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# Costly, confusing, polarizing, and suspect: public perceptions of plant-based eating from a thematic analysis of social media comments

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**Introduction:** A key approach to fostering more sustainable food systems involves shifting dietary patterns towards increased plant-based eating. However, plant-based eating remains low among Canadians. The objective of this research was therefore to explore public perceptions of plant-based eating in a Canadian context.

**Methods:** A qualitative design was used to analyze social media comments posted on Canadian news source Facebook articles between January 16th, 2019 – July 16th, 2020. Investigating perceptions of plant-based eating on social media may capture a broader sample of the population than can be captured using other qualitative methods. Template analysis, a type of codebook thematic analysis, was used to generate themes and subthemes using NVivo software.

**Results:** Nine articles were selected for inclusion and a total of  $n=4,918$  comments were collected. Five themes and 19 subthemes related to plant-based eating were generated and presented with quotations. Themes included: (1) The ethics of food; (2) The affordability and accessibility of food; (3) Distrust of food system stakeholders; (4) Beliefs related to dietary behavior, health, and the environment; and (5) Sensory aspects of plant-based proteins.

**Discussion:** Findings suggest that addressing food affordability and accessibility, increasing public food literacy, using non-judgmental approaches, and increasing food system transparency and communication may be strategies to foster plant-based eating. Results of this study provide insight for the development of more effective public health messaging about plant-based eating and help inform future research and interventions to address barriers related to plant-based eating and promote consumption.

## KEYWORDS

plant-based, qualitative, thematic analysis, sustainable diet, perception

# 1 Introduction

Fostering more sustainable diets is required to address complex food system-related issues including poor diet quality, increasing rates of diet-related chronic disease, and environmental degradation (Willett et al., 2019). The concept of sustainable diets is multidimensional, commonly including health/nutrition, environmental, social/cultural, economic, and political components (Jones et al., 2016; Eme et al., 2019; Drewnowski et al., 2020), and has been defined as:

“dietary patterns that promote all dimensions of individuals’ health and wellbeing; have low environmental pressure and impact; are accessible, affordable, safe and equitable; and are culturally acceptable” (FAO and WHO, 2019, p. 9).

Fostering increased plant-based eating is a key strategy to promote more sustainable diets and food systems and advance the United Nations Sustainable Development Goals 3, 12, and 13 (United Nations, 2015). For this study, plant-based eating is defined as a dietary pattern that includes plant-based protein foods such as nuts, cereals, and legumes (Langyan et al., 2022). Most evidence suggests that increased plant-based eating would be protective for both human health and environmental sustainability (Aleksandrowicz et al., 2016; Nelson et al., 2016; González-García et al., 2018; Springmann et al., 2018; Chen et al., 2019; Grummon et al., 2023; Auclair et al., 2024). In terms of health, plant-based eating has been associated with reduced risk of chronic diseases including cardiovascular disease (CVD) and CVD-related mortality (Quek et al., 2021) and Type 2 diabetes (Qian et al., 2019). Moreover, plant-based eating has been associated with a lesser impact across environmental indicators including greenhouse gas (GHG) emissions, water and land use, biodiversity loss, and risk of eutrophication (Scarborough et al., 2023).

Although shifting towards sustainable diets has the potential to improve human health and environmental degradation, individual dietary behaviour is complex and often difficult to change. Predictors of dietary behaviour may include sociodemographic factors such as gender, age, household structure, marital status, education level, and income (Biasini et al., 2021). Other individual factors may include attitudes, norms, and perceived behavioural control (Biasini et al., 2021). Diet is also shaped by societal factors such as food costs, availability, accessibility, and advertising (Pitt et al., 2017) and public health policy such as national dietary guidelines (Fischer and Garnett, 2016). Other factors related to plant-based eating may include sociodemographic influences, i.e., political orientation, physiology, i.e., allergies, dietary status, i.e., omnivore identity, motive for food selection, i.e., animal welfare, and picky eating, i.e., food neophobia (Giacalone et al., 2022).

In Canada, only 5% of individuals reported following plant-based eating patterns in 2015 (Valdes et al., 2020). Further, while 63% of Canadians reported consuming processed or red meat on any given day, only 34% reported eating nuts or seeds and just 14% reported eating legumes (Statistics Canada, 2018). While past research has examined beliefs and perceptions related to plant-based eating in Canada, this research has often focused on specific plant-based products, e.g., milk alternatives, or populations, e.g., older adults, and used survey and interview-based methods (Clark and Bogdan, 2019; Falkeisen et al., 2022; Moss et al., 2022; Drolet-Labelle et al., 2023;

Gorman et al., 2023). Results from this past research suggest that Canadians are often distrustful of information about plant-based eating (Clark and Bogdan, 2019), perceive undesirable taste, lack of knowledge and skills, and intestinal symptoms as barriers to plant-based eating (Drolet-Labelle et al., 2023), and perceive plant-based products as healthy and environmentally friendly; however, consumer acceptance of these products is variable (Falkeisen et al., 2022; Moss et al., 2022; Gorman et al., 2023).

