

Mount Saint Vincent University  
Department of Applied Human Nutrition

**Perceptions, knowledge, and use of plant-based dietary interventions among healthcare providers in Nova Scotia (Veg-HP Study)**

by  
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**Title: Perceptions, knowledge, and use of plant-based dietary interventions among healthcare providers in Nova Scotia (Veg-HP Study)**

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**Introduction:** Plant-based diets, including vegetarian diets, have been studied extensively for utility in chronic disease management. Recent public health initiatives, including the revision of the Canada's Food Guide (CFG, 2019), reflect favourable health and wellness outcomes. Research investigating public perception of plant-based diets has identified several biases that may impact perceived and actual utility. Limited research exists on Healthcare Professionals' (HCPs) perceptions, knowledge, or use of plant-based diets in practice, all well established outcomes that impact whether or not HCPs use an intervention. **Aim:** To capture and describe perceptions, knowledge, and practice behaviours of HCPs in Nova Scotia (NS), in relation to vegetarian diet usage in chronic disease management (prevention and treatment). **Outcomes:** Guided by our study aim, we collected data under four outcome categories, from registered and regulated physicians, dietitians, nurses, and pharmacists, practicing in NS 1) Demographics, 2) Perceptions 3) Knowledge 4) Use/Application. **Methods:** This cross-sectional survey study included development and implementation of a 60-item close-ended questionnaire which was distributed via LimeSurvey (October 2021-April 2022) to physicians, dietitians, nurses, and pharmacists in NS. Data was subjected to descriptive statistical analysis and described in text, tabular and figure format. **Results:** Of 53 respondents, 94% identified as female and 49% as registered dietitians (RDs). The sample was composed of people who consumed primarily omnivore (49%, n=23/47) or plant-based diets (49%, n=23/47). HCPs described vegetarian diets as a lifestyle choice (86%, n=43/50), legitimate medical practice (58%, n=29/50), and complimentary medicine (44%, n=22/50). Knowledge questions were correctly answered by most (85% or more), excluding one. Thirty-eight percent (n=31/50) of respondents did not know CFG no longer contains a meat and alternatives food group. Respondents identified cardiovascular disease (90%, n=45/50), diabetes (80%, n=40/50), cancers (74%, n=37/50), and mental health disorders (26%, n=13/50) could be beneficially impacted with plant-based diets, with no negative impacts (66%, n=33/50). Respondents (26%, n=13/50) expressed some concern for mental health impacts with vegetarian diets specifically, patients living with eating disorders (5%, n=2/43). Vegetarian diets were recommended by 68% (n=34/50) of HCPs, not recommended by 32% (n=16/50), and 58% (n=29/50) reported waiting for patient interest before discussing vegetarian diets. **Conclusions:** A large percentage of respondents recognized vegetarian diets could beneficially impact disease states and clinical outcomes, a similar percentage of respondents reported not introducing this dietary pattern without prompting from their patient. NS HCPs had better knowledge scores than previous peer-reviewed and published literature, although evaluations/ knowledge evaluation tools differ across studies. This is likely due to the increased representation of RDs in our sample.

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## **List of Abbreviations**

### **B**

BMI            Body Mass Index

### **C**

CAM           Complimentary Alternative Medicine

CFG           Canada's Food Guide

CI             Confidence Interval

CPG           Clinical Practice Guidelines

CVD           Cardiovascular Disease

### **F**

FFQ           Food Frequency Questionnaire

FPG           Fasting Plasma Glucose

### **H**

HCP           Healthcare Professional

HDL-C        High-Density Lipoprotein Cholesterol

HR            Hazard Ratio

### **I**

IHD           Ischemic Heart Disease

### **K**

KABP         Knowledge-Attitude-Behaviour/Practice

### **L**

LDL-C        Low-Density Lipoprotein Cholesterol

LPN           Licensed Practical Nurse

### **N**

NCD           Non-Communicable Disease

NP            Nurse Practitioner

NS            Nova Scotia

### **R**

RD            Registered Dietitian

RN            Registered Nurse

RR            Risk Ratio

**S**

SDA          Seventh-Day Adventists

**T**

T2DM          Type 2 Diabetes Mellitus

**W**

WHO          World Health Organization

## Vocabulary

**Complimentary alternative medicine (CAM):** medical therapies, healthcare systems, and products that exist outside of the conventional treatments of disease (1,2). These may include acupuncture, aromatherapy, homeopathy, vegetarianism, etc. (1,2).

**Lacto-ovo-vegetarian diet:** a vegetarian dietary pattern that includes consumption of some or all types of dairy products (e.g., milk, cheese, yogurt, butter, etc.) and eggs and/or products that contain eggs.

**Lacto-vegetarian diet:** a vegetarian dietary pattern that includes consumption of some or all types of dairy products (e.g., milk, cheese, yogurt, butter, etc.).

**Ovo-vegetarian diet:** a vegetarian dietary pattern that includes consumption of eggs and/or products that contain eggs.

**Plant-based diet (plant-based diets):** an umbrella term that refers to diets that emphasize foods from plant-based sources and may involve the abstention or limited intake of all/any parts of an animal's body, regardless of the type of animal (e.g., bovine, porcine, poultry, piscine, etc.). This can include diets such as the Mediterranean diet, where animal flesh and by-products are still consumed, but the focus is on plant-based foods. Various types of vegetarian (e.g., ovo-, lacto-, lacto-ovo-, etc.) and vegan diets are also considered plant-based diets. Not all literature includes vegetarian and vegan diets in this definition but the focus within this research will be on vegetarian diets as a plant-based dietary intervention.

**Vegan:** a plant-based dietary pattern that typically excludes (or limits) the consumption of all/any parts of an animal's body as well as any animal by-products, regardless of the type of animal (e.g., bovine, porcine, poultry, piscine, etc.). This includes by-products such as dairy, eggs, honey, gelatine, etc.

**Vegetarianism:** a term that can refer to lifestyles that abstain or limit the use of all/any part of an animal's body in dietary choices and sometimes external sources such as glue, leather, fur, etc.

## 1.0 Introduction

In Canada, approximately 17.3% (~ 6.4 million) of the population follow the growing trend of plant-based diets, with 7.1% (~2.3 million) following a vegetarian diet, and 2.3% (~850,000) following a vegan diet (3,4,5). ‘Plant-based diets’ is an umbrella term referring to the abstention/limited intake of animal flesh/by-products of all or specific types of animals (e.g., bovine, porcine, poultry, piscine, etc.). Vegetarian diets are a type of plant-based diet where all flesh products are either eliminated or limited, but may still include animal by-products such as dairy, eggs, and honey. There are several sub-types of vegetarian diets (lacto-, lacto-ovo-, ovo-, and vegan) defined in the vocabulary section. Most research found in the literature refer to plant-based diets but often do not identify which diet type or have inconsistencies in the definition(s) across studies, such as differing allowances for meat intake within a period of time. As discussed, vegetarian dietary patterns are a large percentage of the plant-based diets being followed, as well as researched; therefore, vegetarian diets were used to narrow the focus of the study while representing the majority of those following plant-based diets.

Reasons for deciding whether to follow a vegetarian diet may differ based on values, and/or perceived benefits and difficulties. Common reasons for following a vegetarian diet include concerns involving animal welfare, perceived or actual health benefits, the reduction of environmental impacts, aversion to the sensory characteristics of meat, and religious beliefs, or any combination thereof (6,7,8,9). The perceived benefits and barriers of vegetarian diets have been found to be impacted by several demographic factors, including sex, gender, and life stage (6,7,8,10). These factors may impact vegetarian diet usage in clinical settings as practitioners also belong to the demographic categories reflective of these trends. An online survey in the U.S. (2014) found that 74% of vegetarian/vegan respondents identified as female (this was compared to the U.S. population as a whole, although 58% of respondents were female which was a slight deviation in representation of the female population) (11,12). In a 1998 two-part mixed-methods study with Australian adolescents (n=952) from randomly selected schools, this trend continued with a significantly higher proportion of females (n=536) vs males (n=416) identifying as: currently on a vegetarian diet (8% vs. 3%,  $p=0.004$ ), like (15% vs. 2%,  $p=0.00001$ ) or have considered (40% vs. 9%,  $p=0.00001$ ) vegetarian diets, have been on a vegetarian diet (13% vs.

2%,  $p=0.00001$ ), or identify as semi-vegetarian (16% vs. 6%,  $p=0.00001$ ) (13). In a 2006 randomized questionnaire in Australia ( $n=415$ ), women ( $n=247$ ) more often than men ( $n=168$ ) believed that plant-based diets could be tasty enough (45% vs. 33%,  $p<0.001$ ), provide ample energy (48% vs. 29%,  $p<0.001$ ), help people stay healthy (72% vs. 51%,  $p<0.001$ ), and provide benefits to the environment (40% vs. 29%,  $p<0.001$ ) and animal welfare (37% vs. 20%,  $p<0.001$ ) (7). This same questionnaire also found that women were less likely to believe in the ideology that humans are ‘meant’ to consume large amounts of meat compared to men (8% vs. 20%,  $p<0.001$ ) (6,7).

Differences in motivations and barriers for choosing vegetarian diets have been seen across life stages. According to a 2010 cross-sectional observational study with Seventh-day Adventists (SDA) ( $n=609$ ), respondents aged 11-20 years old often perceived value in vegetarianism for moral ( $p=0.003$ ) or environmental concerns ( $p=0.025$ ), whereas respondents aged 41-60 years old found the health benefits more valuable ( $p=0.010$ ) (8). Furthermore, in a study by Lea et al. Australian adults ( $n=415$ ) aged 20-44 (44% of this age group) and 45-59 years old (37% of this age group) identified the greatest barrier to vegetarian diets was the lack of information about plant-based diets; the greatest barrier for respondents aged 60-91 years old (42% of this age group) was an unwillingness to change their dietary habits (7). This may suggest that perceptions of benefits and difficulties of vegetarian diets could differ among age groups.

Choosing plant-based diets or limiting meat intake for the potential health benefits has been supported by some major Canadian health organizations including Health Canada 2019 (14), the Diabetes Canada Clinical Practice Guidelines (CPG) 2018(15), the Heart and Stroke Foundation (n.d.) (16), and the Canadian Cardiovascular Society 2021(17). The Academy of Nutrition and Dietetics (an American organization) and Dietitians of Canada released a joint position paper in 2016 citing that adequately planned vegetarian diets can prevent and treat certain chronic diseases while also meeting nutrient requirements for protein, omega-3 fatty acids, iron, zinc, iodine, calcium, and vitamin B12 (18). The Dietary Guidelines for Americans 2020-2025 supports that a healthy vegetarian diet can be achieved at various stages in life including adulthood, during pregnancy, and with toddlers aged 12 months and up who are no longer receiving breast milk or formula (19). In 2021, the European Division of the World Health

Organization (WHO) suggested that vegetarian diets could improve health noting a protective effect against coronary heart disease, lower risk for all cancers compared to non-vegetarians, and lower body mass index (BMI) (20). The WHO does mention possible concerns regarding intake or absorption of iron, iodine, zinc, calcium, selenium, and vitamins A, B2, B12, and D in vegan diets, however they note that with proper planning these needs can also be met (20).

Not all health organizations have a positive or neutral position on plant-based diets or the limitation of meat intake. In 2018, the physicians and allied health professionals of the Canadian Clinicians for Therapeutic Nutrition Association stated they do not support plant-based diets as ‘generally’ healthy, and that meat and animal products are an important feature of a healthy diet (21). They are concerned that saturated fat may be beneficial to health, and that as people have consumed less red meat, eggs, and dairy the population has become “sicker”; referring to increases in Type 2 Diabetes Mellitus (T2DM), obesity and other “nutritional diseases” (21). In a 2019 prospective cohort study, it was found that people consuming a plant-based diet may have an increased risk of hemorrhagic and total stroke when compared to meat eaters (22). This study group (the Epic-Oxford study) also found that vegetarian and vegan diets were associated with higher risks of hip and total fractures compared with meat eaters, with vegan diets also having a higher risk of leg and other main site fractures (23,24). Some studies have even considered ‘vegetarianism’ to be ‘Complementary Alternative Medicine’ (CAM) and not a conventional therapeutic intervention (1,2,25).

Klapp et al. (2020) completed a global analysis investigating national dietary guidelines and found the international recommendations regarding plant-based diets were also diverse (26). In 2004, The Nordic Kitchen Manifesto was developed to promote a healthy, sustainable, and ethical food culture, which prompted changes not only in consumer trends but in parliamentary recommendations (27,28). In 2009, Sweden was the first to propose guidelines for environmentally sustainable food choices (29). Meat was identified as the food group with the greatest environmental impact; it was recommended to consumers that meat should be eaten in smaller portions, less frequently and/or to choose vegetarian meals a few times per week (29). In addition to the Nordic Council, dietary guidelines in countries such as the United States, Australia, the Netherlands, Norway, Portugal, Saudi Arabia, South Africa, and Sri Lanka’s all

suggest that a well-planned vegetarian diet can be healthy and meet nutritional needs (26). In the United Kingdom, Australia, Belgium, Lebanon, Malaysia, and Malta it was also suggested that well-planned vegan diets can meet nutrient and calorie needs (26). Concerns about vegetarian diets (vitamin B-12 deficiency being the most frequently stated risk) were highlighted by guidelines in Argentina, Germany, Indonesia, Italy, Luxembourg, Paraguay, Slovenia, and Turkey (26). The guidelines in France, Germany, Italy, and Switzerland advised against vegan diets for the general population and suggested healthy diets always include animal-based products (26,30).

With HCPs and health organizations stating differing views on the effectiveness of vegetarian dietary interventions, the need for further research is indicated (13,14,15,16,21,25,31,32). Past studies regarding vegetarian diets have evaluated physicians' perceptions, training, and dietary pattern use. These studies have lacked input from the interprofessional healthcare team especially from registered dietitians (RDs), whose input is important considering RDs are leaders in dietary interventions for chronic disease management.

While investigating nutrition-based perceptions, knowledge, and dietary pattern usage, it is also important to consider HCPs' training in nutrition education. Essential members of a nutrition support team may include physicians, dietitians, nurses, and pharmacists (33,34). In a 2019 systematic review of 24 studies, it was suggested that medical students in the U.S. (n=11), Australasia (n=7), Europe (n=4)), the Middle East (n=1), and Africa (n=1) possessed inadequate nutrition knowledge and impaired confidence in providing nutrition care (33). Gaps in nutrition education also appear to exist in nursing programs (35). In a 2021 integrative review, investigating studies (n=10) of undergraduate nursing program's nutrition education, the authors concluded that improvements to the curriculum were required (36). Nurses across several studies demonstrated low knowledge scores in nutrition, suggesting a knowledge gap that reduces the professional capacity to provide effective nutrition assessment and care (36). This review did not find any studies from 2010 onward that were conducted within North America (36). A survey of 264 nursing programs in the U.S. found that only 54% of the programs provided a stand-alone nutrition course, however this data is from 1987 demonstrating how limited the research is on nutrition education in nursing programs (37). Pharmacists tend to receive some training in

nutrition specific to nutrition assessment, essential nutrients, formula intolerance, and enteral and parental nutrition support (37). The aim of this study was to investigate the current perceptions, knowledge, and usage/application of vegetarian dietary interventions by interprofessional HCPs: physicians, dietitians, nurses, and pharmacists.

## **2.0 Literature Review**

### **2.1 Vegetarian Diets in Chronic Disease**

According to the WHO, 74% of all deaths and 64% of disease burden worldwide are attributed to non-communicable diseases (NCD) (38,39). Higher rates are seen in Canada, with 90% of all deaths and 86% of disease burden attributed to NCDs (39,40). In Canada, among the leading causes of death in 2021 by NCDs were malignant neoplasms (26% of all deaths), heart diseases (17%), cerebrovascular diseases (4%), and diabetes (2%) (41). In Canada, the proportional rates of disease burden from these NCDs are 20% from cancers, 14% from cardiovascular disease (CVD), and 4% from diabetes and kidney diseases (39). Metabolic risk factors for NCDs include hypertension, overweight/obesity, hyperglycemia, and hyperlipidemia (38). There are modifiable behaviours that can reduce the risk of NCDs and other risk factors, such as eating a healthy diet, being physically active, limiting alcohol intake, and avoiding exposure to tobacco smoke (38).

Although not listed in the NCDs attributed to the leading causes of death in Canada, mental health disorders are one of the leading causes of disease burden both nationally and globally (39). With the increasing popularity of plant-based diets, there has been emerging research into the mental health impacts of vegetarian diets on depression and anxiety (42,43). In a 2020 systematic review of cross-sectional (n=18), prospective cohort (n=3), and randomised controlled trial (n=2) studies, it was suggested that vegetarian and vegan diets compared to omnivore diets had mixed results regarding impacts on depression (42). In this systematic review, 44% (n=11/23) of the studies found a higher incidence of depression, 28% (n=7/23) found beneficial impacts on depression with vegetarian or vegan diets, and 28% (n=7/23) found no association between the diet types and depression (42). In a 2022 systematic review and meta-analysis of studies (n=13) on mental health outcomes; eight studies examined anxiety outcomes



of vegetarian and vegan diets compared to omnivore diets (43). It was suggested that vegetarian and vegan diets were associated with lower anxiety scores compared to omnivores, except in a subgroup analysis where participants under 26 years of age showed a higher risk of anxiety (43).

In addition to impacts on mood disorders, vegetarian and vegan diets have had some association with eating disorders. The National Eating Disorder Information Center in Canada published a bulletin that discussed concerns for the increasing number of people that have been consuming vegetarian and vegan diets as a means to mask restrictive eating tendencies and alter/control body weight (44). The author, Brooke Finnigan, clarifies that this does not mean that vegetarian diets cause eating disorders or should be avoided, more so that it can be a means for someone struggling with food or weight-related issues to publicly control their food choices while avoiding attention to restrictive tendencies (44).

There is an abundance of research that has investigated the impacts of vegetarian diets on various chronic disease outcomes and clinical markers. CVDs and diabetes are two leading causes of death in Canada that have been studied extensively in conjunction with vegetarian diets.

### *2.1.1 Plant-Based Diets and Cardiovascular Disease Risk*

CVD refers to diseases or conditions of the blood vessels or heart (45). This umbrella term refers to conditions such as atherosclerosis, heart attack, ischemic stroke, heart failure, arrhythmia, and heart valve problems (45). Risk factors for CVDs include high blood pressure, high blood cholesterol, diabetes, obesity, physical inactivity, alcohol intake, and smoking (46).

Research into vegetarian diets and CVDs has shown impacts on disease incidence, mortality rates and clinical outcomes. In a 2021 systematic review and meta-analysis of 13 prospective cohort studies, it was suggested that vegetarian diets compared to non-vegetarian diets had a reduced risk of CVD (Risk Ratio [RR]: 0.85, 95% CI=0.79-0.92, 8 studies) and Ischemic Heart Disease (IHD) (RR: 0.79, 95% CI=0.71-0.88, 8 studies), but no clear association with strokes (RR: 0.90, 95% CI=0.77-1.05, 12 studies) (47). Another 2021 systematic review and meta-analysis of prospective cohort studies (n=7) showed no significant association with a reduced

risk of ischemic (Hazard Ratio [HR] = 0.56, 95% CI=0.22-1.42) or hemorrhagic (HR = 0.77, 95% CI=0.19-3.09) stroke with vegetarians compared to non-vegetarians (48). Studies that used only baseline data of vegetarian status showed a lower risk of stroke compared to non-vegetarians, whereas studies that included longitudinal follow-up assessment showed a higher risk of stroke with vegetarian status (48). The authors suggested two potential reasons for these findings: the non-vegetarian groups may have had variable intakes of meat/poultry/fish/seafood that were too low to see a significant effect, and/or the change in nutrient composition of vegetarian diets in recent years, although the vegetarian diet quality in general could be another likely reason (48). Both studies used different tools to grade the evidence, which had low or inconclusive grades for lack of associations between stroke risk and vegetarian diets compared to non-vegetarian diets (47,48).

In a 2021 systematic review and meta-analysis of eight observational studies, it was suggested that vegetarian diets compared to non-vegetarian diets had a significantly reduced risk of IHD mortality rate (RR: 0.70, 95% CI=0.55-0.89, 7 studies), no significant difference for all-cause mortality (RR: 0.91, 95% CI=0.79-1.05, 7 studies adjusted for outlier) or cerebrovascular disease mortality (RR: 0.93, 95% CI=0.74-1.18, 7 studies adjusted for outlier) (49). Outlier analysis was used to detect and exclude heterogeneous studies, the study that was excluded found lower RRs for IHD mortality, all-cause mortality, and cerebrovascular disease mortality (49). The study by Jabri et al. emphasized that the research into plant-based diets has a lack of consistency in the definition of ‘vegetarian diet’, which lead to difficulties in comparing results among different research studies (49). Across studies, the definition of ‘vegetarian diet’ differed where: meat and fish were not consumed or were consumed less than once a week, participants ate egg or dairy or both, and included vegan diets. The authors noted that they had included studies where vegetarian dietary principles differed; European vegetarianism and Japanese Zen Buddhist vegetarianism, where differing lifestyle factors may have been important (49). Differences in diet composition and lifestyle factors can make determination of outcomes difficult and less generalizable.

Hypertension is a condition of persistently high blood pressure and can be a manageable risk factor for CVD (46). In a 2020 systematic review with meta-analysis and trial sequential analysis

of 15 studies, it was found that a vegetarian diet could significantly reduce systolic ( $p < 0.001$ ) and diastolic blood pressure ( $p < 0.001$ ) compared to an omnivore diet (50). A vegan diet demonstrated a significant ( $p = 0.05$ ) reduction in both diastolic and systolic blood pressure compared to a lacto-ovo-vegetarian diet (50). However, the authors used a grading tool that ranked the evidence for this study as very low for both systolic and diastolic blood pressure due to a risk of bias and inconsistencies (50). Researchers in a 2014 systematic review and meta-analysis of controlled clinical trials and observational studies, found similar impacts on blood pressure with vegetarian diets (51). When compared to omnivore diets, vegetarian diets significantly ( $p < 0.001$ ) reduced systolic blood pressure (-4.8 mm Hg) and diastolic blood pressure (-2.2 mm Hg) (51).

