Developing and Validating a Comprehensive Tool to Assess Canadians' Access to Nutrition Information: An Exploration of Information Sources, Channels and the Nutrition Infodemic

by

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Review Committee:

Research Supervisor	Dr. JoAnne Arcand
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The above review committee determined that the Major Paper is acceptable in form and content and that a satisfactory knowledge of the field was covered by the work submitted. A copy of the Certificate of Approval is available from the School of Graduate and Postdoctoral Studies.

ABSTRACT

Access to credible and trustworthy nutrition information is critical to effectively address nutrition mis-/dis-information and promote healthy dietary behaviours. However, the nutrition information sources and channels and the perception and impacts of nutrition mis-/dis-information are largely unknown in Canada. Therefore, this work developed and validated a comprehensive measurement tool to capture data on Canadians' sources and channels of nutrition information, trust in these sources, and experiences with the nutrition infodemic. Through expert validation, the tool achieved high content and face validity scores. The tool will provide novel insights related to nutrition information that can be used in public health interventions.

Keywords: nutrition; information; sources; infodemic; tools

AUTHOR'S DECLARATION

I hereby declare that this major paper consists of original work of which I have authored. This is a true copy of the work, including any required final revisions, as accepted by my committee.

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Manisha Peters

YOUR NAME

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STATEMENT OF CONTRIBUTIONS

This major paper is the result of sole authorship. I, Manisha Peters, identified the scope of research under the guidance of my supervisor, Dr. JoAnne Arcand. Subsequently, I have conceptualized the research objectives and designed the work described in the methodology of this paper. All aspects of the work, including conducting the literature review, developing the methodological design, analyzing and synthesizing data, and drafting and revising this paper, were solely completed by myself. I have used standard referencing practices to acknowledge ideas, research techniques, or other materials that belong to others. Furthermore, I hereby certify that I am the sole source of the creative works and/or inventive knowledge described in this document.

No part of this work has been previously published, nor is it under consideration for publication at this time. The measurement tool created as part of this work and described in Chapter 3, has recently been administered as part of piloting a cross-sectional survey called the Canadian Nutrition and Health Survey (CNHS) in November 2024.

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LIST OF ABBREVIATIONS AND SYMBOLS

CNHS	Canadian Nutrition & Health Survey
CVD	Cardiovascular Disease
CVI	Content Validity Index
CVR	Content Validity Ratio
DRI	Dietary Reference Intake
GBD	Global Burden of Disease
HCP	Health Care Professional
WHO	World Health Organization

1 Introduction

The rise in diet-related chronic diseases, such as cardiovascular disease (CVD), type 2 diabetes, and obesity, remains a significant global and national public health concern. Poor adherence to dietary guidelines, particularly regarding sodium, added sugars, whole grains, fruits, and vegetables, has been identified as a major contributor to these health outcomes (1, 2). Despite the availability of evidence-based dietary recommendations, many Canadians fail to adhere to dietary guidelines, which reflects broader systemic barriers, including affordability, accessibility, cultural influences on food choices (3, 4) and food literacy, underscoring the need for a deeper understanding of the factors influencing dietary behaviours.

Food literacy includes an individual's ability to access, understand, and use nutritional information to make informed food choices and apply practical skills such as interpreting food labels, meal planning, and preparing nutritious meals (5, 6, 7). Functional food literacy, more specifically, refers to an ability to evaluate nutrition information for accuracy and plays a key role in helping individuals distinguish between nutrient-dense and processed, calorie-dense foods (7, 8, 9). Not surprisingly, low levels of food literacy among Canadians have been associated with poorer diet quality, increased reliance on convenience foods, and greater susceptibility to mis-/dis-information (10, 11). Limited food literacy skills also connect to the importance of media literacy, where low levels of media literacy hinder the ability to discern accurate nutrition information from inaccurate nutrition information, altering diet-related and food-purchasing decisions (9).

The "nutrition infodemic" concept has gained increasing attention, particularly with the rapid dissemination of accurate and inaccurate nutrition information through digital

platforms and traditional media. Mis-/dis-information distort public perceptions of healthy eating, leading to confusion, distrust, and potentially harmful dietary practices (12, 13). Social media platforms and influencers often amplify misleading nutrition claims, while traditional sources, such as television or print media, can also contribute to simplified or sensationalized messaging (14, 15, 16). These issues are exacerbated by low media literacy levels, impairing individuals' ability to critically assess and discern credible nutrition information (9, 17). Considering this important public health issue, there is minimal information on the nutrition infodemic and experiences with nutrition mis-/dis-information. Current research fails to capture insights on how nutrition mis-/dis-information and the infodemic alter trust in sources and channels of nutrition information. This is an important knowledge gap to address as digital channels continue to evolve in the realm of nutrition, where mis-/dis-information is easily shared, undermining the credibility of trusted experts such as healthcare professionals, dietitians or researchers in nutrition science, to name a few.

Existing tools used to measure where individuals obtain nutrition information are limited in scope. They often conflate *sources* of nutrition information, such as healthcare professionals, family, and social media influencers, with the *channels* through which this information is communicated, such as digital platforms, traditional media, and interpersonal networks (18, 19). Additionally, few tools account for emerging sources, including artificial intelligence and other digital innovations, or assess the role of trust and experiences with nutrition mis-/dis-information (19, 20). This gap in the literature highlights the need for comprehensive tools that reflect the evolving landscape of nutrition information in today's digital age.

This paper aims to address these limitations by developing and validating a measurement tool to assess where Canadians obtain their nutrition information, their trust in these sources, and their experiences with nutrition mis-/dis-information and the infodemic. The ability of this measurement tool to provide novel insights into how Canadians navigate nutrition information and the role of trust in shaping dietary behaviours will support the design of targeted interventions to improve food literacy, combat mis-/dis-information, and promote healthier dietary choices across diverse populations.

2 Literature Review

2.1 Context of Nutrition and Health Globally and In Canada

2.1.1 Nutrition, Health and Chronic Disease

A diet of high nutritional quality is defined as the consumption of nutritious foods, such as whole grains, fruits, vegetables and proteins, to improve diet quality and reduce the risks of diet-related chronic diseases, such as cardiovascular disease and type 2 diabetes (21). As reported by The Global Burden of Disease (GBD) (2017) study, dietary risks such as high sodium intake, the low consumption of whole grains, and excessive intake of added sugars are among the top dietary risk factors for morbidity and mortality worldwide (1). Thus, the sub-optimal consumption of high-quality diets is a concern globally (1). As part of a healthy diet, there are recommended global dietary guidelines as set by the World Health Organization (WHO) and Dietary Reference Intake (DRIs). (21). However, many of these guidelines are not adhered to, especially for certain foods and nutrients such as sodium, sugars, whole grains, fruit, and vegetable consumption (1).

Despite awareness of the health benefits associated with consuming nutrient-rich foods, the widespread failure to meet these recommendations remains a complex issue (22, 23). These gaps are not merely a reflection of individual dietary habits but are indicative of broader systemic and social influences that shape food choices, including accessibility, affordability, and cultural norms (3, 4). Such dietary inadequacies not only highlight the challenges in dietary adherence but also emphasize the need for research into the factors contributing to such widespread non-adherence among Canadians, including the role of knowledge, perceptions, and external influences on food-related decision-making (3, 4).

