td>II – Consumption of Functional Foods</td>
<td>Current consumption; frequency of consumption; timing of consumption; functional foods consumed most often.</td>
</tr>
<tr>
<td>III – Motivation to Consume Functional Foods</td>
<td>Rationales for consumption; barriers to consumption.</td>
</tr>
<tr>
<td>IV – Information about Functional Foods</td>
<td>Current sources of information; need for more information; preferred sources of information.</td>
</tr>
<tr>
<td>V – Food Matrices as they Relate to Functional Foods²</td>
<td>Food matrices currently consumed as functional foods; food matrices participants would consider consuming as functional foods.</td>
</tr>
<tr>
<td>VI – Bioactive Ingredients as they Relate to Functional Foods³</td>
<td>Bioactives within functional foods perceived to be most effective at improving health; bioactives currently consumed in functional foods; bioactives participants would</td>
</tr>
</tbody>
</table>
consider consuming in functional foods.

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII – Human Health as it Relates to Functional Foods</td>
<td>Health areas addressed through functional food consumption; health areas addressed through consumption of specific bioactives within functional foods.</td>
</tr>
<tr>
<td>VIII – Perceived Risks as they Relate to Functional Foods</td>
<td>Confidence in the safety of functional foods; perceived risks of functional food consumption; previous negative/adverse reactions to functional foods; concerns regarding interactions between medications and functional foods.</td>
</tr>
<tr>
<td>IX – Health Claims as they Relate to Functional Foods</td>
<td>Awareness of health claims, use of health claims, confusion related to claims; potential for claims to increase functional food consumption; type of health claim perceived as being most informative.</td>
</tr>
<tr>
<td>X – Medical Information</td>
<td>Interest in overall health; specific health concerns; frequency of visits to a physician and registered dietitian; use of prescription and over the counter medications.</td>
</tr>
<tr>
<td>XI – Lifestyle Information</td>
<td>Number of people in household; lifestyle descriptor (urban or rural); participation in grocery shopping for household; smoking status; participation in exercise.</td>
</tr>
<tr>
<td>XII – Demographic Information</td>
<td>Gender; age; ethnicity; marital status; education; employment; annual household income.</td>
</tr>
</tbody>
</table>

1 A functional food was defined using an information sheet (Appendix F) in partial accordance with the Health Canada definition of a food that is “similar in appearance to, or may be, a conventional food, is consumed as a part of a usual diet, and is demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions, i.e. they contain a bioactive compound” (Health Canada, 1998). However, the current study excluded conventional foods to limit the definition of a
functional food to foods that had undergone processing or manipulation to add or increase the level of a bioactive.

2 Food matrices were described using an information sheet (Appendix G) as food forms into which bioactive ingredients could be incorporated including beverages, breads, cereals, cheese, crackers/cookies, eggs, granola bars, margarine, pasta, salad dressing and yogurt/yogurt beverages.

3 Functional food bioactives were described using an information sheet (Appendix H) as ingredients that can be added to a food product, or their levels enhanced, to increase the health promoting or disease preventing properties of the product and include ingredients such as antioxidants, dietary fibre, omega-3 fatty acids, probiotics, prebiotics and plant sterols.

4 Health claims including nutrient content claims, nutrient function claims and disease risk reduction claims were described using information sheets (Appendix I). Nutrient content claims were described as claims on food packaging that indicate the presence of a specific nutrient, but do not explicitly relate the nutrient to health. Nutrient function claims were described as health claims on food packaging that link a component of the product to the maintenance of a physiological function or to physical or mental performance, without explicit reference to a disease. Disease risk reduction claims were described to participants as health claims on food packaging that link a component of the product to a reduced risk of a diet-related disease or condition.

3. Data and Statistical Analysis

All data from the study questionnaire were entered into Microsoft Excel spreadsheets. Quantitative data was analyzed through the calculation of summary statistics including frequencies and percentages. Chi-square analysis was used to consider gender, education and income for quantitative variables with a yes/no response related to the awareness and consumption of functional foods, motivation to consume functional foods, information pertaining to functional foods, perceived risks related to functional foods and awareness and perceptions of health claims. Consideration of gender, education and income is consistent with previous literature which has investigated these factors as core socio-demographic variables that have the potential to
influence functional food acceptance (Verbeke, 2005; Niva, 2006; Ares et al., 2007; Herath et al., 2008). Qualitative open-ended response data was examined for common responses, which were then organized into groupings, tallied and summarized as frequencies and percentages. All statistical analyses were performed using the Statistical Analysis System (version 9.3, Cary, NC, USA) with p<0.05 considered statistically significant.
V. RESULTS

1. Participant Characteristics

A total of 200 community-dwelling older adults (70.8 ± 7.17 years old) completed the study questionnaire and are characterized in Table 5.

Table 5. Participant demographic and lifestyle characteristics (n=200)

<table>
<thead>
<tr>
<th></th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>60 (30.0)</td>
</tr>
<tr>
<td>Female</td>
<td>140 (70.0)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
<td></td>
</tr>
<tr>
<td>60-64</td>
<td>52 (26.0)</td>
</tr>
<tr>
<td>65-69</td>
<td>42 (21.0)</td>
</tr>
<tr>
<td>70-74</td>
<td>43 (21.5)</td>
</tr>
<tr>
<td>75-79</td>
<td>37 (18.5)</td>
</tr>
<tr>
<td>80+</td>
<td>26 (13.0)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>190 (95.0)</td>
</tr>
<tr>
<td>African</td>
<td>1 (0.5)</td>
</tr>
<tr>
<td>Asian</td>
<td>5 (2.5)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (2.0)</td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>17 (8.5)</td>
</tr>
<tr>
<td>Married/Common-law</td>
<td>117 (58.5)</td>
</tr>
<tr>
<td>Divorced</td>
<td>31 (15.5)</td>
</tr>
<tr>
<td>Widowed</td>
<td>35 (17.5)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
</tr>
<tr>
<td>Some high school</td>
<td>8 (4.0)</td>
</tr>
<tr>
<td>High school graduate</td>
<td>20 (10.0)</td>
</tr>
<tr>
<td>Some college or university</td>
<td>38 (19.0)</td>
</tr>
<tr>
<td>College or university graduate</td>
<td>84 (42.0)</td>
</tr>
<tr>
<td>Post-graduate degree</td>
<td>50 (25.0)</td>
</tr>
</tbody>
</table>
### Employment Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently employed</td>
<td>35</td>
<td>17.5%</td>
</tr>
<tr>
<td>Not currently employed</td>
<td>165</td>
<td>82.5%</td>
</tr>
<tr>
<td>Retired Yes</td>
<td>164</td>
<td>98.8%</td>
</tr>
<tr>
<td>Retired No</td>
<td>2</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

### Annual Household Income (Canadian $)

<table>
<thead>
<tr>
<th>Income Range</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\leq 24,999$</td>
<td>27</td>
<td>15.3%</td>
</tr>
<tr>
<td>$25,000-49,999$</td>
<td>42</td>
<td>23.9%</td>
</tr>
<tr>
<td>$50,000-74,999$</td>
<td>50</td>
<td>28.4%</td>
</tr>
<tr>
<td>$75,000-99,999$</td>
<td>28</td>
<td>15.9%</td>
</tr>
<tr>
<td>$\geq 100,000$</td>
<td>29</td>
<td>16.5%</td>
</tr>
</tbody>
</table>

### Number of People in Household

<table>
<thead>
<tr>
<th>Number of People</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (i.e. live alone)</td>
<td>74</td>
<td>37.0%</td>
</tr>
<tr>
<td>2</td>
<td>115</td>
<td>57.5%</td>
</tr>
<tr>
<td>3 +</td>
<td>11</td>
<td>5.5%</td>
</tr>
</tbody>
</table>

### Lifestyle Descriptor

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban/city</td>
<td>152</td>
<td>76.0%</td>
</tr>
<tr>
<td>Rural/country</td>
<td>48</td>
<td>24.0%</td>
</tr>
</tbody>
</table>

### Participate in Grocery Shopping

<table>
<thead>
<tr>
<th>Participation</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>197</td>
<td>98.5%</td>
</tr>
<tr>
<td>No</td>
<td>3</td>
<td>1.5%</td>
</tr>
</tbody>
</table>

### Participate in Exercise

<table>
<thead>
<tr>
<th>Participation</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>180</td>
<td>90.0%</td>
</tr>
<tr>
<td>No</td>
<td>20</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

### Smoking Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>1.0%</td>
</tr>
<tr>
<td>No</td>
<td>198</td>
<td>99.0%</td>
</tr>
</tbody>
</table>

### Frequency of Visits to a Physician

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a month</td>
<td>12</td>
<td>6.0%</td>
</tr>
<tr>
<td>Every 3-4 months</td>
<td>48</td>
<td>24.0%</td>
</tr>
<tr>
<td>Every 6 months</td>
<td>50</td>
<td>25.0%</td>
</tr>
<tr>
<td>Once a year</td>
<td>72</td>
<td>36.0%</td>
</tr>
<tr>
<td>&lt; Once a year</td>
<td>18</td>
<td>9.0%</td>
</tr>
</tbody>
</table>

### Frequency of Visits to a Registered Dietitian

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Once a month</td>
<td>3</td>
<td>1.5%</td>
</tr>
<tr>
<td>Every 3-4 months</td>
<td>5</td>
<td>2.5%</td>
</tr>
</tbody>
</table>
Every 6 months 1 (0.5)
Once a year 8 (4.0)
< Once a year 38 (19.0)
Never 145 (72.5)

Number of Prescription Medications Used
0 42 (21.0)
1 37 (18.5)
2 40 (20.0)
3 23 (11.5)
4+ 58 (29.0)

Number of Non-Prescription Medications Used
0 17 (8.5)
1 20 (10.0)
2 32 (16.0)
3 38 (19.0)
4+ 93 (46.5)

1 All data is participant-reported.
2 Sample sizes may total less than 200 as participants had the option of not answering a question.

2. Awareness and Consumption of Functional Foods

Prior to being presented with a functional food definition, 26.0% of participants reported that they were aware of the term “functional food.” When asked how they would define a functional food, participants most frequently articulated that functional foods are foods that contribute to health and healthy body function (34.5%), foods with nutritional value (24.5%), whole/natural foods (6.5%) and foods that are necessary to consume for good health (6.5%).

After being presented with a functional food definition, 93.0% of participants indicated that they currently consume functional foods, with 75.3% of these participants consuming functional foods on a daily basis and 15.1% of participants consuming
functional foods every other day. Functional foods were most likely to be consumed at breakfast (75.3%), followed by lunch (12.1%), snacks (6.6%) and dinner (6.0%) (Figure 2). The top five functional food products consumed included yogurt with probiotics (56.0% of participants), eggs with omega-3 fatty acids (37.0%), bread with added fibre (35.5%), cereal with added fibre (33.5%) and orange juice with added calcium and vitamin D (12.5%) (Figure 3).

There were no significant differences among gender, education or income groups for any variables related to the awareness or consumption of functional foods.

