Utilizing culturally appropriate diet assessment tools: Proposal for comprehensive data collection of dietetic information in South Asian populations

by
Karthika Yogaratnam
B.Sc. (Honours) McMaster University, 2014
B.A. (Honours), McMaster University, 2016

PROJECT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PUBLIC HEALTH

in the
Faculty of Health Sciences

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SIMON FRASER UNIVERSITY
Spring 2018

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Approval

Name: Karthika Yogaratnam
Degree: Master of Public Health
Title: Utilizing culturally appropriate diet assessment tools: Proposal for comprehensive data collection of dietetic information in South Asian populations

Examining Committee:
Chair: Dr. Malcolm Steinberg
   Program Director
   Faculty of Health Sciences

Dr. David Whitehurst
Senior Supervisor
Assistant Professor
Faculty of Health Sciences

Rachel Douglas
Supervisor
Evaluation Specialist, Population Health Observatory
Fraser Health

Dr. Kimberly Miller
External Examiner
Knowledge Translation Leader
Sunny Hill Children’s Centre

Date Defended/Approved: April 9th, 2018
Abstract

Context: The growing prevalence of type 2 diabetes among South Asians has been identified as a public health concern globally, sparking interest in improving dietary data collection strategies from individuals within this population. Peer-reviewed research has suggested that dietary assessments, coupled with diet and lifestyle modifications, can improve disease outcomes. Research also suggests that the collection of dietary information needs to be culturally appropriate for the population of interest.

Objective: To provide an overview of the use of culturally modified diet assessment tools, and their success in data collection, within nutritional epidemiology literature.

Methods: Papers published between January 2006 and January 2018 were identified from 3 electronic databases, supplemented with manual searches of reference lists. The data extraction focused on whether culturally appropriate diet assessment tools had been used with minority or South Asian populations, and whether they yielded response rates >60%.

Results: Twenty-four papers were identified. Food frequency questionnaires (n = 18) were the most commonly administered diet assessment, and often used in conjunction with a 24-hour diet recall. In studies where both tools were used (n = 6), the response rates were found to be >60%. All studies included in the review had used a culturally adapted version of the diet assessment tool.

Conclusion: Although diet assessment methods can be effective for data collection, the use of culturally adapted tools and interviewer-based administration are important for improved data quality and completeness among minority populations. However, prior to implementation of any tool in a larger scale study, pilot testing of the tools on a representative sample of the study population will be required.

Keywords: diet assessments; food frequency questionnaire; ASA24-Canada diet recall; data collection; Punjabi Sikh; South Asians
Acknowledgements

I would like to take this opportunity to thank the following individuals who helped make this capstone process possible:

First, I would like to thank both Dr. David Whitehurst and Dr. Kimberly Miller for providing me with opportunity to work under their supervision and mentorship. I am also grateful for Dr. Whitehurst for stepping into the supervisory role on such short notice, and his guidance throughout this project.

Thank you to Rachel Douglas and the SEHAT team (Dr. Arun Garg, Roman Bhangoo, Deljit Bains, Ruby Bassi, and Karin Rai) for providing me with their unwavering support and enthusiasm. I am incredibly grateful for Rachel’s understanding and flexibility throughout this process, as it was invaluable to the success of my capstone and provided an amazing opportunity to work with her and the team. The team’s willingness to accommodate my timeline and needs for the project made this experience much more comprehensive, as my inclusion in team meetings and discussions enhanced my learning along the way.

Finally, thank you to my family & friends (and friends who have become family), who have provided their unwavering support throughout my graduate journey.
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<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>24 HDR</td>
<td>24 Hour Diet Recall</td>
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<tr>
<td>BMI</td>
<td>Body Mass Index</td>
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<tr>
<td>CNF</td>
<td>Canadian Nutrient File</td>
</tr>
<tr>
<td>CVD</td>
<td>Cardiovascular Disease</td>
</tr>
<tr>
<td>FFQ</td>
<td>Food Frequency Questionnaire</td>
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<tr>
<td>FHA</td>
<td>Fraser Health Authority</td>
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<tr>
<td>FPQ</td>
<td>Food Propensity Questionnaire</td>
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<tr>
<td>M-CHAT</td>
<td>The Multicultural Community Health Assessment Trial</td>
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<tr>
<td>MALASA</td>
<td>The Mediators of Atherosclerosis in South Asians Living in America</td>
</tr>
<tr>
<td>NCI</td>
<td>National Cancer Institute</td>
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<tr>
<td>PDA</td>
<td>Personal Digital Assistant</td>
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<tr>
<td>SAHI</td>
<td>South Asian Health Institute</td>
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<tr>
<td>SES</td>
<td>Socioeconomic Status</td>
</tr>
<tr>
<td>SHARE</td>
<td>The Study of Health Assessment and Risk in Ethnic groups</td>
</tr>
<tr>
<td>T2D</td>
<td>Type 2 Diabetes</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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### Glossary

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tr>
<td>Acculturation</td>
<td>Concept related to culture that is used as a descriptive variable, assuming that cultural knowledge, attitudes, and beliefs lead to certain behaviours and influence health choices</td>
</tr>
<tr>
<td>Culture</td>
<td>Within the context of healthcare, culture is defined as distinct learned and shared values, beliefs, and practices that associated with health-related behaviour or influence the acceptance of health-related messages</td>
</tr>
<tr>
<td>Cultural competence</td>
<td>In health care, cultural competence is defined as a system that acknowledges and incorporates—at all levels—the importance of culture, the assessment of cross-cultural relations, awareness of the dynamics that result from cultural differences, expansion of cultural knowledge, and adaptation of services to meet culturally unique needs</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>A concept recognizing that people tend to identify themselves with social groupings based on unique cultural grounds—including language, lifestyle, religion, food and origins</td>
</tr>
<tr>
<td>South Asian</td>
<td>South Asian ethnicity is defined as having descended from the South Asian subcontinent—including Bangladesh, Bhutan, India, Nepal, Pakistan or Sri Lanka</td>
</tr>
<tr>
<td>‘Western’</td>
<td>Western culture is a term used broadly to refer to a tradition of social norms, ethical and moral values, customs, belief and political systems, and specific artifacts and technologies that either originated or have an association with Europe</td>
</tr>
<tr>
<td>Health literacy</td>
<td>The degree to which individuals can access, process, and understand basic health information and services in order to make informed and appropriate health decisions</td>
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1. Introduction

1.1. Population Demographics

Between 2006 and 2016, the population of Canada increased in number by nearly 11%, while simultaneously expanding in ethnic diversity\(^\text{1}\). The 2011 National Health Survey (NHS), found that the major source countries contributing to the demographic shift in Canada, were India and China\(^\text{2}\). Approximately 25% of the visible minorities in Canada identify as South Asians—a population group comprised of individuals from Bangladeshi, Indian, Pakistani, and Sri Lankan origins\(^\text{1,3}\). South Asians encompassed nearly 15% of the visible minority population living in the Fraser Health region (see Figure 1), launching the South Asian Health Institute (SAHI) in 2013—aimed to support the development of culturally appropriate health promotion practices to improve the health of this population\(^\text{4,5}\). SAHI was created by Fraser Health as a means to better understand health needs of the South Asian population, and to support programs and services that are aimed at improving health outcomes of this population using innovation and evidence-based care strategies\(^\text{5}\).

![Figure 1. South Asian Population residing in the Fraser Health region (by census)\(^\text{5}\).](image-url)
1.2. SAHI study population

South Asian immigration into Canada began to increase into the 1900s, bringing in individuals who were younger, educated, and in good health upon arrival\(^5\). The progressive degeneration of their health after settling in Canada has been hypothesized to be due to the ‘healthy immigrant effect’, whereby immigrants arrive in a better state of health than their Canadian-born counterparts, however as their length of residency increases their health declines\(^6\). The deterioration in health is assumed to be caused by the changes in meal patterns, among other factors such as decreased physical activity, where there has been a stark increase in the consumption of convenience foods and take-out meals throughout the day\(^7\). The hypothesis is that the adaptation of Western food practices, while still maintaining aspects of their traditional diets, may play a role in the increased disease burden seen across South Asian populations\(^7-9\).

The family unit, especially in the intergenerational context, plays a central role in the Punjabi Sikh identity\(^10\). When implementing behavioural changes at the individual level, the intersections between culture, gender and gendered roles, and class need to be taken into consideration—as food preparation and consumption are highly regarded as forms of familial affection and care practices\(^10,11\). Gender roles also play a significant role in food consumption patterns, as females are often responsible for meal preparation—rendering men unaware of what goes into the foods they consume at meal times\(^10\). The communal nature of food has also been documented within Gurdwaras (Sikh temples), where offerings notably contain large amounts of fat and sugar\(^5,10\).

Acknowledging the heterogeneity of South Asians in Canada, the sub-group of interest for the purpose of SEHAT’s\(^*\) pilot research project will be the Punjabi Sikh populations of Abbotsford and Surrey, British Columbia. This South Asian

\(^*\) Under SAHI’s broader mandate, in mid-2015, the SEHAT Wellness Ambassadors, a health promotion program, was developed to address the increased rates of chronic disease among the South Asian population living in the Fraser Health region, where “Apnee Sehat” translates to “My Health” in Punjabi\(^5\).
sub-group originates from the Northern Indian province of Punjab. According to the NHS data, Sikhs accounted for nearly 5% of Vancouver’s population. With such a large subgroup of this population residing across British Columbia, culturally appropriate health information and data collection methods are required.

1.3. Public Health Concern: South Asian Diet and Health

The expansion of cultural diversity in Canada highlights the growing need for cultural competency in research and clinical practice. In order to understand the specific health needs of the population served, cultural differences in dietary patterns and food preparation must be considered and documented. Compared to their European counterparts, South Asians have a higher prevalence of glucose intolerance and diabetes. However, culturally relevant research, educational and clinical tools are still lacking for this population.

The nature of diet patterns and food preparation among South Asians vary significantly across subgroups. Migration and years lived in host country may play a large role in current dietary patterns. Dietary acculturation is a phenomenon that is considered context-specific, and differences in sociocultural environments and food changes may invoke differing responses across ethnic groups. However, the acculturation hypothesis warrants the need for more research in order to understand the differential dietary habits across generations as well.

Although many families still continue to prepare and consume traditional meals, research shows that the consumption of ‘Western’ foods does occur—especially for breakfast, lunch, or as snacks throughout the day, even branching into the occasional take-out dinners. This change in dietary behaviour has been noted globally, where South Asians residing in Britain have been found to consume diets higher in fat and energy, those who immigrated to Scotland consume more fats (particularly saturated fats), and those living in Canada consume less fats but
higher quantities of sugar and total carbohydrates\textsuperscript{7}. These variations highlight the need for researchers to be attentive to the importance of understanding not only cultural influences of food, but how language, environmental, social and historical contexts shape the dietary behaviours of South Asian populations\textsuperscript{7}. Little research has explored the influence of family or household dietary patterns\textsuperscript{10}, as much of the research conducted has been focused on individual health behaviours.

In a study that looked at the cultural connections surrounding lifestyle changes made by Punjabi Sikh men following a myocardial infarction, it was found that participants were willing to change their dietary patterns but were often unable to do so when the family unit played a large role in food consumption behaviour\textsuperscript{10}. The use of high-fat dairy, especially when cooking with ghee (i.e. clarified butter, and whole milk), is of common practice among South Asian households\textsuperscript{10}. Research conducted in the United States has found that there were three prevalent dietary patterns across this population: an increased consumption of animal protein, sweets, fried snacks, high-fat dairy, and sugar-sweetened beverages; and a lower consumption of vegetables, fruits, nuts and legumes, which have been previously identified as contributors to weight gain, adiposity, and \(\beta\)-cell dysfunction\textsuperscript{16,17,18}.

