**Recommendations for Healthy Food Labeling
on UBC Campus**

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University of British Columbia

FNH 473

May 30, 2014

FNH 473: Nutrition Education in the Community

Recommendations for Healthy Food Labeling on UBC Campus

April 11, 2014

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Note: We would like to have the Introduction, Situational Analysis and Planning Framework, and Project Goals and Objectives remarked with the final submission.

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Executive Summary

We have created evidence-based recommendations for the implementation of a food labeling system by UBC Food Services. The main goal of this implementation is to reduce risk factors for diseases associated with poor dietary choice by encouraging all students who eat at UBC Food Services establishments on campus and those living on campus with a meal plan to meet nutrient recommendations as set out by Health Canada. Our project integrates extensive research into studies reporting typical dietary intakes of university students, and discussions and consultation with the UBC Food Services managers and with Jackie Ehlert, the student residence dietitian at The University of British Columbia. Our research has allowed us to determine which nutrients are of greatest concern in the student population and should be emphasized in the labeling initiative. These include: vitamin A, fibre, calcium, vitamin D, and iron, which are under-consumed, and saturated fat and sodium, which are over-consumed[1,2,3]. The first objective of this project is to promote increased healthy food choices, and decreased unhealthy food choices with respect to the above-mentioned nutrients. This outcome will be evaluated through examining sales records. The second objective is to increase the understanding of which foods contain the targeted nutrients. The last objective is to advocate healthier food choices that can be sustained by students exposed to the intervention. These objectives will be evaluated through pre- and post-intervention surveys to the same representative sample of students. The Diffusion of Innovations model is the framework we used for planning, creating recommendations, and determining the evaluation of our proposed initiative. A key component of this model is the five factors that aid in determining how to increase the likelihood of the adoption of our recommendations: relative advantage, compatibility, complexity, trialability and observability[4].

Introduction

UBC Food Services runs thirty-four food establishments including three convenience stores and eight franchises[5]. Food offered at these establishments can have a significant impact on the nutritional status of students who frequently eat on campus. French fries, chicken nuggets, and pizza were reported as the top three foods consumed in residence during the past year (J.Ehlert, RD, personal communication, March 1, 2014). Canadian university students have an inadequate intake of vegetables and fruits, milk and alternatives, and whole grains along with high intake of salty foods that are high in saturated fat[1,3,6]. The current dietary patterns of students are a public health concern since they can lead to nutrient imbalances and short and long-term health consequences, as eating behaviours developed during young adulthood are often carried throughout one's life[7,8]. Long-term consumption of food high in sodium, saturated fat, and energy, and low in fibre can lead to overweight and obesity, which are risk factors for chronic disease including: type 2 diabetes, hypertension, and cardiovascular disease[9]. UBC Food Services has the potential to reach a large group of students and to impact their current and future health status by promoting healthy eating on campus. Our priority is to influence diet change in our target population, which are students who use UBC Food Services for eating on campus and those living on campus with a meal plan. Using the Diffusion of Innovations theory as a framework, our recommendations for a food labeling initiative aim to promote healthier eating habits, which we define as increased consumption of vegetables and fruits, whole grains, calcium-, iron- and vitamin D-containing foods, and reduced consumption of foods high in salt and saturated fat to meet nutrient needs and lower the risk of chronic disease. In addition, we recommend several supplemental interventions, such as an educational campaign, to support the labeling initiative and increase the impact and outcomes of the intervention[10].

Situational Analysis and Planning Framework

Needs assessment

Public Policy level: Laws set out by the Canadian Food Inspection Agency regarding food labeling must be enforced and regulations regarding allergens must be followed (see Appendix E).

Community level: The UBC community needs a food environment that supports sustainable, healthy, and safe food practices through providing nutritional information on food that is accurate and easy to use. Culturally sensitive labeling[11,12] is also required since UBC has a culturally diverse population[13].

Institutional level: The needs of our primary stakeholder, UBC Food Services, were obtained through an interview and subsequent communications. It was found that they desire an appropriate threshold of information that could be included on a nutrition label, a feasible, relevant labeling scheme that could be processed and easily understood by students, recommendations for consistent labeling practices across all UBC Food Services establishments, and a definition of "healthy" for the student population that is both positive and sustainable. Most importantly, they want a label that can help the target population make informed food choices on campus.