**Figure 2. Timing of functional food consumption.** Meal at which participants reported they are most likely to consume a functional food. Data is expressed as the percent of participants.
3. Food Matrices and Bioactive Ingredients as They Relate to Functional Foods

Yogurt and yogurt beverages (51.5% of participants), breads (44.0%) and cereals (40.0%) were the top three functional food matrices that participants reported currently consuming (Figure 4). In terms of food matrices that participants would consider consuming as a functional food, breads (31.0%), pasta (28.5%) and cheese (27.0%) were most commonly reported (Figure 4).
Figure 4. **Current and considered food matrices for functional foods.** Food matrices currently consumed as functional foods and food matrices participants would consider consuming as functional foods. Participants (n=200) indicated the top three food matrices they currently consume and the top three food matrices they would consider consuming as a functional food.

The bioactive ingredients participants considered most effective at improving their health were dietary fibre (86.9%) and omega-3 fatty acids (86.4%), followed by antioxidants (76.4%), probiotics (55.8%), prebiotics (26.6%) and plant sterols (22.1%). Dietary fibre was the most commonly reported bioactive currently consumed in a functional food (79.5%), followed by omega-3 fatty acids (70.0%), probiotics (43.5%), antioxidants (36.5%), prebiotics (3.5%) and plant sterols (3.5%) (Figure 5). Participants most frequently reported that they would consider consuming antioxidants in functional foods (53.0%), followed by omega-3 fatty acids (38.0%), dietary fibre (34.5%), probiotics (33.5%), plant sterols (28.5%) and prebiotics (24.0%) (Figure 5).
Figure 5. **Current and considered bioactives consumed in functional foods.** Bioactive ingredients currently consumed in functional foods and bioactive ingredients participants would consider consuming in functional foods. Participants (n=200) indicated the top three food bioactives they currently consume and the top three bioactives they would consider consuming in a functional food.

4. **Motivation to Consume Functional Foods**

Health reasons were the most frequently (45.0%) reported rationales for consuming functional foods, with 86.2% of participants indicating that they consume functional foods to improve their health. The majority of participants (79.6%) reported that they feel they have more control of their health by consuming functional foods.

Barriers to functional food consumption were not predominately reported, yet the most commonly reported barriers were taste (40.0%), cost/price (39.7%) and risk of adverse/negative effects (38.5%) (Figure 6). Related to cost, the majority of participants (72.2%) noted that they were willing to pay more for a functional food product, although participants with an annual household income < $50,000 were more likely to report cost
as a barrier to functional food consumption compared to those with an annual household income $\geq$ $50,000$ (p=0.0004). There were no other significant differences among gender, education and income groups for any variables related to motivation to consume functional foods.

![Figure 6. Barriers to functional food consumption.](image)

**Figure 6. Barriers to functional food consumption.** Factors reported to currently act as barriers to functional food consumption. Data is expressed as the percent of participants (n=200) who answered “yes” when asked if the factor was currently a barrier to functional food consumption.
5. Human Health as it Relates to Functional Foods

Participants predominately reported that they are very interested in their overall health (94.0%) and that there are specific areas of health that they are concerned about (85.0%). Health areas participants were concerned about were primarily reported as heart health (47.1%), arthritis/joint health (30.0%), osteoporosis/bone health (27.7%), diabetes (22.4%) and cancer (20.6%). Participants were asked which health areas they address or would consider addressing through the consumption of functional foods and response frequencies were high for all health areas considered. Specifically, participants most frequently reported that they address or would consider addressing osteoporosis/bone health (67.5%) through the consumption of functional foods, followed by heart disease (61.0%), arthritis (55.0%), constipation/bowel health (54.5%), eye health (50.0%), cancer (45.5%), diabetes (40.5%), immunity (39.0%) and hypertension (38.0%).

Figures 7-12 summarize the health areas that participants address, or would consider addressing, with consumption of specific bioactives in functional foods. Antioxidants were reported to most commonly address cancer (46.0% of participants), eye health (38.5%) and heart disease (33.5%) (Figure 7). Dietary fibre was reported to address constipation/bowel health (84.5%), cancer (32.0%) and heart disease (26.0%) (Figure 8). Omega-3 fatty acids were reported to address heart disease (65.0%), hypertension (27.0%) and cancer (24.0%) (Figure 9). Probiotics were reported to address constipation/bowel health (41.5%), immunity (21.5%) and heart disease (20.5%), although 38.5% indicated that they did not know (Figure 10). For prebiotics, 67.0% of participants did not know which health areas they address, however, 21.5% and 14.5% of participants reported they would address constipation/bowel health and immunity,
respectively (Figure 11). Finally, plant sterols were met with the most uncertainty with 72.0% of participants indicating they did not know, although 18.5% and 10.5% of participants specified heart disease and immunity, respectively (Figure 12).

Figure 7. Health areas addressed through the consumption of antioxidants in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of antioxidants in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.
Figure 8. Health areas addressed through the consumption of dietary fibre in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of dietary fibre in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.

Figure 9. Health areas addressed through the consumption of omega-3 fatty acids in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of omega-3 fatty acids in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.
Figure 10. Health areas addressed through the consumption of probiotics in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of probiotics in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.

Figure 11. Health areas addressed through the consumption of prebiotics in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of prebiotics in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.
63

Figure 12. Health areas addressed through the consumption of plant sterols in functional foods. Health areas participants (n=200) currently address or would consider addressing through the consumption of plant sterols in functional foods. Participants were able to select more than one health area and could specify “don’t know” as a response.

6. Perceived Risks as They Relate to Functional Foods

The majority (79.0%) of participants reported that they have confidence in the safety of functional foods. However, 41.2% of participants indicated that they feel there are risks involved in the consumption of functional foods, with female participants more likely to report perceiving risks related to functional food consumption (p=0.035). There were no other significant differences among gender, education or income groups in relation to perceived risks of functional foods.
Among participants who perceived risks involved in the consumption of functional foods, the most frequently reported risks were related to the potential for overconsumption/overdose (31.7%), lack of research/testing of functional foods (22.0%), lack of naturalness of functional food products (15.9%), lack of trust in the claimed benefits of functional foods (12.2%) and processing concerns related to the incorporation of bioactive ingredients (6.1%).

While negative/unpleasant/adverse reactions to functional food products were infrequently reported by participants (10.5%), the majority of adverse reactions experienced were related to gastro-intestinal disturbances (60.0%) and unpleasant taste (35.0%). Concerns about adverse interactions between functional food products and medications were uncommon among participants, with 16.6% of participants reporting that they worry about potential interactions.

7. Knowledge and Information about Functional Foods

An increased awareness and knowledge (85.5% of participants) and the influence of a health professional (71.0%) were the most frequently identified factors that would promote functional food consumption among participants (Figure 13). Cost/price ranked fifth as a factor that would promote consumption (48.0%) and participants with an annual household income ≥ $50,000 were less likely to report that cost of functional foods was a factor compared to those with an annual household income < $50,000 (p=0.0017). There were no other significant differences among gender, education or income groups for any factors that would promote functional food consumption.
Related to awareness and knowledge, over half of participants (56.5%) reported that they actively seek out information about functional foods with the most common source of information being food labels (74.3%), followed by newspapers, magazines and/or books (71.7%), family and/or friends (54.9%), the internet (52.2%), television and/or radio (36.3%), a physician (31.9%), dietitian (23.0%), pharmacist (13.3%), naturopathic doctor (11.5%), chiropractor (6.2%) and nurse (4.4%) (Figure 14). Among the 63.5% of participants who indicated they needed further information about functional foods, the preferred sources included newspapers, magazines and/or books (68.5%), food labels (66.1%), the internet (48.8%), a physician (40.2%), dietitian (38.6%), television and/or radio (38.6%), family and/or friends (36.2%), pharmacist (16.5%), nurse (12.6%), naturopathic doctor (11.0%) and chiropractor (7.9%) (Figure 14). The type of information needed was most frequently identified as that pertaining to the health benefits
of functional foods (26.8%), the bioactive ingredients associated with functional foods (15.8%) and the risks/adverse effects related to functional foods (14.2%) (Table 6).

There were no significant differences among gender, education or income groups for any variables related to information about functional foods.

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**Figure 14. Current and preferred sources of information about functional foods.**

Current and preferred sources of information about functional foods expressed as the percent of participants who selected the identified source of information from a list. Participants were able to select more than one source of information. “Printed materials” refers to newspapers, magazines and/or books.
Table 6. Type of information participants would like to receive about functional foods$^{1,2}$.

<table>
<thead>
<tr>
<th>Type of Information</th>
<th>Percent of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information about health benefits</td>
<td>26.8</td>
</tr>
<tr>
<td>Information about the bioactives</td>
<td>15.8</td>
</tr>
<tr>
<td>Information about risks/adverse effects</td>
<td>14.2</td>
</tr>
<tr>
<td>Fact/research-based, credible information</td>
<td>13.4</td>
</tr>
<tr>
<td>Information about other aspects/content of the food</td>
<td>10.2</td>
</tr>
</tbody>
</table>

$^1$Data is expressed as a percentage of the participants who answered “yes” when asked if they would like more information about functional foods (n=127).

$^2$The five most common responses are presented. Participants were able to provide more than one response.

8. Health Claims as They Relate to Functional Foods

The majority of participants (93.5%) reported that they were aware of the health claims that are present on some food labels and of those that were aware, 91.0% indicated that they read the health claims. Participants with a higher education level (college, university or post-graduate degree) were more likely to report being aware of the health claims compared to those with a lower education level (some college or university, high school graduate or some high school) (p=0.045), with no significant differences among gender or income groups.
Nutrient content claims were predominately reported to be informative (80.8% of participants) and the majority of participants (68.5%) indicated that the presence of a nutrient content claim on a functional food label would increase the likelihood that they would consume that functional food product, with no significant differences found in gender, education or income groups. The most frequently reported nutrients that, when mentioned in some type of nutrient content claim on a functional food product, would increase participants’ consumption of the product included salt/sodium (78.0%), dietary fibre (67.5%) and omega-3 fatty acids (61.0%) (Figure 15).

![Bar chart showing nutrient consumption](chart.png)

**Figure 15. Nutrients mentioned in a nutrient content claim that would increase functional food consumption.** Nutrients that, if mentioned in a nutrient content claim on a functional food product, would increase participants’ consumption of the product. Participants (n=200) were able to select more than one nutrient. Nutrient content claims were described to participants using an information sheet as claims on food packaging that indicate the presence of a specific nutrient but do not explicitly relate the nutrient to health.
Nutrient function claims were predominately reported to be informative (76.7%) and the majority of participants (63.5%) indicated that the presence of a nutrient function claim on a functional food label would increase the likelihood that they would consume that functional food product, with no significant differences found in gender, education or income groups. The primary functions or biological roles that, when mentioned in a nutrient function claim on a functional food product, would increase participants’ consumption of the product included “helps lower cholesterol” (60.5%), “factor in the formation and maintenance of bones and teeth” (56.5%) and “dietary antioxidant” (55.5%) (Table 7).

Table 7. The functions or biological roles that, if mentioned in a nutrient function claim on a functional food product, would increase participants’ consumption of the product.