Metabolic improvements have been seen for several clinical indicators for both CVD and diabetes. A 2020 umbrella review of 5 systematic reviews and meta-analyses showed a significant impact on blood lipids with vegetarian diets compared to omnivore diets (52). Three of the studies showed a significantly lower blood or serum concentration of total cholesterol, Low-Density Lipoprotein Cholesterol (LDL-C), and High-Density Lipoprotein Cholesterol (HDL-C) (52). In one study, HDL-C was not significantly lowered (52). Triglyceride levels were significantly lower in only two of the four studies (52). A 2015 systematic review and meta-analysis of randomized controlled trials found similar results with vegetarian diets causing a significant reduction in total cholesterol, LDL-C, HDL-C, and non-HDL-C (53). In a 2023 meta-analysis of randomized trials a reduction was also shown in concentrations of apolipoprotein B (a carrier protein for LDL-C) associated with vegetarian and vegan diets (54).

Several studies have also investigated the impact of red meat consumption on CVD risk. In a 2012 study investigating CVD mortality rates (with up to 22-28 years of follow-up) from two prospective cohort studies ( $n = 121,342$ ) positive associations between red meat consumption and increased risk of CVD were found (55). A 19% increase ( $HR: 1.19$ ,  $95\% CI = 1.00-1.11$ ) of CVD mortality risk was seen with one additional serving of processed meat intake per day over eight years (55). Alternatively, a 2019 systematic review and meta-analysis of cohort studies found uncertainty regarding the impacts of red meat on CVD mortality (56). This study investigated the separate impacts of processed red meat (six cohort studies,  $n = 1,240,643$ , with 9-28 years of

follow-up) and unprocessed red meat (seven cohort studies, n=874,896, with 9-28 years of follow-up) on CVD mortality risk (56). The authors stated there was low-certainty evidence that a reduction in processed (RR:0.90, 95% CI=0.84-0.97) and unprocessed (RR:0.90, 95% CI:0.88-0.91) red meat below three weekly servings could decrease the risk of CVD mortality (56). However, the authors noted several limitations with the studies including a lack of accountability for confounding variables and biases in dietary measurements, primarily a lack of follow-up assessment beyond baseline (56).

More recent large-scale studies into the impacts of red meat consumption on CVD risk include the UK Biobank study (57), the Jackson Heart study (58), PURE study (59), and NIPPON DATA80 (60). The UK Biobank study in 2022 was a population-based large (n=180,642) cohort study of adults with a median follow-up of 8.6 years (57). The highest intakes of red meat were associated with significant increases in risk for CVD (20% increase, compared to lowest red meat intake: HR:1.20, 95% CI=0.92-1.56), coronary heart disease (53% increase, compared to lowest red meat intake: HR:1.53, 95% CI=1.01-2.32) and stroke mortality (101% increase, compared to lowest red meat intake: HR:2.01, 95% CI=1.11-3.65) (57). The Jackson Heart study in 2022 was a population-based longitudinal cohort study of African American (n=3242) adults ( $\geq 21$  years) in Jackson Mississippi with a mean follow-up of 9.8 years (58). Greater intake of unprocessed red meat (3svg/week) was associated with a 42% higher risk of stroke (HR:1.43, 95% CI=1.07-1.90), whereas total (HR:1.00, 95% CI=0.91-1.11) and processed (HR:0.98, 95% CI=0.86-1.12) meat were not associated with CVD outcomes (58). The PURE study (2021) was a large (n=134,297) multinational prospective cohort study with adults from 21 countries with a median follow-up of 9.5 years (59). A higher intake of processed meat (>150g/week vs. 0g/week) was correlated with a significantly higher risk of total mortality (HR:1.51, 95% CI=1.08-2.10) and major CVD (HR:1.46, 95% CI=1.08-1.98), whereas higher intakes of unprocessed red meat and poultry intake were not associated with total mortality (HR:0.93, 95% CI=0.85-1.02, and HR:0.96, 95% CI=0.86-1.06 respectively) or major CVD (HR:1.01, 95% CI=0.92-1.11, and HR:1.02, 95% CI=0.90-1.16 respectively) (59). The NIPPON DATA80 (2020) was a prospective national population-based cohort study in Japan with adults (n=9112) stratified by kidney function who were followed for 29 years (60). No significant association was found between red meat intake and CVD mortality risk with men or women stratified by kidney

function, except for a significantly lower risk of CVD mortality in women (n=182) with decreased kidney function in the highest tertile of red meat intake (HR:0.67, 95% CI=0.46-0.98) (60). Women in this tertile had a higher CVD mortality risk than women in the lowest tertile (n=229) (HR:0.91, 95% CI=0.64-1.29), although this was not significant (60). All four major studies had a limitation in common; dietary assessment occurred only at baseline which does not capture dietary changes that could impact CVD risk (57,58,59,60).

Two studies that did not have this limitation were the Nurses Health Study II and the Health Professionals Follow-Up Study which included semi-quantitative food frequency questionnaires (FFQ) conducted every four years (61,62,63). A review of the Nurses Health Studies (1976 and 1989) summarized the findings of two large (n= 121,700 and n=116,430 respectively) prospective cohort studies of female nurses in the U.S., which investigated lifestyle factors and CVD risk (61,62). Associations between dietary intake and higher CVD risk were seen for trans fats (higher risk of coronary heart disease), saturated fat (compared to unsaturated fats), red meat (especially compared to other dietary proteins), and the Western dietary pattern (high in red and processed meats, refined grains, sugar, and processed foods) (61,62). Lower risk of CVD was seen with fruits and vegetables, whole grains, and the Mediterranean diet (61,62). The Health Professionals Follow-Up Study (1986-2016) was a large (n=43,272) prospective cohort study of male health professionals in the U.S. which included dentists (n=29,683), veterinary surgeons (n=10,098), pharmacists (n= 4,185), optometrists (n=3,745), osteopathic physicians (n=2,218), and podiatrists (n=1,600) (63). In this study, coronary heart disease risk was associated with total (HR:1.12, 95% CI=1.06-1.18), unprocessed (HR:1.11, 95% CI=1.02-1.21), and processed red meat (HR:1.15, 95% CI=1.06-1.25) (63). Lower hazard ratios for total coronary heart disease were associated with the replacement of one serving per day from total red meat intake with legumes (HR:0.82, 95% CI=0.70-0.96), soy (HR:0.67, 95% CI=0.48-0.93, when replacing two servings of red meat for two servings of soy per week), or plant-based proteins (HR:0.86, 95% 0.80-0.93) (63).

### *2.1.2 Plant-Based Diets and Diabetes Risk*

One in three Canadians (~11.7 million) live with diabetes or prediabetes, with those under the age of 20 years old having a 50% chance of developing diabetes within their lifetime (64,65). In a 2017 systematic review and meta-analysis of cohort and cross-sectional studies, it was found that with vegetarian diets (when the data was pooled) had a 27% lower risk of diabetes incidence compared to omnivores (66). The American Dietetic Association and the Dietitians of Canada both give a possible explanation to this in their position paper on vegetarianism: vegetarian diets may be protective of diabetes risk due to the higher fibre intake and lower BMI status, thus helping to improve glycemic control (67). Alternatively, the results from the UK Biobank prospective cohort (n=203,790) study (2022) did not show significantly reduced risk for T2DM with vegetarian diets compared to meat eaters (68). A significantly reduced risk of T2DM was shown with fish (HR: 0.52) and fish and poultry (HR: 0.62) eaters compared to meat eaters (68).

To test glycemic control the hemoglobin A1c test is often used to measure the percentage of average blood glucose (69). A percentage of 6.5 or higher can be considered a diagnosis of diabetes, whereas an A1c in the range of 6.0-6.4% can be considered prediabetes (69). In reference to two systematic reviews (in 2014 and 2019), it is suggested that plant-based diets compared to omnivore diets can have a significant reduction in hemoglobin A1c, which could be comparable to ~1/2 the effect seen with the use of metformin (70,71). In a 2020 meta-analysis of randomized controlled trials (n=9) a significant reduction in Fasting Plasma Glucose (FPG) was also seen with vegetarian diets (52).

## **2.2 Research on Vegetarian Diets with Healthcare Professionals**

### *2.2.1 Early Research on Vegetarian Diets with Healthcare Professionals*

Vegetarian diets in chronic disease management have been studied extensively for health impacts, although research into the perceptions, knowledge, and use of vegetarian diets in healthcare have previously been limited. Originally five studies were found as early research on this topic, with four of these studies originating in the 1990s (1,2,25,31,72). There has been a

more recent surge in interest in this topic area, although more recent research will be discussed in the next section.

All of the research found on HCPs' perceptions, knowledge, and use of vegetarian diets were survey studies (1,2,25,31,72). Prior to the popularity and accessibility of online questionnaires, paper questionnaires were mailed out to members of professional organizations or made available at conferences and/or workplaces. Three of the studies were conducted in the United States (regionally, specific state(s), or nationally) (1,25,72), one study in Kyoto, Japan (2), and one study in a community education clinic in Ontario, Canada (31).

Of the five studies originally investigated, three studies only surveyed physicians (n= 505, n=84 [1999] and n=121 [2005], n=176). One study only included RDs (n=182) in their sample population (72). A more recent pilot study from 2015 had a sample population (n=25) of RDs (n=13), registered nurses (n=11), and an endocrinologist (n=1) (31). The majority of early research into HCPs' perceptions, knowledge, and use of vegetarian diets focused on input from only one healthcare profession which excluded the input of other HCPs that may have also provided dietary interventions (1,2,25).

Early research (n=3) primarily focused on whether "vegetarianism" was perceived as a legitimate medical practice with physicians (1,2,25). Vegetarianism was not defined in these studies beyond being a Complementary Alternative Medicine (CAM), so it is unclear if this included interventions beyond dietary intake, and/or the degree of abstention or avoidance of different flesh products. Across studies most physicians did not view "vegetarianism" as a legitimate medical practice (1,2,25), and one study found that this perception did not change over time (2). Differences in perceptions were investigated in one study between physicians that either complied or denied patients' referral requests for a vegetarian diet consult (1). Physicians that had accepted the referral more often considered it a legitimate medical practice, saw more benefits to "vegetarianism" treatment, and had received training (1). Alternatively, physicians that denied a "vegetarianism" referral more often did not see it as a legitimate medical practice, had not seen treatment benefits, and had not received training (1).

One study investigated both the perception and usage of plant-based diets for the treatment and management of T2DM with participants from different professions (31). A copy of this questionnaire (31) was obtained in consideration for the development of the questionnaire in this research study. The majority (72%) of staff were aware of plant-based diets in the treatment of T2DM but only 32% were currently recommending plant-based diets (31). The most common reasons reported for not recommending plant-based diets were that the diet was unrealistic and difficult, had low acceptability by patients, there was unclear direction from CPG, and lack of supporting educational tools (31).

Of the five studies, only one early study investigated knowledge (17 questions) and attitudes (8 questions) towards vegetarian diets, this was with RDs in the United States. The overall mean scores were 73% for knowledge and 58% for attitude, which the researchers interpreted as a need for RDs to update themselves on research surrounding vegetarian diets (72). Further assessment found a positive correlation between knowledge and attitude scores, suggesting a more favourable attitude towards vegetarian diets with a greater knowledge base (72).

Early research of the perceptions, knowledge, and use of vegetarian diets with HCPs is dated with several gaps in the information (1,2,25,31,72). Canadian HCPs were only represented by one small pilot study from a community healthcare clinic in Ontario, potentially lacking generalizability for healthcare workers in Nova Scotia (NS) (31). Additionally, only the pilot study considered an interprofessional healthcare team (31) and only two studies included RDs who are the leaders in nutrition interventions (31,72).

### *2.2.2 Current Research on Vegetarian Diets with Healthcare Professionals*

With the recent heightened interest in plant-based diets, additional research into these dietary patterns and healthcare settings has emerged in the last eight years. A recent review of the literature has shown eight more studies investigating plant-based diets with HCPs (73,74,75,76,77,78,79,80). All research found on HCPs' perceptions, knowledge, and use of vegetarian diets were survey studies, with the exception of one mixed methods study which included a focus group following the utilization of a questionnaire (75).



All of the current research studies used online questionnaires (n=7) with the exception of one study that passed out paper questionnaires within several healthcare workplaces (n=1) (75). Each study was conducted in a different country with sample populations located in Peru (n=179)(73), Canada (n=411)(74), New Zealand (n=41)(75), Italy (n=418)(76), Norway (n=394)(77), France (n=177)(78), Israel (n=270)(79), and the United States (n=64)(80). The types of HCPs that were surveyed were RDs, physicians (including pediatricians, physician attendings, residents, and fellows), medical students, nurses, pharmacists, midwives, and healthcare support workers. The one Canadian study was administered nationally with RDs and specifically investigated the use of plant-based recommendations in the 2019 Canada's Food Guide (74). Limited research exists in Canada investigating the perceptions, knowledge, and use of vegetarian diets with HCPs.

Investigation into HCPs' perceptions of plant-based diets was explored in recent studies, including health benefits, barriers to dietary changes, diet safety, nutrient impacts, and changes to the CFG recommendations. In a 2019 mixed methods study with physicians (n=149), nurses (n=13) and pharmacists (n=7) in New Zealand, respondents considered plant-based diets to be beneficial to health (61%, n=25) and could improve a person's quality of life (51%, n=20) (75). A minority (46%, n=20) of the respondents assessed plant-based diets as complicated with additional barriers including cost, food accessibility, meal preparation difficulties, and the cessation of animal flesh intake (75). No respondents in this study ranked vegetarian diets as slightly or very harmful, though a majority of the respondents deemed meat to be the best source of protein (73%) and iron (87%) (75). On the other hand, a 2015 U.S. survey study with physician attendings [n=46], residents [n=12], and fellows [n=6], found that 92% of respondents disagreed that quality proteins were only available from animal sources (80). The respondents had also deemed a plant-based diet as safe and healthy (83%), identified it can reduce the risk of CVD incidence (83%), as well as incidence of T2DM (79%) and some cancers (63%) (80). In regard to nutrients, physicians (n=149) and pediatricians (n=28) in the cross-sectional study by Villette et al. (2022) noted concerns for iron deficiency (76%) in lacto-ovo-vegetarian diets and iron (84%), protein (79%), and B12 vitamin deficiencies (69%) in vegan diets (78). In a 2020 Canada-wide cross-sectional survey study with RDs (n=411), 82.8% of respondents had favourable attitudes towards the CFG changes to promote more plant-based proteins and considered these recommendations to be evidence-based, many dietitians have adjusted their

nutrition counselling sessions to reflect this viewpoint (74). In these studies, plant-based diets seem to be perceived as beneficial to health and may reduce the risk of some disease states, although there is some concern for nutrient deficiencies and protein quality.

In current research the focus appears to have shifted toward investigating HCPs' knowledge of plant-based diets. Knowledge of dietary assessment and intervention strategies are important for providing patients with adequate nutrition care. In the current literature, knowledge regarding nutrient considerations, diet risks and benefits, and adequacy of plant-based diets through the life cycle were investigated.

Nutrient considerations with plant-based diets were investigated in a 2020 cross-sectional survey study with Peruvian RDs (n=179) (73). Participants were asked to identify critical nutrients in vegetarian diets by multiple-choice, all the correct items were selected by less than 50% of respondents (35.7% of vegetarian and 25.2% of non-vegetarian respondents) (73). In a 2018 survey study with medical students (n=394) risk of micronutrient deficiency were noted for: vitamin B12 (81%), omega-3 fatty acids (74%), iron (70%), vitamin D (56%), iodine (55%), folate (53%), selenium (43%), zinc (42%), and vitamin A (33%) (77). Dietary sources of B12 were considered by respondents to be (although 16%, n=64 did not answer): beans/lentils/nuts (~33% of all students), meat (65% of omnivore students, 83% of vegetarian students), fruit (13% of omnivore students, 6% of vegetarian students), and bread (25% of omnivore students, 22% of vegetarian students) (77). Twenty percent of all students thought plant foods were a good source of iodine (77). In the study by Krause and Williams (2015), participants were asked about nutrient aspects of a vegetarian diet: 94% identified nuts as high in protein, 93% identified dark leafy green vegetables as high in iron, and 78% of respondents identified you could get enough protein (80). In both the Bettinelli et al. (2019) and Hamiel et al. (2020) studies, only 20% of respondents correctly answered nutrient-based questions (76,79).

When participants in the Santila et al. (2020) study were asked to identify chronic diseases as being more prevalent in omnivores than vegetarians; significantly more ( $p<0.001$ ) vegetarians (93.1%, [n=67]) than non-vegetarians (72.9%, [n=78]) answered correctly (73). In the study by Bettinelli et al. (2019), only 45% of respondents identified risks, and 39.4% correctly identified

benefits of a vegetarian diet (76). Similar results were seen in the Hamiel et al. (2020) study where only 45% of respondents answered correctly regarding risks and benefits of vegetarian diets (79).

In a study by Santila et al. (2020), RD respondents were asked in a true/false question to correctly identify that “a planned vegetarian diet is nutritionally adequate during all stage of the life cycle”; 91.7% (n=66) of vegetarians and 79.4% (n=85) of non-vegetarians correctly answered true ( $p < 0.001$ ) (73).

In regard to HCPs’ knowledge of plant-based diets, several studies noted that there needed to be some improvement (73,76,77,79,80). Most of the respondents (88%), in the Villette et al. (2018) study, self-identified that they did not feel informed enough about vegetarian diets (78). In the study by McHugh et al. (2019), 43% of respondents (physicians, nurses, and pharmacists) regarded their nutrition knowledge to be inadequate (75). Similar to prior research (72), the study by Hamiel et al (2020) found a positive correlation between knowledge and attitude scores (79). Respondents’ mean scores with knowledge questions ( $37.9 \pm 16.0\%$ ) showed a positive correlation ( $p < 0.001$ ) with their mean scores for attitude questions ( $38.1 \pm 20.7\%$ ), showing a more favourable attitude toward vegetarian diets with greater knowledge scores (79).

A few studies have also investigated HCPs’ use of plant-based diets in their professional practice. In a study by Villette et al. (2018), 14% (n=24) of physician and pediatrician respondents noted they would dissuade patients from switching to a vegetarian diet, and 51% (n=88) would dissuade a change to a vegan diet (78). In the study by Hamiel et al. (2020), 69% of the pediatricians noted they would refer parents of vegetarian/vegan children to dietitians, 44.2% would not typically give nutrition recommendations to parents of vegetarian/vegan children themselves, and 39.8% were not comfortable answering questions about vegetarian diets (79). Additionally, 65% of the pediatricians ordered more blood tests for children following a vegetarian diet: 58.2% complete blood count, 56.7% vitamin B12 levels, 56.3% iron panel, 21.5% vitamin D levels, 14.1% electrolytes, and 13% thyroid function (79). Lastly, in the study by Krause and Williams (2015), only 33% of respondents (physician attendings, residents and

fellows) would recommend plant-based diets to their patients, 51% would maybe recommend plant-based diets, and 16% would not recommend plant-based diets (80).

The current research into the perceptions, knowledge, and use of vegetarian diets with HCPs allows several opportunities for further investigation. Research in Canada was limited to one study that investigated the attitudes and behaviours of RDs specific to the changes to CFG's recommendation for plant-based proteins (74). RDs are the leaders in medical nutrition therapy and yet there were only two current studies where they were included in the sample population (73,74). There are further opportunities to investigate a wider range of perceptions, knowledge, and use of vegetarian diets with interprofessional healthcare providers in Canada.

### **2.3 Nutrition Recommendations for Plant-Based Diets in Canada**

In 2019, Health Canada updated their CFG; the former food group labeled 'Meat and Alternatives' was changed to a quarter of a plate visual representation labelled 'protein' (81). This section predominantly illustrates plant-based proteins (various nuts, legumes, seeds, and tofu) as well as eggs and dairy, over the less-represented meat-based sources of protein (chicken, beef, and fish) (81). In the CFG, it is recommended to choose plant-based proteins more often and to plan for a couple of meatless recipes each week (14). The CFG provides guidance and instructions on how to prepare meatless meals even offering suggested recipes and cooking tips (14). The rationale provided for the shift to more plant-based proteins was to decrease saturated fats and incorporate additional fibre (14).

These changes to the CFG have sparked controversy among some health practitioners and agricultural industry leaders alike (82). Prior to the 2019 CFG changes, the Canadian Clinicians for Therapeutic Nutrition petitioned Health Canada with 717 physician and allied health professionals' signatures to not reduce the previous meat intake recommendations (82). Their stated concerns included that saturated fat may be neutral or beneficial to health and that women may not consume enough iron from their diet (82). As well, the National Cattle Feeders Association submitted a brief on June 28<sup>th</sup>, 2018, to the House of Commons with claims of over 900 physician signatures against the recommendations to lower meat consumption (83). Their

concerns included: environmental impacts should not be a focus for the CFG, animal-based proteins are more nutrient dense, and diets higher in protein with reduced carbohydrates can reduce the risk of type-2 diabetes and obesity (83). The Dairy Farmer's of Canada also submitted concerns that prioritizing plant-based proteins over animal proteins could result in a less nutritionally adequate diet with food options that have a poor protein content (84). The rebuttals put forth by these petitions contradict the stance taken by Health Canada, emphasizing more plant-based proteins for increased health benefits (82,83,84). These conflicting viewpoints emphasize a possible divide in health professional standpoints toward meat and dairy consumption.

Health Canada adopting the promotion of plant-based meals occurred after several other health organizations had already suggested plant-based diets were potentially healthy dietary patterns (15,17). The 2018 Diabetes Canada CPG suggested that a vegetarian diet can help manage both diabetes and CVD (15). They suggest that plant-based diets (vegan or vegetarian) may improve glycemic control, blood lipids including LDL-C, reduce myocardial risk (evidence for all three markers ranked Grade B, Level 2), and improve body weight (Grade C, Level 3) (15).