The challenge with adherence to dietary guidelines has been demonstrated worldwide (24). As highlighted by the WHO, when sodium intake exceeds the recommended guideline of 2000 mg (24), this significantly increases the risk of cardiovascular diseases and other health risks (24-26). For instance, excess sodium consumption is strongly associated with hypertension, one of the leading risk factors for myocardial infarction and stroke (27, 28). In 2017, excess sodium was attributed to more than three million deaths globally (1). In Canada, adults consume an average of 2760 mg of sodium daily and continue to exceed recommended intake levels to date (29-31). Despite efforts to reduce sodium consumption, approximately 58% of Canadians continue to consume sodium in excess amounts, with the majority of sodium derived from processed foods such as bread, processed meats, and soups (22, 28).

Refined grains and sugars have been associated with a higher risk of mortality and major cardiovascular disease (CVD) events (32, 33). However, added sugars alone, when consumed in excess amounts, are another nutrient of concern (34). There is agreement in the literature that excess intake of added sugars increases the risk of several adverse health outcomes, such as obesity, type 2 diabetes, hypertension, stroke and coronary heart disease (1, 34-36). These health impacts are partially mediated by insulin resistance and metabolic syndrome (36-38). Canadians added sugar consumption continues to exceed recommended intakes by approximately 85% of the national population (39).

Refined grains and added sugars provide empty calories, but on the other hand, whole grains provide dietary fibre, vitamins, and minerals (40, 41). Whole grain consumption is associated with a reduced risk of cardiovascular disease, colon cancer, and all-cause mortality (42-44). Whole grains are rich in several components that are vital

for health, including fibre, several B vitamins, and minerals such as iron, zinc, and magnesium (42). Fibre from whole grains is particularly beneficial for colon health and regular bowel movement and plays a role in maintaining blood sugar levels, thus helping to prevent and manage diabetes (43, 44). Despite the various health benefits of whole grains, over 80% of Canadians fail to meet the recommended daily intake (45, 46).

In addition, fruits and vegetables are integral to a healthy diet, offering a range of essential nutrients such as vitamins, minerals, and dietary fibre that play key roles in preventing chronic diseases (47, 48). A higher intake of fruits and vegetables has been associated with a lower risk of cardiovascular disease, type 2 diabetes, and stomach and lung cancers (49-51). Consuming 4-5 servings of fruits and vegetables per day supports overall metabolic health by providing antioxidants and anti-inflammatory compounds that help prevent oxidative stress and inflammation (52), both of which are risk factors for chronic conditions (47, 48). Despite these benefits, about 70% of the Canadian population does not meet the recommended daily servings of fruits and vegetables, which can increase the risk of nutrient deficiencies and diet-related health issues (52).

In conclusion, dietary adherence among the Canadian population continues to grow as a public health concern. Efforts to address dietary adherence or lack thereof, require comprehensive strategies, including implementing policies and initiatives aimed at promoting education around healthy eating to mitigate the widespread health impacts associated with poor dietary habits.

2.1.2 Food Literacy and Canadian Diet Quality

Although diet quality is influenced by several factors, including food access, affordability, and utilization, food literacy has emerged as another important factor

impacting diet quality. Food literacy is a multifactorial concept that describes the learned food skills and practices that help individuals navigate their food environment (9, 53). It encompasses skills beyond basic nutrition knowledge; it includes abilities such as shopping effectively, interpreting food labels, and preparing nutritious meals (5, 54, 55). A higher level of food literacy is strongly associated with diet quality (54) as it enables individuals to make informed food choices by understanding and applying nutritional information (5, 54, 55). However, many Canadians lack the skills needed to interpret complex nutritional information because of low levels of food literacy (11), which can result in poor food choices and increased reliance on processed foods high in nutrients of concern (10, 11). Poorer diet quality has been associated with a decline in home cooking and reliance on convenience foods, highlighting a gap in cooking skills among Canadians (7, 10, 11). Individuals with higher food literacy are more likely to choose nutrient-dense foods over nutrient-poor options, leading to healthier dietary patterns (10, 11).

An essential component of the broader framework of food literacy is that of functional food literacy. This involves the ability to access, understand, and use nutritional information to make informed dietary choices, such as reading and interpreting food labels (7, 59, 60). This component of food literacy is essential for critically assessing nutrition information, including the nutritional quality of food products and distinguishing nutrient-dense foods from processed calorie-dense alternatives (7, 59). However, limited functional food literacy can be extended to other types of nutrition information, including media, which alludes to the importance of nutrition and media literacy as a component of food literacy (17, 60). Media literacy involves understanding, analyzing, and effectively using media messages, enabling

individuals to discern credible nutrition information from mis-/dis-information, which is essential for fostering informed dietary behaviours and reducing the impact of misleading media-driven narratives of nutrition information (17, 60). Low levels of media literacy can alter how people understand nutritional information presented to them through mass media outlets, thereby affecting their diet-related and food-purchasing decisions (17).

To summarize, food and media literacy can play a crucial role in shaping diet quality by providing individuals with the skills and knowledge needed to make informed and healthy dietary choices. Low levels of food and media literacy lead to a lack of understanding of the nutrition information being obtained, especially in a growing digital environment, leading to the belief in false information, primarily found online. There are limitations to existing research on how Canadians navigate and evaluate the vast array of nutrition information available through traditional and digital media, as well as the implications for dietary behaviours (17), which is relevant given the proliferation of mis-/dis-information through digital media outlets (17). The next section will delve into the importance of limiting nutrition mis-/dis-information as this relates to having limited food and media literacy, which can affect dietary behaviours and overall health outcomes.

2.2 The Infodemic and Nutrition Information

2.2.1 The Nutrition Infodemic: Misinformation and Disinformation

In the context of nutrition, both misinformation and disinformation include exaggerated or unsupported claims about diets, supplements, and health benefits, which can distort public perceptions and encourage potentially harmful dietary choices (61). Misinformation refers to the dissemination of incorrect or misleading information, which can be either accidental or intentional (62). Disinformation refers to the spread of

misinformation for financial gain, ideological motives, or influence over public opinion (60). Disinformation is particularly harmful as it can intentionally manipulate the audience, leading to the belief of information that may not be accurate (63).

Despite the existence of scientific research, false or misleading information continues to proliferate due to ease of access, leading people to question their abilities to discern accurate information from inaccurate information (61). This relates to the term "infodemic," which arose from the COVID-19 pandemic, defined by the WHO as the rapid and widespread dissemination of both accurate and inaccurate information, particularly in digital media (12, 64). The infodemic explains the difficulties in controlling the flood of information and making sure that reliable, empirically based guidance is presented to the public, amidst the spread of mis-/dis-information (12, 64). For the general public, there are blurred lines between evidence-based guidance and misleading claims, diminishing public trust in science and sources of information.