<table>
<thead>
<tr>
<th>Function or Biological Role</th>
<th>Percent of Participants (n=200)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helps lower cholesterol</td>
<td>60.5</td>
</tr>
<tr>
<td>Factor in the formation/maintenance of bones and teeth</td>
<td>56.5</td>
</tr>
<tr>
<td>Dietary antioxidant</td>
<td>55.5</td>
</tr>
<tr>
<td>Factor in the maintenance of good health</td>
<td>44.5</td>
</tr>
<tr>
<td>Helps build antibodies</td>
<td>44.5</td>
</tr>
<tr>
<td>Promotes regularity</td>
<td>42.5</td>
</tr>
<tr>
<td>Helps build and repair body tissues</td>
<td>40.0</td>
</tr>
</tbody>
</table>
Aids in maintaining the health of skin and membranes 34.0
Aids in red blood cell formation 34.0

1 Participants were able to select more than one function or biological role.

2 Nutrient function claims were described to participants using an information sheet as health claims on food packaging that link a component of the product to the maintenance of a physiological function or to physical or mental performance, without explicit reference to a disease.

Disease risk reduction claims were predominately reported to be informative (67.3%). While 53.8% of participants indicated that the presence of a disease risk reduction claim on a functional food label would increase the likelihood that they would consume that functional food product, gender was a significant factor (females more frequently responded yes \( p=0.033 \)), with no significant differences among education or income groups. The primary health areas that, when mentioned in a disease risk reduction claim on a functional food product, would increase participants’ consumption of the product included heart disease (53.0%), osteoporosis/bone health (53.0%) and cancer (44.5%) (Figure 16).
Figure 16. Health areas mentioned in a disease risk reduction claim that would increase functional food consumption. Health areas that, if mentioned in a disease risk reduction claim on a functional food product, would increase participants’ consumption of the product. Participants (n=200) were able to select more than one health area. Disease risk reduction claims were described to participants using an information sheet as health claims on food packaging that link a component of the product to a reduced risk of a diet-related disease or condition.

In regards to overall understanding of the claims, the majority of participants did not find nutrient content (63.5%), nutrient function (66.0%), or disease risk reduction (74.8%) claims to be confusing. For disease risk reduction claims, education significantly influenced this result in that those with a college, university or post-graduate degree more frequently reported that they did not find them confusing compared to participants with a lower level of education (some college or university, high school graduate or some high school) (p=0.022). Of those participants who provided a reason for their confusion regarding the claims, the primary reason specified for nutrient content claims was that they did not contain enough information (37.1%), with 21.6% of
participants stating that they would further investigate the rest of the label, including the nutrition facts table. For both nutrient function and disease risk reduction claims, the primary reason for confusion specified was that participants were skeptical and/or had a lack of trust in the claims (39.5% and 50.6%, respectively) (Table 8). When asked to compare nutrient content claims, nutrient function claims and disease risk reduction claims, participants primarily reported that the claims were equally informative (34.5%) or that nutrient content claims were most informative (34.5%).

Table 8. Summary of the top five reasons for confusion regarding health claims.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Nutrient Content Claims (n=116)^1</th>
<th>Nutrient Function Claims (n=86)^1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enough information</td>
<td>37.1</td>
<td>19.8</td>
</tr>
<tr>
<td>Skeptical, do not trust claim</td>
<td>24.1</td>
<td>39.5</td>
</tr>
<tr>
<td>Claim is misleading, exaggerated</td>
<td>22.4</td>
<td>10.5</td>
</tr>
<tr>
<td>View claim as advertising/marketing</td>
<td>15.5</td>
<td>14.0</td>
</tr>
<tr>
<td>“High” or “low” relative to what?</td>
<td>12.9</td>
<td></td>
</tr>
</tbody>
</table>

^1 Percent of participants
### Disease Risk Reduction Claims (n=85)

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skeptical, do not trust claim</td>
<td>50.6</td>
</tr>
<tr>
<td>View claim as advertising/marketing</td>
<td>18.8</td>
</tr>
<tr>
<td>Claim is misleading</td>
<td>18.8</td>
</tr>
<tr>
<td>Not enough information</td>
<td>5.9</td>
</tr>
<tr>
<td>What quantity of bioactive is in the product?</td>
<td>5.9</td>
</tr>
<tr>
<td>Disconnect between the claim and the food matrix</td>
<td>5.9</td>
</tr>
</tbody>
</table>

1 Data is expressed as the percent of participants who provided comments about their confusion regarding the health claim.

2 Participants who found disease risk reduction claims confusing for this reason indicated that they were confused because these claims were on food products that contain added sugars and therefore the claims did not make sense on those particular food products.
VI. DISCUSSION

The purpose of the current study was to generate information related to functional food consumption among a sample of 200 community-dwelling older adults using a research-administered questionnaire. The study questionnaire examined awareness of functional foods, current consumption and purchase patterns, motivations for functional food consumption, food matrices, bioactive ingredients and health areas related to functional foods and perceived risks related to functional food consumption. Information sources for functional foods and perceptions of health claims on functional food products were also explored. This study addresses a need to understand the consumption, awareness and perceptions of older adults with respect to functional foods given their rapid expansion within the population (Health Canada, 2002; Turcotte et al., 2007) and the potential for older adults to benefit from the incorporation of functional foods into their diets due to age-related nutrition and health issues (Payette et al., 2000; Paulionis, 2008). To date, a comprehensive investigation into the consumption and perceptions of functional foods among the older adult consumer segment has not been realized and therefore this study addresses a critical knowledge gap.

1. Participant Characteristics

The current study was partly unique in that all participants were 60 years of age or older (mean age of 70.8 years old) which is reflective of the aging population in Canada (Health Canada, 2002; Turcotte et al., 2007). Previous investigations into the consumption, attitudes and perceptions of functional foods have explored a broader age demographic (Urala et al., 2003b; Verbeke, 2005; Badrie et al., 2007; Landstrom et al.,
2007; Ares et al., 2008a; Landstrom et al., 2009) and have primarily been conducted in samples of European (Urala et al., 2003b; Verbeke, 2005; Landstrom et al., 2007; Niva, 2007; Siegrist et al., 2008; Landstrom et al., 2009), South American, (Ares et al., 2007; Ares et al., 2008a) and Australian (Bhaskaran et al., 2002; Patch et al., 2005b) adults. Hence this is the first comprehensive study investigating factors related to functional food consumption among a sample of older adults in Canada. Participants in the current study were predominately female (70.0%) and Caucasian (95.0%) which is consistent with the higher proportion of women and those of Caucasian ethnicity within the Canadian older adult population, as reported by a 2006 Statistics Canada report (Turcotte et al., 2007). However, participants in the current study reported having a higher degree of education and a greater annual household income than the overall Canadian population of older adults (Turcotte et al., 2007), which may limit the generalizability of the study results.

2. Awareness and Consumption of Functional Foods

Prior to being presented with a definition of functional foods, only 26.0% of the current study’s participants reported that they were aware of the term “functional food.” This is comparable to previous research examining consumer awareness of functional foods in which the reported familiarity of the term “functional food” has ranged from 12.5 to 39.4% of participants (Wansink et al., 2005; Badrie et al., 2007; Ares et al., 2008a; Markovina et al., 2011). When asked how they would define a functional food, participants in the current study most frequently responded that functional foods are foods that contribute to health and healthy body function (34.5%), which is consistent with a survey of Uruguayan consumers in which 38.0% of participants associated the term “functional foods” with foods that have some influence on health (Ares et al.,
While the current study’s results demonstrate a relatively low awareness of functional food terminology, it is evident that consumers associate the concept of functionality in food with an impact on health.

Prevalence of functional food consumption was 93.0% in the current study, with 75.3% of participants indicating that they consume functional foods daily and most often at breakfast (75.3%). While no other studies have examined timing of functional food consumption, the high prevalence of consumption is comparable to previous research exploring functional food use among Korean (Kim et al., 2010), Swedish (Landstrom et al., 2007) and Finnish (Urala et al., 2003a) adults in which the prevalence of functional food consumption was 73.3%, 83.0% and 96.0% of participants, respectively. However, the frequency of functional food consumption among the current study’s sample of older adults is greater than that reported among Dutch consumers, of which 30.0% of participants used one functional food or supplement at least once a week (de Jong et al., 2003). Furthermore, a questionnaire study conducted among Trinidadian consumers reported that 54.7% of participants consume functional foods more than twice per week (Badrie et al., 2007) and a survey of French Canadian and American college/university students found that participants who consume functional foods reported doing so about once a month (Labrecque et al., 2006). Considering the rapid advancement of the functional foods industry (Cinnamon, 2009), the more frequent consumption of functional foods among participants in the present study may be related to the increased availability of functional food products in the current marketplace. Overall, the high prevalence and frequency of functional food consumption among participants in this
study suggests that older adults are incorporating functional food products into their diets and that they may prefer to consume those products at breakfast.

The top three functional food products consumed most often by older adults in the current study were reported as yogurt with probiotics (56.0% of participants), eggs with omega-3 fatty acids (37.0%) and bread with added fibre (35.5%). Previous studies have also found probiotic milk products and fibre-added products to be the top functional foods consumed among Swedish (Landstrom et al., 2007) and Finnish adults (Urala et al., 2003a; Niva, 2006; Urala et al., 2007). However, other studies have found eggs with omega-3 fatty acids to be the least frequently consumed functional food among Swedish consumers (Landstrom et al., 2007) and cholesterol-lowering spreads to be among the most frequently consumed functional foods within Swedish (Landstrom et al., 2007) and Finnish (Urala et al., 2003a; Niva, 2006; Urala et al., 2007) consumers. Study differences may be due to variations in functional food product availability between countries, including duration of time available on the market, as consumers are generally more accepting of functional food products that they are more familiar with (Urala et al., 2007). As cholesterol-lowering spreads containing plant sterols were introduced into the Canadian market in 2010 (Health Canada, 2010c), more time may be required before older adult consumers incorporate this functional food into their diets and the functional food products most commonly consumed may change as the Canadian functional food market evolves.

3. Food Matrices and Bioactive Ingredients as They Relate to Functional Foods

The top three functional food matrices participants in this study reported that they currently consume were yogurt and yogurt beverages (51.5%), breads (44.0%) and
cereals (40.0%), while breads (31.0%), pasta (28.5%) and cheese (27.0%) were the top functional food matrices that participants would consider consuming. Participant preference for yogurt/yogurt beverages as a functional food matrix is consistent with results of multiple previous studies that have also found that participants view yogurt as the most attractive and appropriate carrier for bioactive ingredients, likely due to its intrinsically healthy image (van Kleef et al., 2005; Ares et al., 2007; Siegrist et al., 2008; Hailu et al., 2009). Taken together, these results support the premise that intrinsically healthy food matrices are perceived to be credible carriers for bioactive ingredients relative to food matrices viewed as inherently unhealthy. The frequent preference for bread as a functional food matrix in the current study is also consistent with previous studies of Dutch (van Kleef et al., 2005) and Danish (Krutulyte et al., 2011) adults that identified bread among the most attractive matrices for functional foods. Similarly, a consumer survey conducted in the United Kingdom, Italy, Finland and Germany, found that participants perceived a greater benefit of functional ingredients when they were added to staple foods such as bread and pasta compared to occasionally consumed foods (Dean et al., 2007). The concept that older adults prefer functional food matrices that are either intrinsically healthy and/or are staple foods is supported by the current study as well as previous studies. This information is of value from a food industry perspective as it suggests that product development involving these functional food matrices may be well accepted among older adult consumers.