Non-communicable diseases are notably the leading cause of morbidity and mortality on a global scale\textsuperscript{19}. Analysis of type II diabetes (T2D) rates has shown the prevalence to be greater among migrant populations, specifically among South Asians, where research has found a greater prevalence and early onset compared to other ethnic subgroups\textsuperscript{20}. Certain metabolic risk factors, such as waist circumference, dyslipidemia, and deregulated glucose and insulin, underlie the oxidative stressors that trigger the early onset of CVD and T2D within this population\textsuperscript{16,21}. As such, counselling for dietary information is a critical practice for prevention and treatment of medical conditions, and is often undertaken in primary care\textsuperscript{22}. Physicians reported that the integration of electronic diet assessment tools may be helpful in facilitating discussions with patients about
their current diet quality, and how they can assist them in determining changes in these eating behaviours\textsuperscript{22}. Most also report the potential ease and importance of administering, at the least, basic diet assessment tools which report food groups, portion sizes and whether patients are preparing foods at home or eating out, to address concerns in appointments with patients—especially if physicians do not have prior training in nutrition\textsuperscript{22,23}.

Health literacy plays a large role in the management of chronic diseases and can often serve as a barrier for racialized\textsuperscript{†} or minority populations. Language and literacy barriers can affect medication adherence and self-care practices, as these vary widely—as knowledge, attitudes and cultural norms differ within this heterogeneous population\textsuperscript{24}. Lower health literacy levels among newer immigrants can especially be a barrier to not only accessing health services but also from participating in clinical research, as many do not understand English, and may not be able to read or write in their native language\textsuperscript{24-26}.

With an increased chronic disease burden among South Asians, the paradox of a low body mass index (BMI)\textsuperscript{‡} and a high incidence of obesity and its related co-morbidities emphasized the importance of culturally specific health measures\textsuperscript{5,27}. Modifiable lifestyle behaviours, including diet and exercise, are often found at the center of population-level public health strategies for risk mitigation, diabetes prevention and management\textsuperscript{16,28}. However, these health behaviour parameters among South Asians are not as well documented, and thus are of particular

\begin{flushleft}
\textsuperscript{†} Race, as a social construction, often defined through biological concepts—using arbitrary physical traits (i.e. skin colour, hair texture)—creating a racial hierarchy based on visible differences in physical characteristics\textsuperscript{87}. Racialized groups are socially constructed categories, through the process of racialization, resulting in these groups receiving unequal and differential treatment, compared to members of the dominant group\textsuperscript{87}. Many individuals who belong to a racialized community, may face continued inequalities (social, economic, political, and health related)—regardless of being a newcomer, Canadian-born, or having resided in Canada for many years\textsuperscript{88}.

\textsuperscript{‡} Recent recommendations for BMI cut-offs have been developed for South Asians, where the overweight cut-off begins at 23.0 kg/m\textsuperscript{2}, due to tendency towards central adiposity for this population\textsuperscript{5}. As such, this recommendation needs to be taken into consideration when assessing these individuals for health-related concerns.
\end{flushleft}
interest for public health research for better health promotion and nutrition education for this community\textsuperscript{5,7}.

Using European-defined BMI cut-offs has been shown to be problematic, especially in different ethnic groups due to variations in lipid distribution and glucose profiles\textsuperscript{29}. This one-size fits all approach to assessments underestimates the risk factors in populations of non-European descent and is an issue that stems into assessments of health and diet-related factors\textsuperscript{19,29,30}. With diet assessments, using a ‘standardized’ tool is not possible, as food consumptions patterns and behaviours vary within and across populations, with differences in cultural and environmental exposures\textsuperscript{31}. As such, clinicians and researchers need to tailor health services and assessment methods to better reflect the literacy levels of South Asians. This includes understanding specific cultural norms and beliefs, as well making efforts to integrate community-based participation to better inform their respective practices.

1.4. Fraser Health: SAHI’s Previous Strategies

As a community-based health promotion program with the South Asian population in the Fraser region, initial focus of the SEHAT program was to work with local Sikh Gurdwaras to change cooking practices and provide information about healthy eating to the congregation. Previous program monitoring for the SEHAT program had developed and used various tools to collect the dietary information from participants at the individual level.

Previous tools employed by SAHI include the ‘SEHAT Program Participant Diet Log’, the ‘New Diet Survey’, ‘B & B Baseline Survey’, and the ‘Langar Hall Observational Log. The ‘New Diet Survey’ (see Appendix C) is a short food screening tool that aimed to collect basic health and food intake (particularly added sugar, salt and fat consumption) information from community members who frequent the local Gurdwaras. The ‘SEHAT Program Diet Log’ (see Appendix D) is a form of a 24-Hour Diet Recall (24 HDR)/food diary that
participants were required to fill out for 3 consecutive days (2 weekdays and 1 weekend). The B & B Baseline Survey (see Appendix E) is a short 24 HDR tool, intended to collect information about the beverage consumption and typical meal patterns of South Asian employees working at B & B Truss, a manufacturing company located in the Lower Mainland, Surrey, BC. The Langar Hall Observational log (see Appendix F), is a tool used by SAHI’s research team to estimate food consumption patterns at Gurdwaras in Surrey, based on patterns using a naturalistic observation strategy.

Each of the previous strategies employed resulted in extremely low participant response rates (RR) and poor-quality data, where questionnaires were incomplete, which may be the result of not using a culturally appropriate assessment tool with the population. For the SEHAT Program Participant Diet logs, of the 15 participants who initially consented to complete the logs, four diet logs were completed and sent back for analysis (RR = 26.7%). For both the diet survey and the B & B Truss 24 HDR, response rates were much higher (~100%) due to interviewer administration of both tools, offered in both English and Punjabi (n = 40, & n = 44, respectively). However, data quality suffered due to difficulties with recall, estimation of portion sizes and potential misclassification of food items. This could have been mitigated by improved interviewer training, but implementation timelines did not allow for this during the initial pilot.

The Langar Hall Observation logs serve as a tool that allows the researchers to estimate what individual and group diet behaviours are in the temple setting. However, since they are based on arbitrary estimates of food portions seen on plates, this tool introduces observer bias and measurement error for the intended research. Food models and photos of serving sizes accompanied the observation tool to help mitigate this, but observations were still quite subjective.
1.5. Research Question

Based on the background information on the health outcomes of South Asians, and the inadequate data collection from prior research strategies, Fraser Health Authority is seeking out methodologies to improve the response rate and data quality of health-related questionnaires administered to the population of interest. To address Fraser Health’s questions, the subsequent chapters of this review are structured in two phases: (i) a literature review will be conducted to identify significant methodological challenges with dietary assessments of South Asian populations in Canada, particularly to identify challenges in using and collecting culturally tailored information and (ii) suggestions for future directions for Fraser Health’s future pilot project.

Chapter 2 describes the methodology for the literature review process, highlighting the inclusion, exclusion criteria and the search strategies used.

Chapter 3 encompasses a review addressing whether current diet assessment tools are effective measures of dietary patterns when used in research and clinical practice, and whether online dietary assessment tools have been found to be effective means of data collection.

Secondary objectives are addressed in Chapter 4 and are meant to gauge whether a combination of existing tools will be culturally and linguistically appropriate methods to improve participant response rates. Specifically, whether this strategy can be administered to 30-to-60-year-old Punjabi Sikh community members living in both Abbotsford and Surrey, B.C., as part of Fraser Health’s future pilot project. Next steps will be to assess whether the interview-administered SHARE study FFQ and the ASA24-Canadian online 24 HDR, and a web-based self-administered 24 HDR may yield greater participant response rates among this population.
2. Methods

This is not intended to be a comprehensive review of dietary assessment methodologies, as those are widely available in existing literature.

2.1. Data Sources and Search Strategy


2.2. Selection Criteria

Eligibility of papers was identified using a two-staged approach, with an initial general search of the evidence available on diet assessment tools using Google Scholar. Due to the broad nature of the initial search and the search engine used, this stage allowed for identification of exclusion criteria to be applied during the second search. Reference to use of one or more diet assessment tools as a measurement tool, and ‘response rates’ as an outcome measure were sufficient for inclusion during this stage. The initial stage also required that papers be written in English and published in peer-reviewed journals. All full text papers were collected for those that met the inclusion criteria from the initial search.
The second stage was the opportunity to further refine the inclusion criteria (*Table 1*) for the review, specifically that the diet assessment tools were used to obtain data from minority or South Asian population groups. Studies and reviews focused on the validation of diet assessment methods for children, adolescents, and pregnant or breastfeeding women, were excluded as a result.

*Table 1. Inclusion & exclusion criteria for studies using diet assessments, and/or reporting response rates*

<table>
<thead>
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<th>Inclusion Criteria</th>
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<tr>
<td>• Studies using culturally appropriate dietary assessment tools</td>
<td>• Studies conducted on: children, adolescents, pregnant or breastfeeding women</td>
</tr>
<tr>
<td>• Studies using combined dietary assessment methods</td>
<td>• Reviews of dietary assessment tools</td>
</tr>
<tr>
<td>• Studies conducted in Canada, USA, Europe and South Asia</td>
<td>• Studies explaining the development of dietary assessment tools</td>
</tr>
<tr>
<td>(specifically India, Sri Lanka)</td>
<td>• Articles written in a language other than English</td>
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<tr>
<td></td>
<td>• Studies reporting &lt;60% response rates of administered dietary assessments</td>
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### 2.3. Data Extraction

The data extraction focused on whether culturally appropriate diet assessment tools have been administered in previous research with minority or South Asian populations, and when reported, whether the tools used yielded response rates of significance. Specific considerations for response rates were made to identify methodologies applicable for the population seen through Fraser Health, where previous strategies were not effective in garnering responses from participants (<20%). Due to the nature and scope of this review, ethics approval was not required.
3. Results

3.1. Reported Response Rates of Previous Research

The search resulted in 24 research studies included in the following review (see Appendix B). Across existing evidence on diet assessment tools that have been administered in research, multiple studies (see Appendix B) have found the use of culturally tailored tools to garner better participant response rates and data quality in terms of completeness\textsuperscript{9,31-42}. Research conducted on a subsample of a specific population selected from larger ongoing trials, have found that using specific tools that are user-friendly, easy to administer, and provide participants with detailed information (i.e. common household measures in addition to western-style measurements of cups and spoons), participants are more compliant and provide more complete data\textsuperscript{43-47}. Improvements in data quality were observed when the tools administered were reflective of the participants’ food consumption patterns\textsuperscript{39}. Using diet assessment tools that are easy to understand, both culturally and linguistically\textsuperscript{30}, and include foods that participants are familiar with, assist in gathering good quality data\textsuperscript{40-42}.

For the types of diet assessment tools administered, most studies have applied the use of a single, population-specific food screener\textsuperscript{9} or FFQ\textsuperscript{8,15,36,38,39,41,44,46-48}, whereas some studies have combined multiple tools (24HDR, electronic diet assessments) to assess population and individual level dietary behaviours\textsuperscript{31-35,37,42,49,50}. When multiple tools were administered in conjunction, the resulting response rates were much greater (Table 5), which may have been a result of the interview-based administration method used across these studies.

These aspects must be taken into consideration when developing a pilot or large-scale study that may require the use of online data collection tools.

Based on the evidence currently available from clinical research settings, further exploration of the existing and widely used diet assessment methodologies is
required to assess which methods are best suited for Fraser Health’s research needs.