There is limited research on the impact of the infodemic in the realm of nutrition and nutrition information. The spread of nutrition mis-/dis-information has profound effects on public health and health outcomes, including increased risks of morbidity and mortality (65-67). Exposure to conflicting and misleading information can lead to confusion about what constitutes a healthy diet, increasing the risk that an individual adopts harmful dietary habits (68, 69). For instance, the promotion of extreme diets, detox regimens, and unverified supplements can result in nutrient deficiencies, particularly when these practices are followed without professional guidance (68, 69). The uptake of nutrition information from online sources varies widely across age demographics, each with unique implications for exposure to the infodemic. Young

adults are particularly susceptible to nutrition mis-/dis-information on digital platforms due to high engagement with non-expert influencers and crowd-sourced advice (14, 70). Mis-/dis-information targeting younger populations often capitalizes on emotionally appealing narratives or pseudoscientific claims, which can lead to the adoption of harmful dietary practices or distrust in established nutrition guidelines (14, 70). While middle-aged adults may be more discerning in their information processing, they can still be affected by the infodemic due to the algorithmic amplification of misleading content on popular search engines, such as Google and Bing, and digital news sites (71, 72). Similarly, older adults, despite their preference for professional and government resources, are also impacted (73, 44). Simplistic or misleading dietary messages, such as overly generalized recommendations (e.g., "avoid all carbs," "detox for better health") can be harmful when these messages fail to consider individual health conditions, such as diabetes or cardiovascular disease, which are highly prevalent in the older population (73, 74).

The infodemic has intensified challenges in identifying and navigating trustworthy nutrition information (64, 74, 75) Consequently, trust in authoritative nutrition sources, such as healthcare professionals, is undermined, which has substantial implications for public health (70). Studies show that the plethora of mis-/dis-information has further undermined trust in evidence-based guidelines provided by dietitians and health authorities, diminishing public confidence in scientifically supported dietary advice (76). The challenges related to distrust extend beyond nutrition, impacting other areas of health. For example, mis-/dis-information around vaccines has significantly contributed to lower vaccination rates, increasing the risk of preventable diseases (77).

The report on health mis-/dis-information found that COVID-19 mis-/dis-information alone accounted for thousands of preventable hospitalizations, with an estimated 35-42% reduction in mortality if mis-/dis-information were minimized, underscoring the critical impact of mis-/dis-information on morbidity and mortality rates (77, 78). The extent to which the Canadian public trusts different sources of nutrition information is largely unexplored.

There are various ways nutrition mis-/dis-information is spread. Social media and online platforms are largely responsible, where the spread of information is generally done with ease, often without verification of its accuracy (79, 80). The effects of this information sharing are exacerbated when digital algorithms prioritize sensational or emotionally focused content that makes false or misleading information go "viral" (79, 80). Furthermore, influencers and non-expert figures play a significant role in perpetuating nutrition mis-/dis-information (79, 80). However, nutrition mis-/dis-information is not limited to digital or social media platforms; it also permeates traditional media outlets such as television, radio, newspapers, and magazines (15). Commercial interests and advertising can skew the portrayal of nutrition information, leading to biased or incomplete messages that serve business objectives rather than public health (15). These traditional outlets, while generally subject to editorial oversight, still contribute to the spread of simplified or exaggerated nutrition claims, particularly when covering topics like fad diets, "nudges," or "superfoods" (16, 81). Furthermore, television programs and magazine articles sometimes promote sensationalized dietary trends or celebrity-endorsed health advice that lacks scientific evidence (15, 16, 81). Even when research studies are reported, the media can be prone to misinterpreting or exaggerating

the findings of scientific studies, creating sensationalized headlines that serve as "clickbait" to increase readership (82, 83). This tendency for sensationalism is exploited by certain researchers and segments of the food industry, who use media coverage to challenge and create public doubt about health policies (15, 83).

In summary, the increasing popularity of digital media has exposed individuals to various forms of mis-/dis-information, which may negatively impact public health (80). The next section will discuss sources of nutrition information, including from where and from whom individuals obtain their information and how this is presented to various populations. How people obtain their information is important and can limit the extent to which they are exposed to nutrition mis-/dis-information. However, this remains an emerging area of the literature that lacks comprehensive and contemporary investigation.

2.3 Sources of Nutrition Information & Current Measurement Tools

2.3.1 Access to Nutrition Information

How people obtain their nutrition information is of interest because of the quality and credibility of the information derived from different sources (18, 85, 86). In this section, the information source is reviewed, as well as the channels used to access those information sources. Sources are defined as the person who is sharing the information, and channels are defined as the pathways, platforms, or methods through which information is communicated or disseminated between a sender and a receiver (18, 85, 86).

Over the last decade, the sources through which people obtain nutrition information have evolved. Traditionally, credible sources of nutrition information, such as healthcare professionals, played key roles by providing evidence-based

recommendations on what constitutes a diet of high quality (18, 85, 86). However, with the advent of digital platforms, a new array of information channels has emerged, influencing both the accessibility and dissemination of dietary information (18). These shifts highlight the evolving challenges in public understanding of nutrition amidst diverse information sources. Table 2.1 (below) summarizes studies that indicate where the Canadian population has received nutrition information, and Table 2.2 (below) summarizes studies on where the global population obtained their nutrition information. The next few sections will explore how various populations of Canadians obtain their information, summarized by age group and comparing global trends to national trends over the last 15 years. This timeframe is most representative of recent data presented in the literature, reflecting the landscape of nutrition information.

Youth and young adults: Globally, young adults predominantly receive their nutrition information from social media platforms and mobile applications. In the Middle East, for example, platforms like Instagram and Snapchat are commonly used due to their convenience and accessibility (87-89). Similarly, Canadian youth access nutrition information through Instagram, YouTube, TikTok, and health-focused apps (19, 90). While these sources provide youth with diverse and engaging content, reliance on family and schools also persists in Canada, echoing patterns in other countries such as Ghana, where family remains an important source of dietary knowledge (91). The shift toward digital platforms represents a universal trend among youth, with these sources often being favoured over traditional ones due to their ease of use and personalized content (80, 90). Despite this, there is limited research on trust levels for these sources, highlighting a gap

between sources of nutrition information, ability to discern credible sources and trust in these sources.

Middle-aged adults: Among middle-aged adults worldwide, a balance between traditional and digital sources is evident. In countries like Japan, middle-aged individuals combine television and newspapers with digital tools such as Facebook and blogs for practical dietary advice (92). Similarly, middle-aged Canadians utilize digital platforms like Facebook and YouTube for meal planning and recipe ideas, but they also place significant trust in healthcare professionals and government resources like Canada's Food Guide (93, 94). This demographic demonstrates a unique approach by blending the convenience of digital tools with the reliability of professional advice. However, the interaction between these sources and how middle-aged adults validate information remains underexplored in both global and Canadian contexts.

Older adults: Older adults in Canada and globally predominantly rely on traditional media, such as television and radio, for nutrition information. For instance, older individuals in Southeast Asia frequently turn to government-supported television programs that align with dietary guidelines (95). Similarly, in Canada, television serves as a key source of nutrition information for older adults, often through public service announcements or health-focused programming based on Canada's Food Guide (19, 93)., Unlike younger populations, older adults rarely engage with digital sources, reflecting a preference for traditional formats that are perceived as more accessible and familiar (19). Research in Japan also indicates that older adults rely heavily on print and televised media, which continue to shape dietary behaviours in these populations (92). Nonetheless, studies on how older adults integrate guidance from traditional media with

occasional input from healthcare professionals are lacking. Additionally, older adults have reported disliking the use of digital channels of nutrition information, claiming that they are difficult to use and too complicated to navigate (19, 92, 93).