Functional food bioactive ingredients considered most effective at improving health by the current study’s participants were dietary fibre (86.9%) and omega-3 fatty acids (86.4%), followed by antioxidants (76.4%), probiotics (55.8%), prebiotics (26.6%)
and plant sterols (22.1%). Noteworthy is that these results are consistent with participants’ current consumption of the functional food bioactive ingredients with the most frequent being dietary fibre (79.5%) and omega-3 fatty acids (70.0%) and the least frequent being prebiotics (3.5%) and plant sterols (3.5%). The identification of dietary fibre as a commonly consumed functional food bioactive in the current study is comparable to previous studies of Finnish (Urala et al., 2003a) and Uruguayan (Ares et al., 2007) consumers who also reported most frequent use of functional food products with added dietary fibre. These favourable attitudes towards dietary fibre as a bioactive ingredient for functional foods may relate to its familiarity, which could also explain the relatively less frequent consumption of prebiotics and plant sterols. This idea is supported by evidence that consumers are more likely to accept functional ingredients that have been available on the market for a relatively long period of time and that are well-known for their health benefits (Bech-Larsen et al., 2007; Urala et al., 2007).

4. Motivation to Consume Functional Foods

The most commonly reported barrier to functional food consumption among participants in this study was taste (40.0%). However, barriers to functional food consumption were not predominately reported. Taste has been identified in numerous consumer studies as a core factor that influences functional food consumption (Urala et al., 2003b; Patch et al., 2005a; Landstrom et al., 2009; de Morais et al., 2010; Lalor et al., 2011; Markovina et al., 2011) and previous research has found that consumers perceive functional foods to taste worse than conventional foods (Verbeke, 2005; Landstrom et al., 2009). It has been suggested that consumers are unlikely to compromise on the taste of functional foods, even when considering the health benefits of such products (Cox et al.,
However, the results of a Belgian study determined that female consumers, older consumers and consumers with a high general health interest demonstrate a higher willingness to compromise on taste for the perceived health benefits of functional foods (Verbeke, 2005). This is consistent with results of the current study as although taste was the most commonly identified barrier to functional food consumption, it was not predominately reported among participants in this sample, which may be attributable to the older consumer demographic examined.

Cost/price was also reported as a barrier to functional food consumption among 39.7% of participants in the current study. Previous consumer studies have identified cost/price as a primary factor influencing functional food purchase and consumption (Urala et al., 2003b; Niva, 2006; Badrie et al., 2007; Hailu et al., 2009), with some research suggesting that the higher prices of functional foods are perceived by consumers to be unjustified (Frewer et al., 2003; Landstrom et al., 2009). This is dissimilar to the results of the current study in that the majority (72.2%) of participants indicated that they would be willing to pay more for a functional food product. However, participants with a lower annual household income (< $50,000 Canadian) were significantly more likely to report cost as a barrier to functional food consumption compared to those with a higher annual household income (≥ $50,000 Canadian). This is contrary to a previous survey investigating Canadian consumers’ receptivity towards functional food products which reported that consumers who are more receptive to functional foods and nutraceuticals tend to reside in lower income households (Herath et al., 2008). Overall, the majority of previous research has found weak associations in terms of socio-demographic variables.
and factors related to functional food consumption (de Jong et al., 2003; Verbeke, 2005; Sabbe et al., 2009).

Risk of adverse/negative effects was the third most frequently reported barrier to consumption of functional foods, although also relatively low at 38.5% of participants in the current study. Focus groups studies conducted in samples of Australian (Patch et al., 2005a), Swedish (Landstrom et al., 2009) and Finnish (Niva, 2007) adults have also determined that consumers are concerned about the potential adverse effects of functional foods and these concerns are related to the overconsumption of bioactive ingredients (Patch et al., 2005a; Landstrom et al., 2009), possible negative interactions between functional foods or between ingredients within a functional food (Niva, 2007; Landstrom et al., 2009) and unknown long-term side effects (Niva, 2007). Similar concerns were described by participants in the current study, as the top reported risks pertaining to functional food consumption were related to the potential for overconsumption/overdose (31.7%) and lack of research/testing of functional foods (22.0%) and these concerns may be attributable to the relatively novel presence of functional food products in the Canadian marketplace. However, considering that the majority (79.0%) of participants in the present study reported that they have confidence in the safety of functional foods, as well as the high prevalence (93.0%) of functional food consumption among participants, the perceived risk of adverse effects related to functional food consumption does not appear to be a major barrier to functional food consumption in this sample of older adults.

In terms of motivation to consume functional foods, health reasons were the most frequently (45.0%) reported rationales in the present study. The majority of participants indicated that they consume functional foods to improve their health (86.2%) and that
they feel they have more control over their health by consuming functional foods (79.6%). Health-related reasons, including belief in the health benefits of functional foods, have frequently been reported as motivating factors influencing functional food consumption (Urala et al., 2003b; Verbeke, 2005; Niva, 2006; Badrie et al., 2007; Landstrom et al., 2007; Ares et al., 2009) and it has been suggested that consumers connect functional foods with control over life and health (Urala et al., 2003b). Other motivators including mental and physical performance enhancement (Urala et al., 2003b; Badrie et al., 2007), enhancement of general well-being (Herath et al., 2008) and cosmetic reasons (Badrie et al., 2007) have also been reported. The results of the current study provide evidence that older adults are motivated to support and improve their health through functional food consumption and this motivation is essential if functional foods are to be utilized as a strategy to address age-related health concerns.

5. Human Health as it Relates to Functional Foods

The majority (94.0%) of participants in the current study reported that they are very interested in their overall health and a high interest in health has been linked with positive attitudes and greater purchase intention for functional foods in Swedish (Landstrom et al., 2007) and Danish (Krutulyte et al., 2011) questionnaire studies. When the current study’s participants were asked which health areas they address, or would consider addressing through the consumption of functional foods, response frequencies were high for multiple health areas providing evidence that older adults are motivated to address multiple health concerns through functional food consumption. Specifically, participants most frequently reported osteoporosis/bone health (67.5%), heart disease (61.0%), arthritis (55.0%), constipation/bowel health (54.5%) and eye health (50.0%) as
health areas that they address or would address through functional food consumption. Previous studies have linked functional food consumption with health areas including a Swiss study that reported the highest willingness to buy functional foods occurred when they were associated with a reduced risk of osteoporosis, cardiovascular disease and cancer (Siegrist et al., 2008) and a Uruguayan study that reported cancer and cardiovascular disease as the top health areas that participants would prefer to influence through functional food consumption (Ares et al., 2008a). The health areas identified in relation to functional foods in the current study align with a 2006 Canadian report that identified the most common chronic conditions among older adults as arthritis, high blood pressure and eye-related problems and the main causes of death as cancer and heart disease (Turcotte et al., 2007). Hence, it is evident that older adults in the current study are motivated to address the primary age-related health conditions through functional food consumption. Knowledge of the specific health areas that older adults would address through nutritional strategies that include functional foods has the potential to drive the development of functional food products that address these health concerns.

Participants in the current study were also asked to identify the health areas they address, or would consider addressing through the consumption of specific bioactive ingredients in functional foods. The most frequent links were reported between dietary fibre and constipation/bowel health (84.5%); antioxidants and cancer (46.0%); omega-3 fatty acids and heart disease (65.0%); and probiotics and constipation/bowel health (41.5%). These results contrast those of a questionnaire study of a broader Uruguayan demographic in which 48% of participants had low awareness of any health issues related to dietary fibre or antioxidants (Ares et al., 2008b). On the other hand, results of an
Australian focus group found that older participants demonstrated greater knowledge of diet-health relationships, particularly with respect to dietary fibre reducing the probability of bowel cancer (Bhaskaran et al., 2002). It is noteworthy that, as mentioned, dietary fibre, omega-3 fatty acids, antioxidants and probiotics were the top bioactives currently consumed in functional foods by participants in the current study, which may relate to the ability of older adults in this sample to associate these bioactives with particular health benefits. This is supported by previous research which has suggested that the acceptance of a specific functional ingredient is linked to consumers’ awareness of its potential health benefits (Menrad, 2003; Bech-Larsen et al., 2007; Ares et al., 2008b).

Plant sterols and prebiotics were met with the most uncertainty in relation to health as 72.0% and 67.0% of the current study’s participants did not know which health areas they address or could address through their consumption, respectively. Current consumption of these bioactives in functional foods was also low and they were considered the least effective at improving health, all of which may relate to the low awareness of particular health areas that could potentially be improved through consumption of these bioactives. Given that heart disease was both a primary health concern as well as an area of health participants in the current study would address through functional food consumption, older adults in this sample could particularly benefit from knowledge related to the effects of plant sterols on blood cholesterol. Hence, functional food products containing plant sterols and prebiotics may achieve greater success among older adult consumers if further promotion of functional food products effectively communicates the health benefits of these bioactives.
6. Knowledge and Information about Functional Foods

An increased awareness and knowledge about functional foods was the most frequently identified factor (85.5% of participants) that would increase functional food consumption. This is consistent with results of a Portuguese study in which knowledge and familiarity with the functional food product were among the top factors influencing choices of functional foods (de Morais et al., 2010). Other questionnaire studies have also shown that knowledge, particularly with respect to the nutritional attributes and potential health benefits of functional foods, can increase consumers’ perceived healthiness of functional foods (Ares et al., 2008b) and willingness to consume functional foods (Wansink et al., 2005; Ares et al., 2008b). Participants in the current study also frequently reported (71.0% of participants) that the influence of a health professional would increase their consumption of functional foods, suggesting that the advice of health professionals has the potential to influence functional food consumption among older adults. This is in line with previous research that has shown that consumers perceive health professionals to be credible and trustworthy sources of information regarding functional foods (Hilliam, 1996; Bhaskaran et al., 2002; Patch et al., 2005a; Landstrom et al., 2009; Lalor et al., 2011).

Related to information, the majority (56.5%) of participants in the current study indicated that they actively seek out information about functional foods. The most common sources of information about functional foods utilized by participants were food labels (74.3%), newspapers, magazines and/or books (71.7%) and family and/or friends (54.9%). These results are comparable to those of a Swedish questionnaire study in which the most common sources of information for functional foods were identified as
television, advertisements in newspapers or magazines and food packaging. Furthermore, a 2008 Canadian population study investigating nutrition knowledge, attitudes and behaviours found that Canadian consumers obtain food and nutrition information from easily accessible sources and that the most common sources utilized were food labels, the internet and magazines, newspapers and books (Canadian Council of Food and Nutrition, 2008). Also consistent with the current study, focus group research has identified family and/or friends as key sources of information pertaining to functional foods (Patch et al., 2005a; Korzen-Bohr et al., 2006; Lalor et al., 2011). While some studies have suggested that consumers distrust the information on food labels (Patch et al., 2005a; Korzen-Bohr et al., 2006), the results of the current study demonstrate that the older adult consumers primarily utilize food labels as a source of information about functional foods.