Social media use is common among Canadians ages 15–64 (Schimmele et al., 2021), and Facebook is the most widely used platform among Canadians, with 84% adults having an account and 80% being Monthly Active Users (Gruzd et al., 2018). Facebook is also widely used by Canadians across income groups and education levels (Gruzd et al., 2018), and past research exploring perceptions of vaccines suggests that social media comments may be representative of public opinion (Henrich and Holmes, 2011). Using social media to examine public perceptions of plant-based eating is a practical and novel method of capturing data among a sample of the population that may be difficult to access using more traditional methods (such as men and those with lower education; Kripalani et al., 2021). To advance our understanding of public perspectives on plant-based eating, the objective of this research was to explore public perceptions of plant-based eating using Facebook comments posted on articles published by mainstream Canadian news sources between January 16<sup>th</sup>, 2019–July 16<sup>th</sup>, 2020.

## 2 Materials and methods

### 2.1 Data collection

Data were collected from publicly available online comments posted on Facebook news articles between January 16<sup>th</sup>, 2019, and July 16<sup>th</sup>, 2020. As this study used publicly available data, ethics approval was not required. Data from articles published on Facebook by the following six mainstream Canadian news sources were included to incorporate a range of political perspectives: CBC News, CTV News, Global News, The Globe and Mail, National Post, and Maclean’s. Keywords related to plant-based eating were used to search news source Facebook pages and identify potential articles. Twenty nine articles were considered for inclusion based on date of publication and topic. Articles were then selected for inclusion based on two criteria including the relevance of the topic to the research objective and the number of comments. Articles with greater relevance to the research and higher public engagement were prioritized. Data collection was completed directly from Facebook using the copy and paste function. The data set was then prepared by removing images, and unrelated, illegible, or non-English comments. To increase clarity of participant quotations, those selected for manuscript inclusion were edited to correct grammar (Thorne, 2020).

### 2.2 Study design and analysis

Implementation and reporting of this study adhered to the guidelines outlined in the Consolidated Criteria for Reporting Qualitative Research (COREQ; Tong et al., 2007; Supplementary Table 1). Template analysis, described by Braun and

TABLE 1 Facebook comments collected from Canadian news articles.

News source	Article title	Facebook publication date	Number of comments collected
CBC News	Less beef, more beans. Experts say world needs a new diet	January 16 <sup>th</sup> , 2019	1,210
CTV News	Canada's Food Guide recommends we eat more plants, less meat	January 22 <sup>nd</sup> , 2019	1,551
Global News	How to feed your plant-based kids	January 16 <sup>th</sup> , 2020	850
The Globe and Mail	Canada's new food guide shifts toward plant-based diets at expense of meat, dairy	January 22 <sup>nd</sup> , 2019	283
	McDonald's taps Ontario as test market to launch Beyond Meat burger	September 26 <sup>th</sup> , 2019	254
National Post	Demand for meat rising despite deluge of plant-based alternatives, report finds	March 10 <sup>th</sup> , 2020	201
	Plant-based eggs are coming to Canadian freezer sections	July 16 <sup>th</sup> , 2020	131
	Why our love for steak might stop plant-based burgers from saving the planet	May 28 <sup>th</sup> , 2019	160
Maclean's	What the skyrocketing popularity of Beyond Meat means for our planet	July 31 <sup>st</sup> , 2019	278
Total	<i>N</i> = 9		<i>N</i> = 4,918

Clarke (2022) as a codebook thematic analysis approach, was used to generate themes and subthemes related to plant-based eating using NVivo (Lumivero, 2023) software (King and Brooks, 2018). Briefly, template analysis involves the following steps: data familiarization, preliminary coding, clustering, the production of a template, iterative development of the template, and the final template and interpretation (King and Brooks, 2018). For this research, themes are defined as overarching patterns of topics across the data, while subthemes represent different categories or dimensions of the topic within a theme. The analysis plan was specified prior to data collection, and themes were generated using an inductive approach. Initial coding on the same portion of data was first conducted by three independent coders (KE, SD, and FZ) to compare researcher process and interpretations. Following initial coding, the researchers then analyzed separate portions of the data, meeting regularly to compare coding and clustering in an iterative manner. The template was developed using a collaborative approach by defining themes, subthemes, and quotes, and was used for the efficiency of the analysis; inter-coder reliability was not a study goal (Braun and Clarke, 2022). Data saturation was considered adequate once the research objective was addressed through data analysis and generation of themes. Quality maintenance for the analysis included the use of "inter-coder comparison," an audit trail (King and Brooks, 2018), and researcher reflexivity. Participant checking was not feasible as the study collected publicly available data and the participants were not actively involved.