Trends among all adults: Healthcare professionals, including dietitians, doctors, and nurses, remain highly trusted sources of nutrition information globally and in Canada (19, 90-93, 96). In Japan and Turkey, individuals receiving dietary advice from healthcare providers exhibit better adherence to dietary guidelines compared to those relying solely on media sources (92, 96). Similarly, Canadian adults view healthcare professionals as authoritative figures for personalized dietary advice, and studies show that consultations with these professionals are associated with improved dietary knowledge and behaviours (19, 90, 94). However, access to healthcare professionals is not equitable in all regions. Geographic barriers and limited availability of professionals create challenges in both rural Canada and underserved regions globally (19, 89, 92-94). This highlights a gap in understanding how individuals without consistent access to healthcare professionals supplement their nutrition knowledge through other sources demonstrating an urgent need for accessible tools for this segment of the Canadian population.

Globally and in Canada, the rise of digital platforms has introduced new avenues for obtaining nutrition information, while traditional sources such as television and healthcare professionals continue to serve as cornerstones of reliable guidance. Previous research shows that 50% of the adult Canadian population consults the Internet for nutrition information (19, 20, 83). These studies have reported online nutrition information to be problematic, as discussed in the previous section on the nutrition

infodemic and mis-/dis-information. However, there is a prominent knowledge gap in understanding the differences in credible sources online, something that is more widely used in the world today. The rise of social media influencers, algorithmic amplification, and crowd-sourced advice has changed how information is disseminated and consumed, often in ways that existing tools fail to capture (18-20).

To summarize, this section highlights where adults globally compared to adults in Canada gain access to nutrition information. Currently, many younger adults use digital channels more, middle-aged adults have a balance between traditional and digital channels and older adults are more comfortable with using traditional sources and channels for nutrition information. However, there is no clear identification that all the information received from any source or channel of nutrition information is credible, leading to a gap in understanding why certain sources of nutrition information are more often accessed than others. The next section will identify the gaps in current measurement tools for capturing this information and highlight why it is important to develop a comprehensive measurement tool to identify both the sources and channels of nutrition information and trust in these sources.

Table 2.1 - Sources of Nutrition Information in Canada over the last 15 years

Author	Study Design	Population	Measurement Tools	Results / Key Findings
Slater, J. J., & Mudryj, A. N., (2018) (93)	Cross-sectional analysis of the Canadian Community Health Survey (CCHS)	10,098 Canadians aged 12 years and older across all provinces	Questionnaire with items on familiarity, awareness, and use of Canada's Food Guide (CFG), as well as dietary habits. Data analyzed using descriptive statistics and logistic regression.	Over 80% of Canadians were aware of the CFG, with significant gender differences (86.6% of women vs. 80.6% of men). Only 8.7% consulted the CFG in the past six months. Top sources for obtaining the CFG included schools (20.4%) and health professionals (17.2%).
Canadian Foundation for Dietetic Research (2018) (20)	Cross-sectional online survey (Tracking Nutrition Trends Survey)	1,500 Canadian adults	Online questionnaire comprising questions on knowledge, sources of nutrition information, and eating habits; validated using pilot testing for clarity and readability among 10 subjects.	Canadians perceive government/associations, family physicians, and dietitians as the most credible sources. Despite this, food product labels (58%), the internet/social media/blogs (46%), and friends/relatives (40%) were the most frequently used sources. Differences in use and credibility were noted by age and gender.
Goodman, S., et al. (2011) (19)	Mixed-methods (telephone and online surveys across three years)	Representative samples of Canadian adults aged 18+ (2004: n=2,405, 2006: n=2,014, 2008: n=2,001)	11-item survey assessing sources of nutrition information (e.g., labels, Internet, media, health professionals). Validated using pilot tests for clarity.	Food product labels were the most common source of nutrition information in 2008 (67%), followed by the Internet (51%). Magazines and newspapers saw a decline. Gender, age, and socioeconomic factors influenced source preference and credibility.
Marquis, M., et al. (2005) (90)	Cross-sectional survey	870 adults across Canada	10-item questionnaire assessing the frequency of using 15 nutrition information sources and confidence in 14 sources. Validated via pilot testing.	Traditional magazines and books, the internet, food labels, and brochures were the most frequently used sources. Differences by geographic location were significant for media (radio, newspapers, television), dietitians, and naturopaths. Older age groups (45–64 years)

				used media sources more than younger groups (18–34 years). Respondents expressed the highest confidence in dietitians, physicians, books, and government sources.

Table 2.2 - Sources of Nutrition Information Globally over the last 15 years

Author	Study Design	Population	Measurement Tools	Results / Key Findings
Ruani, M. A., et al. (2021) (89)	Cross-sectional quantitative web-based survey	3,500 adults from the US, UK, Australia, and Spain	20-item online questionnaire on digital and professional sources of nutrition information. Validated through pilot testing across multiple countries.	Online platforms were the main source of nutrition information for 47% of the participants, while 25% consulted healthcare professionals.
Murakami, K., et al. (2024) (92)	Quantitative online survey design	1,000 adults in Japan	Online questionnaire assessing use of media and traditional sources of nutrition information. Validation not stated.	68% used traditional media like television and newspapers. Internet users had a 2.5 times lower adherence to dietary guidelines than those consulting healthcare professionals.
Lipoeto NI, et al (2012) (95)	Cross-sectional survey	2,500 adults in South-East Asia (Bangladesh, Nepal, and India)	Survey instrument with sections on nutrition media habits, trust in nutrition information sources, and dietary behaviors. Validated with pilot studies in each country.	Traditional media (radio and television) were dominant sources to find nutrition information (68%), followed by community health workers (25%). Social media use was minimal (8%). Trust was highest in healthcare providers (80%), with significant rural-urban differences in source preference.
Quaidoo, E. Y., et al (2018) (91)	Cross-sectional study using pretested questionnaires	192 young adults aged 18–25 in Accra, Ghana	Pretested questionnaire assessing demographic data, sources of nutrition information, and basic	Online resources were the most popular source (92.7%), followed by traditional media (58.3%). Healthcare professionals were perceived as the most reliable source (86.5%).

			nutrition knowledge. Validated through pilot testing.	
Besler, H. T., Buyuktuncer, Z., & Uyar, M. F. (2012) (96)	Cross-sectional survey	1,536 participants aged 12–56 years across 26 regions of Turkey	Survey measuring level of interest in food labels and barriers to use. Not validated.	Food labels (76.5%) and nutrition labels (72.4%) were frequently used. Barriers included poor presentation and low understanding.

2.3.2 Validation and Appraisal of Current Measurement Tools

To understand how Canadians acquire nutrition information, researchers have used measurement tools (e.g., questionnaires) to capture data on where and from whom people get their nutrition information. Many of these measurement tools typically include standard questions such as "From which of the following sources have you gotten information on food and nutrition in the past year?" (20). However, the questions used are relatively broad, as the response options are rather broad. For example, response options include "Internet" for online sources, "Dietitian" for the only healthcare provider or grouping "health association materials" or "government materials" (19, 20). The challenge with this approach is that there is overlap between the sources and channels of information, failing to capture specificity in sources that exist in the real world today; limiting the relevance and applicability of the data in the context of an increasingly digital and interconnected world.