Interpersonal level: There is a need for labels that are socially acceptable and gender neutral[14] due to the influence of peer pressure on food choice (J.Ehlert, RD, personal communication, March 1, 2014). Also, there is a need for accurate nutrition information to be provided for students to share amongst their social groups (J.Ehlert, RD, personal communication, March 1, 2014).

Individual level: The needs of our target population, UBC students that use UBC Food Services whether eating on campus or living on campus, include: access to sustainable, healthy,

culturally appropriate, safe foods, and access to nutritional information that is relevant, accurate, attractive, and clear[2,11,15].

Problems and Contributing Behaviours

University students under-consume vegetables and fruits, whole grains, and milk and alternatives[3,6,7], and consume salty foods and saturated fat in amounts exceeding recommendations[1,2,7]. These eating behaviours have led to a significant proportion of Canadians aged 19-30 years, the category in which most university students fit[13], not meeting their nutrient requirements. Statistics show that greater than 40% of males and females do not meet their requirement for vitamin A, greater than 90% of males and females do not meet dietary vitamin D needs, 26.5% of males and 47.5% of females do not meet calcium needs, 16-19% of females do not meet iron needs, and almost all males and females do not consume enough fibre[1,2,7].

Imbalances of these nutrients predispose this population to short and long-term health consequences. In the short-term, iron deficiency anemia has been shown to impair cognition in college-age women, and inadequate iron status without anemia may cause functional impairment[16]. In a crossover experimental trial, results suggested that diets high in saturated fat impair intention, affect mood, and reduce cognition[17]. Studies have also shown that dietary fibre from whole grains and cereals, of which students are not consuming enough, have an inverse relationship with obesity[18,19].

In the long-term, chronic overweight and obesity can result in diseases such as cardiovascular disease[19]. In addition, excessive sodium consumption can lead to chronic hypertension, which causes an estimated 14,000 deaths per year[20]. This is of particular concern since 78% of women and 98% of men, aged 19-30, have been found to consume sodium amounts greater than the upper tolerable levels[1]. Osteoporosis and osteomalacia also present an issue as

they are potential consequences of chronic inadequacy of calcium and vitamin D during young adulthood, the period when peak bone mineral density is reached[21].

Mediating Factors

An ecological approach was taken to determine the mediating factors that affect university students' food choices. Healthier dietary intake in this report is defined as decreased consumption of foods that are high in sodium and saturated fat, and increased consumption of whole grains, vegetables and fruits, and the food items rich in calcium, vitamin D, and iron.

Public Policy: As a registered food establishment, UBC Food Services must follow Canada's food labeling regulations[22] (see appendix E).

Community: The UBC population is very diverse and has a variety of nutritional needs and preferences. Currently, 19% of UBC's population consists of international students with the majority (39%) from East Asia[13]. Of the domestic students, 45% are of oriental descent[12]. Some of the barriers surrounding the use of Nutrition Facts tables by the student population include difficulty interpreting labels for students whose first language is not English[12], and a lack of time to read extensive Nutrition Facts tables[2,8]. In addition, students desire convenience[6,8,23], and many convenience foods are unhealthy[8,23]. Students also have a tendency to select unhealthy foods when stressed[8]. Lastly, the media and advertising significantly influence a person's food choice[8,24].

Institution: According to the UBC residence contract, meals plans are mandatory for students living in first year residences[25]. As a result, students are limited in where they can eat and are dependent upon the variety of foods offered by UBC Food Services. Food price is a factor[6], since students often report finding healthy foods too expensive and thus choose less expensive, unhealthy foods[8,23]. Due to cost being a factor, students' food choices can also be

influenced by food deals that are offered on campus (J.Ehlert, RD, personal communication, March 1, 2014).

Interpersonal: Peer-pressure and social acceptability influence food choice (J.Ehlert, RD, personal communication, March 1, 2014). Students take into account what their peers are eating, and how their food choice will be judged by others[23]. Students also rely on information from others as a source of nutrition knowledge[24].