In 2016, the Canadian Cardiovascular Society released the *2016 Canadian Cardiovascular Society Guidelines for the Management of Dyslipidemia for the Prevention of Cardiovascular Disease in the Adult* (85). Among the recommendations to lower CVD risk is the adoption of the portfolio diet (conditional recommendation; moderate-quality evidence), a type of plant-based diet with emphasis on soy protein, nuts, plant sterols and fibre, or adoption of vegetarian dietary patterns (conditional recommendation; very low-quality evidence) (85). A Mediterranean dietary pattern was strongly suggested with the highest level of quality evidence, having been supported by a large randomized controlled trial of cardiovascular events and several systematic review and meta-analyses that feature elements of the Mediterranean diet (85). This diet has daily intakes of vegetables, fruits, nuts, legumes, and grains, weekly intakes of seafood and poultry, and infrequent intakes of red meat (86). The evidence to support a vegetarian diet referred to only one 2014 systematic review and meta-analysis involving SDAs, omitting other studies that investigated the impact of vegetarian diets on CVD prevention and treatment (85).

The Heart and Stroke Foundation (n.d.), has suggested that vegetarian diets may lower blood pressure, reduce risk of T2DM, heart disease, stroke, and improve cholesterol and weight status (16). They also suggest that with careful planning a vegetarian diet can provide all required nutrients including protein, iron, calcium, vitamins B12 and D (16).

More recently (2020) a detailed fact sheet was published by the WHO on healthy diets where plant-based diets or limiting meat intake were not discussed (87). Instead, it was recommended that a healthy diet includes fruits, vegetables, legumes, nuts, and whole grains with limitations on fat intakes (87). It was suggested that total energy intake from fat be less than 30% with <10% from saturated fat (examples given were: fatty meat, butter, cream, cheese, lard, ghee, palm and coconut oils), and <1% from trans-fats (examples given included baked goods, pre-packaged foods, as well as meat and dairy products from ruminant animals) (87). In this fact sheet the WHO does not have suggestions on which protein sources to emphasize but does suggest the types and amounts of fat to consume (87).

## **2.4 Theoretical Frameworks**

This study investigated the perceptions, knowledge, and use of vegetarian dietary interventions by HCPs, therefore it's appropriate to utilize theoretical frameworks involving the factors that would impact these three areas of investigation. The frameworks used in this study are survey methodology and the Knowledge-Attitude-Behaviour/Practice (KABP) continuum.

Survey studies follow a sequential framework heavily influenced by the scientific method and are used to gather and organize information surrounding a topic of interest (88). Government and non-profit organizations (e.g., Statistics Canada) often use surveys to gain insights on aspects or trends within a population (88). The first step in a survey study is the formulation of objectives, including establishment of the topics to address (88). Through a review of the literature, gaps were seen in previous research studies which led to the development of this study's research question, objectives, and outcomes. The steps in survey methodology are outlined in Table 1.

Table 1. Survey methodology steps; adapted from Statistics Canada 2003.

| <b>Survey study steps</b> | <b>Explanation of steps</b>                                                                                                                                                                                                                              |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Formulate objectives      | Define what information needs to be gathered, what can be excluded, and develop the main concepts.                                                                                                                                                       |
| Select survey frame       | Identify means for contacting the sample population. e.g., through an organizational listserv.                                                                                                                                                           |
| Determine sample design   | Determine sample survey or census survey, non-probability sampling or probability sampling.                                                                                                                                                              |
| Questionnaire design      | Decide which questions to ask and formulate in a group or sequence as appropriate. Determine paper or computerized format.                                                                                                                               |
| Data collection           | The process of gathering information for each survey question from the participant whether through observation of the participant or through participant or interview reporting (paper, electronic, auditory, picture-based, etc.).                      |
| Data capture and coding   | Numerical coding of respondent answers to ease in capturing and processing data.                                                                                                                                                                         |
| Editing and imputation    | Editing is the process of identifying any missing, invalid, or inconsistent response options, to ensure a valid and complete data set. Imputation involves assigning an appropriate replacement value to resolve issues with incomplete or invalid data. |
| Estimation                | Obtaining and drawing conclusions about a population based on the information collected from the study's sample population.                                                                                                                              |
| Data analysis             | Summarizing and interpreting the data to provide well-defined answers to the study's objectives / initial questions.                                                                                                                                     |
| Data dissemination        | Distribution of the study's data and information through various media to the public.                                                                                                                                                                    |
| Documentation             | A detailed record of the study and phases of the survey. Can provide context and useful information to a variety of different groups, e.g. designers of other surveys.                                                                                   |

The Knowledge-Attitude-Behaviour/Practice (KABP) continuum (Figure 1.) is a theoretical framework that describes the triad-type relationship between knowledge, attitudes, and behaviours/ practices (89,90). Any category on the continuum (e.g., knowledge) can influence and be influenced by various factors from the other two categories (e.g., attitudes) (89,90).

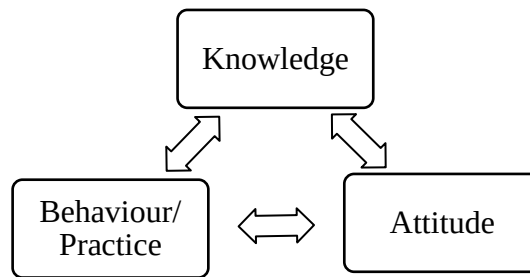


Figure 1. Knowledge-Attitude-Behaviour/Practice (KABP) continuum; adapted from Bano et al. 2013.

The KABP continuum has been used in the development of knowledge, attitude, and practice surveys (91,92). The purpose of a KABP survey is to gather information to investigate what is known, perceived, and practiced in regard to a specific topic (92). The WHO has a toolkit for developing questionnaires using this framework and associated methods, which aligned with gathering information on this study's outcome categories (perceptions → attitude, knowledge → knowledge, and usage → behaviour/practice) (92).

A benefit of this continuum is the dynamic flow with ongoing changes in the environment (e.g., knowledge acquisition) continually interacting and potentially changing or reinforcing factors within the KABP triad (89,90). This theoretical framework also outlines that each outcome category may independently and/or collectively impact each other, which provides a potential opportunity to investigate correlations between outcome categories (91). The data collected from a KAPB questionnaire can lend insight into common attitudes, factors influencing behaviour, and reasons why clinicians may incorporate or abstain from vegetarian dietary intervention, thus providing key data for informing strategic decisions (92).

### **3.0 Research Focus & Objectives**

#### **3.1 Rational**

Despite growing evidence supporting that plant-based diets or the reduction of dietary meat



intake have beneficial impacts on several clinical markers of chronic disease states, several studies have shown a lack of knowledge or perception among HCPs in the utility of plant-based dietary interventions as a legitimate medical practice (1,2,7,25,31,72). Recent research investigating HCP knowledge and attitudes towards plant-based dietary interventions has predominately lacked an interprofessional perspective with most studies only recruiting physician participants and lacking RD representation (1,2,7,25,31,75,76,77,78, 79,80). Current investigation into the perceptions and use of plant-based diets has not been extensive. Additionally, large scale studies of this nature have not been conducted with an interprofessional team within Canada and no studies have existed in NS.

The results of this study will help nutritional scientists, educators, and professionals better understand the current barriers and facilitators to the use of vegetarian dietary interventions.

Possible positive, negative, or neutral perceptions of vegetarian diets may become apparent through this research. Given the changes to Canada's Food Guide in 2019, recent discourse on the topic of plant-based diets, and the stance of health organizations regarding plant-based diets; it is important to understand what is currently influencing the use of vegetarian diets as a medical nutrition therapy. This research may prompt professionals to evaluate their current perceptions and values, knowledge strengths and gaps, and usage of vegetarian dietary interventions, as well as how these factors may interact. Lastly, this research can also provide the basis for future research of the perceptions, knowledge, and use of vegetarian diets within patient populations.

### **3.2 Research Question**

What are the current perceptions, knowledge, and practices of HCPs in NS regarding vegetarian diet use in chronic disease management?

### **3.3 Study Objectives**

The objectives for this research study were to:

1. Develop a face/content validated questionnaire
2. Administer the questionnaire with physicians, dietitians, nurses, and pharmacists
3. Analyze the data with descriptive statistics
4. Report the findings for future consideration in research and clinical practice

### **3.4 Study Outcomes**

To answer the research question, the following outcomes were explored:

1. Demographics.
2. Perceptions and values.
3. Knowledge and skill.
4. Use and practical applications.

## **4.0 Methodology**

### **4.1 Design**

This was a descriptive cross-sectional study that explored HCPs' perceptions, knowledge, and use of vegetarian diets in chronic disease management. The scientific method framed this research which included face/content validation of the questionnaire, limited researcher-participant interactions, and data analysis with computer software (e.g., Microsoft Excel) (93).

A timeline of the study is described in Figure 2. A questionnaire was developed (2021/2022), with incorporation of the current scientific literature on plant-based diets in chronic disease management within healthcare settings. The decision to use vegetarian diets instead of plant-based diets was made to narrow the focus of the research and align with results investigated in the literature review. Co-authors reviewed the questionnaire in 2021 and provided feedback prior to the REB submission. The questionnaire underwent further face and content validation with

additional subject matter experts, discussed further in the next section.

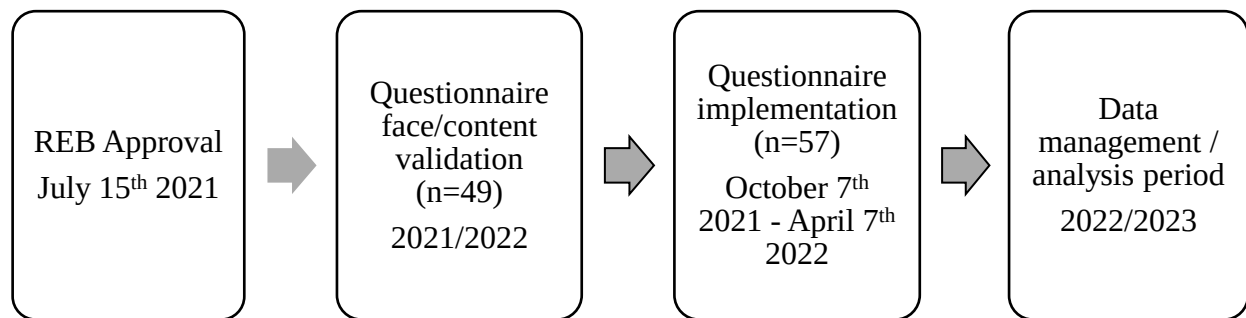


Figure 2. Study timeline

## 4.2 Questionnaire

### 4.2.1 Phase-1: Face/Content Validation

The questionnaire was formulated using the current research on clinical outcomes and nutrient considerations in plant-based diets, along with reviewer feedback from the face/content validation stage.

Question aspects assessed during face/content validation were:

1. Difficulty in question comprehension.
2. Wording that may be interpreted differently by different people.
3. Offensiveness of word(s) or phrases.
4. Construction of questions in a way that may favour a particular answer.
5. Sufficiency of response options.
6. Relatability to the research study question.
7. Redundancies.
8. Inclusivity of various cultures, age groups, orientations, and other demographics.

The questionnaire was also assessed for content gaps, wording (clarity, length, accuracy), format (readability, flow, whitespace), content (breadth and depth), appropriateness, and any additional feedback (94). To aid in comprehension, the questionnaire underwent reading level assessment

using SMOG Index scoring with all reading materials tailored to a grade 10 or lower reading level (94). Since participants completed secondary education degrees, this was deemed an acceptable reading level. Additionally, short lists of answer options were provided to not overwhelm the reader with choices (94). Both uppercase and lower-case letters were used to help with visual readability (94).

Quantitative questions were used in all sections of the questionnaire to provide quick straightforward analysis of the data. Types of questions used were select answer (multiple choice, true/false, 5-point Likert scale) and open-ended (short-answer textbox) questions. The Likert questions followed similar concepts from the literature and were also incorporated from questionnaire feedback. Written values (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree) instead of numerical values were used to create consistency in interpretation between respondents. The Likert options were presented for each question instead of in a table and in a descending format to create more whitespace and aid in comprehension. Answers to open-ended question were collected through an open textbox with a word limit. All open-ended questions had closed-ended (quantitative) responses that were presented as counts or percentages. The aim of the open-ended questions was to reduce potential response biases that could exist in select answer questions. Only one open-ended question was explored in the results section, additional open-ended questions/answers are listed in Appendix A. A break down of the face/content validated questionnaire's format is described in Table 2.

Table 2. Questionnaire format

| Category                       | # of questions | Question types                                                                          |
|--------------------------------|----------------|-----------------------------------------------------------------------------------------|
| Demographics                   | 15             | Multiple-choice<br>Short-answer textbox                                                 |
| Knowledge                      | 14             | Multiple-choice<br>True/False<br>Short-answer textbox                                   |
| Perceptions and values         | 25             | Multiple-choice<br>5-point Likert scale                                                 |
| Use and practical applications | 6              | Multiple-choice<br>5-point Likert scale                                                 |
| <b>Summary</b>                 | <b>60</b>      | <b>Multiple-choice<br/>True/False<br/>5-point Likert scale<br/>Short-answer textbox</b> |

#### 4.2.2. Phase-2: Implementation

During October 2021 to April 2022, the questionnaire (Appendix B) was made available to participants via LimeSurvey. Participants were given the option at the end of the survey to provide additional feedback on the questionnaire.

### 4.3 Sample

#### 4.3.1 Phase-1: Face/Content Validation

Prior to the start of the study, the questionnaire underwent face and content validation by a group of professionals (n=57) that met the following inclusion criteria:

- 1) Adults  $\geq 18$  years of age
- 2) Were subject matter experts OR researchers OR educators OR represented the sample population (physician, dietitian, nurse [RN, NP, LPN] or pharmacist) for the Implementation phase OR were knowledgeable in questionnaire development, or any combination of the above.

Participants were drawn from a body of professional contacts who had expressed interest in the research prior to its commencement and through recruitment at Mount Saint Vincent University. The questionnaire underwent face and content validation through consultations with a focus group of academic trainees (n=16), professional consultants contacted through e-mail (n=4), the advisory committee (n=4), and a presentation to faculty, students, and health care professionals (n=27). Three professional consultants were excluded as feedback was not obtained within the face/content validation phase of the study.

The Mount Saint Vincent University Research Ethics Board (REB) approved the proposed research for this study on July 15<sup>th</sup>, 2021 (File# 2021-005).

#### *4.3.2 Phase-2: Implementation*

Participants were recruited over a six-month period (October 7<sup>th</sup>, 2021, to April 7<sup>th</sup>, 2022) until no new participants were willing to complete the questionnaire. Inclusion criteria for this sample population were:

- 1) Adults  $\geq 18$  years of age
- 2) Registered and licensed in NS as a physician, dietitian, nurse, or pharmacist with a professional college or association (regulatory body) during the study.
- 3) Provider of nutrition advice for patients, clients, or residents within NS during or prior to the study.

This followed criterion and theoretical sampling methods (93), as participants needed to meet eligibility criteria to be included in the study and were a homogenous group; health professionals experienced in providing nutrition education to patients/clients/residents (93). Despite the homogeneity of this group, they were also heterogeneous; interprofessional healthcare providers with differing levels of experience in nutrition training and patient education. There were no restrictions on what populations (e.g., specific chronic disease states) health care professionals provided nutrition education to.

The aim for study recruitment was to achieve a sample population of physicians, dietitians, nurses, and pharmacists within NS. Recruitment for this study occurred until no new participants completed the questionnaire. HCPs were recruited through social media outlets, online notices through provincial and national professional associations, e-mail (through association listservs), and snowball sampling (see Appendix C for recruitment location details).

#### *4.3.3 Sample size determination*

Based on the information from each NS regulatory body, the population studied was approximately 20,077 (95,96,97,98). This population consisted of physicians (n=2,497), nurses (n=15,407), dietitians (n=648), and pharmacists (n=1,525) (95,96,97,98). Using a 10% margin of error, 96 participants would have been needed to complete the questionnaire (99). A 10% response rate was a safe estimate for a population not previously contacted by this committee for research, meaning 960 potential participants would need to be contacted (99). The questionnaire was originally available to participants over a four-month period. The participant sample population (n=33) did not meet the sample size needed for a 10% margin of error; therefore, the Implementation phase was extended by two months to attempt further recruitment. In the thesis proposal, sample saturation was discussed; however, due to the quantitative nature of the study this was no longer a viable strategy.

### **4.4 Data Collection & Analysis**

#### *4.4.1 Phase-1: Face/Content Validation*

Participants from the focus group, advisory committee, and thesis proposal presentation gave either verbal or written feedback on the questionnaire. Feedback was collected for consideration or incorporated as appropriate. The professional sample in this study phase was given a questionnaire feedback tool (see Appendix D), however no feedback was collected from this subsample within the face/content validation phase. The questions within the feedback tool were explored with the rest of the participants in this phase.

#### *4.4.2 Phase-2: Implementation*

This study utilized inductive analysis as the research is exploratory, and a hypothesis is not being proven or disproven. Descriptive statistics were used in the previous research studies mentioned and were therefore utilized to describe this study's outcomes (1,2,25,31,72). Microsoft Excel was used to analyze the data which was then interpreted using descriptive statistics (percentages and counts) and visual diagrams (figures and tables). An open-ended question had close-ended responses that were presented through counts displayed in a table. A copy of the consent form and questionnaire are in Appendix B.

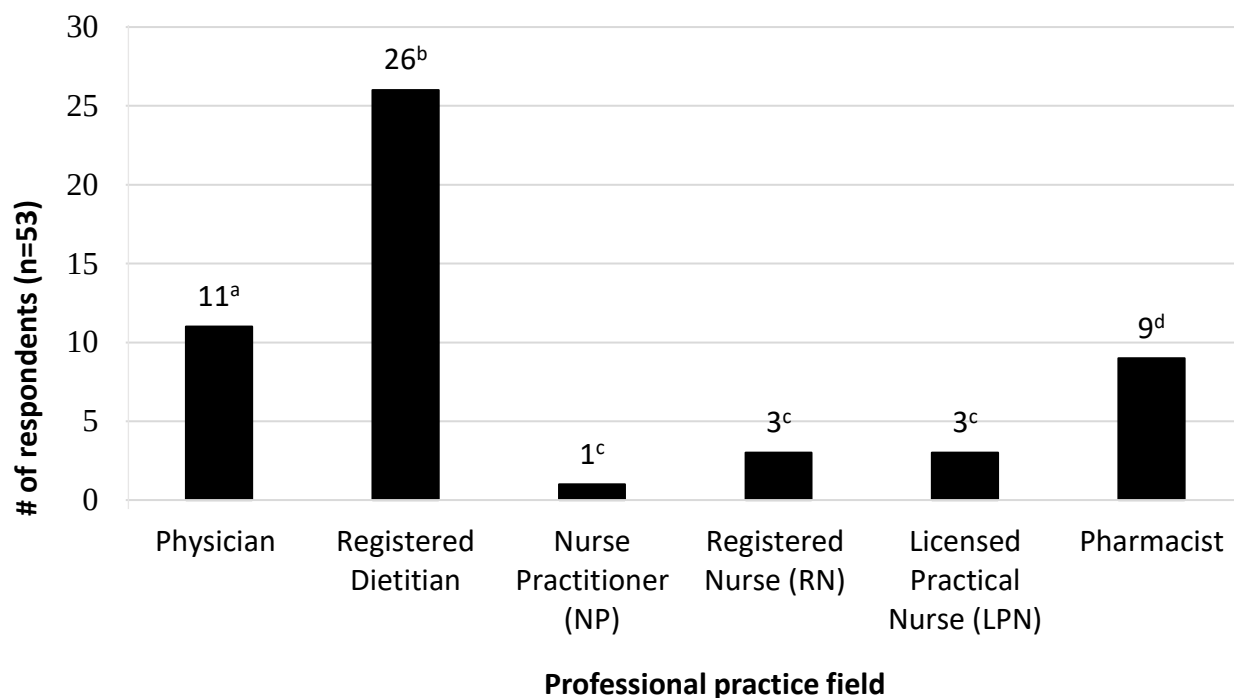
### **5.0 Results**

#### **5.1. Demographic Data**

##### *5.1.1 Professional Information*

The final sample included n=53 HCPs. Most respondents belonged to the Nova Scotia Dietetic Association (49%, n=26/53), followed by the College of Physicians & Surgeons of Nova Scotia (21%, n=11/53), Nova Scotia College of Pharmacists (17%, n=9/53), and Nova Scotia College of Nurses (13%, n=7/53). Respondents type of professional practice membership category are listed in Figure 3.





<sup>a</sup> All Physicians identified as active practicing / full license.

<sup>b</sup> One Registered Dietitian reported having a temporary membership, all other Registered Dietitians reported having a licensed membership.

<sup>c</sup> All Nurses (NP, RNs, LPNs) identified their membership as practicing.

<sup>d</sup> All Pharmacists listed their membership as practicing direct patient care.

Figure 3. Professional practice membership category of respondents (n=53)

Respondents identified that nutrition education was part of their practice (96%, n=51/53) either consistently (75%, n=40/53) or sometimes (21%, n=11/53). Two respondents (4%, n=2/53) identified that they do not provide nutrition education, and one respondent did not complete the questionnaire past the demographic section.

Most respondents (66%, n=35/53) completed their professional education within NS, 15% (n=8/53) attended some education in NS, and 19% (n=10/53) did not complete any of their education within NS. The highest level of education completed, current practice area, and region of practice are listed in Table 3. Respondents had a mean of 13.5 years of practice in a professional healthcare field with a median of 12 years, and a range of <1-40 years in practice.

Table 3. Education and professional practice area of respondents (n=53)

| <b>Highest degree or level of school completed</b>   | <b>x/n (%)</b> |
|------------------------------------------------------|----------------|
| College / Professional school diploma                | 2 (4%)         |
| Professional degree                                  | 7 (13%)        |
| Bachelor's degree                                    | 10 (20%)       |
| Bachelor's degree with internship                    | 18 (34%)       |
| Master's degree                                      | 3 (6%)         |
| Master's degree with internship                      | 5 (9%)         |
| Doctorate degree                                     | 8 (15%)        |
| <b>Current practice area<sup>a</sup></b>             |                |
| Clinical inpatient                                   | 12 (23%)       |
| Clinical outpatient                                  | 22 (42%)       |
| Private practice                                     | 10 (20%)       |
| Public health                                        | 4 (8%)         |
| Long-term care                                       | 4 (8%)         |
| Community health                                     | 2 (4%)         |
| Community pharmacy                                   | 3 (6%)         |
| Education                                            | 1 (2%)         |
| Leadership                                           | 1 (2%)         |
| Other                                                | 16 (30%)       |
| <b>Region of practice in Nova Scotia<sup>b</sup></b> |                |
| Central                                              | 27 (52%)       |
| Eastern                                              | 9 (17%)        |
| Northern                                             | 5 (10%)        |
| Western                                              | 11 (21%)       |

<sup>a</sup> Some respondents listed more than one professional practice area.