Table 2.3 summarizes the sources and channels included in current measurement tools, highlighting the limitations of these existing tools. The Table demonstrates that many tools used in Canada have concentrated on traditional sources of nutrition information, such as healthcare professionals, family, and peers, while newer sources remain underexplored (18, 19). For instance, previous studies have rarely included social media influencers, personal trainers, scientists and researchers, or artificial intelligence. Other professionals who may talk about nutrition, such as nutritionists, holistic nutritionists or naturopathic doctors, were also rarely included as nutrition information sources. Additionally, nutrition information sources and channels of nutrition information were assessed simultaneously, lacking specificity in nutrition information acquisition assessment. For example, when a healthcare professional is presenting information at the clinic, compared to posting on social media, the channel is the method used to

share information, while the source is the healthcare professional. In previous studies, over 70% of Canadian adults consulted food labels as their primary source of nutrition information, whereas less than 30% consulted a dietitian (18-20) A significant piece of knowledge missing from the literature is that digital platforms play a significant role in shaping dietary behaviours, especially among younger populations (19, 94). Current measurement tools do not assess whether trust varies when nutrition information is presented to the general public using different channels, but the same information is being presented. Similarly, books and scholarly articles that used to only be found in libraries can now be easily found online.

A truly comprehensive measurement tool must reflect the diversity of contemporary information sources as well as information channels, allowing for a richer understanding of individuals' motivations, experiences and challenges in navigating nutrition information (19). However, such a tool does not yet exist in the Canadian or international context. By adopting methods that can be adjusted to suit various populations and ensuring relevance across various contexts, such tools can provide a nuanced understanding of how Canadians access and utilize nutrition information and mis-/dis-information. The availability of such measurement tools, along with the data derived from using them in public health research, would equip researchers and policymakers with the data needed to design and implement more effective interventions that reach segments of the population more effectively in support of healthier dietary choices across all demographics.

Table 2.3 – Sources of Nutrition Information in Existing Measurement Tools

Author	Person-to-Person* Sources	Digital Sources	Government Sources	Non-Governmental Organizations	Other
Slater, J. J., & Mudryj, A. N., (2018) (93)	• Family or Friends • Health Professional or Doctor	• None	• Canada's Food Guide	• Health Organizations	• General Research • TV Programs • Weight Loss Programs • Fitness Programs • Health or Community Centre • Food Companies • "Other" • "None"
Canadian Foundation for Dietetic Research (2018) (20)	• Friends/ Relatives/ Colleagues • Family Physician • Dietitian • Other HCPs (Nurse, Physiotherapists etc.) • Natural HCPs (Naturopath, Homeopath etc.)	• Internet, Social Media or Blogs • Mobile Apps	• Government/ Association Materials	• None	• Food Product Labels • Nutrition Facts Table • Magazines, Newspapers or Books • Grocery Store/Pharmacy • Radio/ TV Programs • Food Company Materials, Advertisements, Websites or Apps • Fitness/ Weight Loss Programs • Celebrities
Goodman, S., et al. (2011) (19)	• Family Physician/ Healthcare Professional • Dietitian • Friends/ Relatives/ Colleagues	• Internet	• Government Materials	• Health Association Materials	• Magazines, Newspapers or Books • Food Company Materials/ Ads • Radio/ TV Programs • Food Product Labels

					• Fitness/ Weight Loss Programs
Marquis, M., et al. (2005) (90)	• Family/ Friends/ Colleagues • Dietitian • Physician • Nurse • Naturopath	• Internet • Media	• Government • Government/ Health Professionals	• None	• Magazines • Books • Food Labels • Brochures • Television • Newspapers • Grocery Stores • Radio • School • Drug/ Supplement Companies • Food Companies

* person-to-person interactions to receive nutrition information were assumed based on the nature of the survey questions;
HCP = Healthcare Professional

2.4 Objectives

The objective of this project was to develop and validate a measurement tool to comprehensively capture data on where (e.g., information channels) and from (e.g., information sources) whom Canadian adults are obtaining nutrition information, their level of trust in these information sources, and their experiences with nutrition mis-/dis-information.

3 Methodology

3.1 Research Design

This research took place in three stages. Stage 1 included a review of existing studies and measurement tools to capture data on nutrition information sources and channels, trust in sources of information, and nutrition mis-/dis-information. Stage 2 included the development of new survey items aimed at assessing four domains: sources of nutrition information, channels used to access nutrition information, trust in sources of nutrition information, and Canadian's experiences with nutrition mis-/dis-information and the infodemic. Stage 3 assessed the developed survey items for content and face validity.

3.2 Procedure

3.2.1 Phase 1: Review of the Published Literature

The purpose of the literature review was to identify studies that assessed sources of nutrition information and which channels are used to access nutrition information, trust in sources of nutrition information, and Canadian's experiences with nutrition mis-/dis-information and the nutrition infodemic. A focus was on the adult population. The literature search was conducted in English, through PubMed, Science Direct, Springer Link and the Ontario Tech Library's Omni Search. Search terms included "sources of information" AND "nutrition";

"nutrition information" AND "Canadian adults" OR "globally"; "nutrition misinformation"; AND "Canadian adults"; "nutrition information" AND "infodemic"; "nutrition information" AND "trust." Literature was then refined to "within the last 15 years" to ensure that data was mostly recent and relevant to our scope of research. The timeframe was chosen to show the most up-to-date sources of nutrition information and to reflect a timeframe of internet sources of information.

3.2.2 Phase 2: New Survey Item Development

The objective of Phase 2 was to develop survey items, from the literature reviewed in Phase 1, that assess the sources of nutrition information and which channels are used to access nutrition information, trust in sources of nutrition information, and Canadian's experiences with the nutrition mis-/dis-information and the infodemic. Survey items were designed for a Canadian adult audience. The goal of creating these survey items was to allow for a more comprehensive, inclusive and equitable array of information sources. Survey items on the sources and channels of nutrition information were developed based on what is known in the literature about information sources and what the research team identified to be missing in the literature. The development of survey items related to mis-/dis-information (the nutrition infodemic) questions was guided by the 4iFACT framework. This framework was developed as a method to characterize different levels of infodemic interventions: the informational, individual, interpersonal and institutional levels (97). The new survey items were developed by the author of this paper. The items underwent multiple rounds of iteration with the research team which comprised of professionals in nutrition science and public health.

3.2.3 Phase 3: Expert Validation

The content and face validation of the new survey items took place over the course of two rounds. This is the first step of testing a tool of measurement prior to pilot testing it with respondents. Content validation refers to the extent to which a mode of measurement thoroughly and appropriately assesses the skills and characteristics that it is intended to measure (98, 99). Face validation refers to the extent to which a mode of measurement is relevant based on the subjective judgement of the expert validator (98, 99). A minimum of 3 experts are recommended for face and content validation. Our expert panel consisted of 6 experts who are doctoral students, postdoctoral researchers and faculty members in the field of nutrition. Ethical approval was granted by Ontario Tech University's Research Ethics Board (REB# 17546).