Individual: An individual's taste preferences have the greatest influence on food choice[6,8,23]. Other intrapersonal factors that impact food choice include food's appearance and smell, an individual's emotional state, specific health concerns, one's degree of nutrition knowledge and specific beliefs[26]. In addition, there is a concern with body image and weight in this population, which influences food choice[2,7,8,23]. Consistent with body image concerns, females tend to choose items that are lower in calories and fat, and males often look for high protein foods[2]. This indicates that the student population may be unaware or uninterested in the nutrients that literature states are inadequate or excessive in this group. In terms of knowledge, students who reported reading nutrition labels more frequently had significantly healthier dietary intakes than those who reported reading them only sometimes or rarely[26]. Students associate eating out with consuming unhealthy foods[8], which could create an assumption that UBC Food Services establishments offer only unhealthy foods. We believe this could discourage a person from looking for healthy foods at UBC Food Services establishments. Finally, some people are simply uninterested in making healthy food choices[2,27].

Health Behaviour Theory and Rationale for Choice

The Diffusion of Innovations (DoI) model is the framework for our project planning, outputs, and evaluation. The DoI model is useful to "expand the number of people who are exposed to and reached by successful interventions"[28] and aids in the 'diffusion' of the new intervention at the community-level[29]. For diffusion of a new food labeling scheme to occur and for students to adopt the labeling innovation, the DoI model suggests that they must become aware of the need for the innovation, decide to adopt (or reject) the innovation, initiate use of the innovation, and continue use of the innovation[4,30]. The DoI model encompasses five important factors: relative advantage, compatibility, complexity, trialability and observability[4].We optimized the relative advantage, compatibility, and complexity of our intervention to both the community and UBC Food Services to increase the likelihood of our recommendations being adopted[4]. Trialability and observability were specifically applied to our evaluation.

In terms of relative advantage, the new labeling scheme must be perceived as superior to current practices[31]. According to our situational assessment, the current system within UBC Food Services, which only includes nutrition information on pre-packaged items, is not conducive to students making informed food choices. By implementing nutrition labeling on select unpackaged food items, we want to encourage healthier food choice behaviour[14] in students and improve their health status in the long-term[10]. With respect to compatibility, we have ensured that our nutrition labeling recommendations can be easily assimilated into UBC Food Services establishments and students' eating routines by considering the social desirability, feasibility, cost, benefits, and sustainability of the labeling intervention. In terms of complexity, we have designed our 'innovation' of nutrition labels to be easily implemented by UBC Food Services and to be perceived as easy to use by students, allowing them to select healthier food choices by having labels that are simple and easy to understand.

We chose to use the DoI model because its framework aligns well with our issues, which focus on dissemination of information and include the difficulties in implementation of guidelines and meeting objectives. Two relevant research studies with comparable interventions found success in using this model to examine factors that increase the adoption of a new innovation. The first study by Masse et al[31], looked at the implementation of healthy eating and physical activity guidelines at BC schools and applied the DoI model to explain factors that impede or facilitate implementation of physical activity interventions and food and beverage sale guidelines. The barriers identified in this study are similar to those that we had to overcome in our recommendations: issues with understanding guidelines that are too complex, difficulty determining the delegation of responsibility for initiating and maintaining the initiative, and the potential for the recommendations being difficult to implement[13]. In the second study by Owen *et al*.[32], the DoI model was used to incorporate increased physical activity into elementary schools in the United States. This study used components of the DoI model by using different strategies, and stages of 'dissemination' (a planned process of creating awareness), and explored their success at promoting widespread diffusion of an innovation. Although our target population and specific identified problems are not the same as those of the two studies, the studies are valuable in showing that the DoI model can be used to implement and evaluate evidence-based healthy living initiatives within educational institutions.

Project Goal and Objectives

Goal:

To reduce risk factors for diseases associated with poor dietary choice by encouraging our target population to meet nutrient recommendations as set out by Health Canada.

Short-term objectives:

- 75%[a] of students report noticing the labels
- 15%[b] of students report having an increase in nutrition knowledge specific to the targeted nutrients 2 months after exposure to nutrition labeling.

[a]We believe our labels will be noticeable as they will be widely available on all entrees at all establishments, which is comparable to the intervention by Vanderlee and Hammond[27], which reported 75% of people noticing the labels.

[b]15% is a conservative guess based on an assumed 75% of students noticing the labels. Noticing does not equate to knowledge or behaviour change[27], but with increased exposure, we assume that some of the population will start recognizing trends in which foods tend to have certain labels.