<sup>b</sup> One participant did not answer this question (n=52)

### 5.1.2. Personal Information

The majority of respondents (94%, n=50/53) identified their gender and sex as female. Three respondents (6%, n=3/53) identified their gender as male, two (4%) noted their sex as male, one (2%) respondent wrote they had already answered this question. Most respondents (68%, n=36/53) were in the 25–44-year-old age range, see Table 4. for the complete age distribution.

Table 4. Age distribution of respondents (n=53)

| <b>Age Range</b> | <b>x/n (%)</b> |
|------------------|----------------|
| 18 to 24 yrs.    | 2 (4%)         |
| 25 to 34 yrs.    | 16 (30%)       |
| 35 to 44 yrs.    | 20 (38%)       |
| 45 to 54 yrs.    | 9 (17%)        |
| 55 to 64 yrs.    | 5 (9%)         |
| 65 to 74 yrs.    | 1 (2%)         |

yrs. = years

### *5.1.3. Dietary Preferences*

As shown in Figure 4. the single-most identified diet by respondents was an omnivore diet (49%, n=23/47). A number of respondents (49%, n=23/47) reported the consumption of a primarily plant-based diet although these were identified by subcategories where some animal flesh was consumed (28%, n=13/47) (Mediterranean, pescetarian, flexitarian, mostly plant-based, mainly vegetarian), or plant-based diets where little to no animal-flesh or products were consumed (21%, n=10/47) (lacto-ovo-vegetarian, vegetarian, vegetarian gluten free, vegan). One respondent (2%) identified as a ‘meatitarian’.

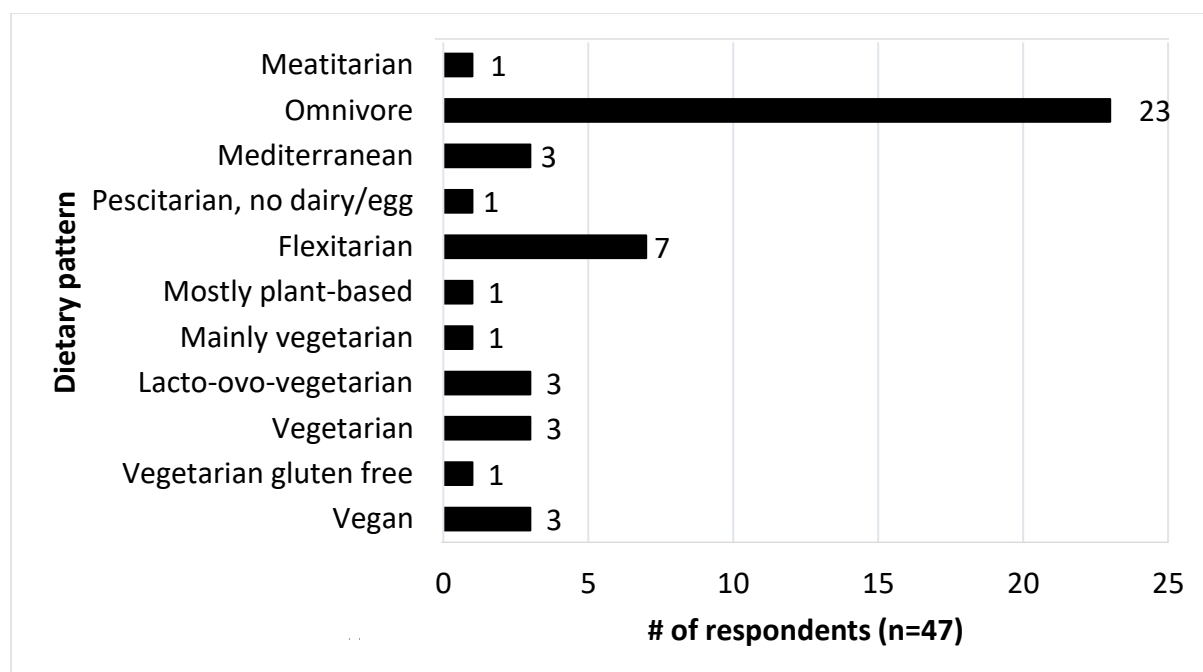


Figure 4. Dietary patterns self-identified by respondents (n=47). Respondents wrote their dietary pattern into a free-text answer box.

Respondents selected their frequency of intaking animal meat (example, beef, poultry, fish, moose, etc.), as shown in Figure 5. The majority of respondents (85%, n=44/52) intake meat one or more times a year, with 77% (n=40/52) intaking meat at least one or more times weekly, and 33% (n=17/52) consuming meat one or more times per day. A minority of respondents (15%, n=8/52) never intake meat.

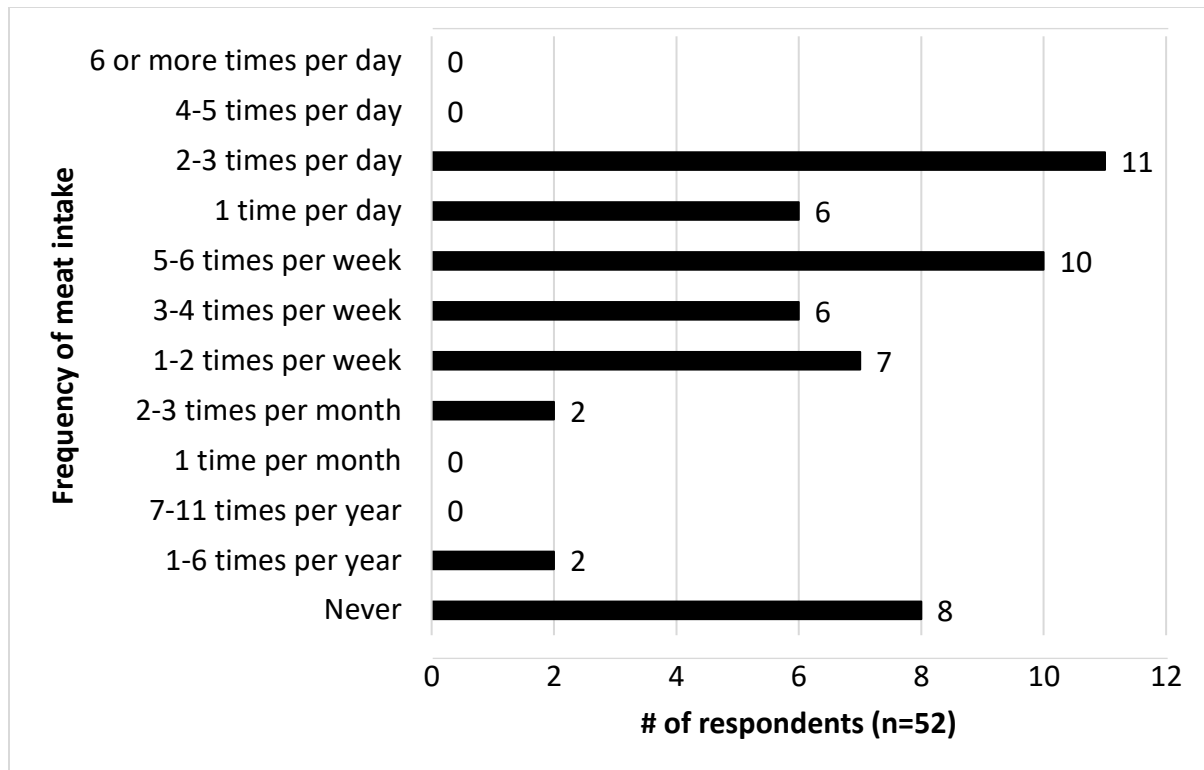


Figure 5. Frequency of animal flesh intake by respondents (n=52).

## 5.2 Knowledge and skill

### 5.2.1. Diet Education

Eighty-one percent (n=43/53) of respondents identified that they have had at least some education regarding vegetarian diets. The amount of time each respondent spent learning about vegetarian diets is captured in Table 5.

Table 5. Respondents' (n=52) vegetarian dietary education in hours

| <b>Length of time</b> | <b>x/n (%)</b> |
|-----------------------|----------------|
| 0-1 hrs.              | 7 (13%)        |
| 2-5 hrs.              | 6 (12%)        |
| 6-10 hrs.             | 10 (19%)       |
| 11+ hrs.              | 22 (42%)       |
| I don't know          | 4 (8%)         |
| Other <sup>a</sup>    | 3 (6%)         |

hrs = hours

<sup>a</sup> Other options that were typed in the response box: self-study/unknown (n=1), and lifelong plant-based lifestyle (n=2).

Respondents (n=50) self-assessed whether they were knowledgeable of vegetarian diets: 42% (n=21/50) identified that they agreed they were knowledgeable, 32% (n=16/50) strongly agreed, 18% (n=9/50) neither agreed or disagreed, 6% (n=3/50) disagreed, and 2% (n=1/50) strongly disagreed. The majority of respondents (74%, 37/50) identified they were knowledgeable of vegetarian diets.

Respondents also identified their interest in receiving training for vegetarian diets: 16% (8/50) strongly agreed, 46% (23/50) agreed, 24% (12/50) neither agreed or disagreed, 10% (5/50) disagreed, and 4% (2/50) strongly disagreed with having an interest in receiving training.

### 5.2.2. Health Impacts

Respondent views on the impact of vegetarian diets on health outcomes compared to non-vegetarian diets is captured in Table 6. The majority of respondents viewed that vegetarian diets lead to lower colorectal cancer risk (92%), does not lead to a higher weight status (96%), has a lower risk of diabetes (90%), and leads to a longer life expectancy (88%). Error in questionnaire administration led to the exclusion of one question, see Appendix A.

Table 6. Responses to health outcomes with vegetarian versus non-vegetarian dietary patterns

| <b>True or False Statements</b>          | <b>x/n</b> |
|------------------------------------------|------------|
| Lower colorectal cancer risk <b>TRUE</b> | 46/50      |
| Higher weight <b>FALSE</b>               | 48/50      |
| Lower diabetes risk <b>TRUE</b>          | 45/50      |
| Longer life expectancy <b>TRUE</b>       | 44/50      |

### 5.2.3. Healthcare Recommendations

Respondents demonstrated their knowledge of current recommendations by Health Canada, the World Health Organization (WHO), and Diabetes Canada. A summary of the results is listed in Table 7. Most respondents correctly identified the healthcare recommendations by Health Canada (62%), the WHO (84%), and Diabetes Canada (82%).

Table 7. Respondents' knowledge of healthcare organizations' recommendations.

| <b>True or False Statements</b>                                                                                                      | <b>x/n</b> |
|--------------------------------------------------------------------------------------------------------------------------------------|------------|
| The 2019 (current), "Canada's Food Guide" has no meat and alternatives food group <b>TRUE</b>                                        | 31/50      |
| The World Health Organization (WHO) classifies chicken as a Group 2A, probably carcinogenic (cancer causing) to humans. <b>FALSE</b> | 42/49      |
| Diabetes Canada states vegetarian diets can help manage blood glucose in people living with diabetes. <b>TRUE</b>                    | 41/50      |

### 5.2.4. Vegetarian Dietary Pattern

Participants were asked to identify the foods typically excluded on a lacto-ovo-vegetarian and vegan diets. The majority of respondents identified that on a lacto-ovo-vegetarian diet meat (100%, n=50/50), fish (94%, n=47/50), and specifically beef and poultry (2%, n=1/50) are typically excluded. For the vegan dietary pattern, respondents identified that meat (100%, n=50/50), fish (100%, n=50/50), eggs (100%, n=50/50), dairy (98%, n=49/50), honey (8%, n=4/50), animal by-products (6%, n=3/50), gelatine (2%, n=1/50), and pectin (2%, n=1/50) are

typically excluded. Participants were also asked how a vegetarian diet is different from other diets, to identify five vegetarian foods, and list three proteins to replace meat on a vegetarian diet; to reduce redundancy the results are included in Appendix A. Respondents were generally able to accurately respond to these three questions.

Participants were also asked for what reasons people choose to become vegetarian. Results are seen in table 8.



Table 8. Respondents' (n=50) listed reasons why people choose a vegetarian diet.

| Reasons to become vegetarian          | Counts |
|---------------------------------------|--------|
| Health considerations                 | 40     |
| Heart health                          | 3      |
| GI intolerances / difficulties        | 2      |
| Diabetes                              | 1      |
| Allergies                             | 1      |
| Animal considerations                 | 22     |
| Environmental considerations          | 20     |
| Climate                               | 2      |
| Global warming                        | 1      |
| Lower greenhouse gases                | 1      |
| Ethics and morals                     | 20     |
| Religious or spiritual considerations | 11     |
| Cost considerations                   | 11     |
| Preferences                           | 6      |
| Personal choices or beliefs           | 5      |
| Culture                               | 4      |
| Sustainability                        | 3      |
| Weight loss                           | 3      |
| Values                                | 3      |
| Taste                                 | 2      |
| Food preferences                      | 1      |
| Dislike                               | 1      |
| Enhance cooking knowledge             | 1      |
| Dislike meat                          | 1      |
| Trendy                                | 1      |
| Food accessibility                    | 1      |
| Social reasons                        | 1      |
| Energy                                | 1      |
| Variety                               | 1      |
| None                                  | 1      |

### 5.3 Application and use

As seen in Figure 6., respondents selected response options reflecting to what extent (if at all) they have recommended vegetarian diets. The majority of respondents (58%, n=29/50) would discuss vegetarian diets only when first asked by the patient / client, with 28% (n=14/50) not recommending and 30% (n=15/50) recommending vegetarian diets when first asked by the

patient/client. Aside from patient initiation, some respondents (38%, n=19/50) reported they recommend vegetarian diets at least some of the time, either rarely (14%, n=7/50), sometimes (14%, n=7/50), frequently (6%, n=3/50), or at every opportunity (4%, n=2/50). Two respondents (4%) do not recommend vegetarian diets. To reduce redundancy, results for the Likert scale questions “I would pass on a referral for vegetarian counselling”, and “I teach vegetarian diets to my patients”, are included in Appendix A.

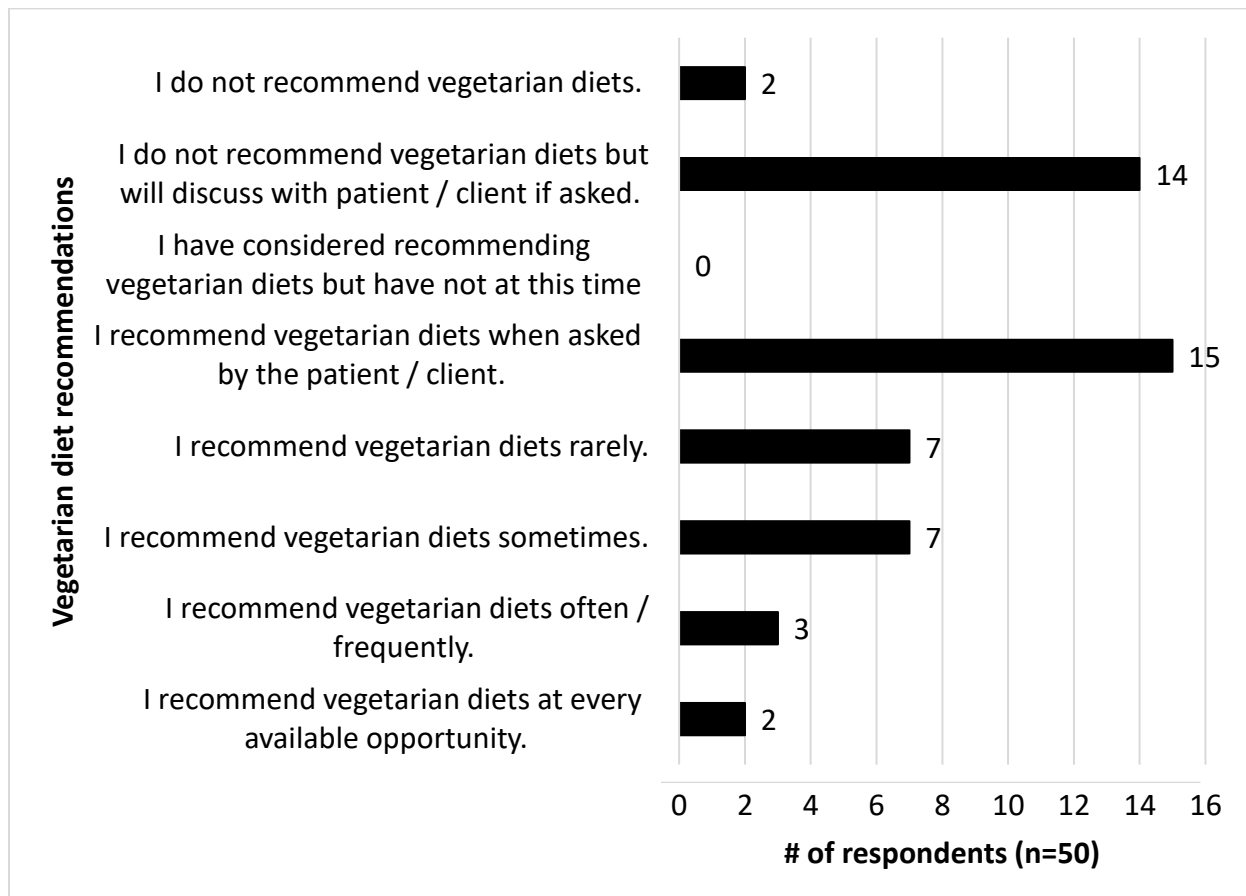


Figure 6. To what extent respondents (n=50) recommend vegetarian diets.

Respondents (n=43) reported on what populations (if any) they would recommend a vegetarian diet, results seen in Table 9. The most reported answer for recommending vegetarian diets was for disease states and clinical indicators, most notably CVD/risk.

Table 9. Populations that respondents (n=43) may recommend a vegetarian diet.

| <b>Populations respondents' (n=43) may recommend a vegetarian diet (n=counts)</b> |                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Disease states and clinical indicators</b>                                     |                                                                                                                                                                                                                                                                                                                                                                                        |
| Disease states (n=34)                                                             | <ul style="list-style-type: none"> <li>→ CVD/risk (n=10) <ul style="list-style-type: none"> <li>→ Hypertension (n=2)</li> <li>→ High blood pressure (n=1)</li> </ul> </li> <li>→ Diabetes (n=7)</li> <li>→ Dyslipidemia (n=7) <ul style="list-style-type: none"> <li>→ High cholesterol (n=5)</li> </ul> </li> <li>→ IBD (n=2)</li> <li>→ Cancer (n=2)</li> <li>→ IBS (n=1)</li> </ul> |
| Weight management (n=4)                                                           |                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Populations</b>                                                                |                                                                                                                                                                                                                                                                                                                                                                                        |
| People interested (n=15)                                                          | <ul style="list-style-type: none"> <li>→ Except when contraindicated (n=4) <ul style="list-style-type: none"> <li>→ Not for people with eating disorders (n=2)</li> </ul> </li> </ul>                                                                                                                                                                                                  |
| Everyone (n=6)                                                                    | <ul style="list-style-type: none"> <li>→ Promote mostly plant-based proteins (n=1)</li> </ul>                                                                                                                                                                                                                                                                                          |
| Adults (n=2)                                                                      |                                                                                                                                                                                                                                                                                                                                                                                        |
| Athletes (n=2)                                                                    |                                                                                                                                                                                                                                                                                                                                                                                        |
| General public (n=1)                                                              | <ul style="list-style-type: none"> <li>→ Except youth under two years of age (n=1)</li> </ul>                                                                                                                                                                                                                                                                                          |
| Younger populations (n=1)                                                         |                                                                                                                                                                                                                                                                                                                                                                                        |
| In low SES (n=1)                                                                  |                                                                                                                                                                                                                                                                                                                                                                                        |
| Assess individual basis (n=1)                                                     |                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>No one</b>                                                                     |                                                                                                                                                                                                                                                                                                                                                                                        |
| No one (n=5)                                                                      |                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Lifestyle decisions</b>                                                        |                                                                                                                                                                                                                                                                                                                                                                                        |
| Dislikes meat preparation (n=1)                                                   |                                                                                                                                                                                                                                                                                                                                                                                        |
| Sustainability (n=1)                                                              |                                                                                                                                                                                                                                                                                                                                                                                        |

SES = socioeconomic status

CVD = cardiovascular disease

IBD = Irritable bowel disease

IBS = Irritable bowel syndrome

Respondents (64%, n=32/50) identified they were confident in providing nutrition education involving vegetarian diets. Respondents either strongly agreed (16%, n=8/50), agreed (48%,

n=24/50), neither agreed or disagreed (18%, n=9/50), disagreed (12%, n=6/50), strongly disagreed (4%, n=2/50), or selected not applicable (2%, n=1/50). Respondents (42%, n=21/50) disagreed with being more confident in providing nutrition education for non-vegetarian diets than for vegetarian diets: 10% (n=5/50) strongly agreed, 26% (n=13/50) agreed, 20% (n=10/50) neither agreed or disagreed, 36% (n=18/50) disagreed, and 6% (n=3/50) strongly disagreed.

## 5.4 Perceptions and values

### 5.4.1. Perceived Healthcare Utility

Respondents identified the response options(s) that best describe their perception of vegetarian diets, as captured in Table 9. The majority (86%, n=43/50) of respondents identified vegetarian diets as a lifestyle choice. The perception of vegetarian diets within a healthcare context was mostly (58%, n=29/50) identified as a legitimate medical practice, followed by complimentary alternative medicine (44%, n=22/50), and alternative medicine (14%, n=7/50).