Outcomes. The experts independently evaluated all survey items using a structured review process. Experts independently evaluated each item based on three criteria: Relevance (e.g., does the item meet the objectives of the research; 4 pt Likert scale), clarity (e.g., is the item comprehensible and free of ambiguity; 4 pt Likert scale), and importance (e.g., how essential each item achieves the objectives of this work; 3 pt Likert scale). As part of this process, experts also reviewed and provided qualitative written feedback on items to improve their clarity to ensure they were straightforward and would be easily understood by the target population. They also assessed whether the language used in each item was appropriate and whether the structure of the questions minimized potential misinterpretation or confusion for respondents. Items rated as highly important were deemed necessary to capture the full scope and objectives of this work. A strength of this approach was that quantitative scores allowed for systematic evaluation across experts, while qualitative comments provided nuanced insights into potential improvements for

each item. The responses were collected through individual Microsoft Word ™ documents returned to the research team via email.

Analysis. Expert responses were transferred to a Microsoft Excel™ spreadsheet, where ratings were summed, and all qualitative comments were consolidated. Quantitative thresholds for relevance and clarity were required to achieve a Content Validity Index (CVI) of 1.00 to be kept in the survey (98). For importance, an item was needed to achieve a Content Validity Ratio (CVR) of 1.00 (99). All qualitative feedback received was reviewed and the research team came to a consensus on question modification and retention for both rounds of face and content validation. The iterative process of validation and refinement ensured that each question in the survey was carefully crafted to meet the research objectives. This approach ensured that the final measurement tool balanced methodological rigour with conceptual innovation, enhancing the survey's relevance, and resulting in a tool that effectively captures Canadians' sources of nutrition information, trust levels, and mis-/dis-information discernment.

4 Results

4.1 Outcomes of Existing Studies Review

Initially, 45,731 articles were identified however, after research was refined to only sources of nutrition information and not nutrition information in general, there were 125 articles. After further analysis, 9 articles were deemed relevant to be included in the analysis. The studies spanned disciplines such as public health, nutrition science, behavioural science, and information science (Tables 2.1 and 2.2, above). Key domains and constructs were identified as well as several limitations to the literature related to nutrition information and mis-/dis-information, as described in Chapter 2, Section 2.2. Many sources of nutrition information were not included in recently published studies, such as AI, nutrition websites, holistic nutritionists, naturopathic

doctors, other healthcare providers (e.g., dentists, chiropractors, etc.), researchers and scientists, personal trainers or social media influencers. Another point to note is that sources of information were being conflated with channels of nutrition information, so there was no specific data related to channels of nutrition information. No surveys have asked questions on nutrition mis-/dis-information or the nutrition infodemic. Three studies that ask about trust only asked about a single item.

4.2 Outcomes of the Item Development Process

Five major survey questions, which included multiple sub-items each, were developed across three domains: sources of nutrition information and which channels are used to access nutrition information, trust in sources of nutrition information, and Canadian's experiences with nutrition mis-/dis-information and the infodemic.

Sources and Channels of Nutrition Information: Two questions were designed to capture a broad spectrum of information sources and channels used by Canadians: "Please tell us, *in general*, where you have received information about nutrition? (Check all that apply)" which contained five sub-items asking about general channels used to obtain information. This question was generated to provide the research team with data on the proportion of Canadians accessing information online (in general) compared to other "traditional" methods. The other question was, "Many individuals are also a source of nutrition information. Please tell us from which individuals you have received information about nutrition, then indicate from where or how the information was obtained. (Check all that apply per line)." This question contained fourteen sub-items asking about sources of information that were individuals. Participants would be required to rate each source as "I have" or "I have not" related to accessing information from a given source. When a participant selected "I have" received information from a particular source, nine

sub-items appeared, asking the participant about channels through which nutrition information was presented Here, they selected all channels that applied to them. For the validation analyses, all sub-items were evaluated qualitatively through expert feedback/comments, while only the two major questions were evaluated quantitatively using CVI/CVR scores (Section 4.3, Table 4.1).

Trust in Sources of Nutrition Information: One question was created to measure respondents' trust levels in different sources of nutrition information: “How much trust do you have in the nutrition information that is obtained from each of the following sources? (Check one per line) Trust is defined as the level of confidence that one has in the person or place that is providing information” which contained 18 sub-items that were all sources of nutrition information. Trust levels were rated on a 5-point Likert scale ranging from very little to very much. For validation analyses, all sub-items were evaluated qualitatively through expert feedback/comments, while the one major question was evaluated quantitatively using CVI/CVR scores (Section 4.3, Table 4.1).

Experiences with the Nutrition Mis-/dis-information and the Infodemic: Two questions were created that evaluated personal experiences with the infodemic: “Please tell us the extent to which you agree or disagree with the following statements (Check one per line),” which contained six sub-items that assessed the ability to discern accurate information from inaccurate information, whether or not the amount of mis-/dis-information found online needs to be addressed, or the ability to find trustworthy information on a 5-point Likert scale ranging from strongly disagree to strongly agree. The other question was “Have you ever made a nutrition-related decision, based on information you found online, that you thought was accurate but later found to be inaccurate?” which did not contain sub-items but only a yes/no/I do not remember

response option. For the validation analyses, the six sub-items for the first question and the major question pertaining to a nutrition-related decision were evaluated quantitatively using CVI and CVR scores (Section 4.3, Table 4.1). The first major question was evaluated qualitatively from expert feedback/comments.

4.3 Validation Process

In the first round of quantitative validation, 6 (60%) of the 10 items met the CVI/CVR thresholds across all three criteria and were retained with only minor adjustments to the wording and order of questions, indicating strong expert consensus regarding their clarity, relevance, and importance (Table 4.1).

Sources and Channels of Nutrition Information: The two questions assessing sources and channels of nutrition information received ratings of 1.00 in the first round of CVI/CVR validation, indicating that these questions were important to include in the measurement tool, relevant and clear to understand (Table 4.1). Under these two questions, feedback and comments were provided for the twenty-nine sub-items, with experts providing constructive feedback on question structure, use of terminology that is easy to comprehend for the general public and order in which the sub-items were presented. Once feedback from the experts was incorporated, the questions went through a second round of quantitative validation, which yielded all CVI/CVR scores of 1.00 once again and positive qualitative feedback regarding appreciation for the feedback integrated.

Trust in Sources of Nutrition Information: The one question assessing trust in sources of nutrition information received CVI/CVR ratings of 1.00 after the first round of validation, indicating similar results to the sources and channels of nutrition information domain, where these questions were considered to be highly important, relevant and clear in terms of

comprehensiveness (Table 4.1). Under this question, eighteen sub-items were validated qualitatively, where experts provided feedback on the phrasing and order of the sub-items and whether all of the sub-items presented were necessary to include under the question. Upon integration of all expert feedback, the trust question went through another round of validation using CVI/CVR scores, which all yielded 1.00 again, and experts provided qualitative feedback showing appreciation of feedback integration.