3.2. Assessment of Dietary Intake

In nutritional epidemiology, one of the significant challenges faced by researchers is the assessment of habitual dietary intake.\textsuperscript{31,51,52} In fact, there is a marked difference in trying to establish the dietary patterns of specific ethnic groups, as their inclusion in research is constrained by the interaction of multiple barriers (i.e., language, culture, low SES), culminating in their underrepresentation in diet-disease studies.\textsuperscript{51} Figure 2 provides a visual representation of the diet assessment system, from data collection to processing and classification of food composition and dietary behaviours.\textsuperscript{53} The simplification of the systematic process involved in diet assessments, as highlighted in figure 2, provides an opportunity for researchers to identify and integrate tools to understand the influence of culture on dietary intakes—ideally within the ‘input’ phase. However, insufficient development and validation of culturally sound diet assessment tools, further hinders the understanding of food consumption patterns cross-culturally.\textsuperscript{51}

![Figure 2. Systematic phases of diet assessments.](image)

Limitations in health assessments are not exclusive to disease-specific parameters but extend to lifestyle and behaviour assessments. The cultural
diversity of the Canadian population poses a number of complexities for health providers and researchers, as the diversification requires improved methods of data collection and analysis to reflect these changes\textsuperscript{30}.

Accuracy in assessing dietary intakes has emerged as a significant challenge in nutritional epidemiology, especially in trying to establish associations between diet and health\textsuperscript{32,48,54}. When conducting large prospective cohort studies, researchers are often limited in the DA methodologies that would provide them with the most accurate representation of usual intake\textsuperscript{55}. Resulting in the use of short-term tools (see Figure 3) that allow for extrapolation of estimates about participants' food consumption patterns without imposing participant burden, which would lead to poor response rate and quality\textsuperscript{55}.

Prior epidemiological research has approached diet-disease associations using a reductionist lens, with examination of individual nutrients or foods groups.

\textit{Figure 3. Framework for individual diet assessments}\textsuperscript{55}. 
identified as risk factors for chronic disease outcomes\textsuperscript{56-58}. This warrants a need to assess the holistic nature of diet-health interactions, as well as differences at the individual, community and population levels.

3.3. Current Diet Assessment Methodologies

Current standardized diet assessment tools vary in applicability, and their use in research depends greatly on the methodology employed by researchers. Table 2 summarizes the frequently used diet assessment methods, along with the specific advantages and limitations of each strategy\textsuperscript{59-61,62}. The most recent study to explore dietary behaviours of the Punjabi Sikh population in Vancouver had used a brief food screener to assess dietary intake, however acknowledged the shortcomings of this strategy, as they were unable to accurately capture the heterogeneous characteristics of their diets\textsuperscript{9}. Future strategies may require the use of multiple diet assessment methods in order to ensure that the full scope of specific cultural diet information is collected\textsuperscript{63}.

Table 2. Advantages and limitations of current diet assessment methods.

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Advantages</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weighed diet records</td>
<td>Cross-sectional, Prospective, Short term; cross-cultural comparisons; low cognitive difficulty; captures details of food prep. &amp; eating occasion; does not rely on memory</td>
<td>High reactivity; requires &gt;20 minutes to complete; requires participants to measure accurately – potential for errors with low literacy levels; not reflective of habitual intake</td>
</tr>
<tr>
<td>24 HDR</td>
<td>Cross-sectional, Prospective, Intervention &quot;Gold standard&quot;; Captures details of food preparation &amp; eating occasion; total diet; short term; cross-cultural comparisons; low cognitive difficulty; low reactivity; interviewer administered</td>
<td>Recall bias; underreporting; random error; limited to past 24 hours; requires training of interviewers; requires ~20-30 minutes to complete expensive; inaccurate portion size estimates; not reflective of habitual intake</td>
</tr>
<tr>
<td>FFQ</td>
<td>Cross-sectional, Retrospective, Prospective, Intervention Can capture total diet &amp; constituents; long-term; observes diet intake over long period (past week/month/year); easy to administer; cost-effective; less labour intensive; less time-</td>
<td>Systematic errors &amp; recall bias; inaccurate estimates of portion sizes; high cognitive difficulty; needs to be specific to population of interest - no cross-cultural</td>
</tr>
</tbody>
</table>
3.3.1. Weighed diet records

The weighed or estimated diet record (or food diary) is an assessment method that requires participants to record all foods and beverages they consume over a specified period of time (usually anywhere from 24 hours, to 3 to 7 days)\textsuperscript{49,64}. Often this method of recording warrants the need for participants to weigh their food and beverage consumption, which allows for the most accurate depiction of individual food intake\textsuperscript{61}. Due to the level of detail required by participants when completing the diet record, there are no restrictions placed on the types of food recorded, thus allowing for cross-cultural utility\textsuperscript{49}. Although weighed food records were once acknowledged to be the gold standard\textsuperscript{61,65} among diet assessment methods, there are still many limitations found with this tool.

Although the detail collected through weighed or estimated diet records provide more accurate information about individual dietary behaviours, this can be hindered by one’s literacy levels—especially when they are unfamiliar with standard measurement tools\textsuperscript{49,61}. Since there is no method of validation available for this self-reported food record, researchers are often limited to assumptions of participant literacy levels, and their ability to make accurate estimations of portion sizes\textsuperscript{34}. Often participants tend to be more reactive to such methods, due to the required documenting of all foods and beverages consumed over the course of the tracking period, which can often lead to alterations of usual intake, or underreporting\textsuperscript{43,61,64}. Aside from the low participant compliance, the data analysis for these records can become quite expensive for researchers\textsuperscript{43}. 
3.3.2. **24-hour diet recall**

Similar to the weighed or estimated food records, 24-hour diet recalls (24 HDRs) are considered to be a more accurate form of data collection. Usually administered by a dietitian during a one-on-one interview with participants, they are able to collect detailed information about their food and beverage consumption over the previous 24 hours. Interviewers can probe individuals for more information by providing prompts (i.e., food photographs, pictures of portion sizes, etc.) based on the details the participant provides, which avoids any omissions that may go unrecorded through self-report methods. The importance of well-trained interviewers becomes critical when using this method of data collection, as they need to be aware of food and food consumption practices in order to probe for more detailed answers. Since there is no limitation on the types of foods that can be recorded, the 24 HDR can also be a useful tool in describing average food intake at the population level. There is no direct need for participants to have a high literacy level since these records are administered via interview.

Similar to the food records, 24 HDRs are not without their limitations. The requirement for participants to recall their food and beverage intake, from the previous 24 hours, can lead to high participant burden and recall bias. Due to the nature of the interview, participants may not recall all foods consumed. This method often requires a multiple pass method, whereby an average intake can be documented over the course of multiple days. The required training and cost of implementing interviewers to administer the 24 HDR can serve as a hindrance for researchers, as it is an expensive method of data collection for large cohort studies. Amongst the South Asian population, use of a 24 HDR may not accurately portray average intake as it does not track variations that may occur seasonally, which may neglect food consumption patterns during festivities or holidays throughout the year.
3.3.3. **Food frequency questionnaire**

The food frequency questionnaire (FFQ) has become the most commonly used diet assessment tool in large epidemiological studies, specifically when researchers want to estimate habitual intake patterns and identify diet-disease associations\(^36,50,66\). Due to the specific nature of the FFQ, dependent on the population of interest and cultural variations in food intake, the FFQ must be validated for that population and often cannot be used across studies\(^67,68\).

Since researchers are required to adapt their FFQs for each specific population, the ability to culturally tailor FFQs, makes them the easy to develop and administer\(^67\). FFQs have the ability to track seasonal variations in food consumption patterns, as well as can assess habitual intake with the administration of a single questionnaire\(^44,55\). Due to the low respondent burden, these self-reported questionnaires can be easily administered in large scale studies, making them the most practical, cost-effective and accessible tool available to researchers\(^43,65\).

As with the previous methods, FFQs have their limitations, particularly with the length of the questionnaires\(^67\). Depending on the frequency of administration, the FFQ may not provide enough information about habitual intake if the questionnaire does not include a comprehensive food list\(^43,61,65,67\). The required validation of the tool against the 24 HDR serves as a limitation due to the variations in data collection across the two methods\(^61\). FFQs also require participants to recall their dietary habits over a longer period of time (typically over the last year), which may lead to recall bias, underreporting, and an overall misinterpretation of their habitual intake patterns\(^43,61,65,67\).

Despite the limitations listed, the FFQ still stands to be the most cost-effective strategy for dietary data collection in larger cohort studies, as long as the tool used has been previously validated for the current study population. For the purpose of the pilot project, Fraser Health will be administering the FFQ
developed for the SHARE study, that was developed and validated for use with South Asians living in Canada\textsuperscript{16,81}.

### 3.3.4. Novel diet assessment tools

Aside from being able to use a combination of diet assessment tools in research, new developments have been made to ease the process of administering these tools, as researchers have developed multiple web-based diet tools that allow for ease of data collection and analysis\textsuperscript{22,45,62,69,70}.

As shown in Table 3, all three diet assessment tools have the capacity to be administered online\textsuperscript{70}. These tools employ various technological instruments, including but not limited to, interactive computer and web-based technology, personal digital assistants, mobile devices, cameras, tape recorders, sensor technology\textsuperscript{62}. By employing technology in this process, researchers are able to facilitate simple data recording, and are able to access the information immediately\textsuperscript{37}.

Table 3. Strengths and limitations of digital diet assessment methods.

<table>
<thead>
<tr>
<th></th>
<th>24-H diet recall</th>
<th>Diet records</th>
<th>FFQ</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required technology</strong></td>
<td>Software, internet</td>
<td>Software, internet, PDA, mobile phone, smartphone application</td>
<td>Skip algorithms, questions with multiple details, pictures of foods</td>
</tr>
<tr>
<td><strong>Strengths</strong></td>
<td>Standardized data collection (reduced interviewer bias); reduced time and costs; improved feasibility</td>
<td>Standardized real-time data collection; reduced time and costs; improved feasibility</td>
<td>Collection of complex information; high accuracy of data</td>
</tr>
<tr>
<td><strong>Limitations</strong></td>
<td>Self-report bias</td>
<td>Self-report bias; requires participant training for technology</td>
<td>Measurement errors of the FFQ methodology</td>
</tr>
</tbody>
</table>

These advances have the ability to improve the validity and accuracy of the dietary data that is collected, and has the potential to reduce participant
burden\textsuperscript{52,70-72}. However, these methods are not immune to the limitation of self-report bias, and the requirement of high technological literacy from participants\textsuperscript{70}. 
4. SEHAT Pilot Project Proposed Tools

The rationale of the proposed pilot project is to assess the strategies that will be required for improved participant response rate and data quality. As their previous experience with data collection has shown, when participants are approached on a voluntary basis, there is little to no response from individuals, and even when incentives are provided, there is little improvement. The use of thorough and culturally appropriate tools may assist in improving the quality of the data collected and participant interest and feedback.

4.1. Current Standardized Assessment

Measuring usual dietary intake is the main objective of diet assessment methods used widely in epidemiological research\textsuperscript{73}. Often this involves developing or administering an assessment tool that can capture the average intake over the course of one year, which is meant to account for the variability seen in dietary behaviours among individuals\textsuperscript{73}. However, researchers are aware that all diet assessment methods do have certain limitations that limit their utility in studies, in most cases due to the lack of appropriateness of the tool for the population of interest\textsuperscript{74}. Due to the variability in diet patterns, researchers are advised to collect a sample of dietary information from their study population in order to develop a tool that is culturally appropriate and tailored to their specific population\textsuperscript{39,73}.