Table 10. Respondents' (n=50) categorization of vegetarian diets

| Category                      | x/n (%)  |
|-------------------------------|----------|
| A legitimate medical practice | 29 (58%) |
| Alternative medicine          | 7 (14%)  |
| Complimentary medicine        | 22 (44%) |
| Lifestyle choice              | 43 (86%) |
| Environmentally beneficial    | 1 (2%)   |
| Healthy eating pattern        | 1 (2%)   |
| Lifestyle (minus choice)      | 1 (2%)   |
| Religious                     | 1 (2%)   |

When asked to identify on a 5-point Likert scale their perception of “a vegetarian diet is a valuable dietary intervention” respondents strongly agreed (16%, n=8/50), agreed (58%, n=29/50), neither agreed or disagreed (22%, n=11/50), disagreed (2%, n=1/50), or strongly disagreed (2%, n=1/50).

Respondents (58%, n=29/50) disagreed that vegetarian diets are too difficult for the general public to understand: 2% (n=1/50) strongly disagreed, 56% (n=28/50) disagreed, 26% (n=13/50)

neither agreed or disagreed, 14% (n=7/50) agreed, and 2% (n=1/50) strongly agreed.

Respondents were also asked whether following a vegetarian diet is too strict for the general public, as seen in Figure 7. Respondents either strongly disagreed (2%, n=1/50), disagreed (50%, n=25/50), neither agreed or disagreed (30%, n=15/50), agreed (16%, n=8/50), or strongly agreed (2%, n=1/50).

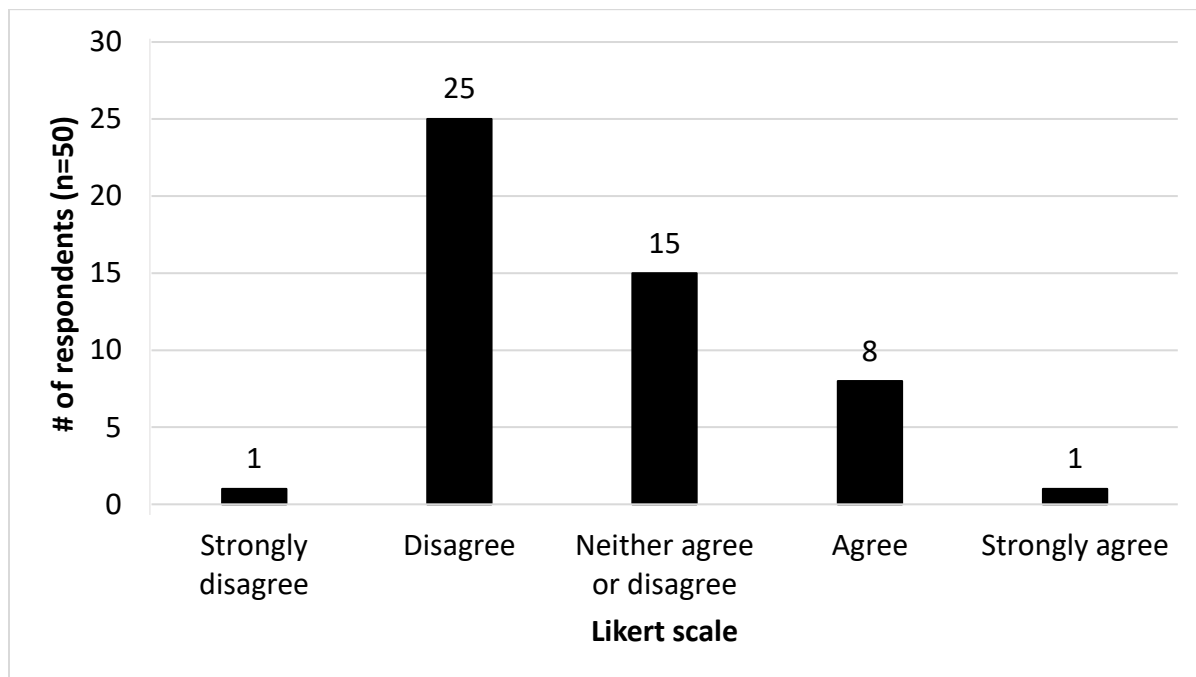
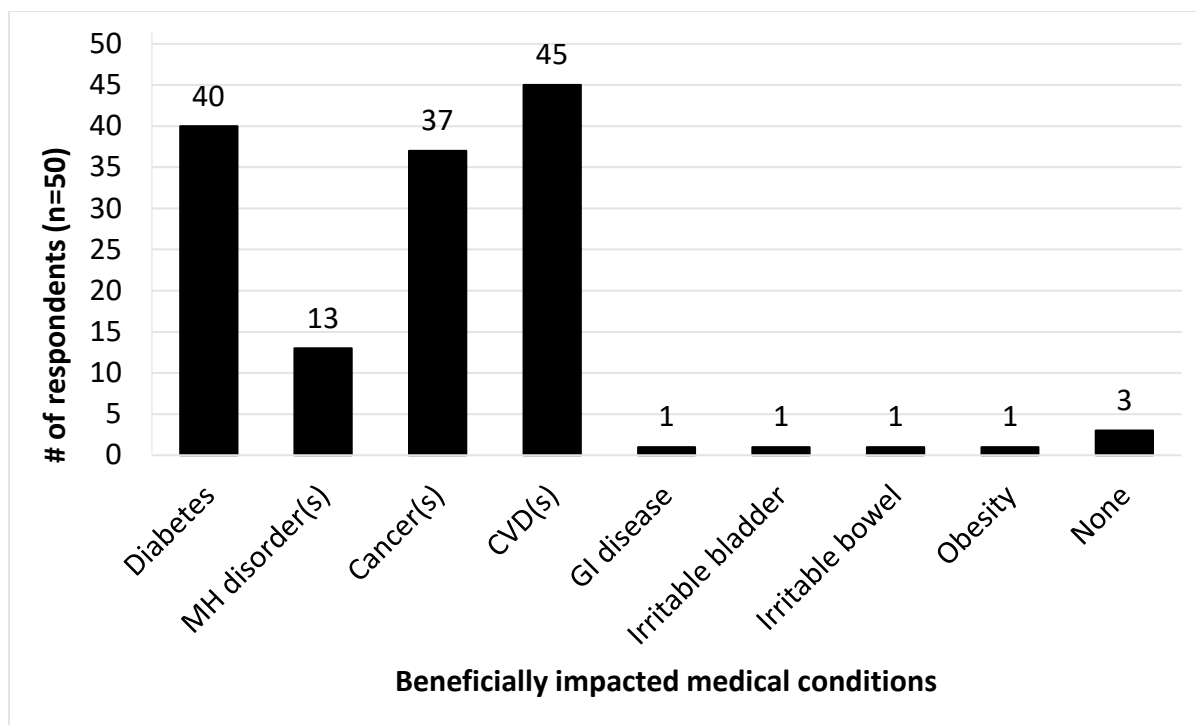


Figure 7. Respondents (n=50) perception of vegetarian dietary patterns being too strict for the general public.

#### 5.4.2. Health Impacts

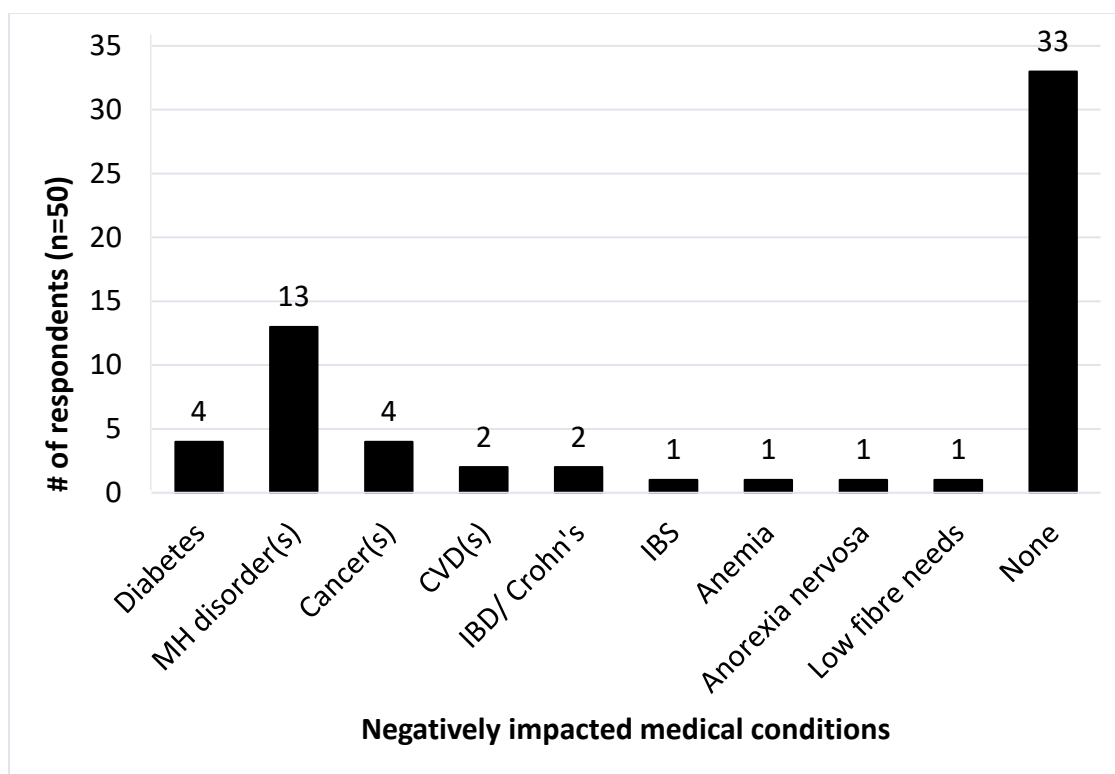
As shown in Figure 8., the majority of respondents identified that CVD(s) (90%, n=45/50), diabetes (80%, n=40/50), and cancer(s) (74%, n=37/50) could be beneficially impacted by a vegetarian diet. Twenty-six percent of respondents also identified mental health disorders as beneficially impacted by a vegetarian diet.



MH = Mental health  
CVD = cardiovascular disease  
GI = gastrointestinal

Figure 8. Medical conditions (if any) respondents (n=50) believe could be beneficially impacted by a vegetarian diet. Respondents wrote in gastrointestinal disease, irritable bowel / bladder, and obesity in the “other” section.

Respondents (n=50) identified what medical conditions could be negatively impacted by a vegetarian diet, the majority stating none (66%, n=33/50), captured in Figure 9. Twenty-six percent of respondents identified that vegetarian diets could negatively impact mental health.



MH = Mental health

CVD = Cardiovascular disease

IBD = Irritable bowel disease

IBS = Irritable bowel syndrome

Figure 9. Medical conditions (if any) respondents (n=50) believe could be negatively impacted by a vegetarian diet. Respondents wrote in IBD/ Crohn's, IBS, anemia, anorexia nervosa, and low fibre needs (e.g., stricture).

Respondents identified in separate questions what clinical outcome(s) (if any) they believed could be beneficially impacted and negatively impacted by a vegetarian diet. Of the beneficially impacted clinical outcomes respondents identified: total blood cholesterol (92%, n=46/50), systolic and diastolic blood pressure (84%, n=42/50), BMI and waist circumference (80%, n=40/50), hemoglobin A1c and FPG (78%, n=39/50), and constipation (2%, n=1/50). One respondent noted that the results would be based on an individual's food choices. Of the negatively impacted clinical outcomes, respondents identified: none (68%, n=34/50), BMI and waist circumference (12%, n=6/50), hemoglobin A1c and FPG (10%, n=5/50), systolic and diastolic blood pressure (8%, n=4/50), B12 levels (6%, n=3/50), iron levels (4%, n=2/50), anemia (2%, n=1/50), and bowel movement frequency/ consistency (2%, n=1/50).

### 5.4.3. Macro- / Micro-nutrient Impacts

Respondents (n=50) perception on whether vegetarian diets have too high a risk for nutrient deficiency is presented in Figure 10. The majority of respondents (70%, n=35/50) disagreed that vegetarian diets have too high a risk for deficiency, with: 16% (n=8/50) strongly disagreed, 54% disagreed (54%, n=27/50), 22% (n=11/50) neither agreed or disagreed, and 8% (n=4/50) agreed. When asked what nutrients (if any) would be of concern for too little an amount in a vegetarian diet respondents (n=50) identified: vitamin B12 (86%, n=43/50), iron (80%, n=40/50), proteins (42%, n=21/50), calcium (30%, n=15/50), zinc (18%, n=9/50), fats (2%, n=1/50), and nothing (2%, n=1/50).

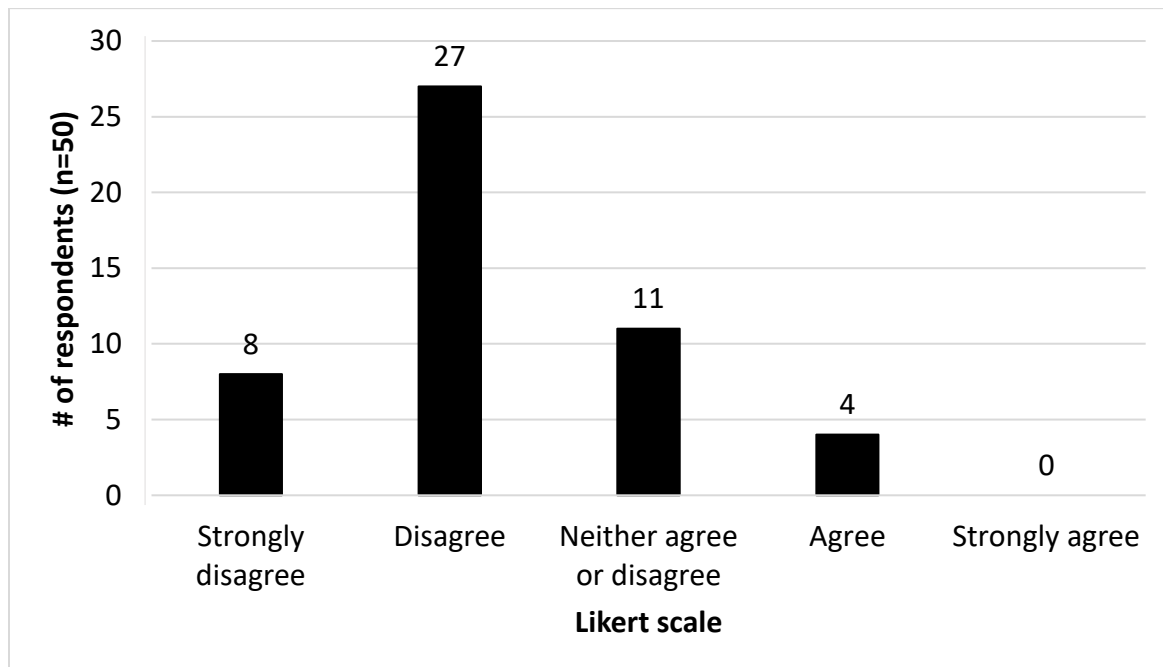


Figure 10. Respondents' (n=50) perceptions on vegetarian diets have too high a risk for nutrient deficiency.

When asked specifically if vegetarians do not get enough protein the majority (72%, 36/50) disagreed, with: 18% (n=9/50) strongly disagreed, 54% (n=27/50) disagreed, 24% (n=12/50) neither agreed or disagreed, and 4% (n=2/50) agreed. When asked whether vegetarians need an iron supplement: 2% (n=1/50) strongly disagreed, 42% (n=21/50) disagreed, 46% (n=23/50) neither agreed or disagreed, 8% (n=4/50) agreed, and 2% (n=1/50) strongly agreed. To reduce



redundancy, results for the Likert question “Eating meat and fish is important for maintaining health” are listed in Appendix A.

Respondents (n=50) also identified if there were any nutrients they would be concerned would be in excess in a vegetarian diet. The nutrients identified were none (62%, n=31/50), carbohydrates (28%, n=14/50), sodium (12%, n=6/50), fibre (6%, n=3/50), B12 (4%, n=2/50), fats (4%, n=2/50), iron (2%, n=1/50), and calcium (2%, n=1/50).

#### *5.4.4. General Health Perceptions*

Participants were asked whether vegetarian diets are healthy for the general public using a 5-point Likert scale, captured in Figure 11. The majority of respondents (82%, n=41/50) either agreed (38%, n=19/50) or strongly agreed (44%, n=22/50) that vegetarian diets are healthy for the general public. Seven respondents (14%) were neutral, and two respondents (4%), either disagreed (2%, n=1/50) or strongly disagreed (2%, n=1/50). The majority of respondents (90%, n=45/50) disagreed that vegetarian diets were unsafe: 42% (n=21/50) strongly disagreed, 48% (n=24/50) disagreed, 6% (n=3/50) neither agreed or disagreed, 4% (n=2/50) agreed.

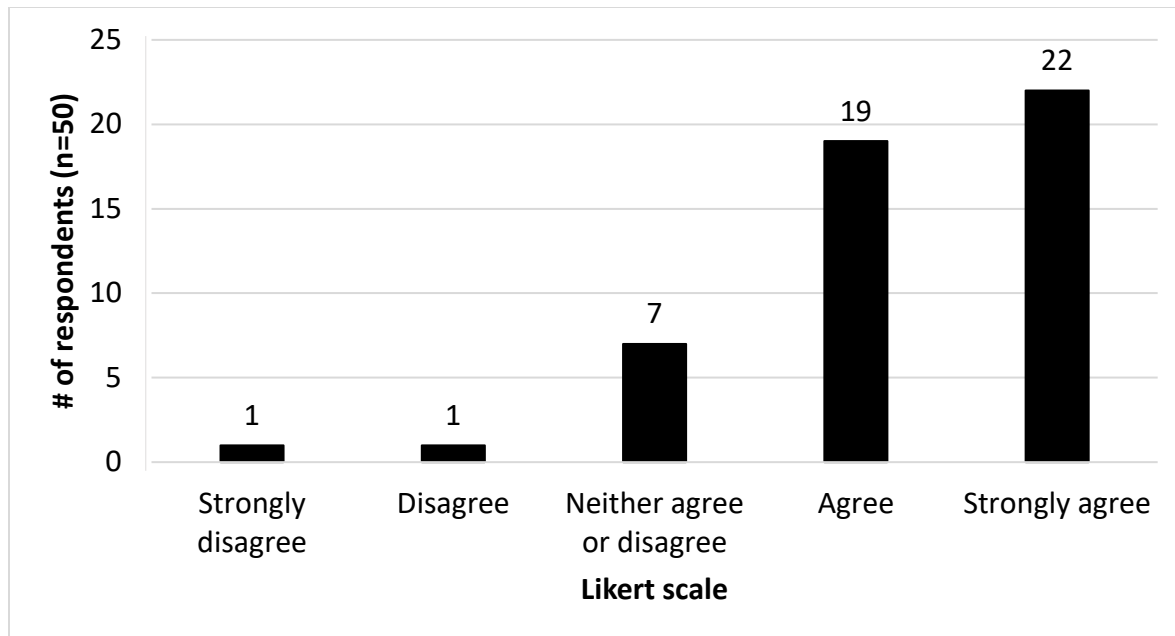


Figure 11. Respondents (n=50) perceptions on vegetarian diets being healthy for the general public.

Respondents (58%, n=29/50) agreed that vegetarian diets were healthy for young children, with: 12% (n=6/50) strongly agreed, 46% (n=23/50) agreed, 28% neither agreed or disagreed, 10% (n=5/50) disagreed, and 4% (n=2/50) strongly disagreed.

When asked whether vegetarians tend to be more knowledgeable about healthy eating than the general public: 42% (n=21/50) agreed, 38% (n=19/50) neither agreed or disagreed, 16% (n=8/50) disagreed, and 4% (n=2/50) strongly disagreed.

Participants (n=50) were asked their perception on vegetarians [being] generally healthier: 2% (n=1/50) strongly agreed, 26% (n=13/50) agreed, 56% (n=28/50) neither agreed or disagreed, 12% (n=6/50) disagreed, and 4% (n=2/50) strongly disagreed. Participants were also asked if vegetarians think they are healthier than the general public, results are captured in Figure 12. The majority of respondents (66%, n=33/50) either strongly agreed (24%, n=12/50), or agreed (42%, n=21/50) that vegetarians think they are healthier than the general public. Other respondents (26%, n=13/50) neither agreed or disagreed, or disagreed (8%, n=4/50) with this statement.

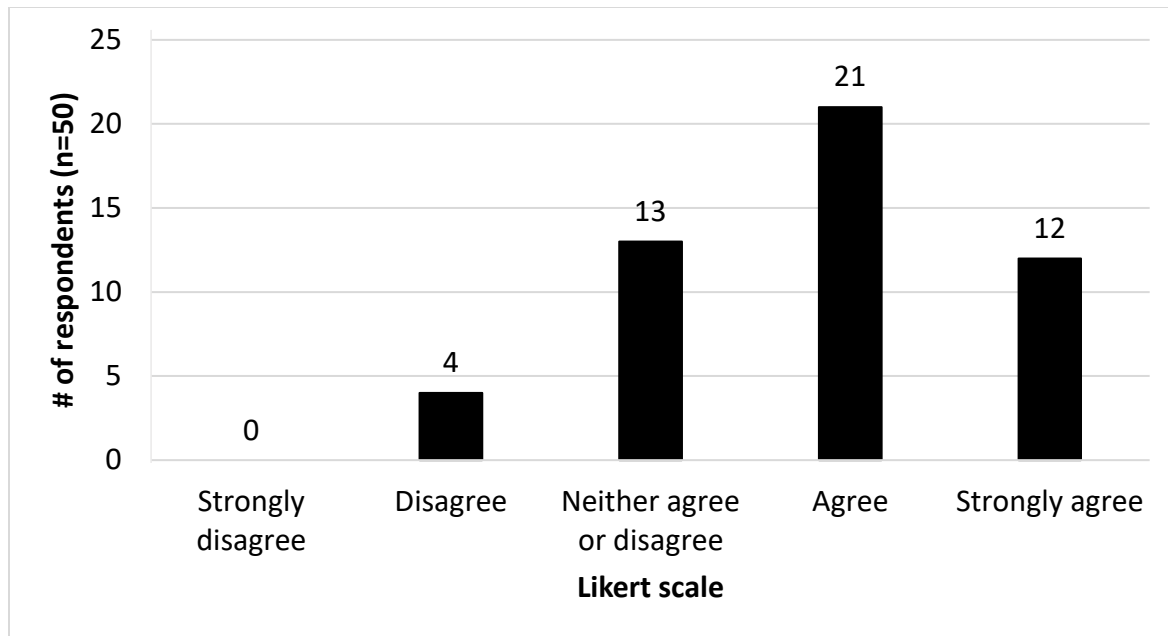


Figure 12. Respondents (n=50) perceptions on vegetarians thinking they are healthier than the general public.