Experiences with the Nutrition Mis-/dis-information and the Infodemic: The six sub-items assessing experiences with nutrition mis-/dis-information and the infodemic received varying CVI/CVR ratings as summarized in Table 4.1. After validation round 1, two of the six sub-items did not meet the threshold of at least 0.80 for CVR-importance, one sub-item did not meet the threshold of at least 0.80 for CVI-clarity, and the question pertaining to a nutrition-related decision did not meet the threshold of at least 0.80 for CVR-importance, for a total of three sub-items and one major question (40%) falling slightly below the threshold. Experts provided qualitative feedback and comments on the two major questions within this domain, assessing question structure and terminology used, as with the two preceding domains. Experts stated that some questions were confusing as they were unfamiliar with the nutrition infodemic and did not fully understand the terminology being used. Some experts stated that they thought these questions were not important to include as this is not relevant to the scope of research. However, this was also due to the novelty of this research. Once all feedback was integrated and addressed, a second round of validation took place, which yielded similar CVI/CVR scores compared to validation round 1, with four items not meeting the CVI/CVR thresholds. Experts once again provided qualitative feedback, the majority of which was now around the comprehensiveness of the sub-items and the use of terminology that would be understood by the general public.

However, the research team reached a consensus that all sub-items and the second major question were retained due to their conceptual importance, as they theoretically aligned with the i4Facts framework. It was also communicated by the experts that because of the consistent evolution of this topic, they might not be familiar with many of these concerns around mis-/dis-information. Retaining these items aligns with the exploratory nature of this work, allowing for the capture of data on mis-/dis-information in a rapidly evolving digital environment.

Table 4.1: Content and Face Validation Results, Rounds 1 and 2

Question	CVI-Relevance		CVI-Clarity		CVR-Importance	
	R1	R2	R1	R2	R1	R2
Please tell us, in general, where you have received information about nutrition.	1.00	1.00	1.00	1.00	1.00	1.00
Many individuals are also a source of nutrition information. Please tell us from which individuals you have received information about nutrition. Then indicate from where or how the information was obtained.	1.00	1.00	0.85	1.00	1.00	1.00
How much trust do you have in the nutrition information that is obtained from each of the following sources? Trust is defined as the level of confidence that one has in the person or place that is providing information.	1.00	1.00	1.00	1.00	1.00	1.00
I am able to find the nutrition information I need online	1.00	1.00	1.00	1.00	0.85	0.85
It is easy for me to find trustworthy and credible nutrition information online	1.00	1.00	0.85	1.00	0.71	1.00
I am confident I can differentiate between accurate and inaccurate nutrition information	1.00	1.00	1.00	1.00	1.00	1.00
I frequently share nutrition information I find on social media with others	1.00	1.00	1.00	1.00	0.71	0.71
It is difficult to trust nutrition science because what research says	0.85	1.00	0.71	1.00	0.51	0.71

is good for me today can be bad for me tomorrow						
I feel the amount of inaccurate nutrition information online is a public health issue that needs to be addressed	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**
Have you ever made a nutrition-related decision, based on information you found online, that you thought was accurate but later found to be inaccurate?	**1.00**	**1.00**	**0.85**	**1.00**	**0.71**	**0.71**

R1 = validation Round 1; R2 = validation Round 2. CVI = Content Validity Index; CVR = Content Validity Ratio

4.5. Final Survey

The final validated survey consisted of all five major questions and 57 sub-items (Appendix A). This set was structured into three key domains: sources and channels of nutrition information (2 items), trust in sources of nutrition information (1 item) and experiences with nutrition mis-/dis-information and the infodemic (1 item; 6 sub-items).

5 Discussion

This project illustrated challenges and gaps in the literature related to our understanding of the sources of nutrition information and which channels are used to access nutrition information, trust in sources of nutrition information, and Canadian's experiences with mis-/dis-information and the nutrition infodemic. These areas are critical as mis-/dis-information and limited trust in nutrition information sources undermine public health efforts that aim to address chronic diseases (1, 21).

The COVID-19 pandemic has amplified the dissemination of both accurate and inaccurate nutrition information, leading to what the World Health Organization terms an "infodemic" (12, 64). However, this research found that little has been explored related to nutrition mis-/dis-information. The literature does highlight that young adults are particularly vulnerable to mis-/dis-information on social media platforms, where non-expert influencers often propagate pseudoscientific claims (14, 70). For older adults, mis-/dis-information often takes the form of overly simplistic or generalized dietary advice that fails to account for individual health conditions, such as diabetes or hypertension (73, 74). These trends underscore the need for tailored strategies to combat mis-/dis-information across different demographic groups. Little work has been done related to how the infodemic is relevant to nutrition; despite knowing there is a plethora of nutrition mis-/dis-information online (70-72). Mis-/dis-information has significant implications for public trust in evidence-based dietary guidelines and professional advice. The literature suggests that conflicting or sensationalized dietary messages, particularly those amplified by social media algorithms, contribute to public confusion and mistrust (71, 75). Traditional sources such as healthcare professionals and government agencies remain

the most trusted, but their influence is often undermined by the pervasive reach of digital mis-/dis-information (19, 93). This research aimed to provide a deeper understanding of how trust mediates the impact of mis-/dis-information on dietary behaviours, by creating a measurement tool to explore trust dynamics and sources of nutrition information that Canadians rely on.

Existing studies on sources of nutrition information have primarily focused on traditional sources, such as healthcare professionals, government materials, and food labels, with limited exploration of emerging digital platforms and influencers (18, 20). The implications and novelty of the work presented in this paper can lead to the development of more effective public health interventions to present credible and accurate nutrition information to the general Canadian population, which will lead to better overall health outcomes and the promotion of a healthy diet. As noted in previous research, Canadians' low levels of food literacy lead to their lack of skills needed to interpret complex nutritional information (11). When nutrition information is presented through digital channels, people may not be able to identify what is credible compared to what is not. When someone actively seeks their nutrition information, they are looking for the information they wish to acquire, whereas if someone is scrolling on social media, for example, they may scroll upon a video that catches their attention and distorts their knowledge on the nutrition information they already know, leading them to believe what they see online as a result of visual appeal. This also alludes to why it is important to differentiate between various channels of nutrition information, which, in the past, have been conflated with sources of nutrition information.

A significant contribution of this research is the development of a novel measurement tool that integrates both traditional and emerging sources of nutrition information, including AI tools and digital influencers while differentiating between sources and channels. Unlike previous tools that aggregated diverse sources under broad categories like “internet” or “media” (19, 20), the tool developed in this research provides a more granular understanding of how Canadians access and interpret nutrition information. For example, distinguishing between nutrition information shared by healthcare professionals in a clinical setting versus on social media provides insights into how the dissemination channel influences trust and reception (18, 19). This is one example of why it is important to differentiate channels of nutrition information from the sources of nutrition information. Previous research has shown the vast majority of people trusting credible sources, without identifying from what channels those credible sources are using to present nutrition information. Furthermore, by incorporating questions on trust and mis-/dis-information discernment, this tool addresses critical gaps in existing literature, providing a more comprehensive framework for exploring the interplay between these factors and dietary behaviours. The findings from this work have significant implications for public health and policy. Enhancing food literacy through education and community programs can empower individuals to make informed dietary choices and reduce their susceptibility to mis-/dis-information. Policies that promote transparency and accountability among digital platforms are also critical to ensuring that credible information is prioritized over sensational content. This data can be used to support food literacy through integration into public health interventions, where Canadian adults can learn how to interpret the information they access and how that information affects their

dietary choices. Furthermore, expanding access to professional dietary advice, particularly in underserved regions, can help bridge gaps in knowledge and trust.