Medium-term objectives:

- By 2 years, increase in the sales of food products labeled with vegetables and fruits, whole grains, calcium, iron and vitamin D labels by 10%[c] compared to before the labeling initiative.
- By 2 years, lower intakes of sodium and saturated fat by 10%[c] measured by decrease in the sales of unhealthy, unlabeled foods compared to before the labeling initiative.

[c] 10% is an estimate based on literature results and information from Jackie Ehlert (personal communication). According to the paper from Vanderlee and Hammond[27], only a proportion of those that notice nutrition information change food behaviours. Older adults tend to be more interested in nutrition information[20], but our target population is mainly young adults so we have made a conservative estimate based on this fact.

Long-term objectives:

- By 5 years, UBC students and alumni who reported eating at UBC Food Services establishments 5 years prior report healthier food choices[d] compared to their peers who did not eat at UBC Food Services establishments.

[d]There have been few studies that have evaluated the long-term outcomes of nutrition labeling[14]. Therefore we could not find a percentage of people who were affected in the long-term by nutrition labeling in the literature to base a specific percentage for this outcome on. Thus, we recommend looking for significant differences between the two groups.

Project Outputs

Our primary output is an evidence-based document recommending best practices for the implementation of a nutrition labeling initiative by UBC Food Services (see Appendix C for the full document of the recommendations). A review of twenty point-of-choice nutrition labeling schemes concluded that nutrition labeling produces healthier food choice behaviour in the short-term[14]; however, due to a lack of follow-up studies, conclusions cannot be drawn about its effects in the long-term[14]. The purpose of a labeling initiative for UBC Food Services is to enhance students' capacity to make healthier food choices by informing them of foods that contribute to a balanced diet, and to increase their awareness of important nutrients that they are lacking. This initiative is intended to help improve nutritional status and lower the risk of chronic disease associated with poor dietary choice. Our recommendations take into account the DoI model factors of relative advantage, complexity and compatibility.

The Labeling System: We recommend that UBC Food Services focus their labeling efforts on the nutrient issues identified in the problems section. For the label suggestions, we targeted the food groups, vegetables and fruits, and whole grains because they provide a variety of essential nutrients and are under-consumed by our target population[3,33]. The remaining nutrients targeted by our intervention come from various food groups; therefore we separated them into specific nutrients[33]. The specific statements we recommend on food labels are: good source of calcium, good source of vitamin D, iron-rich, contains 2 (or more) servings of vegetables and fruits, contains greater than 50% whole grains, low in saturated fat and low in sodium. We have made guidelines in our document of recommendations for determining what threshold values must be met for a nutrient claim to be applied to a food. This is to avoid confusion over what foods can and cannot be labeled[14], and reduces the complexity of labeling

foods by UBC Food Services. Only foods that meet the threshold numbers for labeling will have labels. These threshold numbers were chosen based on serving sizes, recommendations from Canada's Food Guide[33], and from the CFIA's Specific Nutrient Content Claim Requirements (see Appendix E).

Positive Messaging: We suggest that positive messaging be used on the labels. Currently a gap exists in research supporting the use of positive nutrition messaging for our target population; however, we believe that by emphasizing the beneficial aspects of food items rather than highlighting the negative aspects, we can encourage individuals to have positive relationships with food. Positive messaging would include claims such as "high in fibre" and "low in saturated fat", as opposed to negative messaging, which includes claims such as, "high in fat". Positive messages have been shown to be effective in promoting disease prevention[34]. Moreover, many food company advertisers use positive messaging on their products to promote diet quality and the well-being of the individual[35,36]. This allows consumers to identify a relative advantage of the item over competing products that do not make the same positive claims, which consumers infer do not have the same beneficial qualities[36].