Between 1995 and 1996, Kelemen and colleagues developed various cultural food frequency questionnaires to be administered to South Asian, Chinese and European populations in Canada\textsuperscript{38}. They found that most existing FFQs had quite restrictive food lists, that often neglected to include foods their participants were consuming, and as a result they modified an existing FFQ used for the Canadian Study of Diet, Lifestyle and Health (CSDLH)\textsuperscript{38}. To ensure that the food lists created were reflective of the populations studied, colleagues of the three different origins were consulted to validate the FFQs\textsuperscript{38}. The FFQ developed for South Asians resulted in a 163-item questionnaire, with 61 items unique to South
Asian diets, and were translated for the various language requirements for their main study, SHARE\textsuperscript{38,75}.

Participants recruited for the SHARE study (resided in either Hamilton, Ontario, Canada or Edmonton, Alberta, Canada) were asked to complete the FFQ at home, instructed to provide detailed information about the foods consumed (volume of bowls and cups used, weights of prepacked foods, recipes of homemade meals, etc.)\textsuperscript{38}. Researchers validated the FFQ against 7-day diet records to ensure that the tool was comparable and deemed that it should be generalizable to other South Asian populations living in North America\textsuperscript{38}.

One of the main objectives of the FFQ developed was to have ethnic FFQs that would capture information to determine diet-disease associations in these populations, and subsequently lead to ethnically-specific diet interventions\textsuperscript{38}. With the SEHAT population for the propose pilot project, the SHARE South Asian FFQ will be used to determine whether the FFQ is generalizable to this population in British Columbia, and whether it captures individual dietary behaviour patterns and changes over time.

4.1.1. \textit{SHARE Food Frequency Questionnaire}

Since 1996, the SHARE South Asian FFQ has been used in prior research, MASALA and M-CHAT studies, and continues to be adapted as the nutrient database develops overtime\textsuperscript{75,76}. The current version to be used with SEHAT’s pilot project consists of fourteen pages and 167-items (\textit{see Appendix G for sample of FFQ}).

For the purpose of SEHAT’s pilot project, the SHARE FFQ would be best used with interviewer administration, during the initial recruitment, as it will allow interviewers to provide more clarification to participants and allow them to administer the questionnaire in both English and Punjabi as needed.
4.2. Web-based Assessment

Using technology to aid in the collection of dietary information has been thought to improve the assessment process\textsuperscript{22}. There are various forms of technological assessment tools that have been developed for diet assessment purposes, of which the web-based technologies have been used for larger cohort studies\textsuperscript{22,62,70}. The web-based assessments are easier to facilitate and simplify the recording process for users and allow researchers quick access to the collected data\textsuperscript{70}. They are thought to improve the validity, reliability and accuracy of the assessment tool, and reduce costs to researchers and the level of participant burden experienced by users\textsuperscript{37,52,65,71}. These novel methods of diet assessments are preferred as they allow for collection of data from populations that may have lower literacy levels, the elderly, while providing higher quality data\textsuperscript{55,77}.

As alluded to earlier, 24HDRs are considered to be the most high-quality diet assessment tool available to researchers, however are quite impractical to implement in larger scale studies due to the associated costs (i.e. trained interviewers, multiple records, cost of analyzing data, etc.) and burden on participants\textsuperscript{78}. The Automated Self-Administered 24-h (ASA24) diet recall tool was developed by the U.S. National Cancer Institute\textsuperscript{77,78}, and is a publicly available, free web-based tool that researchers can employ in studies\textsuperscript{78}. This web-based diet assessment tool uses a multiple pass method to ensure that respondents are providing as much detailed information as possible\textsuperscript{78}.

4.2.1. SurveyMonkey 24HDR

In order to assess the 24HDR with this population, Fraser Health will use a SurveyMonkey online survey tool administered onsite at the Gurdwaras. This tool will be a brief questionnaire developed for the purpose of the pilot study, in order to assess whether having a simplified version of a diet recall questionnaire will result in a better response rate among participants.
This tool will be a modified version of the B&B Truss questionnaire that will inquire about their dietary intake over the previous 24 hours, while taking into consideration added sugar intake through recording beverage consumption. By implementing this tool as an online tool, the option of completing the questionnaire on-site or at home can be left up to the discretion of the participants, reducing participant burden.

4.2.2. **ASA24-Canada-2016**

Since its development and use across U.S. based research studies\(^7\),\(^8\), the NCI has developed a Canadian version of the online tool, accessible to researchers\(^7\),\(^9\), (see Appendix H for their provided overview of this tool).

The ASA24-Canada-2016 is the latest version of the diet assessment tool released in October 2016\(^7\),\(^9\). With this update, modifications were made to the existing tool to reflect foods unique to Canada, changing brand names and restaurant items to those available here, as well as the inclusion of metric units for measurement\(^7\),\(^9\). The nutrient database used for the ASA24-Canada is based on the Canadian Nutrient File (CNF2015)\(^7\),\(^9\). With the updated version of the diet assessment tool, the NCI has released a mobile version of the tool that can be used by respondents, and the Canada-specific tool is currently available in both English and French language options\(^7\),\(^9\).

Although the tool may not be offered in Punjabi, which would make it much more culturally specific for the use in the proposed pilot project, the multiple pass system used, with an extensive food list and database, may be useful in collecting information from the population of interest here in B.C. Similar to the FFQ to be developed for the pilot project, the ASA24 would be best administered by an interviewer onsite, however upon registration, the interviewer can provide participants with a web-link to access and complete the diet recall on their own accord. However, in order to ensure participant compliance and to guarantee data completeness and quality, interviewer administration would be ideal.
Table 4 highlights the multiple mass method used for the ASA24, that prompts users to complete the survey by providing as much detail as they can recall, which can be useful for ensuring data quality\textsuperscript{78}.

Table 4. Order and content of ASA24 diet recall’s multiple pass system.

<table>
<thead>
<tr>
<th>ASA24 passes</th>
<th>Description of information collected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meal-Based Quick List</td>
<td>Respondents asked to report meal name, and time. Option to report: location, television or computer use, and who they ate with. Foods and drinks consumed are reported without details by browsing or searching the database.</td>
</tr>
<tr>
<td>Meal Gap Review</td>
<td>Respondents are asked whether they consumed anything during any 3-hour gaps between eating occasions, between midnight and first eating occasion, and between the last eating occasion and midnight. “Yes” responses return the respondent to the Quick list to add foods or drinks.</td>
</tr>
<tr>
<td>Details</td>
<td>Respondents are asked for details about the foods and drinks recorded in the Quick list, including form, preparation methods, amount eaten, and any additions.</td>
</tr>
<tr>
<td>Forgotten Foods</td>
<td>Respondents are asked about the consumption of commonly forgotten foods and drinks and report them as needed by returning to the Quick list.</td>
</tr>
<tr>
<td>Final Review</td>
<td>Respondents are prompted to review all of the foods and drinks reported for the intake day; can make edits and add meals and foods as desired.</td>
</tr>
<tr>
<td>Last Chance</td>
<td>Respondents are given another opportunity to add foods or drinks.</td>
</tr>
<tr>
<td>Usual Intake</td>
<td>Respondents are asked: “Was the amount of food that you ate yesterday more than usual, usual, or less than usual?”</td>
</tr>
<tr>
<td>Supplement Module</td>
<td>Respondents are asked to provide information about the types and doses of supplements consumed by completing Quick List, Detail, and Final Review passes.</td>
</tr>
</tbody>
</table>

4.3. **SEHAT-specific Diet Assessment Protocol**

For the purpose of the pilot project, the use of existing diet assessment tools will allow the team to the necessary information to assess whether they will need to develop a separate tool for the SEHAT study population. The process of
developing and validating a new diet assessment tool can be costly and requires trained researchers and staff to administer a sample diet assessment in order to create a new database specific to the population to be observed.

The concurrent use of two existing validated tools, and one simplified web-based tool, will allow for collection of the pertinent dietary information and can then be used to assess whether a more specific and modified tool may be required for the population of interest.

4.3.1. Rationale for using a combination of tools

The administration of the two diet assessment tools will be dependent on the timeline established for the pilot project. Using a FFQ can be useful in retrospective research studies, whereas a 24-HDR can be beneficial for collecting information about recent intake for prospective studies. As previous research has found, that the combination of repeated 24-HDRs and a FFQ resulted improved participation rates, suggesting that this approach is most feasible for collecting more detailed dietary information for epidemiological research. Since the main objective for the pilot project will be to improve participant response rates, the combined use of both tools may assist in achieving the desired outcome among this specific population.

Ideally to achieve adequate data collection, the FFQ should be administered at 2 or 3 time-points within the study timeline—one immediately after recruitment and the second prior to the conclusion of the study participation. The 24-HDRs can be collected more frequently throughout the study period, and this should be administered at specific time points for the study duration (i.e. biweekly, monthly, etc.). In order to establish the appropriate timeline for administration of these diet assessment tools, and the required number of days for the repeated 24-HDR, the study timeline and budget must be predetermined.

Having the FFQ administered at the beginning and end of the study can capture the changes in diet behaviours that may have taken place over the course of the study.
study. Since the FFQ would be geared towards capturing average intake over a specified period of time, depending on the duration of the pilot project, this may be useful in providing the researchers with the necessary information to tailor the current nutrition programs to better reflect these changes. The use of the online 24-HDR will be a beneficial supplement for collecting dietary information, especially from participants who prefer the web-based assessment for its convenience and ease of use.
5. Discussion

With the steady rise in chronic conditions, and the need to develop a better understanding of diet-disease relationships, the use of appropriate evaluation tools is important. For South Asians, who are at an increased risk of chronic conditions such as type II diabetes, hypertension, and dyslipidemia, this is a cause for concern. Especially since this population has a notably high intake of added sugars, carbohydrates, sodium and fat. Prior research (through diet screeners) conducted by Fraser Health has found these patterns to be consistent, however the data required for further analysis were lacking. This invoked the need to explore options that would enable the team to utilize a validated method for data collection which would yield better responses from participants and improve the quality of the data collected.

Through a search of the literature, the most feasible options available for the team included the implementation of a FFQ, and a 24-HDR. The use of combined diet assessment strategies has garnered better response rates in previous research. With the use of a culturally-tailored FFQ, prepared specifically for South Asian populations, this tool can be implemented with ease to collect detailed information about individual dietary behaviours. Since the tool includes food items that resonate with the population of interest and offers measurement values for portion sizes that may reflect participants’ daily practice, it makes this an ideal option for use with the current population. In addition to tailoring tools culturally, they need to be linguistically appropriate as well, or researchers must be able to provide translation services during interviews to meet the needs of individuals who may have lower literacy levels. This would ensure that participants are able to comprehend the questions being asked and would likely be inclined to provide more accurate answers, which would improve data quality.

Implementing the web-based diet assessment, ASA24-Canada, provides another data collection strategy that may improve data quality, especially when participants are required answer each question in detail before moving onto the
next. With the prompts and food models that the website provides, used in conjunction with an interview-administration strategy onsite, there may be a notable improvement in the quality of data collected—even from a small sample size. While the lone web-based DA tool can be an effective strategy, including an additional online tool that may provide more information about participants’ willingness to respond. Offering a simplified version of a 24 HDR that can be self-administered through a user-friendly survey website, SurveyMonkey, may appeal to the lower age range of the population of interest for the purpose of the proposed pilot project (i.e. the 30 to 40-year-old demographic).

Assessing the dietary behaviours of a large proportion of Vancouver’s second largest minority population has been implemented in prior research\(^9\), however has been limited by the scope of the study protocols, or the assessment tools available at the time of the study.