## 2.3 Researcher reflexivity

The authors are female, university-educated (BSc, MSc, and PhD), applied nutrition researchers with high levels of food literacy and interest in food as it relates to health and the environment. KE, FZ, AD, PB, and JH are Registered Dietitians. Due to the study design and nature of the data collection, social desirability bias was not a concern. However, as the researchers' training and expertise differ compared to that of the public, the authors are positioned as "etic" to the participants and recognize that their interpretation of participants' lived experiences may be different than their original meaning. Results were therefore considered to be co-generated by both participants and researchers (Braun and Clarke, 2022).

## 3 Results

### 3.1 Participants

Nine articles were selected for inclusion and a total of  $n = 4,918$  comments were collected from news articles (Table 1).

### 3.2 Themes

Five key themes and 19 subthemes related to plant-based eating were generated and presented with representative quotations. Quotations do not include participant demographics or numbers due to the nature of the data collected. Themes included: (1) The ethics of food; (2) The affordability and accessibility of food; (3) Distrust of food system stakeholders; (4) Beliefs related to dietary behavior, health, and the environment; and (5) Sensory aspects of plant-based proteins.

#### 3.2.1 Theme 1: the ethics of food

Within the "ethics of food" theme, 5 subthemes were generated (Table 2). Feeding practices for children were debated, and some participants expressed concern about the nutritional adequacy of plant-based diets for children. Dietary freedom was discussed, with participants expressing discontent about being told what to eat by other individuals such as the vegan community and by institutions through dietary recommendations. Responsibility for food system impacts was also considered. Some participants perceived population growth and having children to be a more significant contributor to environmental degradation compared to diet. The relative responsibility of individuals compared to leaders and corporations was also questioned. Moreover, participants expressed concern about the ethical implications of transitioning to more plant-based consumption for the agricultural industry, particularly regarding loss of employment for those working in dairy or meat production. Lastly, agricultural practices were a contentious issue. Animal rights and industrial agriculture practices were disputed, and concern about the ethics of food production was a prominent finding.

TABLE 2 “The ethics of food” subthemes and quotes.

Subthemes	Quotes
Feeding practices for kids	<p><i>If beans, fruits etc. are all they are getting with no meat or dairy, yes, it deprives them of what they need to grow healthy and strong both mentally and physically.</i></p> <p><i>Are not plant-based foods, overly processed foods, which is what we should not be feeding our children. Give them a balance of real meat, fruits, veggies, and dairy.</i></p> <p><i>People actively feed their children only processed foods and soda, but eating whole grains, beans, fruits and vegetables only is child abuse???</i></p>
Dietary freedom	<p><i>I like my beef, and nobody can tell me what I can and cannot eat.</i></p> <p><i>If you do not want to eat meat THAT is your choice DO NOT tell me what to eat.</i></p> <p><i>Seems lately there's always someone who wants to change our behaviour.</i></p> <p><i>Why do you people feel the need to try and force your choices onto others and make them out to be horrible people for eating meat?!</i></p> <p><i>I have no issues with those that decide veganism is their dietary and moral decision... but I expect vegans to respect my informed decision.</i></p>
Responsibility for the impacts of food systems	<p><i>As for the environmental impact, it's better but when 100 corporations contribute 70% of ghg it really does not matter if some people switch to plant-based burgers.</i></p> <p><i>The world needs population control. That is a taboo topic though. Less people, less demand for everything.</i></p>
Concern about agricultural jobs	<p><i>Ridiculous and way to kill Canadian dairy and meat farms!</i></p> <p><i>Yes, let us ruin yet another industry that so many people rely on for jobs!</i></p> <p><i>A more plant-based diet, at a time when the economy is squeezing farmers out of business at a record rate... Yup, seems a legitimate idea.</i></p>
Agricultural practices	<p><i>There's no such thing as ethical or sustainable meat in western developed nations.</i></p> <p><i>Buying factory farmed meat at a supermarket is a destructive act.</i></p> <p><i>Plant-based eating is not perfect but it's less destructive and violent than eating plants AND eating animals.</i></p> <p><i>Everything in a field dies to harvest your vegetarian cuisine.</i></p> <p><i>I hauled these animals from farm to slaughter in Alberta and BC. And it's disgusting what people are eating.</i></p> <p><i>“To each their own” ... except the animals. They have no choice.</i></p> <p><i>Small family farms could produce enough for that, eliminating the need for factory farms.</i></p> <p><i>We acknowledge the fact that our food system is not perfect, but we are trying our best to cause the least amount of harm. Some nonvegans bury their heads in the sand while looking for anyway/any excuse to continue being unnecessarily violent just so they can continue satisfying mouth pleasure and eating the foods they are addicted to!</i></p> <p><i>Vegans support compassion and justice for all our animal brethren... nothing evil about that. Evil is when omnivores justify the horrors of animal agriculture and slaughter to satisfy their selfish taste for animal flesh.</i></p>

TABLE 3 “The affordability and accessibility of food” subthemes and quotes.