Label Design and the Threshold of Information on Labels: Our proposed labeling system avoids numerical labeling in order to reduce label complexity, because studies show that consumers often misinterpret numerical nutritional content of foods because they are unsure of recommended intake levels to use for comparison[37]. Research has concluded that the use of simple verbal descriptors may aid in reducing confusion and avoidance of reading food labels[37]. In addition, cluttered labels can be overwhelming because they increase complexity as consumers spend additional time examining the label[38]. We recommend avoiding visual clutter on labels[14] as students are often rushed in making their food choice[2,8]. To further decrease complexity, we suggest applying a maximum of two specific labels on a food item as this will

reduce clutter and emphasize the most prevalent nutrients in the food item. Please refer to Appendix C, under *Uncluttering the Label* for a Label Design Tree. The label design tree serves as a guide for when a food or recipe contains more than two of the food groups/nutrients we recommend. Justification for prioritization is based on consuming whole foods versus individual nutrients[39] when looking at the wider scope of chronic diseases and the leading causes of death in Canada[40] (see Appendix C for justification).

Desire to use a nutrition label stems from: an interest in nutrition information, personal motivation, nutritional knowledge, the relevance of the nutritional information to the person and the ease of understanding the information[11,15]. By recommending simplified messages to optimize understanding and by encouraging attractive label designs[14], we strive to achieve two key dimensions of label perception: understanding and attractiveness to the consumer[15]. To increase compatibility with students' characteristics, we suggest that the labels be culturally acceptable and gender neutral[14] to promote use by UBC's diverse population.

Which Foods to Label: There is insufficient evidence on whether overall food choices are healthier when nutrition labels are included on all foods or when they are included on only certain components of a meal[14]. We decided to recommend initially labeling entrees and soups because these dishes can be very diverse and are usually composed of many different ingredients. Thus, there can be a variety of different nutrients present in the foods. In addition, with the larger portion sizes of entrees, the concentration of nutrients is likely higher in these items. The reason we did not recommend labeling all foods is that assessing the nutrient content of all of the foods within UBC Food Services would be a time-consuming task and we wished to reduce the complexity of implementation by recommending fewer items be assessed initially.

According to public policy, ingredients do not have to be labeled on certain foods such as baked goods and foods that are not pre-packaged[22] (see Appendix E). This lack of labeling

restricts safe and appropriate food choices for those with ingredient-related dietary restrictions. We recommend that information on priority allergens (see Appendix E) in food offerings be compiled into a binder and provided in a visible, easily accessible area in each establishment to promote a safer food environment for those with dietary restrictions.

Standardizing Recipes: UBC Food Services has indicated that they are in the process of standardizing their recipes (Loriann McGowan, e-mail communication, March 5, 2014). This is essential since it forms the foundation for accurate analysis and labeling of targeted nutrients for each recipe. When standardization occurs, we recommend listing the labels that correspond with a recipe and the priority allergens it contains on the recipe itself to identify which labels go on which foods, and which allergens are present in the food. This reduces the complexity of accurate labeling and allergen listings. It also allows labeling and allergen listings to be done by anyone, rather than requiring a nutrition expert[14]. Standardization is cost-effective, and efficient[14], thus offering a relative advantage over the current system.

Educational Campaign: Although the planning of a nutrition education campaign is not within the scope of our project, we recommend a campaign be implemented to complement the labeling initiative. Awareness or attention paid to the nutritional information does not automatically stem from nutrition label exposure[27]. Research has shown that educational campaigns on nutritional issues prompt nutrition label awareness[11,15,41]. In addition, as mentioned in the mediating factors, nutrients of concern to students when choosing foods[2] are not aligned with those that are inadequate in this population as reported by Health Canada. An educational campaign can be used to increase awareness of why the targeted nutrients should be of importance to students. This can increase the compatibility of the targeted nutrients with the desires of the student population. We recommend continuing with positive messaging and suggest simple, informative posters in visible areas where students choose their meals[42].

Evaluation Plan

We used the DoI model to determine how to evaluate both the adoption of our recommendations by UBC Food Services and the effectiveness of the food labeling intervention on our target population.

A process evaluation to determine the adoption of our recommendations by the primary stakeholders should be completed. We suggest an interview with the stakeholders be carried out after they have had time to adequately review the recommendations[14]. The complexity of the recommendations, compatibility with the UBC Food Services' current practices, and the relative advantage of the recommendations will be explored. Barriers will be determined and specific changes will be suggested to improve the chances of the successful implementation of a new food labeling initiative in UBC Food Services establishments.