**Limitations**

As with any research, there are limitations with the proposed tools for the pilot project. Due to the scope of the current review, the focus was not dependent on finding the best strategy to collect dietary information on specific macro- or micronutrients, however, with the proposed diet assessment tools, since they have been previously administered and used widely in ongoing research projects, that may not pose a significant limitation during the full-scale study at a later time.

In trying to find data about research conducted on South Asians in Canada, it was apparent that there is a lacking body of evidence for this population. Much of the literature excluded for the purpose of this review were primarily studies conducted on pregnant or breastfeeding women, children and adolescents, and were not considered applicable to the population of interest. As such, there may have been advantages and limitations of the existing tools that would not have been taken into consideration in this review. However, with Fraser Health’s pilot project, the objective will be to discover which of the chosen tools will yield better
response rates from the Punjabi Sikh community, with an age range of 30 to 60-year olds.

Within South Asian communities, the communal and gendered nature of food needs to be considered prior to data collection to ascertain whether it would be more appropriate to administer these tools with the family unit as a whole, rather than just one member of the family. Since much of the food preparation is done by the women in the household, including them as a part of the research process would be critical in obtaining accurate measures of the ingredients used during the cooking process, which can provide more insight into the food preparation process that others in the family may not be familiar with. Gathering the information from the family, rather than just the individual would add to the quality of the collected data.

For health-related research on South Asians, much of the focus is placed on finding causal factors of disease, and most often in doing so, researchers make use of evaluation and assessment tools that are not developed to capture the necessary information, as the tools are developed based on research conducted in Caucasian populations. This poses significant limitations for researchers who wish to explore risk factors that are unique to minority populations, when there are no baseline tools available for that process.

The work of Kelemen and colleagues has broadened the data collection methodologies that are now available for research in minority populations and is where the SHARE FFQ originated. Though this tool has been previously validated for South Asians in Canada, one potential limitation is that it may not account for recent immigration patterns. One of the major limitations across epidemiological studies looking at dietary behaviours is the use of length of residency to account for trends of acculturation, as seen in the analysis by Lesser et al. Many diet tools have only been administered in short-term, cross-sectional studies, which does not take into consideration the changes in dietary behaviours over time, and as a result may underestimate or overestimate the
health risks associated with certain food intake patterns. Participants may also be reluctant to completing the ASA24-Canada tool if the coverage of South Asian specific foods are not provided, as that was among the limitations of the previous tools administered among this population. That being said, the pilot project for Fraser Health is intended to be a short, cross-sectional study that is primarily focused on the data collection process, thus in developing the full-scale study, this limitation must be taken into consideration—especially when planning the study timeline, and for grant writing purposes.

Although the 24-HDR is a valid and effective tool when administered correctly, failure to probe for details, and flexibility in how the data is collected may offset the goals of the pilot project. To ensure that the tool is effective in improving data quality, interviewer must be well-trained in how to properly administer the tool and must be prepared to offer the tool in the languages required to meet the needs of the population. In the past, Fraser Health volunteers have translated tools, like the B&B Truss tool, in Punjabi during the administration process. Although this strategy does allow for improved outreach, it may compromise the integrity of the data collected, as the information may be interpreted differently by different interviewers. To avoid this, standard operating procedures (SOPs) must be created to ensure that all interviewer undergo the same standardized training prior to administering any of assessments.

For all three assessment tools, another limitation, albeit one that can be assessed and controlled for, is the attention required to how the data will be analyzed. In partnering with McMaster University, to use their database and online version of the FFQ, there is a cost associated for researchers, which may serve as a hindrance to accessing the full potential of the tool and the collected data. Though the paper-based version can be administered, later analysis of the data will require a trained individual for inputting, cleaning and analysing the data collected. The methods required for that process must be outlined prior to commencing the project, as it may hinder access to interpretation of the results at a later stage. This is applicable to the SurveyMonkey tool, considerations for
what the tool will be measuring and the scoring system it will follow must be established prior to administration.

After discussion about the potential sample groups that will be used to pilot the efficacy of the proposed DA tools, there are a few potential limitations that may arise. Although there are programs in place at these locations geared towards improving the nutritional quality of the foods served at the temples, whether those strategies are being followed through and implemented on an individual level at the home has not been thoroughly identified. Previously, Fraser Health’s recruitment strategy was based on voluntary participation, where participants were approached and asked to provide their time during meals at the Gurdwaras to answer the surveys. Using this approach, the refusal rate observed was quite high, as participants either did not understand the importance of the data being collected, or simply were not interested in providing information about their dietary habits. This may serve as a limitation since the proposed tools involve more rigorous questions that require an upwards of 30 minutes to complete, participants may pass on the opportunity to provide their input due to the time commitment. This may be overcome with the use of incentives and emphasis on the fact that the interview is a one-time procedure, acknowledging the potential for bias that may be introduced.

**Future Directions**

The SEHAT team will need to develop standardized procedures for application of these tools in their research practice, even for the cross-sectional pilot project. This process will allow them to identify any of the administrative or methodological problems that may arise when using these tools with the current population. Considerations will be needed for adequate incentives to garner improved response rates among participants recruited, following the necessary ethical guidelines. Addressing the aforementioned concerns in designing the pilot project will assist in effective implementation of culturally appropriate diet assessment tools in yielding the improved results.
References


Appendix A1.

PRISMA Literature Review Search Strategy

Records identified through database searching (n = 743)

Records after duplicates removed (n = 464)

Records screened (n = 252)

Records excluded (n = 212)

Full-text articles assessed for eligibility (n = 146)

Full-text articles excluded (n = 122)

Quantitative studies included in review (n = 24)

Reasons for Stage I exclusion:
Not a peer-reviewed article; non-English language; not related to diet assessment; not original research

Reasons for Stage II exclusion:
Not related to diet assessment; review papers; papers on pregnant or breastfeeding women, children, adolescents; papers reporting <60% response rate

Figure 4. Flow chart of literature review search strategy\textsuperscript{65}.
Appendix A2.

Database Search Strategy

1) diet assessment
2) dietary data collection
3) diet surveillance
4) culturally appropriate
5) nutritional epidemiology
6) nutrition
7) clinical practice
8) research
9) South Asians
10) minority group
11) ethnic foods
12) food frequency questionnaires
13) 24-hour recalls
14) weighed food diaries
15) health literacy
16) reductionist theory
17) 1 or 2 or 3 or 4
18) 2 or 4 or 7 or 8 or 9 or 10
19) 1 or 2 or 3 and 4 and 12 or 13 or 14
20) 1 or 2 or 3 and 5 and 7 or 8 and 9 or 10
21) Limit 18 to (English language and year="2006-Current")
22) Limit 19 to (English language and year="2006-Current")
23) Limit 20 to (English language and year="2006-Current")
# Appendix B.

## Results of Literature Review

*Table 5. Results of studies included to determine the effectiveness of existing diet assessment tools.*