Subthemes	Quotes
Affordability of protein foods	<p><i>Dried beans are so crazy cheap!</i></p> <p><i>Fresh veggies outside of the season cost a mint in many parts of the country, could you imagine in the North? This does not address the food crisis in the North of Canada. Many families can hardly afford a loaf of bread up there, let alone the cost of bulk ingredients to make all these vegetarian-based meals. Add to that the cost of other ingredients to make them palatable, it's laughable. The spirit of this is ok, but it is totally blind to the reality of many Canadians.</i></p> <p><i>I was about to try a beyond meat product until I noticed it was more expensive than what it's trying to replace so I squashed that idea.</i></p>
Accessibility	<p><i>I'm going to say it, this guide is a guideline that many Canadians cannot follow. Many are working 2 or 3 jobs just to keep the lights on. Cooking legume-based meals takes quite a bit of time.</i></p> <p><i>My cooking time has cut in half now that I'm not thawing and cooking meat! I can make a very healthy and delicious meal in 20 min!</i></p> <p><i>Ok, if you live in a city with no grocery stores around and the only way to *get* to one is a 2h bus ride each way, that big Mac is cheaper to get than oranges.</i></p>

### 3.2.2 Theme 2: the affordability and accessibility of food

The cost of food and plant-based proteins were noted as barriers to healthy eating and plant-based consumption for some (Table 3). Accessibility of food was another subtheme discussed, and conflicting beliefs about the feasibility of plant-based eating (i.e., grocery shopping, cooking) were noted. Lastly, access to supermarkets to purchase healthy food was another barrier to plant-based eating described.

### 3.2.3 Theme 3: distrust of food system stakeholders

Distrust of food system stakeholders was commonly observed. Sources of distrust included food industry related practices such as government lobbying, food ingredients and components, processed plant-based protein products, and food recalls (Table 4). Some participants were suspicious about government intentions, perceiving nutrition recommendations to be linked with government intention to tax meat. Concerns about government political agendas and plans

TABLE 4 “Distrust of food system stakeholders” subthemes and quotes.

Subthemes	Quotes
Food industry	<p><i>I'm sure that big vegetable, just like big pharma, has been working on the government. I do not like the sound of this one bit.</i></p> <p><i>Beyond meat has the same ingredients as dog food.</i></p> <p><i>Since meat substitutes contain so many chemicals and are so high in sodium, we are looking at a massive increase in sick people.</i></p> <p><i>Read the ingredients of plant-based foods. Cancer cancer cancer!</i></p> <p><i>With all the vegetable recalls, it is not safe to eat anything from the stores anymore.</i></p> <p><i>The guide shifts to science and away from lobbying.</i></p>
Government	<p><i>All part of the Liberal UN plan to start taxing meat.</i></p> <p><i>They [state owned media] want to ruin another industry and millions of jobs in Ag worldwide... I swear they want everyone on welfare begging the government to look after us.</i></p> <p><i>State owned media in Canada is pushing the fake narrative of veganism. They claim it's healthy, it is not, it's good for the environment, it is not... This planted story is part of that taxation process.</i></p> <p><i>This is right out of the UN Agenda 2030 - they want to turn us all into vegetarians and restrict Beef!</i></p> <p><i>Like the government needs to tell us what we should or should not eat.</i></p> <p><i>Bacon wrapped steak is for me, you go ahead with your vegan diets. Canada liberal... gibberish to control the masses on what we eat.</i></p> <p><i>This sanctimonious federal government thinks it can tell us all how to live, and how not to eat.</i></p> <p><i>Very interesting government control.</i></p>
Scientists and researchers	<p><i>A biased panel of experts with shaky science and clearly vegan motivation.</i></p> <p><i>I think some remarks are a reflection of many people's increasing disenchantment and cynicism about science and research in general... for example, for every study that comes to one conclusion, you can probably find one that says the opposite. Research often does involve other agendas. Much research is inconclusive, and then used as a basis for policy. Plus, maybe people do not like feeling they are doing something wrong, when they thought they were doing it all right (hence, the cynicism when the "facts" change). I do think the latest food guidelines are an improvement over the previous set, given what is known now about nutrition, an inexact science.</i></p> <p><i>I will never trust another expert after they preached low-fat since the 80's.</i></p> <p><i>It's annoying how all over the map the recommendations are.</i></p>
Media and advertising	<p><i>This is a fad that is just pushed by the media.</i></p> <p><i>CBC - Canada's Brainwashing Corporation.</i></p>