Noteworthy is that although participants in the current study predominately reported that the influence of a health professional would increase their functional food consumption, health professionals were not among the common sources of information for functional foods. Hence, there is great potential for health professionals to promote increased functional food acceptance and consumption among older adults by serving as a source of credible information pertaining to functional foods.

Participants in the current study predominately (63.5%) indicated that they need more information about functional foods and would prefer to receive this information from newspapers, magazines and/or books (68.5%), food labels (66.1%) and the internet (48.8%). As increased awareness and knowledge was the primary factor that would increase functional food consumption among this sample of older adults, functional food information coming from these sources is likely to influence awareness and consumption.
The type of information participants would like to receive about functional foods largely pertained to the health benefits of functional foods (26.8%), the bioactive ingredients in functional foods (15.8%) and the risks/adverse effects related to functional foods (14.2%). Similarly, participants of a focus group study conducted in Sweden expressed a lack of knowledge regarding which ingredients in functional foods have an effect on the body and how these ingredients impact health (Landstrom et al., 2009). Previous questionnaire studies conducted in Uruguayan (Ares et al., 2008b) and American (Wansink et al., 2005) adults have also suggested that the most influential information with respect to consumer acceptance of functional foods is that which communicates the relationship between the functional ingredient and health. While a relatively low percentage (14.2%) of participants in the current study perceived the need for information pertaining to the risk of adverse/negative effects of functional foods, previous focus group studies have highlighted consumer concerns regarding the safety of functional foods, particularly with regards to the potential long-term effects on health (Niva, 2007), the possibility of overconsumption of bioactive ingredients (Patch et al., 2005a; Landstrom et al., 2009) and negative interactions between functional foods or between ingredients within a functional food product (Niva, 2007; Landstrom et al., 2009).

Overall, it is evident that older adults in this sample are motivated to seek out information about functional foods and more information, particularly with respect to the health benefits of functional foods, has the potential to increase functional food consumption among this consumer segment.
7. Health Claims as they Relate to Functional Foods

The majority of participants (93.5%) in the current study reported that they were aware of the health claims on food labels. Of those that were aware, 91.0% indicated that they read the health claims which is relatively higher than the prevalence of food label use identified in studies conducted in France (Mannell et al., 2006), Uruguay (Ares et al., 2008a), New Zealand (Gorton et al., 2009) and the United Kingdom (Grunert et al., 2010) which ranged from 27.0% to 82.0% of participants. This difference may be due to the fact that participants in the current study were asked specifically about their awareness and use of health claims on food labels, while the mentioned studies inquired about overall food label use among participants (Mannell et al., 2006; Ares et al., 2008a; Gorton et al., 2009; Grunert et al., 2010). The difference may also be due to over-reporting by participants in the current study; however, some studies have shown that older consumers tend to be more health-oriented and have a greater interest in healthy eating (Bech-Larsen et al., 2007; Grunert et al., 2010) which may translate into greater use and interest in nutrition information (Williams, 2005; van Trijp, 2009). In the current study, participants with a higher education level were significantly more likely to report being aware of health claims compared to those with a lower education level, which is comparable to previous research that has demonstrated a greater use of nutrition labels among individuals with a higher level of education (McArthur et al., 2001; Williams, 2005). Overall, these findings indicate that older adult consumers in this sample are cognisant of the health claims on functional food products and that level of education plays a role in consumer awareness of health claims.
The majority of older adult participants in the current study indicated that they found nutrient content claims, nutrient function claims and disease risk reduction claims to be informative and that the presence of these health claims on a functional food label would increase their likelihood of consuming that functional food product. Similarly, results of a number of questionnaire (Tuorila et al., 2002; Sabbe et al., 2009; Saba et al., 2010), interview-based (Roe et al., 1999) and purchase simulation (Aschemann-Witzel et al., 2010) studies have shown that the presence of a health claim on a functional food product has a positive effect on purchase intention and the likelihood of consumption of the product. The presence of health claims on functional food products has been shown to influence consumers’ perceptions of the healthiness and nutritional value of the products (Roe et al., 1999; Mialon et al., 2002; Ares et al., 2009; Sabbe et al., 2009; Saba et al., 2010), which may rationalize consumers’ reported preference for products with health claims. In the present study, females were significantly more likely than males to report that the presence of a disease risk reduction claim on a functional food label would increase the likelihood that they would consume that product. Although a number of previous studies conducted in samples of Belgian (Verbeke, 2005; Sabbe et al., 2009; Verbeke et al., 2009) and Finnish (Urala et al., 2007) adults have found weak associations between socio-demographic variables and attitudes towards functional foods and their health claims, some studies have demonstrated that women are more interested in nutrition information (van Trijp, 2009) and healthy eating (Poulsen, 1999; Grunert et al., 2010) than men. Ultimately, further research is needed in order to elucidate the relationship between socio-demographic variables and consumer perceptions of health.
claims on functional food products in order to develop targeted nutrition information that will appeal to specific consumer groups.

Participants in the current study were asked to indicate which nutrients, when mentioned in a nutrient content claim on a functional food product, would increase their consumption of the product. The most common responses were salt/sodium (78.0% of participants), dietary fibre (67.5%) and omega-3 fatty acids (61.0%) although responses were high for most of the nutrients listed, suggesting that older adults in this sample consider a number of food components when using nutrient content claims to make choices regarding functional food products. The frequent choice of a salt/sodium nutrient content claim in the current study is comparable to previous studies conducted in Australian (Bhaskaran et al., 2002) and English (Grunert et al., 2010) adults in which participants most frequently searched for information on food labels regarding the content of fat, sugar, salt and calories. This finding may also be attributable to the current focus on reducing the sodium content in food products in Canada and the increased public awareness of health issues related to high sodium intake (Health Canada, 2012e).

Additionally, heart health was the most frequently reported (47.1%) health concern among participants in the current study, which may further explain the participants’ cognisance of the sodium content of functional food products. Dietary fibre and omega-3 fatty acids were also frequently chosen by participants in the current study as nutrients that, when mentioned in a nutrient content claim on a functional food label, would increase consumption, suggesting that the content of these bioactive ingredients is of particular interest to older adults when choosing functional food products. This information is of value from a food industry perspective as further development of
functional food products which are low in sodium and contain these bioactives may be well accepted among older adult consumers.

When participants in the current study were asked to select the primary functions or biological roles that, when mentioned in a nutrient function claim on a functional food product, would increase the likelihood that they would consume the product, their most common responses were “helps lower cholesterol” (60.5%) and “factor in the formation and maintenance of bones and teeth” (56.5%). These findings are similar to the results of questionnaire studies conducted in a broader consumer demographic in the Netherlands (van Kleef et al., 2005), Trinidad (Badrie et al., 2007) and Uruguay (Ares et al., 2008a) in which claims for functional foods related to lowering or maintaining healthy cholesterol levels were among the top preferred claims, although claims related to strengthening the immune system and providing the body with energy were also among the top preferred claims (van Kleef et al., 2005; Badrie et al., 2007; Ares et al., 2008a). In the current study, participants reported heart disease (53.0%), osteoporosis/bone health (53.0%) and cancer (44.5%) as the top health areas that, when mentioned in a disease risk reduction claim on a functional food product, would increase their consumption of the product. Claims on functional foods pertaining to a reduced risk of cancer and heart disease were also among the top preferred claims reported by participants in previous questionnaire studies (van Kleef et al., 2005; Ares et al., 2008a) and it has been suggested that claims on functional food products relating to health areas that are of personal relevance to consumers are expected to be most successful in the marketplace (Hilliam, 1996; Urala et al., 2003a; van Kleef et al., 2005). The results of the current study suggest that the primary health concerns of older adults in this sample are heart health, maintenance of
healthy cholesterol levels and osteoporosis/bone health. This information has the potential to drive the development of functional food products that bear claims relating to these health concerns, as they may be successful among older adult consumers.

With respect to understanding of health claims on functional food products, the majority of participants in this study did not find nutrient content (63.5%), nutrient function (66.0%), or disease risk reduction (74.8%) claims to be confusing. Furthermore, participants with a higher level of education were significantly more likely to report that they did not find disease risk reduction claims confusing compared to those with a lower level of education, suggesting that education not only contributes to awareness of health claims among older adults in this sample, but also to understanding of the claims. However, as highlighted by a large-scale cross-national study conducted in Italy, Germany, the United Kingdom and the United States, numerous factors are likely to influence consumer understanding of health claims including knowledge pertaining to the claim or the food component mentioned in the claim, familiarity with the product and familiarity with the terminology used in the claim (van Trijp et al., 2007). Among participants in the current study, the main reason for confusion regarding nutrient content claims was that they did not contain enough information (37.1%), with 21.6% of participants stating that they would look to the rest of the label, including the nutrition facts table, for more information. This is contrary to an interview-based study conducted by the United States Food and Drug Administration which found that in the presence of a nutrient-health claim, consumers tend to truncate their information search to only the claim itself and do not typically investigate the nutrition information on the rest of the label (Roe et al., 1999). However, coinciding with the frequent use of the food label as a
source of information for functional foods, it is evident that older adults in the present study utilize the nutrition information present on food labels to increase their knowledge and understanding of the health claims associated with functional food products.

Of the participants in the present study who found nutrient function and disease risk reduction claims to be confusing, the primary reason for confusion specified was that participants were skeptical and/or had a lack of trust in the claims (39.5% and 50.6%, respectively). A number of focus group studies examining consumer beliefs and attitudes towards functional foods and their associated health claims also found that participants exhibited skepticism towards health claims, which was related to a lack of trust in the information provided by food manufacturers (Bhaskaran et al., 2002; Patch et al., 2005a; Korzen-Bohr et al., 2006; Landstrom et al., 2009). Participants sampled from Canadian (Hailu et al., 2009), Australian (Patch et al., 2005a) and Uruguayan (Ares et al., 2008b) adults have communicated that they would be more trusting of claims that were substantiated by scientific evidence and verified by the government. These data highlight the importance of consumer trust in the information pertaining to functional foods, which is a key factor for functional food acceptance (Frewer et al., 2003; Siegrist et al., 2008).

While the minority of participants in the current study expressed skepticism towards the health claims on functional foods, the implementation of educational campaigns designed to inform consumers of the thorough regulatory process required to approve health claims for food products in Canada may improve consumers’ perceptions of the credibility of health claims.

In order to elucidate the type of health claim preferred by older adults in the present study, participants were asked whether they found nutrient content claims,
nutrient function claims, or disease risk reduction claims to be most informative. Participants primarily reported that the claims were equally informative (34.5%) or that nutrient content claims were most informative (34.5%). Numerous previous studies have attempted to determine the type of health claim preferred by consumers (Urala et al., 2003a; van Kleef et al., 2005; Grunert et al., 2009; Hailu et al., 2009; Verbeke et al., 2009), however the results have been inconsistent which may be related to differences in the consumer demographics examined. The preferred type of health claim for functional foods will differ depending on the consumer group examined and may change over time as consumers develop more knowledge pertaining to functional foods and health claims (Grunert et al., 2009). Despite these inconsistencies, the results of studies conducted in the United States (Wansink et al., 2004) and Finland (Urala et al., 2003a) demonstrated that participants prefer shorter claims relating to the content of nutritional components such as fat or probiotics, which coincides with the preference for nutrient content claims observed in the current study. Ultimately, these results indicate that older adult consumers perceive health claims on functional food products to be informative and demonstrate some preference toward claims that indicate the presence of specific nutrients or food components.