<table>
<thead>
<tr>
<th>Study</th>
<th>Measure(s)</th>
<th>Population</th>
<th>Diet Assessment Tool Used</th>
<th>Response Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raza et al. (8)</td>
<td>FFQ</td>
<td>2418 participants sampled from HELIUS study; South-Asian Surinamese (females: n = 558, males: n = 410) &amp; Dutch (females: n = 796, males: n = 654); Mean age = 46 - 49 years</td>
<td>Ethnic-specific 220-item FFQ</td>
<td>Not reported</td>
</tr>
<tr>
<td>Kandola et al. (9)</td>
<td>Block screener</td>
<td>Convenience sample of 428 South Asian Canadians in the metro Vancouver area; length of residency in Canada: 24 years +/- 15 years; mean age = 65 years +/- 10 years; males: n = 247, females: n = 177</td>
<td>Culturally adapted rapid Block screener: 5-point Likert scale,</td>
<td>422/428 = 98.6%</td>
</tr>
<tr>
<td>Talegawkar et al. (15)</td>
<td>SHARE FFQ</td>
<td>South Asian sample from MALASA study; n = 874 (women = 47%); Mean age: 55.5 years +/- 9.34 years; Length of residency in USA: 27.0 years +/- 10.8 years</td>
<td>SHARE FFQ: culturally appropriate tool, developed and validated for South Asians in Canada</td>
<td>Not reported</td>
</tr>
<tr>
<td>Sudha et al. (31)</td>
<td>FFQ + 24HDR</td>
<td>125 participants from CURES, males: n = 34, females: n = 68; mean age = 40.9 years +/- 12.8 years</td>
<td>Semi-quantitative 222-item FFQ &amp; 24 HDR</td>
<td>81.6% (102/125)</td>
</tr>
<tr>
<td>Liu et al. (32)</td>
<td>24HDR + FFQ</td>
<td>432 participants, Newfoundland (NL), Canada, adults; aged 35 - 70 years</td>
<td>Hawaii FFQ modified for NL food consumption habits, 169-item list; FFQ + 24 HDR</td>
<td>Response rate = 93% (n = 400), only 195 included in analysis with complete data</td>
</tr>
<tr>
<td>Study</td>
<td>Dietary Tool/Method</td>
<td>Sample Description</td>
<td>Design/Methodology</td>
<td>Response/Completion Rate</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Garduño-Diaz et al. (48)</td>
<td>FFQ</td>
<td>100 South Asian men (n = 34, mean age = 44 years) and women (n = 66, mean age = 46 years) from Leeds, U.K.</td>
<td>Interview-administered FFQ: 229-item developed to cover western and eastern foods, portion size estimates using Western-style measures (cups, spoons), and South Asian style measures ('katoris')</td>
<td>Not reported</td>
</tr>
<tr>
<td>Illner et al. (55)</td>
<td>24-HDR; FPQ/FFQ (European Food Propensity Questionnaire - EFPQ)</td>
<td>n = 400 from 5 cohort studies (80 from each: EPIC-San Sebastian, Spain; EPIC-Florence, Italy; EPIC-Potsdam, Germany; Norwegian Women and Cancer study (NOWAC), Norway; Estonian Genome Center (EGC), Estonia)</td>
<td>Country-specific versions of 24-HDR administered, except in EGC, English version; multilingual EFPQ based on 102-item FFQ validated for EPIC-Potsdam; recalls; 56.3% (n = 225) completed 3 recalls</td>
<td>EFPQ Response Rates: of 261 enrolled in pilot, n = 143 (54.8%) completed the web-based EFPQ, n = 118 (45.2%) completed the paper EFPQ: EPIC-San Sebastian (n = 55: 14 web [57.1%], 41 paper [56.1%]), EPIC-Florence (n = 50: 24 web [33.3%], 26 paper [53.9%]), EPIC-Potsdam (n = 56: 19 web [36.8%], 37 paper [62.2%]), EGC (n = 70: 65 web [44.6%], 5 paper [80.0%], NOWAC (n = 30: 21 web [100.0%], 9 paper [100.0%]); 24-HDR Response Rates: 63.0% (n = 252) completed one recall; 60.3% (n = 241) completed 2</td>
</tr>
<tr>
<td>Liu et al. (49)</td>
<td>Oxford WebQ + 24 HDR</td>
<td>116 women (n = 84) and men (n = 32) Oxford, UK; mean age = 42 years (range: 19-82 years); 72% women</td>
<td>Oxford WebQ: avg completion time = 14 mins; interview-administered 24HDR = 30 mins to complete</td>
<td>24 HDR = 30 mins to complete</td>
</tr>
<tr>
<td>Study</td>
<td>Methodology</td>
<td>Population Description</td>
<td>Overall Agreement</td>
<td></td>
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<tr>
<td>------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Bejar et al.</td>
<td>e-EPIDEMIOLOGY app; FFQ</td>
<td>120 medical and pharmaceutical students from the University of Seville, female (n = 85), male (n = 34)</td>
<td>99%</td>
<td></td>
</tr>
<tr>
<td>Carroll et al.</td>
<td>1-12 24 HR recalls; single calibrated FFQ; combination of 24HR recall &amp; FFQ</td>
<td>1997-1998 Eating at America’s Table Study (EATS) population data</td>
<td>965 respondents with successful completion of 4 telephone-administered 24 HR recalls over 1 year, and 1 FFQ at the end of the year</td>
<td></td>
</tr>
<tr>
<td>Jayawardena et al.</td>
<td>FFQ; 7-d weighed-intake dietary record (7DWR)</td>
<td>100 adults recruited from urban and rural areas of Sri Lanka; mean age = 46.5 years +/- 8.3 years; females: n = 65, males: n = 35</td>
<td>77%</td>
<td></td>
</tr>
<tr>
<td>Sharma et al.</td>
<td>QFFQ</td>
<td>3 communities in Nunavut (A [n = 1500], B [n = 800], C [n = 1000]), 3 communities in Northwest Territories (D [n = 3500], E [n = 900], F [n = 400]); Median ages: 39 - 46 years</td>
<td>Community A = 0.047% (n = 71, M = 30%, W = 70%) Community B = 0.093% (n = 74, M = 9%, W = 91%) Community C = 0.066% (n = 66, M = 12%, W = 88%) Community D = 0.019% (n = 66, M = 23%, W = 77%) Community E = 0.097% (n = 87, M = 22%, W = 78%) Community F = 0.193% (n = 77, M = 27%, W = 73%)</td>
<td>QFFQ</td>
</tr>
<tr>
<td>Study</td>
<td>Methodology</td>
<td>Characteristics</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>------------------</td>
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<td>---------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Olendzki et al.</td>
<td>FFQ + 24HDR</td>
<td>49 Caucasian and 44 African-American, community-dwelling, Washington, D.C. women, mean age = 74.2 years +/- 7.0 years</td>
<td>GNA FFQ + 24 HDR to compare racial differences - found limitations in analysis for racial disparities</td>
<td></td>
</tr>
<tr>
<td>Lesser et al.</td>
<td>SHARE FFQ</td>
<td>207 participants of South Asian origin, 30 - 65 year old men and women; age ranges: 46 - 53 years</td>
<td>SHARE FFQ, culturally appropriate (validated) FFQ for South Asians living in Canada</td>
<td></td>
</tr>
<tr>
<td>Touvier et al.</td>
<td>Web-based 24-H Recall</td>
<td>France, 147 volunteers aged 48-75 years, 59.2% women</td>
<td>24-H Recall web-based + interview administered: meal-based approach, 100% response rate, 92.7% of participants found the interface to be user-friendly, 96.8% appreciated help provided by dietician during interview recall, completion time: web = 31 mins +/- 29 mins; interview = 27 mins +/- 13 mins; median time for both = 25 mins</td>
<td></td>
</tr>
<tr>
<td>Raatz et al.</td>
<td>3-day diet record</td>
<td>Grand Forks, North Dakota; n = 19 (11 women, 8 men), crossover-designed clinical trial</td>
<td>4 weeks of completing the 3-d DR, 4-week washout where participants filled in a DR via web using Nutrihand, or Tap &amp; Track app for Apple 100% (n = 228 DRs = 12/participant)</td>
<td></td>
</tr>
<tr>
<td>Hongu et al.</td>
<td>Recaller - tracker app; 24HR recall interview</td>
<td>19 - 28 year olds (23 males, 22 females) college students (Arizona), mean age = 22.8 years +/- 2.6 years</td>
<td>Recaller app: 6 days/week x 3 weeks; Students took photos of every meal: 3,315 total photos (female avg. 84.5 [30-144 photos]; male avg. 56.0 [33-118 images])</td>
<td></td>
</tr>
<tr>
<td>Study</td>
<td>Design</td>
<td>Population</td>
<td>FFQ Details</td>
<td>Completion Rate</td>
</tr>
<tr>
<td>-------</td>
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<td>-----------------</td>
</tr>
<tr>
<td>Kelemen et al. (38)</td>
<td>FFQ</td>
<td>342 South Asians (mean age: men = 48.4 +/- 8.1; women = 51.3 +/- 8.9), 317 Chinese (mean age: men = 48.2 +/- 9.8; women = 45.8 +/- 8.6), 326 Europeans (mean age: men = 54.6 +/- 12.2; women = 52.5 +/- 11.5)</td>
<td>FFQ: 163 items SA FFQ; 169 items Chinese FFQ; 157 items European</td>
<td>SA (95%, 71%), Chinese (89%, 82%), Europeans (98%, 85%)</td>
</tr>
<tr>
<td>Sharma et al. (36)</td>
<td>QFFQ</td>
<td>2 communities in Nunavut, 87 (n = 39 men, n = 44 women); Mean age: men = 45 years, women = 49 years</td>
<td>Culturally appropriate QFFQ for Inuit population</td>
<td>73%; completed recalls collected (total: n = 47 community 1, n = 40 community 2)</td>
</tr>
<tr>
<td>Sharma et al. (40)</td>
<td>FFQ</td>
<td>25-79 year olds, African-Caribbean origin (Immigrants: 60% Jamaica, 6% Barbados, 14% other Caribbean islands)</td>
<td>FFQ: West Indian &amp; European foods, 108 items, food models &amp; standard household measures;</td>
<td>83% (n = 255)</td>
</tr>
<tr>
<td>Sharma et al. (41)</td>
<td>24-HDR</td>
<td>8 First Nations communities (Oji-Cree and Ojibway) in north-western Ontario, n = 140, (mean ages: FN men [n = 47] = 18-74, 42 +/- 14; FN women [n = 75] = 19-80, 44 +/- 17)</td>
<td>24-HDR</td>
<td>92% (n = 129; 65 remote communities, 64 semi-remote communities)</td>
</tr>
<tr>
<td>Ribas-Barba et al. (42)</td>
<td>24-HDR, FFQ</td>
<td>Catalan population, 10-85 years (n = 2160, 954 men &amp; 1106 women); Canary Islands population, 6-75 years (n = 1747, 821 men &amp; 926 women)</td>
<td>24-HDR</td>
<td>Catalan pop’n = 62%; Canary Island pop’n = NIR; Final sample included in pooled analysis: n = 2542, 1223 men &amp; 1319 women</td>
</tr>
<tr>
<td>Mohan et al. (46)</td>
<td>FFQ</td>
<td>&gt;20 years, n = 1843 (sampled from CURES study, Chennai, India (cross-sectional study)</td>
<td>FFQ: 222 items, meal-based semi-quantitative, common household measures for portion size estimates;</td>
<td>100%</td>
</tr>
<tr>
<td>Radhika et al. (47)</td>
<td>FFQ</td>
<td>2042 South Asians (recruited from the Chennai Urban Rural Epidemiological Study (CURES)), 917 men, 1125 women; Mean age: 40.7 years +/- 12.8</td>
<td>FFQ</td>
<td>87%</td>
</tr>
</tbody>
</table>
Appendix C.

SEHAT New Diet Survey

Introduction:

We are conducting this survey to learn more about the eating patterns of the South Asian population. We are working with the temple kitchens to learn more about how langar is being prepared. We would like to help everyone make healthy food choices.

1. Is most of your diet...

(a) home cooked

(b) from restaurants/take out (pizza, samosa, shahi paneer)

2. How often do you eat home cooked food?

(a) Daily

(b) 2-6 times per week

(c) Once per week

(d) 2-3 times a month

(e) Once a month

3.i) How often do you order pizza, samosa, shahi paneer, etc.?

(a) Daily

(b) 2-6 times per week

(c) Once per week

(d) 2-3 times a month
(e) Once a month

(f) Other (describe __________________________________________________)

ii) What food do you order? ________________________________________________

4. How often do you eat at the temple?

(a) Daily

(b) 2-6 times per week

(c) Once per week

(d) 2-3 times a month

(e) Once a month

(f) Other (describe __________________________________________________)

5. When eating at the temple, do you take...

Roti? Y N How many? _____

Rice? Y N

Both? Y N Kheer? Y N

6. Which healthy foods would you like to see more of?

__________________________________________________________

7. Which foods do you think are less healthy?

__________________________________________________________

8. Have you made any changes to your diet because of health concerns?

Yes No

If yes, please describe: Why?

__________________________________________________________
9. a. How many fresh fruit and vegetable servings do you have each day? (1 serving = ½ cup)

___________________________________________________ ____________________

b. Do you provide fresh fruit and vegetables at home for your family? If not, why not?

_______________________________________________________________________________

10 a. When you use milk for drinking and cooking, do you prefer:

   i) homo milk    ii) 2%    iii) 1%    iv) skim

b. If you use only whole milk, would you consider using 2%, 1%, or skim at times?
   Y      N

If not, why not? ___________________________________________________________________

11. What kinds of food do you consider a treat?

____________________________________________________

How often do you have treats?

Daily   2-6x/week   1x/week   2-3x/month   1x/month

12. Do you add extra sugar to your food/drinks during preparation? After it’s cooked/made?

_______________________________________________________________________

13. Do you add extra salt to your food during preparation? After it’s cooked?

_______________________________________________________________________

14. Which of these foods do you think could increase your blood cholesterol?

   cookies   nuts   ghee   rusk
15. Which of these food preparation/cooking methods can help reduce the amount of fat in your diet?

Bake Pan fry Deep fry Barbequing

16. Which of these foods do you think can turn to sugar in your body and can increase blood sugar?

Naan Rice Peanut butter Oatmeal

17. How often do you drink the following (every meal, 1/day, 2x/week, 3x/week):

Pop _______

Chai with sugar _______

Fruit juice _______

Flavored drink (Sunny Delight) _______

Coffee with sugar _______

Water _______

Plain milk _______

Lassi with sugar or salt _______

Thank you for your help!
Appendix D.

SEHAT Participant Diet Log

Thank you for taking part in the SEHAT Program Evaluation! In order to complete the evaluation process and receive an appreciation gift, we would like to have you complete this diet log over 3 days. All you have to do is:

1) Choose 2 days of the week and one weekend to track down everything that you eat and drink that day.
2) Take a picture or scan the diet log and email it to SouthAsianHealth@fraserhealth.ca to receive a prize!

*your email will not be linked to your diet log when data is entered.

By participating in the SEHAT Participant Diet Log, you are helping us to increase the awareness on chronic disease prevention in the South Asian community!

Here is an example:

<table>
<thead>
<tr>
<th></th>
<th>Thursday</th>
<th>Drinks</th>
<th>Friday</th>
<th>Drinks</th>
<th>Saturday</th>
<th>Drinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td>2 slices toast with peanut butter</td>
<td>1 cup tea – made with homo milk, 1 tsp sugar</td>
<td>2 cups cheerios with homo milk, 1 apple</td>
<td>1 cup tea – made with homo milk, 1 tsp sugar</td>
<td>2 large aloo gnathry</td>
<td>1.5 cup tea (homo milk) with 2 tsp of sugar</td>
</tr>
</tbody>
</table>

Thank you for your time 😊

For more information visit www.fraserhealth.ca/sahi or email at SouthAsianHealth@fraserhealth.ca

South Asian Health Institute
Appendix E.

B & B Baseline Survey – Screener: Brief 24 HDR

Gender:  □  Male    □  Female

How many glasses of the following did you drink yesterday?

□  Regular pop           □  Juice
□  Diet pop              □  Energy Drink
□  Tea with sugar         □  Hot Chocolate / French Vanilla (circle one)
□  Tea without sugar      □  Water
□  Coffee with sugar      □  Other (Specify: ________)
□  Coffee without sugar

What did you eat yesterday?