#### 5.4.5. Lifestyle Perceptions

Participants were asked about social impacts of a vegetarian dietary pattern using a 5-point Likert scale. Respondents identified their perceptions of vegetarian diets as socially isolating: 16% (n=8/50) strongly disagreed, 42% (n=21/50) disagreed, 28% (n=14/50) neither agreed or disagreed, 14%, (n=7/50) agreed, and no respondent strongly agreed. When asked whether cooking for vegetarian diets was too time-consuming: 18% strongly disagreed (n=9/50), 54% (n=27/50) disagreed, 18% (n=9/50) neither agreed or disagreed, 10% (n=5/50) agreed, and no one strongly agreed. Most respondents (90%, n=45/50) also agreed that breastfeeding can be done healthily while vegetarian, results are in Appendix A.

### 5.5 Limiting Redundancy

Questionnaire data not displayed in the results section is included in Appendix A, along with the rationale for omission. For future drafts of the questionnaire, these questions could undergo further revision. The responses to these questions either provided no additional information or the questions did not fit with other content that was explored.

Questions (with data) included in Appendix A, are:

- Studies comparing vegetarian diets to non-vegetarian diets, have shown (click the box next to the best answer) d. Higher HDL cholesterol T/F
- How is a vegetarian diet different from other diets? (75 character maximum)
- What are five vegetarian foods?
- List three protein sources you would recommend (if any) to replace meat for a vegetarian diet?
- I would pass on a referral for vegetarian counselling.
- I teach vegetarian diets to my patients.
- Eating meat and fish is important for maintaining health.
- Breastfeeding can be done healthily while vegetarian.

Inferential statistics between HCP groups were not conducted as comparisons between professional groups would not be appropriate given the differences in training and specializations. HCP groups inherently receive different amounts and depths of medical nutrition training, which would not be a fair comparison for subgroup analysis. Additionally, small sample sizes in the HCP subgroups may not lead to results representative of the greater populations. Comparisons between total knowledge scores and perception/values, and total knowledge and use were identified by stakeholders as relevant to practice and may be explored in the manuscript.

## **6.0 Discussion**

The aim of this study was to capture and describe the perceptions, knowledge, and practice behaviours of HCPs in NS in relation to vegetarian dietary use in chronic disease management. Aligning with the principles in survey development and the KABP continuum, the studies objectives were completed: 1) develop a face/content validated questionnaire, 2) administer the questionnaire with the target population, 3) analyze the data with descriptive statistics and 4) report the findings for future consideration in research and clinical practice. The study outcomes of participants' demographic information, vegetarian dietary perceptions and values, knowledge

and skill, use and practical applications, were investigated. This thesis, aligning with the study's exploratory and descriptive purpose and objectives, details the development, implementation, and evaluation of a cross-sectional survey study (conducted in 2020-2023) of HCPs' (n = 53) perceptions, knowledge, and use of vegetarian diets in chronic disease management.

This study was cross-sectional in design with a small sample size (n=53). The low response rate could be due to a number of explanations including recruitment during the Covid-19 pandemic leading to increased strain on the healthcare system, demand for workers and overtime shifts, the background stress of working in high-risk areas during a pandemic, all of which may have resulted in a reduced ability and/or interest in research participation. Additionally, the questionnaire was accessed a large number of times (n= 808) without advancement past the Informed Consent form. Potential reasons for this may be the realization of how time-consuming or lengthy the questionnaire was, the inability to save progress, or a barrier with the consent form since it was lengthy compared to other studies that use implied consent for participation. The questionnaire was also lengthy compared to other studies (72,73,78,79). The length in time and effort required may have led some participants (n=7) to discontinue further participation past the demographic section. Multiple-choice questions were also used in the questionnaire which could prompt selection-biases, although this was limited with Likert scale and open-text questions. Given the small sample size, subsample analysis across professions was not performed which means the data was only interpreted as a homogenized group of interprofessional healthcare providers. Future considerations for this body of research could include recruitment within the Nova Scotia Health Authority directly, which would require an additional REB submission.

The majority of respondents identified as female (94%, n=50/53, sex and gender) and/or as a registered dietitian (49%, n=26/53); therefore, the results may not be generalizable and could represent a sampling bias. The self-selecting sample may also over-represent participants that have a strong opinion on plant-based diets, or nutrition education. A predominately female sample population is not unexpected as our two most represented professional categories (registered dietitians and nurses) tend to be predominately female proportioned professions (100) as well, previous studies have also shown a higher proportion of female respondents (73,74,76,77,79,80). Prior research detailing the outcomes we explored with interprofessional

HCPs (primarily physicians, registered nurses, and pharmacists), were limited and RDs were not represented in some cases because they declined to participate (75). RDs were well represented in this study, which is important in this body of research since they are the primary HCPs implementing dietary changes for medical nutrition therapy.

Unique to this questionnaire, respondents were provided with an open-text box (75 characters) to describe their dietary pattern(s) in their own words. This approach was taken to avoid researcher bias (4/5 members of the research team consume a plant-based diet, 3/5 members consume a vegan diet) and account for the diversity of dietary pattern interpretations including types of vegetarian and plant-based diets. Compared to Canadian population trends this study had a disproportionately larger representation of people consuming a plant-based dietary pattern (51% versus 17.3%), as well as people consuming vegetarian (21% versus 7.1%), and vegan (6% versus 2.3%) dietary patterns (3,4,5). Of these respondents, 10 people identified they consume a vegetarian/vegan dietary pattern, but only eight respondents reported they never eat meat. As seen in previous studies, this may further lend to the idea that interpretation of dietary labels can differ across individuals (49).

This study investigated various aspects of HCPs' perceptions of vegetarian diets. The literature has identified that plant-based diets have often been regarded by the general public for their real or perceived health benefits (7,8). Respondents' perceptions for why people choose to follow a vegetarian diet were similar to prior research (78): health considerations, animal considerations (e.g., animal welfare), and environmental considerations (e.g., climate change). A common criticism of or reason for non-adherence to plant-based diets (and other "healthy diets" or medical nutrition therapy) is that they are too time consuming, too strict, cause bloating or abdominal discomfort (which is typically transient) and can be socially isolating (101,102). This feedback tends to come from healthcare providers outside of the dietetic profession. Previous research showed physicians and registered nurses thought plant-based diets were complicated, unrealistic, difficult, and not well accepted by patients (31,75). These perceptions/ positions were not in agreement with our sample, who did not view vegetarian diets as too time consuming (72%, n=36/50), difficult for the general public to understand (58%, n=29/50), socially isolating (58%, n=29/50), or strict (52%, n=26/50). Moreover, these data do not include the perceptions

and thoughts of the clients/ patients, a key population to survey to ensure HCPs' perceptions are aligning with the public they serve. In previous work conducted on the glycemic index, Grant et al. (2020) found that participants consuming a lower glycemic index diet perceived the diet to be "liberating" (e.g., more dietary options) and less restrictive (101). These data were in direct contrast to previous research published by Kalergis et al. (2005, 2006) that showed RDs' perceptions of patients position on the diet were contradictory (103,104). One possible explanation for this contradictory view could be related to healthcare providers knowledge and training regarding vegetarian diets, including lack of guidance from CPGs or educational support tools (31). Several studies with healthcare providers noted that the professionals' knowledge base of plant-based diets needed some improvement, with some respondents self-identifying their knowledge gap (31,72,73,75,76,77,78,79,80). In a survey study by Lea et al. (2006), few adult respondents perceived barriers to eating a plant-based diet; the most stated barrier noted was a lack of dietary information (31).

Although 70% of respondents disagreed that vegetarian diets have too high a risk for nutrient deficiencies; there were still concerns for too little B12 (86%), iron (80%), protein (42%), calcium (30%), and zinc (18%). This conflicted with results from other questions where only 4% of respondents agreed that vegetarians do not get enough protein, and 44% did not see the need for iron supplements by vegetarians. Concerns for deficiencies in B12, iron, protein, calcium, and zinc, were also noted in previous studies (77,78,79). The Academy of Nutrition and Dietetics states that well-planned vegetarian diets can meet a person's need for these micronutrients at all stages of the life cycle, although people following a vegan diet need to regularly consume B-12 fortified foods and/or supplements (18).

Respondents were also asked questions that would test their knowledge of vegetarian diets. Questions regarding health outcomes with vegetarian diets were correctly identified by a majority of the respondents: lower colorectal cancer risk (92%, n=46/50), higher weight (96%, n=48/50), lower diabetes risk (90%, n=45/50), and longer life expectancy (88%, n=44/50). Questions on healthcare organizations' recommendations were not answered as correctly as other knowledge questions in the survey, although incorrect answers were still low: Canada's Food Guide recommendations (38%, n=19/50), Diabetes Canada (18%, n=9/50), and WHO (14%,

n=7/49). This may suggest some knowledge gaps on current nutrition recommendations. Previous studies asked participants to define a vegetarian diet with a low success rate of 2.2% (76). Participants in this study were given the option to click on food items that would typically be excluded in a lacto-ovo-vegetarian diet with a high success rate (100% meat, 94% fish). The six percent that did not note the omission of fish from a lacto-ovo-vegetarian could be attributed to the lack of consistency in the vegetarian label, noted from previous research, or misinformation on dietary patterns. Additional answers were written in for food items excluded on either a lacto-ovo-vegetarian or vegan diet. One participant added that beef and poultry are excluded which would have been covered under the exclusion of “meat” which they also checked, this lends to the question if “meat” needs to be further explained into subcategories. For vegan diets, additional written-in answers included honey, animal-by-products, gelatine, and pectin. All written-in answers were correct with the exclusion of pectin which is a vegan gelling agent; this could further support food-based education.

In this study, respondents (81%, n=43/52) reported “some education” on vegetarian diets (examples given were workshops, courses, self-study), with 42% (n=22/52) identifying 11+ hours of formal vegetarian dietary education. A smaller proportion of respondents (13%, n=7/52) reported that they had less than 1 hour of formal education on vegetarian diets, while only 8% (n=4/50) identified as having no knowledge of vegetarian diets. This study has a much larger percentage of respondents (74%, n=37/50) that identify as knowledgeable about vegetarian diets compared with previous studies of 31%-57.3%, which may in part be due to the majority of respondents identifying as RDs (2,25). In other studies, it was identified that 88% of physicians did not feel informed enough about plant-based diets (78) or only 13.4% of pediatricians believed that their studies had prepared them for counselling patients with vegetarian diets (79). These findings are likely related to curriculum and training currently received by RDs versus other healthcare professionals. The majority (62%, n=31/50) of respondents in this study identified their interest in receiving training for vegetarian diets. As it stands, the Medical Council currently does not have nutrition education listed in competency requirements for curriculums or for the licensing examination (105). The gap in nutrition education in medical schools has prompted the University of Toronto to provide a half-day workshop to their medical students, where a RD guides the students in food purchasing, label reading, and food preparation



(106). Although this workshop may provide useful nutrition-related information, it may not extensively cover knowledge gaps in medical nutrition therapy (106).

In previous studies with HCPs, the higher the knowledge scores for plant-based diets the higher the acceptance for these types of diets (72,79). This study had higher knowledge scores compared to previous studies, and the majority of respondents (68%) would also recommend vegetarian diets unprompted or when asked by the client/patient. The most stated population that respondents (24%, n=10/42) would recommend a vegetarian diet for was with CVD/risk, which aligns with the recommendations from the Canadian Cardiovascular Society (85). The percentage of respondents that listed CVD/risk may have been low due to the format of the question, where participants were given an open text box to list free-form answers. Ninety percent (n=45/50) of respondents identified elsewhere in the survey that CVD could be beneficially impacted by a vegetarian diet, similar results were seen in a 2019 study by Krause and Williams where 83% of respondents identified that a plant-based diet could reduce CVD incidence.

Previous research (conducted in 1995-2005) highlighted a lack of HCP recognition of the evidence in support of plant-based diets, despite there being several peer-reviewed longitudinal studies published prior to and during this research (e.g., SDA studies 1974-1988, and 2002-present) (1,2,25,31,72). The first study found on HCP perceptions of “vegetarianism” was conducted eight years after the first SDA study concluded (1,2). Studies into the length of time for health research translation suggests 17 years, meaning findings from the SDA studies would likely not have been incorporated into practice yet (107). Older studies showed ~45% of physicians viewed “vegetarianism” as a legitimate medical practice, compared to 58% of our sample of interprofessional HCPs (2,25). A previous study (25) also had 53.3% of respondents label “vegetarianism” as alternative medicine compared with 14% (n=7/50) in our current study. Potential explanations for these differences in perception could be the number of RDs in the sample population, and/or the increasing knowledge and awareness of vegetarian diets over the decades. Additional options not previously explored in these older studies, found that vegetarian diets were also considered a lifestyle choice (86%, n=43/50) and complementary medicine (44%, n=22/50). Even though 58% (n=29/50) identified vegetarian diets as a legitimate medical

practice, a larger proportion (74%, n=37/50) identified vegetarian diets as a valuable dietary intervention, which may have included respondents that still viewed the diet as valuable from a complimentary or alternative perspective. These changes could be reflective of a global trend that shifts toward adopting healthy, sustainable, and ethical dietary patterns as seen with The Nordic Kitchen Manifesto, and more currently the CFG recommendations (27,81).

The majority (58%) of respondents identified that they would only discuss vegetarian diets when first asked by the patient/client. In the Code of Ethics for the formerly named Nova Scotia Dietetic Association, it is best practice to collaboratively work with clients/patients to provide care that informs them of their options while considering their interests (108). Responding to the patient/client's request to discuss vegetarian diets could be a demonstration of client-centered care (109). However, in a study by Lee et al., 89% of patients surveyed were not aware that dietary interventions such as plant-based diets could be used for T2DM management or prevention (31). Patients need to be presented with all appropriate options for care (without overwhelming them) to meet the needs of informed consent and client-centered care (108,109). This can highlight the importance of RDs on care teams, since they are experts educated in medical nutrition therapy for a wide range of chronic diseases. If dietary interventions that may provide a benefit to a patient in chronic disease management are not presented, this could be an important gap in communication and client care. In this study 38% of respondents identified that they would recommend a vegetarian diet; however, again the patient's needs, values, beliefs, preferences, and health status would need to be factored into this decision (108,109).

As mentioned by Grant et al. (2023), the Canadian Cardiovascular Society 2021 CPG still recommends that plant-based diets such as the Mediterranean diet, Dietary Approaches to Stop Hypertension (DASH) diet, and Portfolio diet; can all be beneficial in the prevention and management of CVD (110). In this study, vegetarian diets were recommended in disease states (n=34), and more specifically in CVD/risk (n=10). Respondents (80%, n=40/50) also perceived that vegetarian diets could be beneficial for diabetes management/prevention which is supported by Diabetes Canada (15). Vegetarian diets were also recommended by 74% of respondents in the management/prevention of cancer(s), some findings have shown a lower rate of total cancers, although it is unclear which specific types of cancer may be affected (111). Mental health was

seen to be equally impacted beneficially and negatively (26%, n=13) with vegetarian diets. In this study, mental health was not further broken down into subcategories, leaving the question unanswered as to what aspect(s) of mental health respondents may perceive to be impacted. In a previous study, 32% of respondents perceived the choice to follow a vegetarian diet could be linked to an eating disorder (78). In this study, two respondents wrote that a vegetarian diet was contraindicated for people with eating disorders. Recent research has also investigated associations between plant-based diets and mood disorders often with mixed results and a call for additional research (42). Future research could be conducted to explore HCPs' perceptions of the impact of plant-based diets on mood disorders as well as aspects of disordered eating.

## **6.1 Strengths and Opportunities**

Most of the other studies (10 out of 13 studies found) (1,2, 25,77,78,79,80) noted how their questionnaire only investigated aspects of plant-based diets within a single profession such as physicians/medical students (7 studies), or RDs (3 studies). This study added to the body of knowledge from an interprofessional perspective, albeit with high representation from RDs, which was an opportunity mentioned by some previous studies (73).

This study had an extended recruitment period which may have given participants increased exposure to recruitment initiatives and extra time to participate. Although incentivization may have further increased participation, no remuneration was offered to participants, which can eliminate the potential for personal response bias from undue influence or financial coercion (112). Opportunities for future research could include investigation with larger sample sizes within each professional category (e.g., pharmacists). This could allow for subsample analysis between interprofessional designations (e.g., perception of vegetarian diets across professions).

Mitigation of potential biases occurred throughout the study, such as not seeking funding support from initiatives that may be biased toward plant-based diets (this study was not funded). Although there may be a perceived personal bias with 4/5 committee members following plant-based diets, all members of the research team are regulated professionals which requires a patient-focus approach and evidenced-based practice. The wording of the questionnaire

underwent face/content validation with a professional sample that differed in dietary patterns, further mitigating any potential biases in the wording that could have been biased for plant-based diets or against animal-flesh consumption. No biases were present in this study.

A strength of this study is the use of a mixed-form questionnaire, which may lend to the collection of a breadth and depth of information. It was also mentioned that future research into plant-based diets in healthcare could expand on the topics of motivations and barriers to plant-based diets in medical nutrition therapy (80). This was investigated through our questionnaire.

Given the recent literature into the investigation of plant-based diets and mood disorders, as well as risks of strokes and fractures, these could be additional health outcomes investigated in future research.

## **6.2 Conclusions and Future Directions**

The following cross-sectional survey study investigated the perceptions, knowledge, and use of vegetarian diets among interprofessional healthcare providers in NS. The objectives were to develop a face/content validated questionnaire, administer questionnaire with sample population (physicians, dietitians, nurses, and pharmacists), analyze the data with descriptive statistics, and report the findings for future consideration in research and clinical practice. In summary, HCP perception of vegetarian dietary interventions was positive with HCP perceiving benefits for several chronic disease states and clinical indicators. Knowledge scores were high although there is still room for some improvement with nutrient considerations and healthcare recommendations. Most respondents would recommend vegetarian diets to clients/patients, although a higher proportion of respondents would wait for the patient to initiate discussion prior to discussing vegetarian diets. This study would be better supported with future research with larger sample sizes across different professions. The next step is to report the findings for future consideration in research and clinical practice.

The findings from this research will be presented through a manuscript and conference presentation(s) to facilitate knowledge dissemination to other researchers and HCPs. The

questionnaire will be available upon request to other researchers for future research in this field with the potential to compare or pool results. Important to reflect on this questionnaire before it is adapted or reimplemented, an open-text box may have helped to reduce response bias and add a breadth of response options, but also allowed for vague or unclear responses such as “meatitarian”. As well, more clarity could be brought to questions referring to “mental health” impacts to capture data on specific disorders such as anxiety or anorexia nervosa. A mixed-methodological study could also be recommended in the future, to interview participants and gain clarity on these types of questions.

This research covered a wide range of topics investigating vegetarian diets and health impacts, mental health as well as other health impacts could be further investigated. The wide-range of topics in this research fit the exploratory and descriptive purpose of this thesis, whereas future research could explore each disease state individually in more depth and across different types of plant-based diets (e.g. vegan diets). Future research could also investigate any impacts of plant-based diets with depression, anxiety, stress, and eating disorders. As well, this research investigated the perceptions, knowledge, and use of vegetarian diets with HCPs, while missing input from the client/patient perspective. Future research could examine client/patient perceptions, knowledge, and use of plant-based diets to better understand if plant-based diets would be an accepted form of medical nutrition therapy.

Outside of research applications, this study had important implications for clinical settings. With the highest proportion of participants identifying as RDs (58%, n=26/53) and knowledge scores of plant-based diets being higher than previous studies this gives a launching point for discussing RDs in primary care settings (2,25). Dietitians are integral to interprofessional healthcare teams as they are able to initiate discussions with patients on medical nutrition therapy for chronic disease management. RDs are informed of the wide variety of dietary interventions recommended in CPGs by various health organizations such as Diabetes Canada. Collaboration with RDs in primary healthcare teams leads to a more comprehensive assessment, intervention, and ultimately to improved patient care. In NS, policy decisions for best care could include the use of dietitians in primary healthcare teams to improve patient outcomes and patient-centered care.

**Potential next steps:**

Report study findings for consideration in research and clinical settings.

Re-evaluate questionnaire for any questions that may have overlapped.

Consider mixed-methodological approaches in future research for clarity with answers.

Further examine the impacts of different plant-based diets in specific disease states: mood disorders, eating disorders, strokes, and fractures.

Explore patient perspectives and knowledge of plant-based diets in chronic disease management.

Recommend implementation of policy directives to include RDs in primary healthcare teams.

Development and incorporation of introductory nutrition courses and competencies in curriculums for healthcare professions that may provide basic nutrition care.

**7.0. Relevance to Practice**

The knowledge scores in this study showed some room for improvement. This may be relevant to interprofessional education and dietetic education. Opportunities for further knowledge growth and awareness of vegetarian diets in chronic disease management may include nutrition competencies in interprofessional HCP education, reviewing recent literature on the impact of plant-based diets in chronic disease states, and assessment of any potential biases towards plant-based diets in medical nutrition therapy. In this study, participant perceptions showed there were still concerns that patients would be deficient in several nutrients. However, the Academy of Nutrition and Dietetics suggests that well-planned vegetarian diets can meet a person's need for micro- and macronutrients at all stages of the life cycle (18). As HCPs it is important to understand how a well-planned diet can be formulated to meet the needs of the client/patient and may be an opportunity for further learning. In previous studies, non-RD HCPs have stated a lack of training or knowledge of plant-based diets and a need for additional educational support tools. This study found that the majority (62%, n=31/50) of respondents have an interest in receiving further training for vegetarian diets. Support tools could also be developed for generalized information on plant-based diets or be more specialized to apply to the management of different

chronic disease states. Examples of support tools could be pamphlets/handouts, webinars/presentations, or information sessions.