8. Study Limitations and Strengths

Although the current study comprehensively explored factors related to functional food perceptions and consumption, it is not without limitations. All data collected through the study questionnaire was self-reported and therefore there may be discrepancies between reported and actual information pertaining to functional food consumption and perceptions. While consistent with the demographics of Canadian older
adults (Turcotte et al., 2007), the majority of the participants in the current study were Caucasian which limits potential comparisons with respect to ethnicity and factors related to functional food consumption. Additionally, participants were primarily recruited from Guelph, Ontario and the surrounding areas. Recruitment from a limited geographic area may hinder the generalizability of results to all Canadian older adults.

Despite its limitations, the current study had strength in its utilization of a researcher-administered questionnaire to allow for researcher and participant interaction to ensure understanding of concepts examined and ascertain completeness of the data. The study questionnaire was also a strength in that it consisted of a wide variety of both open- and close-ended questions which allowed for the collection of a substantial breadth of knowledge. This also allowed participants to qualitatively describe the functional food products they consume and their motivations for consumption. This is unique as previous studies generally limit participant responses by presenting a pre-set list of functional foods from which the participant answers questions about consumption (Urala et al., 2003a; Labrecque et al., 2006; Niva, 2006; Landstrom et al., 2007). Finally, the present study had broad inclusion criteria, which allowed for the recruitment of a wide sample of older adults from which to gather data regarding functional food awareness and consumption.
VII. SUMMARY AND CONCLUSIONS

This comprehensive exploration of factors related to functional food consumption in a sample of older adults provides insight into the awareness of functional foods, current consumption, motivating factors for functional food consumption, the current and preferred sources of information for functional foods, preferences related to food matrices, bioactive ingredients and health areas, as well as the awareness and perceptions of health claims on functional food products. While awareness of the term “functional foods” was relatively low, prevalence of functional food consumption was very high, providing evidence that older adults are incorporating functional food products into their diets. Preferred functional food matrices and bioactive ingredients were identified, which has the potential to inform functional food product development directed towards older adult consumers. It was evident that the bioactive ingredients participants believed were most effective at improving health (dietary fibre and omega-3 fatty acids) were also the ingredients that were most commonly consumed in functional foods. Hence, there is potential to influence the consumption of specific bioactives through informational strategies designed to increase awareness of the health benefits related to these bioactives. Barriers to functional food consumption were also identified, although they were not predominately reported among participants. However, an increased awareness and knowledge pertaining to functional foods was the most frequently reported factor that would promote functional food consumption. Related to awareness and knowledge, the majority of participants indicated that they actively seek out information about functional foods, suggesting that older adults are motivated to expand their knowledge and understanding of functional food products. The food label was identified as a primary
source of information pertaining to functional foods; however, older adults in the current study perceived the need for more information, specifically with regards to the health benefits of functional foods. Further information from the preferred sources of information identified by participants in the current study has the potential to improve functional food acceptance and consumption. With respect to health claims as a source of information for functional foods, participants in the current study predominately reported that they found nutrient content, nutrient function and disease risk reduction claims to be informative. The results also demonstrate that the presence of health claims on functional foods, specifically claims related to nutrients or health concerns that are of particular interest to older adults, can increase the likelihood of consumption of a functional food product.

Overall, the potential for functional foods to support improved health among the older adult population is substantiated by the results of the current study as it was demonstrated that functional food consumption among older adults is prevalent and that older adults are motivated to address multiple age-related health concerns through functional food consumption. Furthermore, the current study identified the needs and perceptions of nutrition and health information pertaining to functional foods, which can be utilized by stakeholders to further educate older adults regarding the age-related health benefits of consuming functional foods.

The results of the current study have been incorporated into an educational toolkit that provides guidance and materials to assist Registered Dietitians in interacting with their older adult clients about functional foods and their potential to support healthy aging. However, the results of this study provide valuable information to a number of
stakeholders including healthcare professionals and the food industry with respect to factors that can encourage functional food consumption and the full potential for functional foods to promote health among the growing older adult population.
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IX. APPENDICES

Appendix A: Participant Recruitment Flyer

Older Adults (≥60 yrs old)
Needed for a
Food Survey Study

- Study involves completing a questionnaire that will take approx. 40 minutes
- Those who complete the questionnaire will receive a gift

This study is run out of the Departments of Human Health and Nutritional Sciences and Family Relations and Applied Nutrition at the University of Guelph and has received approval from the University of Guelph Human Research Ethics Board (REB#10SE012).

If you are interested, please contact Meagan at

519-824-4120 x58081 or mvella@uoguelph.ca

Thank you 😊
Appendix B: Eligibility Questionnaire and Data Collection Flowsheet

Participant Number (assign after consent): __________________________

Exploration of the consumption, awareness, understanding and motivating factors related to functional foods in older adults

Data Collection Flowsheet

Date: ___________ Time: _________ Location: ______________
Researcher Name: ____________________

1. Determine eligibility:
   a. Are you aged 60 years or older? YES NO (must be YES, ≥60 yrs old)
   b. Are you community-dwelling? YES NO (must be YES)
   c. Do you use any meal-assisted service (e.g. meals on wheels)? YES NO (must be NO)
   d. How did you hear about the study? __________________________

2. If questionnaire can be done right now:
   ☐ a. Complete the study consent form. Sign 2 copies, keep 1 and give 1 to participant.
   ☐ b. Assign a participant number and start a file folder and go to item 4.

3. If questionnaire will be done at a study appointment:
   a. Book a study appointment at the HNRU: __________________________ and ask them to bring a list of their medications and dietary supplements to their appointment.
   b. Record contact:
      • Name: ____________________ Best way to contact: __________________
   c. At the study appointment:
      ☐ a. Complete the study consent form. Sign 2 copies, keep 1 and give 1 to participant.
      ☐ b. Assign a participant number and start a file folder and go to item 4.

4. ☐ a. Complete the study questionnaire.
   ☐ b. Have them complete the participant contact for study feedback form.
   ☐ c. Provide them with the study gift.
   ☐ d. File all forms in their file.
   ☐ e. Address the study feedback envelope and leave in their file.
   ☐ f. Enter data into excel file and follow up with participant as needed.

*************************************
Date Study Feedback Summary Mailed or Emailed (circle): __________________________

Notes (record phone communication, email communication, any issue)
Appendix C: Study Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

Exploration of the consumption, awareness, understanding and motivating factors related to functional foods in older adults

Questionnaire Study

INTRODUCTION

You are asked to participate in a research study conducted by Professor Alison Duncan from the Department of Human and Health and Nutritional Science, Professor Judy Sheeshka from the Department of Applied Human Nutrition and graduate students Meagan Vella and Laura Stratton at the University of Guelph. This research is funded by the Canadian Foundation for Dietetic Research, Dietitians of Canada.

If you have any questions or concerns, please feel free to contact the study personnel at any time:

1. Study Investigator: Prof. Alison Duncan, Ph.D., R.D. at 519-824-4120 x58081 or amduncan@uoguelph.ca
2. Study Investigator: Prof. Judy Sheeshka, Ph.D., R.D. at 519-824-4210 x54479 or jsheeshk@uoguelph.ca
3. Graduate Student Meagan Vella, B.Sc., at 519-824-4210 ext. 58081 or mvella@uoguelph.ca
4. Graduate Student Laura Stratton, B.Sc. at at 519-824-4210 ext. 58081 or lstratto@uoguelph.ca

STUDY PURPOSE

The purpose of this study is to assess how older adults perceive functional foods and their impact on health. The information gathered around functional foods will have to do with consumption patterns, barriers to consumption, preferences, and links to health conditions. This information will help inform Registered Dietitians of the most effective ways to include functional foods in their practice.
STUDY PROCEDURES
If you volunteer to participate in this study, we would ask you to complete a written questionnaire under the guidance of a study coordinator regarding your attitudes and opinions about functional foods. We are interested in hearing from people who consume functional foods, as well as those who do not. Thus, you do not need to consume functional foods to participate in this study. It is expected that the questionnaire will take 40 minutes to complete. If you are interested, a summary of the research results will be mailed to you. Please note that we will retain your contact information in case we need to contact you to clarify any of your questionnaire answers.

POTENTIAL RISKS AND DISCOMFORTS
There are no known risks or discomforts associated with this research.

POTENTIAL BENEFITS TO PARTICIPANTS and/or TO SOCIETY
Your involvement in this study will contribute to overall results that will help Registered Dietitians better understand how to incorporate functional foods into their work with older adults. These results will help older adults receive more comprehensive nutritional care, leading to reduction of disease risk and improved health.

The results will also benefit industry by providing information about consumer reaction to functional foods and generating ideas for new product development.

PAYMENT FOR PARTICIPATION
You will receive a cookbook as a gift for completing the questionnaire (value of $27.30).

CONFIDENTIALITY
Every effort will be made to ensure confidentiality of any identifying information that is obtained in connection with this study. All participants will be assigned a study number, and a study code will be used. Your name will never be used in communicating results of this study. Records will be kept on a password protected computer, or in a locked file cabinet in a locked office. All data will be kept indefinitely. In following these procedures, your confidentiality will be maintained to the best of our ability. Results of the study may be published, but will always be presented in group form. Your name will not be listed in any publication or presentation, nor will individual results be reported.
PARTICIPATION AND WITHDRAWAL
You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you don’t want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise that warrant doing so.

RIGHTS OF RESEARCH PARTICIPANTS
You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. This study has been reviewed and received ethics clearance through the University of Guelph Research Ethics Board. If you have questions regarding your rights as a research participant, contact:

Research Ethics Coordinator
Telephone: (519) 824-4120, ext. 56606
E-mail: sauld@uoguelph.ca
Fax: (519) 821-5236

University of Guelph
437 University Centre
Guelph, ON N1G 2W1
SIGNATURE OF RESEARCH PARTICIPANT AND WITNESS

I have read the information provided for the study “Exploration of the consumption, awareness, understanding and motivating factors related to functional foods in older adults” as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

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<tr>
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<td>Human Health &amp; Nutritional Sciences</td>
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<tr>
<td>SPONSOR:</td>
<td>CANADIAN FOUNDATION FOR DIETETIC RESEARCH</td>
</tr>
<tr>
<td>TITLE OF PROJECT:</td>
<td>Exploration of the Consumption, Awareness, Understanding and Motivating Factors Related to Functional Foods in Older Adults</td>
</tr>
</tbody>
</table>

The members of the University of Guelph Research Ethics Board have examined the protocol which describes the participation of the human subjects in the above-named research project and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement.

The REB requires that you adhere to the protocol as last reviewed and approved by the REB. The REB must approve any modifications before they can be implemented. If you wish to modify your research project, please complete the Change Request Form. If there is a change in your source of funding, or a previously unfunded project receives funding, you must report this as a change to the protocol.