for increased government control related to dietary recommendations were noted. Scientists and researchers were other stakeholders subject to distrust. Some participants were wary of changing and conflicting nutrition recommendations and perceived nutrition research to be biased or flawed. Skepticism about the role of media in promoting plant-based eating was also stated.

### 3.2.4 Theme 4: beliefs related to dietary behavior, health, and the environment

A wide range of beliefs were expressed related to dietary behavior, health, and the environment (Table 5). In terms of health, the negative gastrointestinal effects of legumes and apprehension about potential nutrient deficiencies associated with plant-based eating were commonly reported. Environmentally, there was debate about the relative sustainability of animal and plant-based agricultural practices, and support for practices perceived as sustainable such as regenerative agriculture and local foods was observed. Other subthemes included beliefs about meat consumption and gender, e.g., meat was observed to be associated with masculinity and soy with femininity, support for balanced eating approach, and beliefs that plant-based eating goes against human nature and evolution.

### 3.2.5 Theme 5: sensory aspects of plant-based proteins

Results related to the sensory aspects of plant-based proteins included perceptions about the taste and texture (Table 6). Some

participants noted their dislike of the taste and texture of plant-based proteins, and a strong preference for eating meat compared to plant-based proteins was observed.

## 4 Discussion

In this thematic analysis investigating public perceptions of plant-based eating, diverse views were observed among participants. We identified 5 themes and 19 subthemes related to the ethics of food, the affordability and accessibility of food, distrust of food system stakeholders, beliefs related to dietary behavior, health, and the environment, and sensory aspects of plant-based proteins. In the following sections, we synthesize these findings and discuss how addressing food affordability and accessibility, increasing public food literacy, reducing polarization by using non-judgmental approaches, and promoting food system transparency and communication may be strategies to foster plant-based eating. Participant quotes have been integrated into the discussion to better illustrate the main findings by adding depth and authenticity.

### 4.1 Addressing food affordability and accessibility

The affordability and accessibility of food was a key theme generated in this study. Results indicate that food affordability and



TABLE 5 “Beliefs related to dietary behavior, health, and the environment” subthemes and quotes.

Subthemes	Quotes
Human healthfulness of plant-based eating	<p><i>Except beans and lentils aren't actually healthy for humans. Fibre is the cause of so many digestive diseases.</i></p> <p><i>The 100,000 nutritional professionals of The Academy of Nutrition and Dietetics have stated that a diet without animal products can be nutritionally adequate for all stages of the life cycle, including pregnancy, lactation, infancy, childhood, adolescence, older adulthood, and for athletes.</i></p> <p><i>That's great for people that can digest beans. Some people actually suffer from issues that make consumption of beans and lentils impossible. People should be looking up how dangerous unfermented soy can be.</i></p> <p><i>Beans can be really hard to digest for some people.</i></p> <p><i>Not everyone can tolerate a plant-based diet. Some people's systems just cannot take it.</i></p> <p><i>What about iron deficiency? I was a vegetarian for more than 25 years, but susceptibility to extreme fatigue, anxiety, panic attacks, dizziness, chest pain, heart palpitations, etc. made me realize that it is hazardous to one's general health.</i></p> <p><i>If you eat a strictly vegetarian diet, you end up short of B12.</i></p> <p><i>That must be why veggies have to take vitamin supplements to replace what they are not getting from their tofu.</i></p>
Environmental sustainability and plant-based eating	<p><i>Beans and lentils would increase global warming as human methane releases would be worse than cows.</i></p> <p><i>Meat consumption, beef in particular, is one of the leading drivers of climate change. If we all ate less meat, especially beef we could effect change for the better.</i></p> <p><i>The benefits of carbon storage in properly managed cattle farms vastly outstrips harvest CO2 emissions. Plus creates needed habitat for our wild critter friends that does not come from intensive farming practices used for a vegan diet.</i></p> <p><i>Pasture raised cattle sequester carbon in the ground and contribute less to global warming than all the processed foods and plants that have to be transported around the globe.</i></p> <p><i>Actually, choose food from farms and ranches that practice regenerative agriculture, and you'll have the greatest positive impact on the environment and your health.</i></p>
Support for local food systems	<p><i>Buy your beef from a farmer you know; do not know one go meet one. It's good for farmers, its good &amp; responsible for the environment and it's a healthier option.</i></p> <p><i>Buy local and eat seasonally.</i></p>
Meat and gender	<p><i>I need meat to keep my testosterone levels up.</i></p> <p><i>The west wasn't won on broccoli!</i></p> <p><i>To paraphrase that old gun-loving actor, "You can have my beef when you pry it out of my cold dead hands..."</i></p> <p><i>Many of the men who did not do their research become feminized from all of the phyto / xenoestrogens and end up with erectile dysfunction and breasts.</i></p> <p><i>Soy? Do you want to turn us men into little sissy boys?</i></p>
Balance and moderation	<p><i>Perhaps moderation is key for all food consumption. Instead of trying to eliminate certain foods completely, let us just all be more responsible with how much we consume since we all have different food preferences and needs.</i></p> <p><i>Eat a balanced diet of meat, veg, and all. Going to meat free is not at all necessary.</i></p> <p><i>I'm not sure why there is so much outrage. No one is saying you Cannot eat meat-based proteins. All that is being said is that it would be wise to incorporate more plant-based proteins in our diets.</i></p> <p><i>I have no clue what is healthy and is not anymore and have decided simply to cut the processed stuff where I can and do the moderation thing.</i></p>
Eating plant-based proteins goes against nature/human evolution	<p><i>200,000 years of meat eating and now plants are the healthiest choice. Me thinks evolution over this fad.</i></p> <p><i>Humans have evolved by being carnivores, developing our large brains and musculature because of meat.</i></p>