Before the new labeling system is implemented, we suggest conducting a survey and food frequency questionnaire (FFQ) on a representative sample of our target population. The data collected will allow us to determine baseline measures of students' nutrition knowledge, their current eating patterns and their knowledge which foods contain the targeted nutrients. The surveys should be tested for validity and reliability through a pilot test and formative feedback from the residence dietitian[43]. Before implementation, sales records of all foods purchased at each UBC Food Services establishment should be collected to determine what current purchasing patterns are[14]. These baseline measurements allow for observability to be achieved as they can be compared to post-intervention survey results on an identical survey, FFQ results, and sales data.

Next, we suggest the implementation of a pilot project to allow the stakeholders to try out the new food labeling recommendations on a smaller scale[4]. This will allow for a formative evaluation of the implementation of the initiative by UBC Food Services and a process evaluation on the effect of the initiative on the target population. Only entrees and soups will be

labeled, allowing for the impact of the initiative to be evaluated before it is expanded. The formative evaluation of the implementation should be assessed according to whether or not the initiative followed the recommendations and guidelines we provided. For the process evaluation, sales of healthy labeled foods should be measured and compared to pre-intervention records. We propose that an increase in labeled food sales be used as a surrogate measure of students' food choice behavioral change[14]. If sales have increased, UBC Food Services will be more likely to implement our recommendations on a larger scale as the DoI factor of observability and trialability have been achieved[4]. In addition, after the intervention is implemented, student focus groups could be run to identify whether the food labels have influenced students' food choices and what changes they would like to see to the labeling system[8]. Labeled food sales and nutrition knowledge should be evaluated periodically to determine the continued outcomes of the intervention as more students adopt use of the labels[4].

To determine long-term outcomes, we recommend UBC Food Services to email FFQs to UBC alumni who were exposed to the intervention as students. This will allow for sustainability of food choice behaviour to be examined by seeing if individuals continued to make healthier food choices outside of UBC Food Services establishments[14]. Moreover, UBC Food Services should conduct periodic quality assessments to ensure a high level of accuracy and consistency in labeling be achieved within each establishment[14].

The results of our evaluations would be used to measure the extent to which our objectives of positive and sustained behavioural change and increased nutrition knowledge are achieved[14].

Conclusion

This project was a wonderful opportunity to determine issues facing our own community. It allowed us to put forth evidence-based suggestions to improve the overall health of students, therefore moving towards our overall goal of reducing risk factors for diseases associated with poor dietary choice by encouraging our target population to meet nutrient recommendations as set out by Health Canada. Some of our recommendations included: using positive food messaging to encourage students to choose healthier foods, and uncluttering the label by only including two nutrition statements. To support the label initiative our recommendations further included standardizing recipes, creating allergen binders to be put at UBC Food Services establishments, and designing an educational campaign focused on our targeted nutrients.

One of the lessons we learned was to integrate the needs of the stakeholder and current research to meet the health needs of our target population by means of an updated labeling program. We also learned to apply health models and theory, specifically the diffusion of innovation theory, to assess, plan, implement and evaluate a health initiative in a university setting.

The next step for our project is for our recommendations to be accepted and implemented by UBC Food Services. If implemented, the objective would be to observe if our intervention causes increased nutrition knowledge and sustained healthier food choice behaviours. As there is a lack of research into the long-term effects of nutrition labeling, this labeling initiative could potentially be used for future research to determine dietary behavior within a university population in the long-term. We enjoyed working together as a group and look forward to our collective recommendations potentially being introduced by UBC Food Services.