Most participants found vegetarian diets useful in chronic disease management. Provision of a consistent message to clients/patients on dietary recommendations may provide a consistent message that instills confidence. Most participants used a patient-led approach where the patient would need to initiate conversation on vegetarian diets, but it is also relevant to note the patient may not know all the possible dietary interventions that could be explored. To promote informed patient-led care, it is important to discuss with patients the variety of dietary patterns effective for their chronic disease management. This research may highlight a gap in communication where plant-based dietary patterns may be an applicable intervention that is not being discussed as providers wait for the patient to first mention this diet type.

RDs are leaders in medical nutrition therapy for chronic disease management. Dietary interventions have proven to be an effective management tool for a variety of chronic disease states, as recommended in various CPGs. Nutrition training across HCP fields is inconsistent or lacking, and this can provide a gap in knowing where, how, and what type of dietary interventions may help a patient/client. The results of this study help support the rationale for RDs in primary healthcare settings. Further steps could be taken to advocate for RDs on interprofessional teams within primary healthcare settings.

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## Appendix A: Question results not included in the thesis.

### 6.2.2. Health Impacts

Question #10 of knowledge section: Studies comparing vegetarian diets to non-vegetarian diets, have shown (click the box next to the best answer) d. Higher HDL cholesterol.

Results: question not analyzed due to error in questionnaire administration. True or false options were unavailable to participants.

Omitted: due to no participant responses.

### 6.2.4. Vegetarian Dietary Pattern

Question #1 of knowledge section: How is a vegetarian diet different from other diets?

Results:

Table A1. Respondents (n=49) identify how a vegetarian diet is different from other diets.

|                                                |    |
|------------------------------------------------|----|
| Eliminates meat                                | 19 |
| Some animal products included/excluded         | 12 |
| Plant-based focus                              | 11 |
| Some animal by-product inclusion/exclusion     | 9  |
| Macronutrient and micronutrient considerations | 8  |
| High in fibre                                  | 3  |
| Lower in saturated fat                         | 2  |
| Lower in cholesterol                           | 1  |
| Potentially lower iron                         | 1  |
| Potentially less protein                       | 1  |
| Includes plant-based proteins                  | 4  |
| Animal protein considerations                  | 5  |
| No animal protein                              | 2  |
| Some animal protein                            | 3  |
| Potentially healthier                          | 2  |
| Lifestyle choice                               | 1  |
| Values beyond health                           | 1  |
| Environmental considerations                   | 1  |
| Ethical                                        | 1  |
| Within meal variety                            | 1  |

Omitted: redundancy, top results found in this question overlap with knowledge questions #3 and #4.

#3 A lacto-ovo-vegetarian diet would typically not include (Check any / all that apply):

#4 A vegan diet would typically not include (check any / all that apply):

Question #5 of knowledge section: What are five vegetarian foods?

Results:

Table A2. Respondents (n=49) each listed five vegetarian foods.

|                      |     |
|----------------------|-----|
| Proteins             | 118 |
| Nuts                 | 16  |
| Almonds              | 1   |
| Peanut butter        | 2   |
| Legumes              | 61  |
| Pulses               | 47  |
| Beans                | 21  |
| Black beans          | 3   |
| Edamame              | 1   |
| Kidney beans         | 1   |
| Lentils              | 15  |
| Peas                 | 9   |
| Chickpeas            | 8   |
| Eggs                 | 2   |
| Seeds                | 6   |
| Sunflower seeds      | 1   |
| Plant-based proteins | 2   |
| Soy-based foods      | 29  |
| Tempeh               | 1   |
| Tofu                 | 21  |
| TVP                  | 2   |
| Vegetables           | 47  |
| Broccoli             | 5   |
| Carrots              | 8   |
| Celery               | 1   |
| Cucumber             | 1   |
| Kale                 | 1   |
| Lettuce              | 1   |
| Onions               | 1   |
| Peas                 | 1   |
| Peppers              | 1   |
| Tomatoes             | 3   |
| Zucchini             | 1   |
| Grains and starches  | 41  |
| Oats                 | 1   |
| Pasta                | 2   |
| Potatoes             | 3   |
| Quinoa               | 3   |
| Rice                 | 10  |
| Wheat                | 3   |
| Fruit                | 32  |

|                        |    |
|------------------------|----|
| Apples                 | 6  |
| Avocado                | 2  |
| Bananas                | 3  |
| Meals & prepared items | 16 |
| Meals                  | 8  |
| Prepared items         | 8  |
| Drinks                 | 6  |
| Milk                   | 1  |
| Plant-based milks      | 5  |
| Almond Milk            | 1  |
| Soy milk               | 2  |
| Dairy                  | 3  |
| Cheese                 | 1  |
| Milk                   | 1  |
| Miscellaneous          | 3  |

Omitted: redundancy, this question overlaps with knowledge questions #3 and #4.

#3 A lacto-ovo-vegetarian diet would typically not include (Check any / all that apply):

#4 A vegan diet would typically not include (check any / all that apply):

Question #6 of knowledge section: List three protein sources you would recommend (if any) to replace meat for a vegetarian diet?

Results:

Table A3. Respondents (n=50) each recommended three proteins to replace meat on a vegetarian diet.

|             |    |
|-------------|----|
| Legumes     | 75 |
| Pulses      | 64 |
| Beans       | 33 |
| Black beans | 2  |
| Edamame     | 1  |
| Peas        | 9  |
| Chickpeas   | 9  |
| Lentils     | 20 |
| Soy         | 48 |
| Tempeh      | 6  |
| Tofu        | 31 |
| Seitan      | 2  |
| TVP         | 5  |
| Nuts        | 19 |
| Nut butters | 6  |
| Dairy       | 10 |
| Cheese      | 3  |

|                 |   |
|-----------------|---|
| Cottage cheese  | 1 |
| Greek yogurt    | 3 |
| Halloumi        | 1 |
| Eggs            | 7 |
| Seeds           | 7 |
| Quinoa          | 4 |
| Fish            | 1 |
| Meat Substitute | 1 |
| Protein powder  | 1 |
| Spinach         | 1 |
| Whole grains    | 1 |

\* One participant only listed two sources instead of three.

Omitted: redundancy, this question overlaps with knowledge questions #3 and #4.

#3 A lacto-ovo-vegetarian diet would typically not include (Check any / all that apply):

#4 A vegan diet would typically not include (check any / all that apply):

### 6.3 Practical Applications and use

Question #4 of usage and application section: I would pass on a referral for vegetarian counselling.

Results:

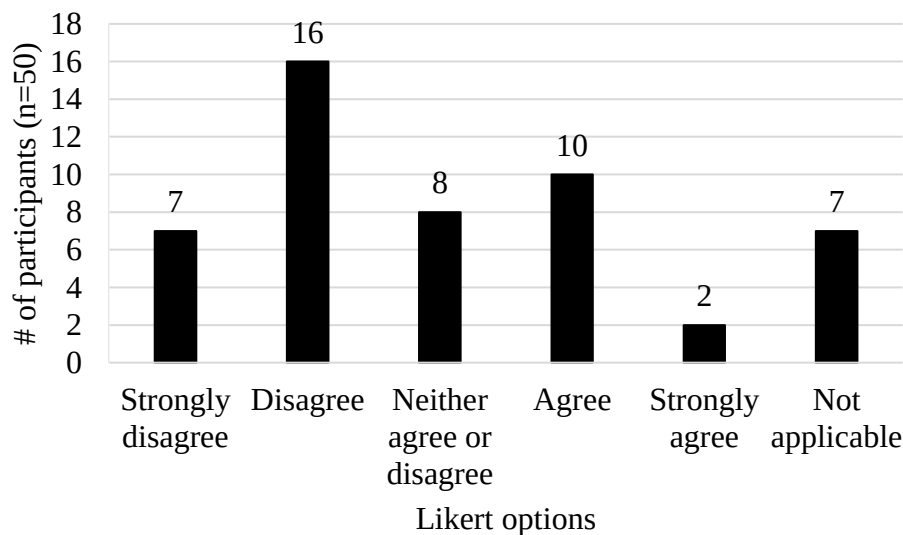


Figure A1. Respondents (n=50) perceptions on passing on referrals for vegetarian counselling.

Omitted: redundancy, question overlaps with practical applications and use question #6 and #1.

#1 I teach vegetarian diets to my patients.

#6 To what extent (if at all) have you recommended vegetarian diets?

Question #1 of usage and application section: I teach vegetarian diets to my patients.  
Results:

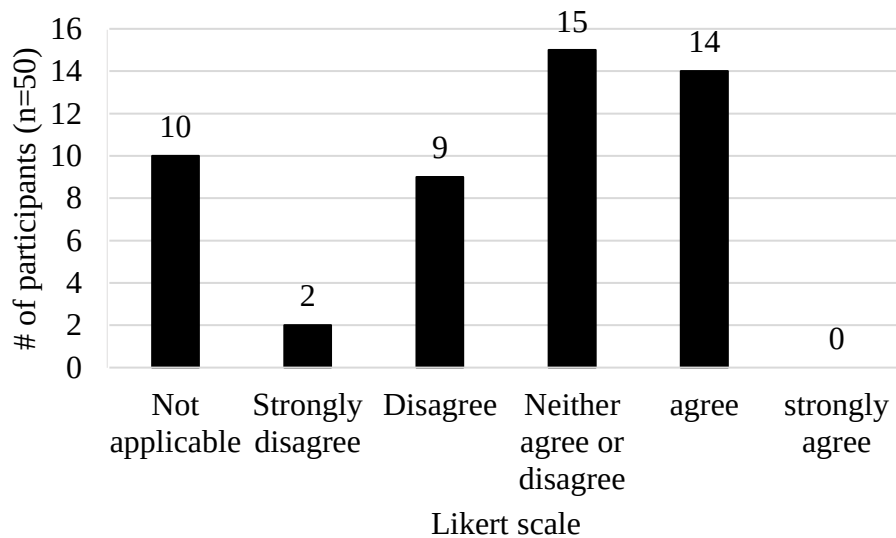


Figure A2. Respondents (n=50) report whether they teach vegetarian diets to patients.

Omitted: redundancy, question overlaps with practical applications and use questions #4 and #6.

#4 I would pass on a referral for vegetarian counselling.

#6 To what extent (if at all) have you recommended vegetarian diets?

#### 6.4.3. Macro- and Micro-nutrient Impacts

Question #16 of perceptions and values section: Eating meat and fish is important for maintaining health.

Results:



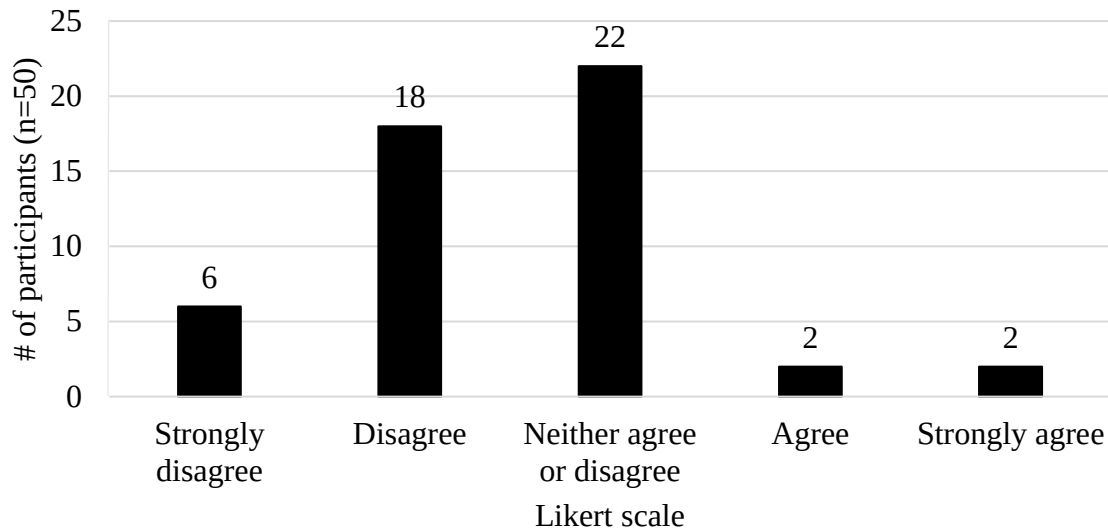


Figure A3. Respondents (n=50) perceptions of meat and fish intake being important for maintaining health on a 5-point Likert scale.

Omitted: redundancy, overlaps with perception and values questions #3,4,13,15,20.

- #3 What nutrients (if any) are you most concerned are too little in a vegetarian diet?
- #4 What nutrients (if any) are you most concerned are too much in a vegetarian diet?
- #13 Nutrient deficiency risk is too high in vegetarian diets.
- #15 Vegetarians do not get enough protein.
- #20 Vegetarians need an iron supplement.

#### 6.4.5. Lifestyle Perceptions

Question #22 of perceptions and values section: Breastfeeding can be done healthily while vegetarian.

Results:

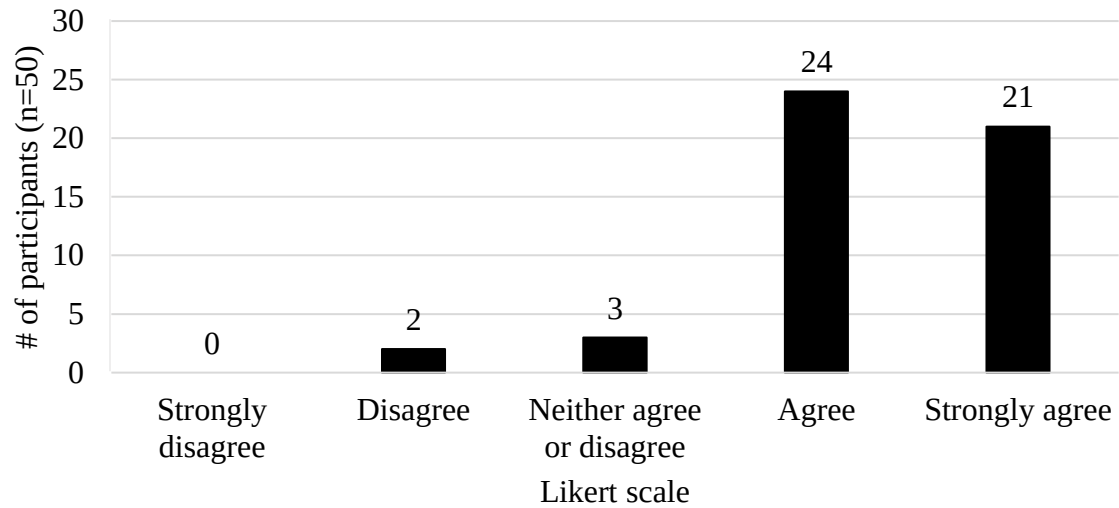


Figure A4. Respondents (n=50) perceptions of breastfeeding being a healthy practice while vegetarian.

Omitted: standalone question that does not fit in with the other questions explored in this study.

## **Appendix B: LimeSurvey consent form and questionnaire**

# **Veg in Healthcare Study**

Greetings and welcome to the research study "Knowledge, Perceptions and Use of Plant-Based Dietary Interventions Among Health Care Providers in Nova Scotia" (Veg-HP Study). You will find a consent form on the following page detailing the aspects of this study. Thank you for your time and consideration.

There are 73 questions in this survey.

## Informed Consent to Participate in a Research Study

**Study Title** Knowledge, Perceptions and Use of Vegetarian Dietary Interventions Among Healthcare Providers in Nova Scotia

**Short Study Title** Veg-HP Study

**Study E-mail** [VegHPstudy@msvu.ca](mailto:VegHPstudy@msvu.ca)

### Research Team

Principal Investigator / Study Coordinator:

|                                     |                                                                                                                                                                                                                                                                                                                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Laura Bockus-Thorne, PDt, MAHN, BSN | Registered Dietitian and Master of Science Student<br>Department of Applied Human Nutrition,<br>Mount Saint Vincent University<br>Tel: 902-457-6573 (shared number)<br>E-mail: <a href="mailto:Laura.Bockus.Thorne@msvu.ca">Laura.Bockus.Thorne@msvu.ca</a><br>(mailto: <a href="mailto:Laura.Bockus.Thorne@msvu.ca">Laura.Bockus.Thorne@msvu.ca</a> )<br>Available: 9am to 5pm, Monday to Friday |
|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Co-Investigators:

|                                       |                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Dr. Shannan Grant, PDt, PhD, MSc, BSc | Study Supervisor<br>Assistant Professor and Registered Dietitian<br>Department of Applied Human Nutrition,<br>Mount Saint Vincent University<br>Tel: 902-457-5400<br>E-mail: <a href="mailto:Shannan.Grant2@msvu.ca">Shannan.Grant2@msvu.ca</a><br>(mailto: <a href="mailto:Shannan.Grant2@msvu.ca">Shannan.Grant2@msvu.ca</a> )<br>Available: 8am to 4pm, Monday to Friday |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                     |                                                                                                                                                                                                                                                                      |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Andrea Glenn, MSc, RD, PhD (c)      | Registered Dietitian and PhD Candidate<br>Department of Nutritional Sciences<br>Faculty of Medicine, University of Toronto<br>Tel: 647-385-5502<br>E-mail: andrea.glenn@utoronto.ca<br>(mailto:andrea.glenn@utoronto.ca)<br>Available: 11am to 7pm, Monday to Friday |
| Dr. Kelly Lackie, PhD, RN, MN, BScN | Assistant Professor and Registered Nurse<br>School of Nursing<br>Dalhousie University<br>Tel: 902-494-6510<br>E-mail: klackie@dal.ca (mailto:klackie@dal.ca)<br>Available: 8am to 4pm, Monday to Friday                                                              |
| Dr. Mary Lynch, MD, MA, BSc         | Professor and Medical Doctor<br>Faculty of Medicine<br>Dalhousie University<br>Tel: 902-473-6428<br>E-mail: mary.lynch@dal.ca<br>Available: 8am to 4pm, Monday to Friday                                                                                             |

**How to:** The consent form below has check boxes for each section. Once you have read each section, if you agree with the content and still want to participate in the study, click the check box to confirm consent. The check boxes for each section of the consent form will need to be checked before continuing to the survey. Please read below for more information.

### Introduction

We invite you to take part in the research study “Knowledge, Perceptions and Use of Plant-Based Dietary Interventions Among Health Care Providers in Nova Scotia” (Veg-HP Study). Before agreeing to take part in this research study, it is important that you read and understand this consent form. It provides all the information you need to know in order to decide whether you wish to participate in this study. If you have any questions, feel free to contact one of the study investigators listed above or contact VegHPstudy@msvu.ca (mailto:VegHPstudy@msvu.ca). You should not sign this form until you are sure you understand all of it. All research is voluntary and even if you consent to participate, you can withdraw at any time.

You have been invited to join our study since you are > 18 years of age and are registered and licensed in Nova Scotia as a Doctor, Dietitian, Nurse (RN, NP, LPN) or Pharmacist with a professional college or association (regulatory body). You also have or are in a position where you provide nutrition advice to patients, clients or residents within Nova Scotia. You do not qualify to participate in this study if you are not a health professional or do not practice in the above listed fields. All eligible participants are encouraged to participate as we are attempting to reach saturation from each of the listed professions.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### Why is this study being done?

Plant-based diets have become a popular topic in the media with more billboard ads, changes in consumer purchasing, and a rise in plant-based meat alternative products in grocery stores and fast-food chains. The aims of this study are to investigate the perceptions of health care professionals in regard to vegetarian diets and assess their current knowledge and usage of these diets. Previous research has mostly been in other countries, conducted only with medical doctors, and is older. This study aims to fill in the gaps from previous research by completing a more in-depth analysis of the knowledge and utility of vegetarian diets from the broader health care team.

We hope to collect data that will help identify current strengths or gaps in health care professionals' readiness and preparedness in providing plant-based counselling. The purpose of this survey is to collect information on the following research question:

What are the perceptions, knowledge and use of vegetarian diets in chronic disease management by health care professionals in Nova Scotia? The outcomes we are interested in measuring are:

1. Descriptive demographics among respondents
2. Knowledge strengths or gaps for vegetarian diets
3. Perceived utility of vegetarian diets
4. The current usage of vegetarian diets in health care

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### What will happen during this study?

Once the consent form is completed you will have access to the survey. You will be able to access the survey for four months (October 7th 2021 to February 7th 2022). The survey cannot be closed and re-opened. Please ensure you have answered all the questions you have intended to answer and have clicked the submit button before closing the survey.

The survey will ask you to complete close-ended and short-answer questions in 4 sections. These sections are: demographics, knowledge and skills, perceptions/ values, and usage/ application of vegetarian diets in practice. Approximate length of time needed to complete this survey is 15 minutes.

Please note, all data will be collected and handled only by the study staff. If you do not feel comfortable answering any question(s) you may contact the study staff to address any concerns or choose not to answer; this is your right as a study participant. A survey that does not have the demographic section filled out will not be included in this study. Answers cannot be excluded once the submit button has been clicked, as answers are not linked to participants.

This survey has been assessed for face / content validity by subject matter experts, academics and survey developers. If there is any feedback on the study design, please include comments at the end of the survey.