accessibility are perceived as barriers to plant-based eating for some participants. Some of these barriers are illustrated by the following:

“I'm going to say it, this guide is a guideline that many Canadians can't follow. Many are working 2 or 3 jobs just to keep the lights on. Cooking legume-based meals takes quite a bit of time”

“Fresh veggies outside of the season cost a mint in many parts of the country, could you imagine in the North? This doesn't address the food crisis in the North of Canada. Many families can hardly afford a loaf of bread up there, let alone the cost of bulk ingredients to make all these vegetarian-based meals. Add to that the cost of other ingredients to make them palatable, it's laughable. The spirit of this is ok, but it is totally blind to the reality of many Canadians”

While there was some disagreement among the public regarding the affordability of plant-based eating, this debate may in part represent a discrepancy between those who are consuming highly processed plant-based foods (which are often more expensive compared to meat) and more minimally processed plant-based foods, such as tofu and beans (which tend to be less expensive). For example, one individual commented:

“I was about to try a beyond meat product until I noticed it was more expensive than what it's trying to replace so I squashed that idea.”

This is an important finding as it suggests that increased public awareness about the cost of minimally processed plant-based foods may be beneficial for promoting consumption. However, similar

TABLE 6 “Sensory aspects of plant-based proteins” subthemes and quotes.

Subthemes	Quotes
Taste and texture of plant-based proteins	<p><i>Food should be enjoyable and, preferably, fun. Food should not be a chore to choke down and then try to feel noble and guilt-free that you ate the “right” foods but generated no joy in doing so. We’ll all be smaller, and therefore, healthier, because we cannot gag down more than a few mouthfuls.</i></p> <p><i>We love our pulses. They are so good.</i></p> <p><i>That new a&amp;w burger “beyond meat” is really good. My husband who eats beef tried it and really liked it too. In fact, we both ordered it again a few days later. I think that meat alternates are going to keep improving and there are going to be new innovations in this area.</i></p> <p><i>I wish there were other sources of protein. I really cannot stand the texture of beans and lentils, so I do not eat them.</i></p> <p><i>Beyond meat is disgusting, it’s too dry</i></p>
Preference for animal products	<p><i>I’m in the less vocal camp of fully knowing a plant-based diet would be better for me and for the environment, but desperately not wanting to give up pizza and filet mignon and other such wonderful meaty foods</i></p> <p><i>What’s the point of living if you cannot eat meat.</i></p>

findings about the connection between food affordability, accessibility, and plant-based eating have also been noted among previous studies investigating public perceptions of sustainable and healthy eating from both the UK and Australia (Ronto et al., 2022; Whittall et al., 2023). Food insecurity is defined as “inadequate or insecure access to food due to financial constraints” and impacts nearly 18% of households across the Canadian provinces (Li et al., 2023). In Northern Canada, over 26% of individuals were from food insecure households in 2021 (Statistics Canada, 2023). For Canadians without adequate and secure access to food, fostering increased plant-based consumption, whether minimally or highly processed, may not be feasible. Addressing food insecurity must therefore be a priority for advancing healthy and sustainable eating.