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Inputs	Outputs		Outcomes - Impact		
	Activities	Participation	Short (present-2 years)	Medium (2-6 years)	Long (>6 yrs)
What We Invest: **Financial Resources:** $150 dollars from FNH 473 class fund. **Human resources**: Our consulting team of nutrition experts. Residence Dietitian (Jackie Ehlert). **Partners:** UBC Food Services, UBC Food Systems Project. **Knowledge base:** Past research, past FNH courses, observational study, discussions with residence dietitian and stakeholders. **Technology** **Time:** preparation and execution of observational study, preparation for and participation in group meetings, research, communication with stakeholders and partners and putting together a coherent final report of suggested recommendations.	*What We Do:* **Collective summary of research:** Identification of the important health concerns in the target population and how they have successfully been addressed by other jurisdictions. **Creation of specific labeling recommendations for UBC Food Services:** recommendations include: which foods to label, the specific statements that should be used on the label, basic label design and a brief explanation of the importance of an accompanying educational campaign. **A set of specific guidelines to determine what suggested statements apply to the food item:** Guidelines are given for the numerical threshold values required to make specific statements. Values are based off the DRIs.	*Who We Reach:* 1. Students who use UBC Food Services as a food choice for eating on campus and students living on campus with a meal plan (target population) 2. UBC Food Services (stakeholder)	*What the short term results are:* 75% of students report noticing the labels 15% of students report having an increase in nutrition knowledge specific to the targeted nutrients 2 months after exposure to nutrition labeling.	*What the medium term results are:* By 2 years, increase in the sales of food products labeled with calcium, iron and vitamin D by 10%, compared to before the labeling initiative. By 2 years, lower intakes of sodium and saturated fat by 10% measured by decrease in the sales of unhealthy, unlabeled foods, such as compared to before labeling initiative.	*What the ultimate impacts are:* By 5 years, UBC students and alumni who reported eating at UBC Food Services establishments 5 years prior report healthier food choices compared to their peers who did not eat at UBC Food Services establishments.

Appendix B: Newsletter to stakeholders

Healthy Food Labeling on UBC's Campus
Group 11 FNH 473, 2014

Our group was privileged to work with an on-campus partner, UBC Food Services. We had the opportunity to undertake extensive research to explain dietary behaviors of university students, which included studies reporting typical dietary intakes of this population and in-depth discussions with Jackie Elhert, the Dietitian in residence at The University of British Columbia. We have become proficient at targeted research and have learned the importance of evidence-based recommendations for nutrition interventions in the community. We have also learnt the difficulties of dealing with a diverse population that is considered relatively healthy and before research, appeared to have no urgent health issues.

Our initial meeting with UBC Food Services unveiled their concern for students' health and the gap they were faced with in terms of their current food labeling practices. Barriers included issues with understanding guidelines that are too complex, difficulty determining the delegation of responsibility for initiating and maintaining a labeling initiative and having recommendations that are too difficult to implement. In terms of the student population, our research determined that intakes of calcium, vitamin D, iron, whole grains, and fruits and vegetables were low in this population.[1] In addition, intakes of sodium and saturated fat were found to be high.[2,3] Our research also showed that students are often rushed when making food choices[3,4] and that they often tend to seek out quick, convenient food options.[4,5]

This project was a wonderful opportunity to determine issues facing our own community. It allowed us to put forth evidence-based suggestions to improve the overall health of students; therefore moving towards our overall goal of reducing risk factors for diseases associated with poor dietary choice by encouraging our target population to meet nutrient recommendations as set out by Health Canada. Our recommendations included: using positive food messaging to encourage students towards healthier choices and uncluttering the label by only including two nutrition statements.

We enjoyed working together as a group and look forward to our collective recommendations potentially being introduced by UBC Food Services.

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3 Driskell JA, Schake MC, Detter HA. Using Nutrition Labeling as a Potential Tool for Changing Eating Habits of University Dining Hall Patrons. *J Am Diet Assoc.* 2008;108(12):2071-2076.
4 Garcia AC, Sykes L, Matthews J, Martin N, Leipert B. Perceived Facilitators of and Barriers to Healthful Eating among University Students. *Can J Diet Pract Res.* 2010;71(2):28-33.
5 Marquis M. Exploring convenience orientation as a food motivation for college students living in residence halls. *Int. J. Consum Stud.* 2005;29:55-63.

Appendix C: Specific Recommendations of Thresholds Values for Food Labeling

Why is Food Labeling Important for UBC Students?
Our project involved extensive research into Canadian statistics of university students, studies reporting typical dietary intake of this population and in-depth discussions with Jackie Ehlert, the Dietitian in residence at The University of British Columbia.

Our research revealed a few main issues facing university students. According to Jackie Ehlert, french fries, chicken nuggets and pizza were reported as the top three foods consumed in residence during the past year (J.Ehlert, personal communication, March 1st, 2014). Data from statistics Canada[3] showed that university students have low intakes of fruits and vegetables, whole grains, and milk and alternatives, and have high intakes of salty, high fat foods. These observations are concerning as long term consumption of foods high in sodium, fat, and energy can lead to overweight and obesity, which are known risk factors for chronic diseases including: Type 2 diabetes, hypertension, and cardiovascular disease[9]. More importantly, eating behaviours developed during young adulthood are often carried throughout one's life[8].