Once the survey has been shut down on February 7th 2022, surveys that have the demographic section filled in will undergo data analysis. The software, Statistical Package for the Social Sciences (IBM SPSS 25) will be used to analyze descriptive and inferential types of data. The results will be presented in a Master of Science thesis by Ms. Laura Bockus-Thorne. Information obtained from this study may also be presented at conferences, in media, or other writings.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

**What are the risks or harms of participating in this study?**

It is hoped that what is learned will provide a more in-depth body of knowledge on this topic. There are no other perceived risks of this study. If you experience any negative effects from this study please contact Dr. Shannan Grant at [Shannan.Grant2@msvu.ca](mailto:Shannan.Grant2@msvu.ca) (mailto:Shannan.Grant2@msvu.ca) or 902-457-5400.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

**What are the benefits of participating in this study?**

You may or may not benefit directly from participating in this study. Participation may result in self-identification of strengths or gaps in providing nutrition counselling for vegetarian diets. Your participation may or may not help identify strengths or gaps within demographics. The results of this study will contribute further to the growing research in plant-based diets.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section



**Can I withdraw from this study at any time?**

It is your decision whether or not to participate in this study. If you do take part, you can leave the survey at any time and do not have to provide a reason. Withdrawing from the study will not affect your participation in any future studies or interactions with Mount Saint Vincent University. Filling out the information at the end of this form means you consent to the survey answers being included in the study. Once a submit button is clicked, the answers cannot be withdrawn from the study as individual answers are not linked in any way to those who participate. Surveys that do not have the demographic section filled in will not be included in the study. You are able to skip one or more of the questions from the rest of the survey, and all answers will be included.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

**Are study participants paid to participate in this study?**

You will not be paid to participate in this study. This study offers no monetary incentives for participation.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### How will my information be kept confidential?

It is possible that the results of this study may be published in scientific literature or presented at conferences or seminars. Confidentiality will be upheld, and no names or identifying information about you will be used in any publication or presentation.

All information you give to members of our research team will be kept private. When we share our project findings in the final thesis, conferences, publications or other media we will only talk about group results and general statements. Any identifying information about you (like your name) will not be collected or presented.

All information collected from the surveys will be stored at MSVU for a minimum of 5 years. This will be on a password protected account on the MSVU servers. The only people with access to this information will be the research team.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### Do the study investigators have any conflicts of interest?

Laura Bockus-Thorne, Dr. Shannan Grant, Andrea Glenn and Dr. Mary Lynch follow plant-based diets which may be perceived as a conflict of interest. This study is also to complete part of Ms. Laura Bockus-Thorne's master of science degree (MSc) requirements, which may also be perceived as a conflict of interest. None of the study staff listed above believe there are any actual conflicts of interest. Dr. Kelly Lackie has no conflicts of interest to report.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### What are the rights of participants in a research study?

You have a right to receive all significant information that could help you make a decision about participating in the study. You also have a right to ask questions about the study and your rights as a participant, and to have these answered to your satisfaction prior to participating. You also have a right to ask any questions and receive answers during the survey.

If you have any questions for the principal investigator, please message Laura Bockus-Thorne at [Laura.Bockus.Thorne@msvu.ca](mailto:Laura.Bockus.Thorne@msvu.ca) (mailto:Laura.Bockus.Thorne@msvu.ca). If a phone call is needed, a meeting can be arranged within the week provided covid precautions allow access to the MSVU campus.

If you have any questions regarding your rights as a research participant or any ethical issues related to the study, you may contact Brenda Gagne - Ethics Coordinator, Mount Saint Vincent University at [Brenda.Gagne@msvu.ca](mailto:Brenda.Gagne@msvu.ca) (mailto:Brenda.Gagne@msvu.ca) or 902-457-6350.

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

### Will I be notified of the study results?

If you would like to be sent the key findings of this survey, you will have an opportunity to submit your e-mail in a separate section of the LimeSurvey website. Your e-mail will not be linked to the survey or the results in any way.

### Study Contacts

If you have any other questions about the study, please contact the study staff at [VegHPStudy@msvu.ca](mailto:VegHPStudy@msvu.ca) (mailto:VegHPStudy@msvu.ca).

\*

Please choose **only one** of the following:

☐ I have read and consent to this section

## DOCUMENTATION OF INFORMED CONSENT

You may print a copy of this informed consent form for your records.

Full Study Title: Knowledge, Perceptions and Use of Plant-Based Dietary Interventions Among Health Care Providers in Nova Scotia

### Participant

By clicking yes on this form, I confirm that:

- This research study has been fully explained to me and all of my questions answered to my satisfaction
- I understand the requirements of participating in this research study
- I have been informed of the risks and benefits, if any, of participating in this research study
- I have been informed of any alternatives to participating in this research study
- I have been informed of the rights of research participants
- I have read each section of this form
- I have agreed to participate in this research study

Thank you for taking the time to consider this questionnaire.

Do you consent to participate in this study?

\*

Please choose **only one** of the following:

☐ Yes

☐ No

## Is nutrition education part of your practice? \*

❗ Choose one of the following answers

Please choose **only one** of the following:

☐ Yes

☐ No

☐ Sometimes

☐ Unsure

☐ Other, please specify:

Please indicate your professional practice membership category. \*

❗ Choose one of the following answers

Please choose **only one** of the following:

☐ College of Physicians & Surgeons of Nova Scotia

☐ Nova Scotia Dietetic Association

☐ Nova Scotia College of Nurses

☐ Nova Scotia College of Pharmacists

☐ Other, please specify:

## Current membership status with regulatory body?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Physician - Active practicing / Full license
- ☐ Physician - Temporary
- ☐ Physician - Defined license
- ☐ Physician - Academic license
- ☐ Physician - Restricted license
- ☐ Physician - Clinical assessment license
- ☐ Physician - Retired
- ☐ Dietitian - Licensed membership
- ☐ Dietitian - Temporary membership
- ☐ Dietitian - Retired
- ☐ Nurse - Licensed practical nurse (LPN) - Practicing
- ☐ Nurse - Licensed practical nurse (LPN) - Conditional
- ☐ Nurse - Licensed practical nurse (LPN) - Retired
- ☐ Nurse Practitioner (NP) - Practicing
- ☐ Nurse Practitioner (NP) - Conditional
- ☐ Nurse Practitioner (NP) - Retired
- ☐ Registered Nurse (RN) - Practicing
- ☐ Registered Nurse (RN) - Conditional
- ☐ Registered Nurse (RN) - Retired
- ☐ Pharmacist - Practicing direct patient care
- ☐ Pharmacist - Practicing indirect patient care
- ☐ Pharmacist - Non-practicing

☐ Other, please specify:

## Years of practice in professional field.

Please write your answer here:

## What is your current practice area?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Clinical inpatient
- ☐ Clinical outpatient
- ☐ Public health
- ☐ Private practice
- ☐ Other, please specify:

## In what region of Nova Scotia do you practice?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Central zone
- ☐ Eastern zone
- ☐ Northern zone
- ☐ Western zone

## Did you complete your professional education within Nova Scotia?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Yes
- ☐ No
- ☐ Some

## What is the highest degree or level of school you have completed?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ College / Professional school diploma
- ☐ Associate degree
- ☐ Associated degree with internship
- ☐ Bachelor's degree
- ☐ Bachelor's degree with internship
- ☐ Master's degree
- ☐ Master's degree with internship
- ☐ Professional degree
- ☐ Doctorate degree

## Gender.

Please write your answer here:

## Sex.

Please write your answer here:



## What is your age?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ 18-24 years of age
- ☐ 25-34 years of age
- ☐ 35-44 years of age
- ☐ 45-54 years of age
- ☐ 55-64 years of age
- ☐ 65-74 years of age
- ☐ 75+ years of age

Please state the dietary pattern closest to your own (for example, omnivore, flexitarian, vegetarian, etc.):

Please write your answer here:

How often do you eat animal meat (example, beef, poultry, fish, moose, etc):

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Never
- ☐ 1-6 times per year
- ☐ 7-11 times per year
- ☐ 1 time per month
- ☐ 2-3 times per month
- ☐ 1-2 times per week
- ☐ 3-4 times per week
- ☐ 5-6 times per week
- ☐ 1 time per day
- ☐ 2-3 times per day
- ☐ 4-5 times per day
- ☐ 6 or more times per day

Have you had any education on vegetarian diets (example: workshops, courses, self-study, etc)?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Yes
- ☐ No
- ☐ Unsure

If yes, how much education would you say you have accumulated in regard to vegetarian diets?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ 0-1 hours
- ☐ 2-5 hours
- ☐ 6-10 hours
- ☐ 11+ hours
- ☐ I don't know

☐ Other, please specify:

How is a vegetarian diet different from other diets? (75 character maximum)

Please write your answer here:

What are some reasons people choose to become vegetarian? (75 characters maximum)

Please write your answer here:

A lacto-ovo-vegetarian diet would typically **not** include (Check any / all that apply):

Please choose **all** that apply:

- ☐ Meat
- ☐ Fish
- ☐ Dairy
- ☐ Eggs
- ☐ Legumes
- ☐ Vegetables
- ☐ Fruit
- ☐ Grains

☐ Other, please specify::

A vegan diet would typically **not** include (check any / all that apply):

Please choose **all** that apply:

- ☐ Meat
- ☐ Fish
- ☐ Dairy
- ☐ Eggs
- ☐ Legumes
- ☐ Vegetables
- ☐ Fruit
- ☐ Grains

☐ Other, please specify::

What are five vegetarian foods?

List three protein sources you would recommend (if any) to replace meat for a vegetarian diet?

Studies comparing vegetarian diets to non-vegetarian diets, have shown (click the box next to the best answer)

a. Lower colorectal cancer risk.

Please choose **only one** of the following:

☐ True

☐ False

b. Higher weight.

Please choose **only one** of the following:

☐ True

☐ False

c. Lower diabetes risk.

Please choose **only one** of the following:

☐ True

☐ False

e. Longer life expectancy.

Please choose **only one** of the following:

☐ True

☐ False

The 2019 (current), "Canada's Food Guide" has no meat and alternatives food group.

Please choose **only one** of the following:

- ☐ True
- ☐ False

9. The World Health Organization (WHO) classifies chicken as a Group 2A, probably carcinogenic (cancer causing) to humans.

Please choose **only one** of the following:

- ☐ True
- ☐ False

10. Diabetes Canada states vegetarian diets can help manage blood glucose in people living with diabetes.

Please choose **only one** of the following:

- ☐ True
- ☐ False

Which of the following response options best describes your perception of vegetarian diets?

❗ Check all that apply

Please choose **all** that apply:

- ☐ A legitimate medical intervention
- ☐ Alternative medicine
- ☐ Complimentary medicine
- ☐ Lifestyle choice
- ☐ None of the above

☐ Other, please specify::

I am knowledgeable of vegetarian diets.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree



## What nutrients (if any) are you most concerned are too little in a vegetarian diet?

❗ Check all that apply

Please choose **all** that apply:

- ☐ Carbohydrates
- ☐ Fats
- ☐ Proteins
- ☐ Iron
- ☐ Sodium
- ☐ B12
- ☐ Zinc
- ☐ Calcium
- ☐ Fibre
- ☐ None

☐ Other, please specify::

## What nutrients (if any) are you most concerned are too much in a vegetarian diet?

❗ Check all that apply

Please choose **all** that apply:

- ☐ Carbohydrates
- ☐ Fats
- ☐ Proteins
- ☐ Iron
- ☐ Sodium
- ☐ B12
- ☐ Zinc
- ☐ Calcium
- ☐ Fibre
- ☐ None

☐ Other, please specify::

What medical conditions (if any) do you believe could be beneficially impacted by a vegetarian diet (check any / all that may apply):

❗ Check all that apply

Please choose **all** that apply:

- ☐ Diabetes
- ☐ Mental health disorder(s)
- ☐ Cancer(s)
- ☐ Cardiovascular disease(s)
- ☐ None

☐ Other, please specify::

What clinical outcome(s) (physiological measures of disease or health status), (if any) do you believe could be beneficially impacted by a vegetarian diet:

❗ Check all that apply

Please choose **all** that apply:

- ☐ Hemoglobin A1c and fasting plasma glucose
- ☐ Systolic and diastolic blood pressure
- ☐ Body mass index (BMI) and waist circumference
- ☐ Total blood cholesterol
- ☐ None

☐ Other, please specify::

What medical conditions (if any) do you believe could be negatively impacted by a vegetarian diet:

❗ Check all that apply

Please choose **all** that apply:

- ☐ Diabetes
- ☐ Mental health disorder(s)
- ☐ Cancer(s)
- ☐ Cardiovascular disease(s)
- ☐ None

☐ Other, please specify::

What clinical outcome(s) (physiological measures of disease or health status) (if any) do you believe could be negatively impacted by a vegetarian diet:

❗ Check all that apply

Please choose **all** that apply:

- ☐ Hemoglobin A1c and fasting plasma glucose
- ☐ Systolic and diastolic blood pressure
- ☐ Body mass index (BMI) and waist circumference
- ☐ Total blood cholesterol
- ☐ None

☐ Other, please specify::

Vegetarian diets are healthy for the general public.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

A vegetarian diet is too difficult a diet for the general public to understand.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Following a vegetarian diet is too strict for the general public.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

I am interested in receiving training for vegetarian diets.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Nutrient deficiency risk is too high in vegetarian diets.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Vegetarian diets are unsafe.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

## Vegetarians do not get enough protein.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

## Eating meat and fish is important for maintaining health.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

## Vegetarians are generally healthier.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Vegetarians tend to be more knowledgeable about healthy eating than the general public.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Vegetarians think they are healthier than the general public.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

Vegetarians need an iron supplement.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

**A vegetarian diet is a valuable dietary intervention.**

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

**Breastfeeding can be done healthily while vegetarian.**

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

**A vegetarian diet is healthy for young children.**

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree



## Vegetarian diets are socially isolating.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

## Cooking for vegetarian diets is too time consuming.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree

## I teach vegetarian diets to my patients.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable

I am confident in providing nutrition education involving vegetarian diets.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable

I am more confident in providing nutrition education for non-vegetarian diets than for vegetarian diets.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable

I would pass on a referral for vegetarian counselling.

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree or disagree
- ☐ Disagree
- ☐ Strongly disagree
- ☐ Not applicable

What patient population(s) would you recommend (if any) a vegetarian diet? (75 characters maximum)

Please write your answer here:

To what extent (if at all) have you recommended vegetarian diets?

❗ Choose one of the following answers

Please choose **only one** of the following:

- ☐ I recommend vegetarian diets at every available opportunity.
- ☐ I recommend vegetarian diets often / frequently.
- ☐ I recommend vegetarian diets sometimes.
- ☐ I recommend vegetarian diets rarely.
- ☐ I recommend vegetarian diets when asked by the patient / client.
- ☐ I have considered recommending vegetarian diets but have not at this time.
- ☐ I do not recommend vegetarian diets but will discuss with patient / client if asked.
- ☐ I do not recommend vegetarian diets.

If you have any additional feedback for the researchers at this time, please provide a brief comment in the following text box. For more urgent concerns, questions or feedback, please contact the researchers at [VegHPStudy@msvu.ca](mailto:VegHPStudy@msvu.ca) .

Please write your answer here:

If you would like to be sent the key findings of this survey, you will have the opportunity to submit your e-mail in the text box below. Your e-mail will not be linked to the survey results.

Please write your answer here:

Thank you for taking the time to complete our questionnaire.

2022-09-13 – 16:23

Submit your survey.

Thank you for completing this survey.

## Appendix C: Implementation phase: online recruitment location details

Table B1. Implementation phase: online recruitment location details

| Social media notices                                                                                                                                                                                                                                                                                                                                                                                                                                   | Online notices / e-mail                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Social media outlets                                                                                                                                                                                                                                                                                                                                                                                                                                   | Professional associations**                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p>1) LinkedIn</p> <p>2) Facebook and Groups</p> <ul style="list-style-type: none"> <li>- Dietitians Network Nova Scotia</li> <li>- Nova Scotia Family Doctors*</li> <li>- Nova Scotia Nurse Practitioner Network*</li> <li>- Nova Scotia More Than Medicine**</li> <li>- Public Health Association of Nova Scotia**</li> <li>- Dietitians of Canada**</li> <li>- Nova Scotia Health**</li> </ul> <p>3) Twitter (6 recruitment posts and 8 shares)</p> | <p>1) Pharmacy Association of Nova Scotia</p> <p>2) Acadia University</p> <p>3) St. Francis Xavier University</p> <p>4) Nova Scotia Dietetic Association</p> <p>5) Family Practice Nurses Association of Nova Scotia</p> <p>6) Canadian Nutrition Society*</p> <p>7) Resident Doctors of Canada**</p> <p>8) Maritime Resident Doctors**</p> <p>9) Dietitians Network Nova Scotia**</p> <p>10) Nova Scotia Health**</p> <p>11) Nova Scotia Nurses Union**</p> <p>12) Canadian Medical Association**</p> <p>13) Canadian Nurses Association**</p> <p>14) Nurse Practitioners Association of Nova Scotia**</p> <p>15) Registered Nurses Professional Development Centre**</p> <p>16) Nova Scotia Department of Health and</p> |

|  |                                                                                                                                                                                                                                                                                   |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Wellness**<br><br>17) Canadian Pharmacists Association**<br><br>18) Canadian Society of Hospital Pharmacists**<br><br>19) Canadian Family Practice Nurses Association<br>(ATlantic Region Representative)**<br><br>20) Doctors Nova Scotia***<br><br>21) Dietitians of Canada**** |
|--|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

\* Organizations or groups that agreed to post recruitment materials, although verification could not be attained since researcher was not a member of these groups.

\*\* Organizations or groups contacted with no response given.

\*\*\* Organizations or groups contacted that were willing to post but timeframe was not workable.

\*\*\*\* Organizations or groups that wanted payment

## Appendix D: Questionnaire feedback tool



### **Veg-HP Study Questionnaire Feedback Form**

#### **Directions:**

Please read each question in the Veg-HP Study questionnaire and provide your feedback using this feedback form. If you also wish to write feedback directly on the questionnaire, you are welcome to do so. We will take feedback on the questionnaire through comments made on Adobe Acrobat or comments / feedback handwritten on a hardcopy of the questionnaire, scanned to .pdf and emailed back. If you choose to include feedback on the questionnaire, we still ask that you fill out the feedback form and return it to us. **Please do not include any personal identifiers (e.g., your name) on the feedback form or questionnaire, to ensure confidentiality.**

After you have finished providing feedback, please e-mail all documents back to [VegHPstudy@msvu.ca](mailto:VegHPstudy@msvu.ca). **Thank you for your participation.**



1. Write an “X” on the line left of each Veg-HP Study question that you found hard to understand.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study are hard to understand.

If you marked “X” next to any of the above question numbers, please provide more detail on the line below. For example, tell us why Section A: question 5 was hard to understand.

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2. Write an “X” on the line left of each Veg-HP Study question that you think contains words that might be interpreted differently by different people.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study contain words that might be interpreted differently by different people.

If you marked “X” next to any of the above question numbers, please provide more detail on the line below. For example, tell us what word may be interpreted differently for Section A: question 5.

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3. Write an “X” on the line left of each Veg-HP question that you think contains or may contain offensive word(s) or phrases.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP contain offensive words or phrases.

If you marked “X” next to any of the question numbers, please provide rationale for your response on the lines below. For example, tell us what word(s) or phrase(s) may be offensive in Section A: question 5.

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4. Write an “X” on the line left of each Veg-HP Study question that you think is constructed in a way that a particular answer is favoured over others.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study are constructed in a way that a particular answer is favoured over others.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.



5. Write an “X” on the line left of each Veg-HP Study question that you think does not provide sufficient response options.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study lack sufficient response options.

[illegible]

6. Write an “X” on the line left of each Veg-HP Study question that you think does NOT relate to the research study question of:

*“What is the current knowledge, perceptions and practice of health care practitioners in Nova Scotia with regard to vegetarian diet utility in chronic disease management?”.*

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study are unrelated to the research study question.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

7. Write an “X” on the line left of each Veg-HP Study question that you think is redundant or provides no informational value.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
| ___ Question 21 | ___ Question 22 | ___ Question 23 | ___ Question 24 |
| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study are redundant or provides no informational value.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. There are no margins, text, or other markings on the paper.

8. Write an “X” on the line left of each Veg-HP Study question that you think may have content that is not inclusive of various cultures, age groups, orientations, or other demographics.

Section A: Demographics

|                 |                  |                    |                 |
|-----------------|------------------|--------------------|-----------------|
| ___ Question 1  | ___ Question 2   | ___ Question 3     | ___ Question 4  |
| ___ Question 5  | ___ Question 6   | ___ Question 7     | ___ Question 8  |
| ___ Question 9  | ___ Question 10  | ___ Question 11    | ___ Question 12 |
| ___ Question 13 | ___ Question 14) | ___ Question 14 b. |                 |

Section B: Knowledge and Skills

|                   |                   |                   |                   |
|-------------------|-------------------|-------------------|-------------------|
| ___ Question 1    | ___ Question 2    | ___ Question 3    | ___ Question 4    |
| ___ Question 5    | ___ Question 6    | ___ Question 7 a. | ___ Question 7 b. |
| ___ Question 7 c. | ___ Question 7 d. | ___ Question 7 e. | ___ Question 8    |
| ___ Question 9    | ___ Question 10   |                   |                   |

Section C: Perceptions and Values

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
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| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |
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| ___ Question 25 |                 |                 |                 |

Section D: Usage and Application

|                 |                 |                 |                 |
|-----------------|-----------------|-----------------|-----------------|
| ___ Question 1  | ___ Question 2  | ___ Question 3  | ___ Question 4  |
| ___ Question 5  | ___ Question 6  | ___ Question 7  | ___ Question 8  |
| ___ Question 9  | ___ Question 10 | ___ Question 11 | ___ Question 12 |
| ___ Question 13 | ___ Question 14 | ___ Question 15 | ___ Question 16 |
| ___ Question 17 | ___ Question 18 | ___ Question 19 | ___ Question 20 |

\_\_\_ I do not think any questions in the Veg-HP Study has content that is not inclusive of various cultures, age groups, orientations, or other demographics.

If you marked “X” next to any of the question numbers, please provide rationale for your response on the lines below. For example, tell us how the question in Section A: question 5 has content that is not inclusive of various cultures, age groups, orientations, or other demographics.

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9. Do you think the general content flow from question to question in the Veg-HP study questionnaire is easy to follow?

\_\_\_\_ Yes

\_\_\_\_ No

9. b. Please provide rationale for your response above and / or additional feedback in the lines below.

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10. Are there any additional questions you think could be added to enhance the informational value or fill in relevant content gaps? If yes, please include it on the lines below.

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11. Do you have any additional feedback on the Veg-HP study? If yes, please include it on the lines below.

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12. Do you have any feedback on your experience as a study participant? If yes, please include it on the lines below.

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**End of feedback form.**  
**Thank you for your input.**

End of Documentation.