## 4.2 Increasing public food literacy and understanding of plant-based eating

Another major finding prevalent across all five themes was the lack of understanding of the definition of plant-based eating and nutrition recommendations about consuming plant-based proteins. In some instances, misunderstanding was demonstrated explicitly with comments asking for recipes and education; however, in most cases this was implicitly observed, with comments demonstrating confusion about nutrition recommendations, Canada’s Food Guide (CFG), and the definition of plant-based eating (Health Canada, 2019). One participant noted their concern about plant-based foods, stating:

*“Are not plant-based foods, overly processed foods, which is what we should not be feeding our children. Give them a balance of real meat, fruits, veggies, and dairy.”*

Some comments supported eating a balanced diet, but argued against recommendations that advocate for decreasing intake of meat, appearing to believe that the guidelines advocated for a vegan diet. Many comments appeared to not have fully read the articles or misunderstood the recommendations for increasing consumption of plant-based proteins. For example, one participant commented:

*“Eat a balanced diet of meat, veg, and all. Going to meat free is not at all necessary.”*

Nutrient deficiencies related to plant-based eating were often discussed, with particularly strong concern about whether plant-based eating can support children’s growth and beliefs about the gastrointestinal and health effects of beans and soy. For example, participants responded:

*“People should be looking up how dangerous unfermented soy can be.”*

*“Beans can be really hard to digest for some people.”*

Issues related to meat and masculinity were also raised, with some individuals perceiving soy as “feminizing” and meat as masculine:

*“I need meat to keep my testosterone levels up.”*

Comments regarding the sensory aspects of plant-based proteins, a key theme generated, also suggest the need for increased knowledge in terms of plant-based meal preparation, with some comments describing a dislike of the taste and texture of plant-based proteins (a subtheme). Learning methods to prepare plant-based proteins that are appetizing as well as new recipes that include both plant- and animal-based proteins may be feasible approaches to increase plant-based eating while maintaining enjoyment of food.

These findings suggest a need for increased food literacy among the public about CFG and plant-based eating. Food literacy is defined as:

*“the ability of an individual to understand food in a way that they develop a positive relationship with it, including food skills and practices across the lifespan in order to navigate, engage, and participate within a complex food system. It’s the ability to make decisions to support the achievement of personal health and a sustainable food system considering environmental, social, economic, cultural, and political components” (Cullen et al., 2015, p. 143).*

Previous research about CFG, food literacy, and plant-based eating aligns with the findings from the current study. In a qualitative study about CFG perceptions, parents reported a lack of information about plant-based eating (Barco Leme et al., 2022), and research

among children echoes these findings (Zhang et al., 2022). Inadequate knowledge about cooking plant-based protein meals has also been reported among older Canadians (Drolet-Labelle et al., 2023). Interventions designed to promote food literacy about plant-based eating may therefore be key to increase public understanding, address misinformation, and foster plant-based consumption.

### 4.3 Plant-based eating is a polarizing issue

Findings from this study suggest that dietary recommendations and perceptions related to the health and environmental sustainability of plant-based eating are highly contested, with polarized views about protein consumption. As the 2019 CFG was newly published when this data was collected, this may account for some of the polarization observed. Debate among vegans and meat eaters was particularly fervent and was linked with personal values and the ethics of food, one of the main themes generated. For instance, some participants were critical of meat eaters, stating:

*“We acknowledge the fact that our food system is not perfect, but we are trying our best to cause the least amount of harm. Some nonvegans bury their heads in the sand while looking for anyway/ any excuse to continue being unnecessarily violent just so they can continue satisfying mouth pleasure and eating the foods they are addicted to!”*

*“Vegans support compassion and justice for all our animal brethren ... nothing evil about that. Evil is when omnivores justify the horrors of animal agriculture and slaughter to satisfy their selfish taste for animal flesh.”*

*“There’s no such thing as ethical or sustainable meat in western developed nations.”*

In contrast, others noted negative perceptions about the vegan community:

*“Why do you people feel the need to try and force your choices onto others and make them out to be horrible people for eating meat?!”*

*“I have no issues with those that decide veganism is their dietary and moral decision ... but I expect vegans to respect my informed decision.”*

A scoping review investigating perceptions of vegans and vegetarians found that while vegetarianism is linked with both positive and negative qualities, veganism is perceived more negatively (Corrin and Papadopoulou, 2017). Recent research among young people in the UK has also observed negative stereotypes of those following plant-based diets (McInnes et al., 2023). Given the conflict demonstrated, emphasizing moderate and non-judgmental approaches may be an important approach for reducing extreme views, fostering compassion among those with different dietary patterns, and unifying the public when promoting plant-based eating. Findings from Canadian food insecurity research by Patterson et al. (2016) align with this recommendation, observing that a “non-polarizing centrist, pragmatist, approach” may be useful for fostering healthy public policy.