Adverse or unexpected events must be reported to the REB as soon as possible with an indication of how these events affect, in the view of the Responsible Faculty, the safety of the participants, and the continuation of the protocol.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and approvals of those facilities or institutions are obtained and filed with the REB prior to the initiation of any research protocols.

The Tri-council Policy Statement requires that ongoing research be monitored by, at a minimum, a final report and, if the approval period is longer than one year, annual reports. Continued approval is contingent on timely submission of reports.

Membership of the Research Ethics Board: B. Beresford, Ext.; F. Caldwell, Physician; K. Cooley, Alt. Health Care; J. Clark, PolSci (alt); J. Devlin, OAC; J. Dwyer, PRAN, M. Dwyer, Legal; D. Dyck, CBS; D. Emslie, Physician (alt); H. Gilmour, Legal (alt); G. Holloway, CBS (alt); B. Ferguson, CME (alt); J. Hansen, OAC (alt); L. Kuczynski, Chair; J. Minogue, EHS; I. Newby-Clark, Psychology (alt); L. Neil, OVC (alt); A. Papadopoulos, OVC; B. Power, Ext.; L. Robinson, CBS; V. Shalle, SOAN (alt); L. Son Hing, Psychology; J. Surbery, CBS (alt); T. Turner, SOAN, E. van Duren, CME.

Approved: per Chair, Research Ethics Board

Date: OCT 25 2011
Appendix E: Study Questionnaire

Date and Time: ___________________Interviewer: ___________________
Participant Number: ______

Exploration of the consumption, awareness, understanding and motivating factors related to functional foods in older adults

Please answer all of the questions to the best of your ability. If there are any questions that you would prefer not to answer, feel free to move to the next question. Several information sheets have been provided for your reference and use while answering the questions.

I. Definition of Functional Food

1. Are you aware of the term ‘functional food’? YES NO

2. How would you define a functional food?

________________________________________________________________
________________________________________________________________

II. Consumption of Functional Foods

*Before completing these questions, the researcher will review with you the information sheet entitled “Definition of a Functional Food”

1 a. Do you currently consume functional foods? YES NO

    b. If YES, please list 3 functional foods that you consume most often:

       i. __________________________________________________________

       ii. _________________________________________________________

       iii. _________________________________________________________

2. How frequently do you consume functional foods?

    i. Daily
    ii. Every other day
    iii. Once a week
    iv. Monthly
    v. As needed/seasonal
    vi. Other (Please Specify):________________________
3. When would you be MOST likely to consume a functional food? Please circle one.
   i. Breakfast
   ii. Lunch
   iii. Dinner
   iv. Snack

### III. Motivation to Consume Functional Foods

1. Why do you consume functional foods? (Please be as specific as you can)

_____________________________________________________________________

_____________________________________________________________________

2. Do you feel that you have more control of your health by consuming functional foods?  
   YES  NO

3. Would you be willing to pay more for a functional food product?  
   YES  NO

4. Please indicate (with an X) whether or not any of the following factors currently act as barriers to your consumption of functional foods:

<table>
<thead>
<tr>
<th>Factor</th>
<th>YES acts as a barrier</th>
<th>NO does not act as a barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertisements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness/Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost/Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family/friends’ influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Professionals’ influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information (from others)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk of adverse / unpleasant / negative effects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
5. Please indicate (with an X) whether or not any of the following factors increase your consumption of functional foods (either currently or in the future):

<table>
<thead>
<tr>
<th>Factor</th>
<th>YES would increase consumption</th>
<th>NO would not increase consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertisements</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Awareness/Knowledge</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost/Price</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family/friends’ influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Professionals’ influence</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Information (from others)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taste</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IV. Information about Functional Foods**

1 a. Do you actively seek out information about functional foods?  YES NO

   b. If YES, where do you get this information? Please circle all that apply.

   i. Physician  vii. Food Label
   ii. Dietitian  viii. Newspapers, Magazines and/or Books
   iii. Nurse  ix. Television and/or Radio
   iv. Pharmacist  x. Internet
   v. Naturopathic Doctor  xi. Family and/or Friends
   vi. Chiropractor  xii. Other (Please specify):____________________

2 a. Do you feel you need more information about functional foods?  YES NO
b. i) If YES, what type of information would you like to receive?

______________________________________________________________

______________________________________________________________

ii) If YES, from whom/where would you like to receive information about
functional foods? Please circle all that apply.

i. Physician                                   vii. Food Label
ii. Dietitian                                 viii. Newspapers, Magazines and/or Books
iii. Nurse                                    ix. Television and/or Radio
iv. Pharmacist                                x. Internet
v. Naturopathic Doctor                        xi. Family and/or Friends
vi. Chiropractor                              xii. Other (Please specify): ____________________
V. Food Forms as they relate to Functional Foods

*Before completing these questions, the researcher will review with you the information sheet entitled “Food Forms”*

1. Please complete the following table regarding food forms.

<table>
<thead>
<tr>
<th></th>
<th>Please indicate (with an X) the top 3 food forms that you currently consume as functional foods</th>
<th>Please indicate (with an X) the top 3 food forms that you would consider consuming as functional foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beverages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cereals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cheese</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crackers / Cookies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Granola Bars</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Margarine</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pasta</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salad Dressing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yogurt and Yogurt Beverages</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VI. Bioactive Ingredients as they relate to Functional Foods

*Before completing these questions, the researcher will review with you the information sheet entitled “Bioactives”*

1. Which bioactive ingredients do you think are most effective in improving your health? Please circle all that apply.

   i. Antioxidants (e.g. beta-carotene, lutein, lycopene)

   ii. Dietary fibre (e.g. beta-glucan, flax, psyllium, wheat bran)

   iii. Omega-3 fatty acids (e.g. fish oil, flax)

   iv. Plant Sterols

   v. Prebiotics (e.g. inulin)

   vi. Probiotics

   vii. Other: _________________________________ (Please specify)

2. Please complete the following table regarding bioactives.

<table>
<thead>
<tr>
<th></th>
<th>Please indicate (with an X) the top 3 bioactives that you currently consume in functional foods</th>
<th>Please indicate (with an X) the top 3 bioactives that you would consider consuming in functional foods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antioxidants (e.g. beta-carotene, lutein, lycopene)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dietary Fibre (e.g. beta-glucan, flax, psyllium, wheat bran)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Omega-3 Fatty Acids (e.g. fish oil, flax)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plant Sterols</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prebiotics (e.g. inulin)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (Please specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
VII. Human Health as it relates to Functional Foods

1. Do you consume functional foods to improve your health? **YES NO**

2. Which health area(s) do you address or would you consider addressing by consuming functional foods? Please circle all that apply.
   - i. Arthritis
   - ii. Cancer
   - iii. Constipation / Bowel Health
   - iv. Diabetes
   - v. Heart Disease
   - vi. Eye Health
   - vii. Hypertension
   - viii. Immunity
   - ix. Osteoporosis / Bone Health
   - x. Other (Please specify): __________

3. Bioactive constituents can be used in the prevention, management and/or treatment of disease. Please indicate the health areas that you either currently address or would consider addressing by consuming the specified bioactives.

<table>
<thead>
<tr>
<th>Bioactive (present in functional foods)</th>
<th>Health Area (for which you do or would consume the functional food, list as many as apply)</th>
<th>Health Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antioxidants (e.g. beta-carotene, lutein, lycopene)</td>
<td></td>
<td>A = Arthritis</td>
</tr>
<tr>
<td>Dietary Fibre (e.g. beta-glucan, flax, psyllium, wheat bran)</td>
<td></td>
<td>B= Cancer</td>
</tr>
<tr>
<td>Omega-3 Fatty Acids (e.g. fish oil, flax)</td>
<td></td>
<td>C= Constipation / Bowel Health</td>
</tr>
<tr>
<td>Plant Sterols</td>
<td></td>
<td>D= Diabetes</td>
</tr>
<tr>
<td>Prebiotics (e.g. Inulin)</td>
<td></td>
<td>E= Eye health</td>
</tr>
<tr>
<td>Probiotics</td>
<td></td>
<td>F= Heart disease</td>
</tr>
<tr>
<td>Other (Please specify):</td>
<td></td>
<td>G= Hypertension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H= Immunity</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I= Osteoporosis / Bone Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>J= Don’t Know</td>
</tr>
</tbody>
</table>
VIII. Perceived Risks as they relate to Functional Foods

1. Do you have confidence that functional foods are safe?  
   YES  NO

2 a. Do you feel there are risks involved in the consumption of functional foods  
   YES  NO
   
   b. If YES, what are they?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

3 a. Have you experienced a negative/unpleasant/adverse reaction to consumption of a functional food?  
   YES  NO
   
   b. If YES, please describe:

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________

4 a. Do you worry about functional foods interacting with your medications?  
   YES  NO
   
   b. i) If YES, have you taken any measures to address these concerns?  
       YES  NO

   ii) If YES, what sort of measures have you taken?

   ________________________________________________________________

   ________________________________________________________________

   ________________________________________________________________
IX. Health Claims as they relate to Functional Foods

*Before completing these questions, the researcher will review with you the information sheet entitled “Health Claims”*

1. a. Are you aware of the health claims that exist on some food labels?  
   YES  NO

   b. If YES, do you read the health claims that exist on some food labels?  
   YES  NO

2. In regards to NUTRIENT CONTENT claims:
   a. Do you find them informative?  
   YES  NO

   b. Do you find them confusing?  
   YES  NO

   c. Please comment why:

   ___________________________________________________________

   ___________________________________________________________

   d. Would their presence on a functional food label increase your likelihood of consuming that functional food?  
   YES  NO

   e. Please circle the nutrients that, when mentioned in a NUTRIENT CONTENT claim on a functional food, would increase your consumption of that product. Please circle all that apply.

   i. Cholesterol
   ii. Energy
   iii. Fat
   iv. Dietary Fibre
   v. Omega-3 fatty acids
   vi. Salt / sodium
   vii. Saturated fatty acids
   viii. Sugar
   ix. Trans fatty acids
   x. Other (Please specify): __________

3. In regards to NUTRIENT FUNCTION claims:
   a. Do you find them informative?  
   YES  NO

   b. Do you find them confusing?  
   YES  NO

   c. Please comment why:

   ___________________________________________________________

   ___________________________________________________________

   d. Would their presence on a functional food label increase your
likelihood of consuming that functional food?  YES  NO

e. Please circle the functions or biological roles that, when mentioned in a NUTRIENT FUNCTION claim on a functional food, would increase your consumption of that product. Please circle all that apply.

   i.  Aids in maintaining the health of the skin & membranes
   ii. Aids in red blood cell formation
   iii. Dietary antioxidant
   iv. Factor in the formation & maintenance of bones & teeth
   v. Factor in the maintenance of good health

   vi. Helps build & repair body tissues
   vii. Helps build antibodies
   viii. Helps lower cholesterol
   ix. Promotes regularity
   x. Other (Please specify): ___________________

4. In regards to DISEASE RISK REDUCTION claims:

a. Do you find them informative?  YES  NO

b. Do you find them confusing?  YES  NO

c. Please comment why:

_________________________________________________________________________
_________________________________________________________________________

   d. Would their presence on a functional food label increase your likelihood of consuming that functional food?  YES  NO

e. Please circle the health areas that, when mentioned in a DISEASE RISK REDUCTION claim on a functional food, would increase your consumption of that product. Please circle all that apply.

   i. Arthritis
   ii. Cancer
   iii. Constipation / Bowel Health
   iv. Diabetes
   v. Heart Disease

   vi. Eye Health
   vii. Hypertension
   viii. Immunity
   ix. Osteoporosis / Bone Health
   x. Other (Please specify): ______________
5. In comparing NUTRIENT CONTENT claims, NUTRIENT FUNCTION claims and DISEASE RISK REDUCTION claims, which do you find more informative?
   i. Nutrient content claims
   ii. Disease risk reduction claims
   iii. Nutrient function claims
   iv. Nutrient content, nutrient function and disease reduction claims are equally informative
   v. None of nutrient content, nutrient function or disease reduction claims are informative

X. Medical History

Note that ALL information, including this medical history information, will be kept confidential and will only be presented in GROUP format, never individually. If there are any questions you would prefer to not answer, it is OK to not answer them.