<table>
<thead>
<tr>
<th>Meal</th>
<th>Food Item</th>
<th>Amount Consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snack</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix F.

**Langar Hall Observation Log**

<table>
<thead>
<tr>
<th>Participant Row and place #</th>
<th>Gender of Diner</th>
<th>Age of Diner</th>
<th>Initial serving sizes on plate (use guide to write down serving size):</th>
<th>Number of times dish refilled (state what is being refilled and by how much):</th>
<th>What is not consumed:</th>
<th>General Observations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row: Place:</td>
<td></td>
<td></td>
<td>D: ______  K: ______  Ro: _____</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Abbreviations:**
- D: Dahl
- MS: Mixed Sabji
- SP: Shahi Paneer
- K: Kheer
- MC: Mithai Chawal
- Sey: Seyma
- Swt: Sweets
- Ro: Roti
- Rj: Rice
- O: Other

---

53
Appendix G.

SHARE South Asian FFQ

<table>
<thead>
<tr>
<th>BEVERAGES</th>
<th>Per Day</th>
<th>Per Week</th>
<th>Per Month</th>
<th>Per Year or Never</th>
<th>Average Serving</th>
<th>Less Than Average (small)</th>
<th>Average (medium)</th>
<th>More Than Average (large)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. WHOLE MILK (HOMO)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(as beverage or in cereal, but not in coffee or tea)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. 2% MILK (includes Lactaid)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(as beverage or in cereal, but not in coffee or tea)</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>3. 1% MILK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(as beverage or in cereal, but not in coffee or tea)</td>
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<td></td>
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<tr>
<td>4. SKIM MILK</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(as beverage or in cereal, but not in coffee or tea)</td>
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<td></td>
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<tr>
<td>5. COFFEE, regular</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(brewed or instant)</td>
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<td></td>
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<tr>
<td>6. COFFEE, decaffeinated</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>7. TEA, regular</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 cup or 250 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>(Red Rose, Salada)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>8. MILK in Tea and Coffee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 tbsp or 30 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>Homo milk</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>2%/1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 tbsp or 30 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>Skim</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 tbsp or 30 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>9. CREAM in Tea and Coffee</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 tbsp or 15 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>Coffee cream</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Half &amp; Half</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 tbsp or 15 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
<tr>
<td>Non dairy creamer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 tbsp or 15 ml</td>
<td>s</td>
<td>w</td>
<td>l</td>
</tr>
</tbody>
</table>

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## SHARE

<table>
<thead>
<tr>
<th>Participant’s Centre No.</th>
<th>Recruitment No.</th>
<th>Participant’s Initials</th>
<th>F</th>
<th>M</th>
<th>L</th>
</tr>
</thead>
</table>

### VEGETABLES, PEAS AND BEANS cont.

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Day</th>
<th>Per Week</th>
<th>Per Month</th>
<th>Per Year or Never</th>
<th>Average Serving</th>
<th>Your Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>48. CUCUMBER</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>49. CARROTS, raw or boiled</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>50. CARROTS SABJI, stir fried</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>51. MIXED VEGETABLE SALADS (kachumber, onion, tomato, pepper)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>52. SWEET POTATO, LEEKS, RADISH, OTHER ROOTS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>53. OTHER VEGETABLES, CURRY (example mushrooms, celery)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>photo B, medium (1/2 cup)</td>
<td>S</td>
</tr>
<tr>
<td>54. OTHER VEGETABLES, STIR FRIED (example mushrooms, celery)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1/2 cup or 125 ml</td>
<td>S</td>
</tr>
<tr>
<td>55. KIND OF FAT USED IN VEGETABLE SABJIS/CURRIES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 tsp</td>
<td>S</td>
</tr>
<tr>
<td>Specify:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56. KIND OF FAT USED IN RAW VEGETABLE SALADS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 tsp</td>
<td>S</td>
</tr>
<tr>
<td>Specify:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## COOKED DRIED BEANS AND LENTILS

<table>
<thead>
<tr>
<th>Item</th>
<th>Per Day</th>
<th>Per Week</th>
<th>Per Month</th>
<th>Per Year or Never</th>
<th>Average Serving</th>
<th>Your Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>57. LENTIL/DAL CURRY (moong, masoor, urad, chana dal, split peas, besan curry)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>photo B, medium (1/2 cup)</td>
<td>S</td>
</tr>
<tr>
<td>58. SAMBHAAR, RASAM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>photo B, medium (1/2 cup)</td>
<td>S</td>
</tr>
</tbody>
</table>

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### SHARE

#### SA FFQ

<table>
<thead>
<tr>
<th>Participant’s Centre No.</th>
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<th>M</th>
<th>L</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>COOKED DRIED BEANS AND LENTILS cont.</th>
<th>How often? Write in ONE column only</th>
<th>Average Serving</th>
<th>Your Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Day</td>
<td>Per Week</td>
<td>Per Month</td>
<td>Per Year or Never</td>
</tr>
</tbody>
</table>

| 59. CHICK PEAS CURRY (chane, white gram) | | | | photo B, medium (1/2 cup) | | |
| 60. OTHER DRIED BEANS CURRY (kidney beans/Rajmah, black-eyed beans) | | | | photo B, medium (1/2 cup) | | |
| 61. KIND OF FAT USED IN LENTIL/DAL CURRIES Specify: | | | 1 tsp | | | |
| 62. DHOKLA, IDLI (includes KHICHRI, no ghee) | | | 2.2” pieces | | | |
| 63. DOSA | | | 1 medium | | | |
| 64. BUTTER/PURE GHEE on lentils, baghar | | | 1 tsp or 1 pat | | | |
| 65. MARGARINE on lentils, baghar | | | 1 tsp or 1 pat | | | |
| MEATS/GOSHT | | | | | | |
| 66. BEEF CURRY, kofta, no vegetables | | | | photo B, medium (1/2 cup) | | |
| 67. GROUND BEEF (mince, hamburger, keema kabob, dry kofta) | | | 6” kabob or 2 koftas or 3” patty | | | |
| 68. OTHER BEEF (roast, steak) | | | | photo C, medium | | |
| 69. PORK CURRY, kofta, no vegetables | | | | photo B, medium (1/2 cup) | | |

Please continue on next page

Page 6
### SHARE SA FFQ

<table>
<thead>
<tr>
<th>Participant's Centre No.</th>
<th>Recruitment No.</th>
<th>Participant's Initials</th>
<th>P</th>
<th>M</th>
<th>L</th>
</tr>
</thead>
</table>

#### MISCELLANEOUS cont.

<table>
<thead>
<tr>
<th>Food</th>
<th>How often? Write in ONE column only</th>
<th>Average Serving</th>
<th>Your Serving Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>161. PICKLES in brine (such as dills, relish, Kanji)</td>
<td></td>
<td>1/2 dill or 1 tbsp</td>
<td>S ● L</td>
</tr>
<tr>
<td>162. SOY SAUCE, in cooking, added to food</td>
<td></td>
<td>1 tsp</td>
<td>S ● L</td>
</tr>
<tr>
<td>163. GINGER</td>
<td></td>
<td>1/2 tsp</td>
<td>S ● L</td>
</tr>
<tr>
<td>164. FRESH GARLIC (includes use in cooking)</td>
<td></td>
<td>1/2 tsp</td>
<td>S ● L</td>
</tr>
<tr>
<td>165. CHILIES, green, red</td>
<td></td>
<td>1 small</td>
<td>S ● L</td>
</tr>
<tr>
<td>166. ADDED SALT AT TABLE on raw or cooked dishes</td>
<td></td>
<td>2 sprinkles</td>
<td>S ● L</td>
</tr>
<tr>
<td>167. SUGAR SUBSTITUTE (such as Equal, Nutrasweet)</td>
<td></td>
<td>1 pak or 1 tablet</td>
<td>S ● L</td>
</tr>
</tbody>
</table>

Is there anything else that you eat at least once a month? Please write the NAME of the food, HOW OFTEN you have it and the AMOUNT.

### FOOD or DRINK

<table>
<thead>
<tr>
<th>Food or Drink</th>
<th>How often? Write in ONE column only</th>
<th>Your Usual Serving Size</th>
<th>For Office Use Only</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Per Day</td>
<td>Per Week</td>
<td>Per Month</td>
</tr>
</tbody>
</table>

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Appendix H.

Overview of the ASA24® Respondent Websites and Considerations Related to Data Security and Participant Confidentiality

Extensive evidence has demonstrated that 24-hour dietary recalls provide the highest quality, least biased dietary data. Traditional 24-hour recalls, however, are expensive and impractical for large-scale research because they rely on trained interviewers and multiple administrations to estimate usual intakes. As a result, researchers often make use of food frequency questionnaires, which are less expensive but contain substantial error.

To address this challenge, investigators at the National Cancer Institute (NCI) created the Automated Self-Administered 24-hour Dietary Assessment Tool (ASA24), a freely-available, web-based tool that enables multiple automated self-administered 24-hour recalls and food records. The ASA24 system was developed under contract with Westat®, a social science research firm located in Rockville, MD, and builds on the Food Intake Recording Software System (FIRSSS) developed by Dr. Tom Baranowski of the Baylor College of Medicine. An External Working Group provided advice about the needs and interests of potential users.

The ASA24 system consists of a Respondent Website used to collect recall and food record data and a Researcher Website used to manage study logistics and obtain data analyses. The ASA24-2016 Respondent Website is compatible with mobile devices and is available in English and Spanish. ASA24-2016 allows for the collection of both recalls and food records. This document provides an overview of the methodology and main features of the ASA24-2016 Respondent Website, as well as information on security of the data collected and protections to the confidentiality of the participants of studies that make use of the ASA24 system. Images of the main Respondent site screens are also included.
5.1.1.1. **ASA24 Respondent Website Methodology**

Respondents asked to complete a recall are guided through the 24-hour recall interview using a modified version of the United States Department of Agriculture’s (USDA) Automated Multiple-Pass Method (AMPM). The steps in the interview process include:

1. Meal-based Quick List
2. Meal Gap Review
3. Detail Pass
4. Final Review
5. Forgotten Foods
6. Last Chance
7. Usual Intake Question

A food record in ASA24-2016 can consist of one or more days of data collection as determined by the Researcher during study setup. Respondents are instructed to complete a food record in real time. The methodology for food records was adapted from the ASA24-2016 methodology for 24-hour recalls described above.

The steps in the food record process are:

1. Meal-based Quick List
2. Detail Pass
3. Meal Gap Review

Finished reporting for the day? If no, go back to step 1. If yes, go to step 4.

4. Final Review
5. Forgotten Foods
6. Last Chance
7. Usual Intake Question

5.1.1.2. **Meal-based Quick List**

During the first pass of a 24-hour recall, Respondents are asked to provide a list of the foods and drinks consumed at each meal occasion during the previous 24-hour recall period from midnight-to-midnight or for the past 24-hours (starting at the time of the first login).

For food records, Respondents first provide a list of foods and drinks for the meal they are reporting. After reporting all foods and drinks for that meal, they immediately proceed to the Detail Pass.
Respondents are required to search to find foods, drinks, or supplements; search results can then be filtered if desired. Foods, drinks, and supplements reported at each meal are recorded in the My Foods and Drinks panel within the instrument. In addition to selecting an eating occasion (e.g., breakfast, lunch, snack), Respondents are also prompted to specify the time of the occasion before reporting the foods and drinks consumed. The Researcher can opt to collect additional contextual information including where meals were eaten, television and computer use during meals, and whether the meal was eaten alone or with others by turning on the corresponding module during study setup.