By integrating the 4iFACT framework into the development of survey items, this work also offers a novel approach to examining the infodemic. This framework emphasizes the informational, individual, interpersonal, and institutional levels of infodemic interventions, providing a holistic perspective on how Canadians interact with and trust nutrition information (97). The primary strength of the framework lies in its ability to provide a holistic perspective on how information is produced, shared, and interpreted, enabling researchers and policymakers to identify gaps and target mis-/dis-information effectively. This structured approach is particularly advantageous in assessing the alignment between public health messaging and needs, ensuring that interventions are evidence-based and contextually appropriate. Additionally, examining mis-/dis-information in the manner described in this work is highly novel. Previous research has mainly focused on reviews of the accuracy of social media content, and not public views or perceptions on this matter (72, 79, 80). However, the framework also presents limitations, such as its potential oversimplification of complex information, especially within digital environments characterized by rapidly evolving mis-/dis-information. Additionally, its application across diverse populations can be challenging due to variations in cultural, social, and technological contexts, as well as the resource-intensive nature of its implementation.

Future directions

The measurement tool created as part of this work was administered as part of a large cross-sectional survey called the Canadian Nutrition and Health Survey (CNHS) in

November 2024. It was administered to 3400 adults across Canada. The cross-sectional design enables data collection at a single point in time, which is ideal for examining current patterns in information access and trust among Canadians. Additionally, qualitative research offers significant benefits for future studies in nutritional sciences, particularly in understanding the nuances of individuals' experiences and perspectives. By incorporating qualitative methods, researchers can explore complex areas of this field that quantitative research may overlook, such as trust in nutrition information or personal experiences related to the infodemic and nutrition information, These insights can inform the development of more targeted interventions and tools that address specific barriers to a healthy diet. Integrating qualitative research alongside quantitative approaches ensures a more comprehensive understanding of nutrition-related issues, both in the field of nutrition research and for the general population.

Limitations

Despite the strengths of this research, the research has notable limitations. Cultural and geographic factors were not explicitly captured in the survey questions, although demographic data collected alongside the tool could provide indirect insights through stratified analyses. Additionally, while this work included emerging sources like AI tools and influencers, these remain evolving domains, and their impact on trust and mis-/dis-information requires ongoing investigation. The exclusive use of quantitative methods also limits the exploration of participants' nuanced experiences, suggesting that future studies adopt mixed-methods approaches to enrich the findings. Finally, the validation process employed in this research adds to its methodological rigour. Through two rounds of content and face validation, the tool achieved high CVI scores across most items,

ensuring clarity and relevance. However, unlike other studies that employed broader psychometric evaluations, such as test-retest reliability or confirmatory factor analysis (98, 99), this research was limited to face and content validation. Future studies should extend validation efforts to include these methods to enhance the tool's reliability and generalizability.

6 Conclusion

In conclusion, this research examined and developed a comprehensive tool to measure how Canadians access and trust nutrition information, their ability to discern mis-/dis-information and their experiences with mis-/dis-information and the infodemic. By addressing the limitations of existing research and incorporating emerging information sources, this work contributes to a deeper understanding of the sources and channels being accessed for nutrition information. The insights gained will inform public health strategies and policies aimed at mitigating the impact of nutrition mis-/dis-information and promoting evidence-based nutrition practices across all demographics.

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APPENDICES

Appendix A. Final Survey Questions

1. **Please tell us, in general, where you have received information about nutrition.** ***(Check all that apply)***

    a. Online and internet sources (e.g., websites, artificial intelligence tools like Chat GPT, digital newspapers, news-based websites, Wikipedia, e-books, scientific journal articles, email and online advertisements)

    b. Mobile apps (e.g., MyFitnessPal, Fitbit, Apple Fitness, Noom, Cronometer)

    c. Social media (e.g., Facebook, YouTube, Instagram, WhatsApp, TikTok, Snapchat, X (formerly Twitter), Pinterest)

    d. Other sources (e.g., cable TV, digital streaming services like Netflix, books, magazines, newspapers, brochures/pamphlets, radio, podcasts, conversations with healthcare providers, family, or friends)

    e. I have not received any information about nutrition

2. <u>Individuals</u> are also a source of nutrition information.
Please tell us from which individuals you have received information about nutrition.
Then indicate from where or how the information was obtained. ***(Check all that apply per line)***

	I <u>have not received</u> information from this source	**<u>I have received</u> nutrition information from the source through:**								
		Websites	**Social media (including YouTube)**	**One-on-one conversations (including group nutrition classes)**	**Podcasts/ Radio**	**Advertisements**	**TV/ Streaming Sources (e.g., Netflix)**	**Formal news media (e.g., newspapers, news channels)**	**Books/ Magazines**	**Scientific journal articles**
Medical doctor										
Nurse										
Registered Dietitian										
Nutritionist (i.e., a nutrition professional who does not have a Registered Dietitian license)										
Scientists or researchers										
Naturopathic doctor										
Other healthcare providers (e.g., dentists, chiropractors, physiotherapists, pharmacists, midwives)										
Fitness professionals (e.g., personal trainers, yoga instructors)										
University/college professors or lecturers										

Elementary or high school teachers										
Celebrities										
Non-healthcare provider member of the general public who gives nutrition and dietary advice online (e.g., online influencer, content creators)										
Non-healthcare provider member of the general public who gives cooking tips and demonstrations (e.g., chefs or cooks, online influencer, content creators)										
Family members and/or friends										

3. **How much <u>trust</u> do you have in the <u>nutrition information</u> that is obtained from each of the following sources? *(Check one per line)***
Trust is defined as the level of confidence that one has in the person or place that is providing information.

	Very little				Very Much
	1	2	3	4	5
Medical doctor					
Nurse					
Registered Dietitian					
Nutritionist (i.e., a nutrition professional who does not have a Registered Dietitian license)					
Scientists or researchers					
Naturopathic doctor					
Other healthcare providers (e.g., dentists, chiropractors, physiotherapists, pharmacists, midwives)					
Fitness professionals (e.g., personal trainers, yoga instructors)					
University/college professors or lecturers					
Elementary or high school teachers					
Celebrities					
Non-healthcare provider member of the general public who gives nutrition and dietary advice online (e.g., online influencer, content creators)					
Non-healthcare provider member of the general public who gives cooking tips and demonstrations (e.g., chefs or cooks, online influencer, content creators)					
Family members and/or friends					
Artificial intelligence tools (e.g., ChatGPT, Meta AI)					
Nutrition labels on food packages and front-of-pack labelling					
Mobile health apps					
Wikipedia					

4. Please tell us the extent to which you agree or disagree with the following statements *(Check one per line)*

	Strongly Disagree				Strongly Agree
	1	2	3	4	5
a) I am able to find the nutrition information I need online (e.g., websites)					
b) It is easy for me to find trustworthy and credible nutrition information online (e.g., websites)					
c) I am confident I can differentiate between accurate and inaccurate nutrition information					
d) I frequently share nutrition information I find on social media with others					
e) It is difficult to trust nutrition science because what research says is good for me today can be bad for me tomorrow					
f) I feel the amount of inaccurate nutrition information online is a public health issue that needs to be addressed					

5. Have you ever made a nutrition-related decision, based on information you found online, that you thought was accurate but later found to be inaccurate?

a. Yes
b. No
c. I do not remember
d. Not applicable – I have not used online nutrition information