1. How interested are you in your overall health?
   i. Not interested
   ii. Somewhat interested
   iii. Very interested

2 a. Are there specific areas of health that you are concerned about? YES NO
   b. If YES, please describe:

   __________________________________________________________

3. How often do you visit your physician? Please circle one.

   i. Once a month
   ii. Every 3-4 months
   iii. Every 6 months
   iv. Once a year
   v. Less than once a year
4. How often do you visit a Registered Dietitian? Please circle one.
   i. Once a month
   ii. Every 3-4 months
   iii. Every 6 months
   iv. Once a year
   v. Less than once a year
   vi. Never

5 a. Do you take over the counter medications regularly? (Note that this includes dietary supplements such as vitamins, minerals, herbal supplements)  YES  NO
   b. If YES, please complete the following table:

<table>
<thead>
<tr>
<th>Medication Name</th>
<th>Frequency of Use (daily, weekly)</th>
<th>Recommended by a health care provider? (yes or no)</th>
<th>Reason for use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
</tr>
</tbody>
</table>

6 a. Do you take prescription medications regularly?  YES  NO
   b. If YES, please complete the following table:

<table>
<thead>
<tr>
<th>Medication Name</th>
<th>Frequency of Use (daily, weekly)</th>
<th>Reason for use</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>
XI. Lifestyle Information

Note that ALL information, including this lifestyle information, will be kept confidential and will only be presented in GROUP format, never individually. If there are any questions you would prefer to not answer, it is OK to not answer them.

1. How many people live in your household, including yourself? Please circle one.
   i. 1 person (i.e. you live alone)
   ii. 2 people
   iii. 3 people
   iv. 4 people
   v. 5 or more people

2. Please circle the choice that best describes your living environment.
   i. Live on your own and/or with family members
   ii. Within a retirement community
   iii. Other: ________________________

3. Which lifestyle descriptor would you use to best describe yourself?
   i. Urban/City
   ii. Rural/Country

4 a. Do you participate in the grocery shopping for your household? YES NO
   b. If YES, are you the person in charge of the shopping? YES NO
5. In regard to where you do your grocery shopping, please complete the following table.

<table>
<thead>
<tr>
<th>Shopping centres</th>
<th>Most common place to shop (Please choose one)</th>
<th>Places where you have shopped (Please choose all that apply)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grocery Store</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Department Store (e.g. Wal-Mart, Zellers)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drug Store</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specialty Food Store (e.g. ethnic, health food, butcher, cheese)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farmer’s Market</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify):</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6 a. Do you read the nutrition information present on food labels?     YES     NO

b. If NO, why not?

__________________________________________________________
__________________________________________________________

7. How willing are you to try new food products, for example a new functional food product?

i. Very willing
ii. Somewhat willing
iii. Neither willing nor unwilling
iv. Somewhat unwilling
v. Very unwilling

8 a. Are you a vegetarian?     YES     NO

b. If YES, what type of vegetarian are you?

__________________________________________________________

9. Do you currently smoke cigarettes?     YES     NO

10 a. Do you participate in exercise?     YES     NO
b. If YES, what type of exercise do you do?

____________________________________________________________________

c. If YES, how often?
   i. 1-2 days per week
   ii. 3-4 days per week
   iii. 5-6 days per week
   iv. 7 days per week

XII. Attitudes Towards New Foods

*For the following questions, please circle only one number on the continuum for each statement.*

1. I am constantly sampling new and different foods.
   Disagree  Neither Agree  Agree
   Strongly  Nor Disagree  Strongly
   1        2           3           4           5           6           7

2. I do not trust new foods.
   Disagree  Neither Agree  Agree
   Strongly  Nor Disagree  Strongly
   1        2           3           4           5           6           7

3. If I do not know what is in a food, I will not try it.
   Disagree  Neither Agree  Agree
   Strongly  Nor Disagree  Strongly
   1        2           3           4           5           6           7

4. I like foods from different countries.
   Disagree  Neither Agree  Agree
   Strongly  Nor Disagree  Strongly
   1        2           3           4           5           6           7

133
5. Ethnic food looks too weird to eat.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

6. At dinner parties, I will try a new food.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7. I am afraid to eat things I have never had before.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. I am very particular about the foods I will eat.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. I will eat almost anything.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. I like to try new ethnic restaurants.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Agree</td>
<td>Neither Agree Nor Disagree</td>
<td>Disagree Strongly</td>
<td>Neither Agree Nor Disagree</td>
<td>Agree Strongly</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
XIII. Demographic Information

*Note that ALL information, including this demographic information, will be kept confidential and will only be presented in GROUP format, never individually. If there are any questions you would prefer to not answer, it is OK to not answer them.*

1. What is your gender?
   
   i. Male
   
   ii. Female

2. What is your date of birth? (year-month-day) _______________

3. What is your age range?
   
   i. 60-64
   
   ii. 65-69
   
   iii. 70-74
   
   iv. 75-79
   
   v. 80 or older

4. What is your marital status?
   
   i. Single
   
   ii. Married / Common-law
   
   iii. Divorced
   
   iv. Widowed

5. What is your ethnicity?
   
   i. African
   
   ii. Asian
   
   iii. Caucasian
   
   iv. Hispanic
   
   v. Other: _______________

6. What is your highest level of education attained?
   
   i. Some high school
   
   ii. High school graduate
   
   iii. Some college or university
   
   iv. College or university graduate
   
   v. Post-graduate degree
7. a. Are you currently employed?
   YES   NO
   b. If NO, are you retired?
   YES   NO

8. What is your annual household income?
   i. <$24,999
   ii. $25,000 – $49,999
   iii. $50,000 – $74,999
   iv. $75,000 – $99,999
   v. > $100,000

XIV. General Comments
Please use the space provided below to express any further thoughts or comments you may have with respect to functional foods in relation to any of the questionnaire sections.

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

This is the end of the questionnaire. Thank you very much for taking the time to complete it! If you have any questions, please do not hesitate to ask them of the researcher. Please make sure you have completed the research feedback contact form before you leave and that you receive your cookbook!
Definition of a Functional Food

“A functional food is similar in appearance to .......... a conventional food that is consumed as part of a usual diet, and is demonstrated to have physiological benefits and/or reduce the risk of chronic disease beyond basic nutritional functions, i.e. they contain bioactive compound.”

-Health Canada, 1998

For the purposes of this questionnaire, a functional food
• has undergone processing or manipulation
• has increased health promoting, or disease preventing properties
• does NOT include conventional foods that have not been manipulated

The following pages offer examples of functional foods as defined for this questionnaire. Feel free to refer to these examples throughout the process, and ask questions of the researcher if needed.
Types of Functional Foods

Foods with **added** bioactives:

A food with a bioactive ingredient not naturally present added to the product.

E.g. Milk with Omega-3 Fatty Acids

Foods with **enhanced** bioactives

A food that has been produced to increase the level of a bioactive naturally found in the product.

E.g. Yogurt with increased Probiotics
Eggs and Dairy

• Eggs with Omega-3 fatty acids
• Cheese with Probiotics
• Yogurt products with added Antioxidants, Prebiotics and Probiotics, Omega-3 fatty acids, Dietary fibre
Grain Products

- Pasta with added Dietary fibre
- Cereal with added Omega-3 fatty acids, Dietary fibre, Prebiotics
- Bread with added Omega-3 fatty acids
Beverages

• Fruit or vegetable juice with added Antioxidants, Dietary fibre
• Soymilk with Omega-3 fatty acids
• Milk with Omega-3 fatty acids
Snacks

• Cookies with added Dietary fibre, Omega-3 fatty acids
• Granola bars or energy bars with added Omega-3 fatty acids, Dietary fibre
• Crackers with Omega-3 fatty acids, Dietary fibre
Condiments

• Margarine with added Omega-3 fatty acids
• Margarine with added Phytosterols
• Salad dressing with Omega-3 fatty acids
• Salad dressing with added Prebiotics
Appendix G: Information Sheets for Functional Food Matrices

Food Forms

Functional foods may come in different food forms. Below are some examples of food forms, and some products within them.

Beverages:

Breads:
Cereals:

Cheese:

Crackers / Cookies
Eggs:

Granola Bars:

Margarine:
Pasta:

Salad Dressing:

Yogurt and Yogurt Beverages:
Appendix H: Information Sheets for Functional Food Bioactive Ingredients

Bioactives

Ingredients, called bioactives, can be added to a food product, or their levels enhanced, to increase the health promoting, or disease preventing properties of the product, thus creating a functional food.

Below are some examples of bioactives and the products they are found in. Note that this is not an exhaustive list of bioactives that may be found in functional foods.

Antioxidants, (e.g. beta-carotene, lutein, lycopene) found in:
Dietary Fibre (e.g. beta-glucan, flax, psyllium, wheat bran) found in:

Omega 3 Fatty Acids (e.g. fish oil, flax) found in:
Plant Sterols, found in:

Prebiotics, found in:

Probiotics, found in:
Appendix I: Information Sheets for Health Claims

Health Claims

**Nutrient Content** Claims:

Claims on food packaging that indicate the presence of a specific nutrient, but do NOT relate the nutrient to health.

- "Excellent source of vitamin C"
- "No cholesterol
  No trans fat"
- "Very high source of fibre"
- "Low Sodium"
Health Claims

Nutrient Function Claims:

Health claims on food packaging that link a component of the product to the maintenance of a physiological function or to physical or mental performance. Does NOT make reference to a disease.

“DHA, an omega-3 fatty acid, supports normal development of the brain!”

“Pro-activ with plant sterols lowers cholesterol absorption”
Health Claims

**Disease Risk Reduction** Claims:

Health claims on food packaging that link a component of the product to a reduced risk of a diet related disease or condition.

“**A healthy diet low in saturated and trans fats may reduce the risk of heart disease.** Life cereal is free of saturated and trans fats.”

“A healthy diet with adequate calcium and vitamin D, and regular physical activity, helps to achieve strong bones and may reduce the risk of osteoporosis. **Minute Maid** is a good source of calcium.”