### 4.4 Distrust in food systems is prevalent

Distrust was a key theme identified that was prevalent throughout the data. Various food system stakeholders were subject to distrust and comments were grouped as subthemes including distrust related to the food industry, government, scientists and researchers, and the media and advertising. Changing nutrition recommendations and skepticism about government, food industry, and media motives were identified as sources of distrust. Interestingly, the concept of “doing your own research” instead of trusting nutrition recommendations developed by government or the scientific community was a sentiment observed among the comments. One participant commented on potential explanations for the distrust, stating:

*“I think some remarks are a reflection of many people's increasing disenchantment and cynicism about science and research in general ... for example, for every study that comes to one conclusion, you can probably find one that says the opposite. Research often does involve other agendas. Much research is inconclusive, and then used as a basis for policy.”*

To address distrust and increase public understanding of nutrition research and policy, increased food literacy and science education among youth is necessary to foster “competent consumers of scientific information” (Nasr, 2021). However, establishing greater transparency among food systems stakeholder activities is also required to increase trust in the food system and dietary recommendations, including the promotion of plant-based eating. For instance, initiatives to increase transparency in dietary guidelines have been implemented in Canada with the development of the 2019 CFG (Health Canada, 2021). The 2019 CFG recommendations were developed in public consultation with food system stakeholders, including industry and the public, but private meetings with industry were not held to avoid potential conflicts of interest (Health Canada, 2021). Each phase of the development process was outlined, and a summary made publicly available (Health Canada, 2021). These changes were noted by some who were supportive of the 2019 CFG:

*“The guide shifts to science and away from lobbying.”*

However, given the significant findings of distrust observed in the present research, there is a clear need for increased messaging to foster greater public awareness of this transparency and combat misinformation. Mozaffarian and Forouhi (2018) echo this message and call on academic institutions to increase science communication to foster trust with the public.

### 4.5 Strengths and limitations

A key limitation of this research includes the potential for bots within the data collected which could influence the findings through the posting of comments designed to spread misinformation and which are not representative of public opinion (Santia et al., 2019; Lynn et al., 2020). Second, we did not have access to the demographic information of participants due to the nature of the data collected and are unable to describe our sample's characteristics. Third, the data used for this study were from the period when CFG was launched; therefore, public



perceptions of plant-based eating and CFG may have since shifted. Further, as this research is exploratory, additional research is required to develop evidence-based strategies to promote plant-based eating. Fourth, our data may not capture perspectives of Canadians who are elderly or do not have access to the internet. Finally, although individuals with more extreme opinions and beliefs about plant-based eating may be more likely to have published comments compared to those with moderate beliefs, previous research suggests that social media comments may be representative of public opinion (Henrich and Holmes, 2011). Study strengths include the analysis of a robust sample of publicly available online data to explore the public's views about plant-based eating. News outlets with diverse political orientations and comments from a range of article topics related to plant-based eating were included in the analysis. Results from this study may provide targets for intervention for future research investigating public perceptions of plant-based eating and strategies to promote healthy and environmentally sustainable diets in a Canadian context.

## 4.6 Conclusion

In this thematic analysis of Facebook comments from Canadian news articles about plant-based eating, five themes related to the ethics of food, the affordability and accessibility of food, distrust of food system stakeholders, beliefs related to dietary behavior, health, and the environment, and the sensory aspects of plant-based proteins were generated. Findings suggest that addressing food affordability and accessibility, increasing public food literacy, using non-judgmental approaches, and fostering food system transparency and communication with the public may be strategies to promote plant-based eating. These results provide insight for the development of more effective public messaging about plant-based eating and help inform future research interventions to promote plant-based eating among Canadians.

## Data availability statement

The datasets presented in this article are not readily available because they contain potentially identifiable data. Requests to access the datasets should be directed to [kecker01@uoguelph.ca](mailto:kecker01@uoguelph.ca).

## Ethics statement

Ethical approval was not required for the study involving humans in accordance with the local legislation and institutional

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requirements. Written informed consent to participate in this study was not required from the participants or the participants' legal guardians/next of kin in accordance with the national legislation and the institutional requirements.

## Author contributions

KE: Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Software, Writing – original draft, Writing – review & editing. SD: Formal Analysis, Investigation, Writing – review & editing. FZ: Formal Analysis, Investigation, Writing – review & editing. PB: Methodology, Writing – review & editing. AD: Methodology, Writing – review & editing. JH: Conceptualization, Methodology, Supervision, Writing – review & editing.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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## Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2024.1397004/full#supplementary-material>

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