5.1.1.3. Meal Gap Review

For 24-hour recalls, once Respondents finish creating their My Foods and Drinks list at the end of the Quick List step, they are asked if they consumed anything during any 3-hour gaps between eating occasions. For a food record, the Meal Gap Review follows the Detail Pass. For the midnight-to-midnight version of a 24-hour recall and for food records, Respondents are also asked if they consumed anything between midnight and the first eating occasion, and between the last eating occasion and midnight regardless of the length of time gaps. During a Gap Review, Respondents have the opportunity to return to the Quick List pass to add a meal(s) and the foods, drinks, and supplements consumed at them.

5.1.1.4. Detail Pass

Respondents are asked for details about the foods and drinks they recorded during the Quick List, including form (e.g., raw), preparation methods (e.g., grilled or roasted), the amount eaten, and any additions (e.g., sugar, coffee cream, salad dressing). An option is available to probe Respondents about the source (e.g. grocery store, farmer's market, etc.) of where reported foods and drinks were obtained.

5.1.1.5. Final Review

Respondents are prompted to review all of the foods and drinks reported for the intake day, and make edits and add meals, foods, drinks, and supplements as necessary.
5.1.6. Forgotten Foods

Following the Final Review, Respondents are asked questions probing about the consumption of commonly forgotten foods and drinks (e.g., snack foods, fruits, vegetables, cheese, water, coffee, tea) and supplements. Respondents must select either "Yes" or "No" for each food or drink probed. For any "Yes" response, the Respondent will be returned to the Quick List to add the forgotten item(s).

5.1.7. Last Chance

After Forgotten Foods, Respondents are asked if they have reported all that they consumed. If Respondents want to add more foods, drinks, or supplements, they will be returned to the Quick List to add more items; otherwise, they will move forward to the Usual Intake Question.

5.1.8. Usual Intake Question

The final question asks: Was the amount of food that you ate yesterday more than usual, usual, or less than usual? This question probes whether this was a typical day's intake.

5.1.9. Supplement Module

Supplements include vitamins, minerals, and other supplements including prescription supplements. The supplements included are based on those reported in the National Health and Nutrition Examination Survey (NHANES). This module can be turned on or off by the Researcher during study setup. Respondents are able to report supplements similar to how they report foods and drinks throughout the day as part of a meal regardless of whether the module is turned on or off. However, if the module is turned on, Respondents are cued in several places to include supplement intakes in their report.

5.1.10. Respondent Nutrition Report

For 24-hour recalls and food records collected using the U.S. version of the ASA24-2016 system, Researchers can select an optional module to allow Respondents to receive a Respondent Nutrition Report. This Report provides information to Respondents regarding how their intake on a single reporting day compares to U.S. dietary guidance and nutrient requirements.
When this optional module is selected by Researchers, for their 24-hour recall or food record, Respondents are asked their age and sex, and if female, if they are pregnant or lactating. For 24-hour recalls, the ASA24 system later presents Respondents with a Nutrition Report. The Respondent Nutrition Report provided to Respondents is also available to Researchers on the Researcher website. For food records, Researchers can choose to provide the report to the Respondent after obtaining it from the Researcher website. Note that the Respondent Nutrition Report will only be generated if the Respondent provides their age, sex and pregnancy/lactation status.

5.1.1.11. ASA24 Respondent Website Features

The ASA24 Respondent Website guides the participant through the completion of either a 24-hour recall for the previous day or, a single or multiple day food record. The ASA24 instrument:

- Flows as per modified United States Department of Agriculture (USDA) Automated Multiple-Pass Method (AMPM) for 24-hour recalls, which was further adapted for collection of food records;
- Allows researchers to specify timing of recall, either from midnight-to-midnight or for the past 24-hours from time of login;
- Asks Respondents to report eating occasion and time of consumption;
- Enables Respondents to search to find foods, drinks and supplements;
  - Presents Respondents with search results for misspelled and related food items;
  - ASA24-2016 includes >17,500 misspellings and synonyms in the U.S. version (>13,000 in the Canadian version and >14,500 in the Australian version);
- Asks detailed questions about food form, preparation, portion size, and additions using an extensive branching question database with greater than 13 million pathways so that food codes can be assigned;
- Uses images to assist Respondents in reporting portion size;
- Allows the Respondent to add or modify food, drink, and supplement choices at multiple points during the recall or record;
• Includes optional modules to query where meals were eaten, whether meals
were eaten alone or with others, television and computer use during meals, and
source of foods consumed;
• Includes an optional module to query dietary supplement intake;
• Is available in English and Spanish, except for ASA24-Canada, which is available
in English and French;
• Is accessible by individuals using assistive technologies, such as screen readers.
• The 2016 version includes an optional Respondent Nutrition Report that
Researchers can choose to make available to Respondents. The Respondent
Nutrition Report will provide feedback on nutrient and food group intake in
comparison with U.S. dietary guidance. This report is available only for
Respondents completing food recalls or records using the U.S. version of
ASA24-2016.

5.1.1.12. Data Security and Protections to Confidentiality of Participants
Using the ASA24 System

Researchers using the ASA24 system do not provide the NCI, Westat, or the ASA24
system with any identifying data for participants of their studies. Rather, researchers
specify a unique numeric identifier for each Respondent and download system-
generated usernames and encrypted passwords that they provide to Respondents so
that they may access the application.

The ASA24 system also does not collect any identifying data directly from Respondents.
However, IP address information is accessed for the purpose of routing information
between the server and the respondent's computer—often the IP address is that of the
user's Internet Service Provider (ISP). IP addresses are not stored or tracked by the
ASA24 system. However, logs of connections are kept in the hosting environment for
audit trail purposes. This information is not mined in any way but would be available if
there were a legal obligation to release it.

Response data are secured at the hosting site using industry standard security controls,
including firewalls and encryption. All data entered into the ASA24 system at the
Respondent's computer is encrypted by the internet browser (e.g., Internet Explorer,
Firefox) before they are transmitted to our servers using Secure Socket Layer (SSL)
Technology. SSL allows for the authentication of the sending and receiving computers.
Only a particular study’s investigator(s) and the ASA24 operations team can access response data. Access is gained through usernames and strong passwords.

5.1.1.13. **ASA24 Respondent Website Screen Shots**

Screen layouts will vary depending upon the screen size of the device.

*Figure i.* The Respondent can choose to complete the ASA24 records or recalls in English or Spanish.

*Figure ii.* An introductory screen prompts the participant to report everything that she or he had to eat or drink for the desired period.
Figure iii. The meal details screen collects information on the eating occasion and time, and displays optional modules that can be selected by the researcher to query where meals were eaten, whether meals were eaten alone or with others, and television and computer use during meals. This is the first step in the meal-based Quick List.
Figure iv. The Find Foods & Drinks screen is used to select foods, drinks, and supplements to be added to a meal during the Quick List Pass during the reporting period assigned by the Researcher.
Figure v. Respondents complete the Quick List pass by adding meals and selecting foods, drinks, and supplements. The food, drink, and supplement terms are based on the National Health and Nutrition Examination Survey (NHANES).
Figure vi. In a recall, after the Respondent reports the foods, drinks and supplements consumed and selects the Next button in Figure 5, gaps between meals are identified (Meal Gap Review pass). After reviewing the gaps, the Respondent selects the 'Add Details' button.
Figures vii.a-c: The detail pass prompts the Respondent to report the details of each food, drink, and supplement including the specific type or how it was prepared, anything added to it, and the amount that was consumed.

Add details to your Bagel

Lunch Wednesday, November 4th - 8:05am

Bagel: Did it have any fruit or vegetable?

Select an option
Plain
Apple
Blueberry
Cranberry
Garlic
Onion
Raisins
Other
Don’t know

Figure vii.a.

Add details to your Bagel

Lunch Wednesday, November 4th - 8:05am

Bagel: How much did you actually eat?

Don’t know
Less than 1/4 bagel
1/4 bagel
1/2 bagel
3/4 bagel
1 bagel
More than 1 bagel

AMOUNT: 1/2 bagel

Figure vii.b.
Figure vii.c.
Once the Detail Pass is complete, the Final Review begins. The Respondent can make changes to the details for a given food or drink and add more foods and drinks if necessary.
Figure ix. The forgotten foods pass queries the Respondent about frequently forgotten foods. Responding yes to one or more categories will result in a prompt to add the forgotten foods or drinks.

Figure x. The Last Chance Pass provides Respondents one more opportunity to edit their intake.
Figure xi. The final question in the food and drink module asks the Respondent whether the amount of foods and drinks consumed yesterday was usual.

Figure xii. Once the Respondent completes the food and drink module and the supplement module, if selected by the Researcher during study set up, his or her responses are saved in the secure database and he or she can exit the ASA24 system.* Only the Researcher(s) who are registered to that study and the ASA24 operations team can access the response data.

*xii.b. If the Researcher chose to include the option of providing a Respondent Nutrition Report at the end of diet recall or record entries, participants are given the option of answering a few basic questions in order to receive a copy of nutrition report about the food he/she reported. To view a sample of a Respondent Nutrition report, visit https://epi.grants.cancer.gov/asa24/respondent/nutrition-report.html
Appendix I.

Critical Reflection

Having the opportunity to focus my capstone project on finding culturally appropriate methodologies for conducting research in minority populations was highly rewarding, as through completing the literature review I was able to gauge how much work has been done to improve data collection strategies among South Asian populations. This was one of the biggest challenges encountered during my search, as the data for this growing subset of Canada’s population still remains to be quite understudied. Though cultural competency is beginning to emerge within research, a gap still persists within nutritional epidemiology—which is already quite a complex field. Aside from nutrition, health promotion efforts that are currently done in South Asian populations, and the successes or failures encountered, are not well documented, which poses limitations for future program development and evaluations. Understanding that many community-based programs are often financially constrained may lend an explanation as to why they are not well-established, however, generalizing data collected from the population at large to inform new programs and policies is not reflective of the priority population.

I was extremely grateful for having worked with such a unique team at Fraser Health (FH) for the duration of my capstone project. Working closely with FH’s Evaluation Specialist, Rachel Douglas, and the SEHAT team was an enriching experience, as I had an opportunity to learn more about the work that is being done to enhance the wellbeing of the South Asian population in Surrey. That was an important factor in why I chose to pursue this project and complete my capstone with FH, as I hope to establish a career in health promotion, specifically with minority populations. This project provided insight into the various factors that need to be taken into consideration for the planning and development of health promotion initiatives, especially the importance of stakeholder engagement.

Working with Dr. Whitehurst, provided me with an opportunity to expand on my knowledge of research methodologies, particularly in learning the importance of conducting a rigorous literature review and summarizing that evidence. This project integrated various aspects of the public health competencies we were exposed to at the
beginning of this journey, which lead to the initiation of a research pilot project. I am pleased that this project has informed the basis of their pilot study, that will allow for a greater understanding of how to improve data collection with the South Asian community in the Fraser Region. Though the capstone experience was enlightening and enriching, I wish there was additional time to see the pilot project through and engage directly with community members. This would have provided an opportunity to thoroughly understand the iterative process of conducting a research pilot, and the changes that would need to be made to ensure each stakeholder’s needs are met. However, I do believe that this has set the stage for FH to further refine their research methodologies as they continue to work with this community.

As I approach the end of my MPH degree, I have had time to truly reflect on my experience within the program overall. It was not until I sat down to write this reflection, that I realized how quickly the past two years have gone by, but not without priceless memories and a vast wealth of information and skills that I will carry forward with me into the next chapter of my career as a public health practitioner.