Our analysis of the research has allowed us to determine that the nutrients of concern in the student population include the following: calcium, vitamin D, vitamin A, iron, saturated fat and sodium[1,2,3]. Our labeling recommendations are centered around these priority nutrients.

Recommendations for Food Labeling:
1. Standardizing Recipes: This is an important step, as our recommendations require that food be analyzed for nutritional content.
   ● If the recipes are standardized, we recommend putting the labels that correspond with each on the recipe to identify which labels go on which foods. This would allow labeling to be done by anyone, rather than requiring a nutrition expert[14]. This is both more cost-effective, and more efficient.

2. Using positive food messaging: Positive food messaging means stating the benefits that a foods will provide instead of focusing on negative aspects[34,35]. Examples of positive messaging are statements such as: Iron-rich, Low in saturated fat, Good source of calcium.

3. The food labeling system: Our research determined that intakes of calcium, vitamin D, iron, saturated, sodium, whole grains and fruits and vegetables were low in this population. To target these problems we suggest food labels include the following statements, only if applicable:
   ● Good source of calcium
   ● Good source of vitamin D
   ● Iron-rich
   ● 2+ servings of vegetables and fruits

- >50% whole grains
- Low in saturated fat
- Low in sodium

To determine if these statements are applicable to a product, the following conditions must be determined through nutritional analysis of a standardized recipe.

Table 1 Vitamins and Minerals:

Statement:	Must contain:	Recommended Dietary Allowance/ Adequate intake is:	To make a statement, must contain:
Good source of calcium	15% or more of the RDA for calcium	1000 mg	150 mg or more per serving
Good source of vitamin D	15% or more of the RDA for vitamin D	600 IU (15 mcg)	90 IU (2.25 mcg) or more per serving
Iron rich	25 % or more of the RDA for iron	14 mg (Average used for DV)	3.5 mg or more per serving
Low in saturated fat	-	-	2 g or less per serving
Low in sodium	5% or lower of the AI for sodium	1500 mg	75 mg or less per serving

Table 2 Food Groups:

Statement:	Requirement for Statement
2+ servings of vegetables/fruits	Food item must include at least 2 Canada's Food Guide Servings of a fruit and/or vegetable. 1 serving of a fruit or vegetable is defined by Canada's Food Guide as: • 125 mL (½ cup) fresh, frozen or canned vegetable or fruit • 125 mL (½ cup) 100% juice • 250 mL (1 cup) leafy raw vegetables or salad • 1 medium piece of fruit or vegetable Additional vegetable/fruit servings definition: http://www.hc-sc.gc.ca/fn-an/food-guide-aliment/choose-

	choix/fruit/serving-portion-eng.php
>50% whole grains	Of all grain products included in the product, more than 50% must be considered whole grains. Common whole grains include: ● Amaranth, teff, wheat (with bran, germ and endosperm intact), barley, buckwheat, quinoa, triticale, brown rice, wild rice, rye, oats and millet.

These guidelines are in accordance with the Canadian Food Inspection Agency's requirements for food labeling. Specific guidelines can be reviewed here:
http://www.inspection.gc.ca/food/labelling/food-labelling-for-industry/nutrient-content/specific-claim-requirements/eng/1389907770176/1389907817577

4. Uncluttering the label:
Our research showed that students are often rushed and do not have time to read an extensive Nutrition Facts table[2,8]. In addition, they tend to seek out quick, convenient food options[8,23]. To address this behaviour, we suggest the following labeling system:
a) Recipe standardization and nutritional analysis must be completed:
   a. The amounts of calcium, vitamin D, iron, saturated fat and sodium in the item, in addition to the servings of vegetables and fruits and percentage of whole grains must be determined.
b) Specific analysis on each nutrient and food group stated above must be completed by: using the guidelines in Table 1 and Table 2, calculating if the item is considered a good source of calcium, a good source of vitamin D, iron-rich, low in saturated fat, low sodium, contains 2 or more servings of vegetables and fruits, and/or contains >50% whole grains.
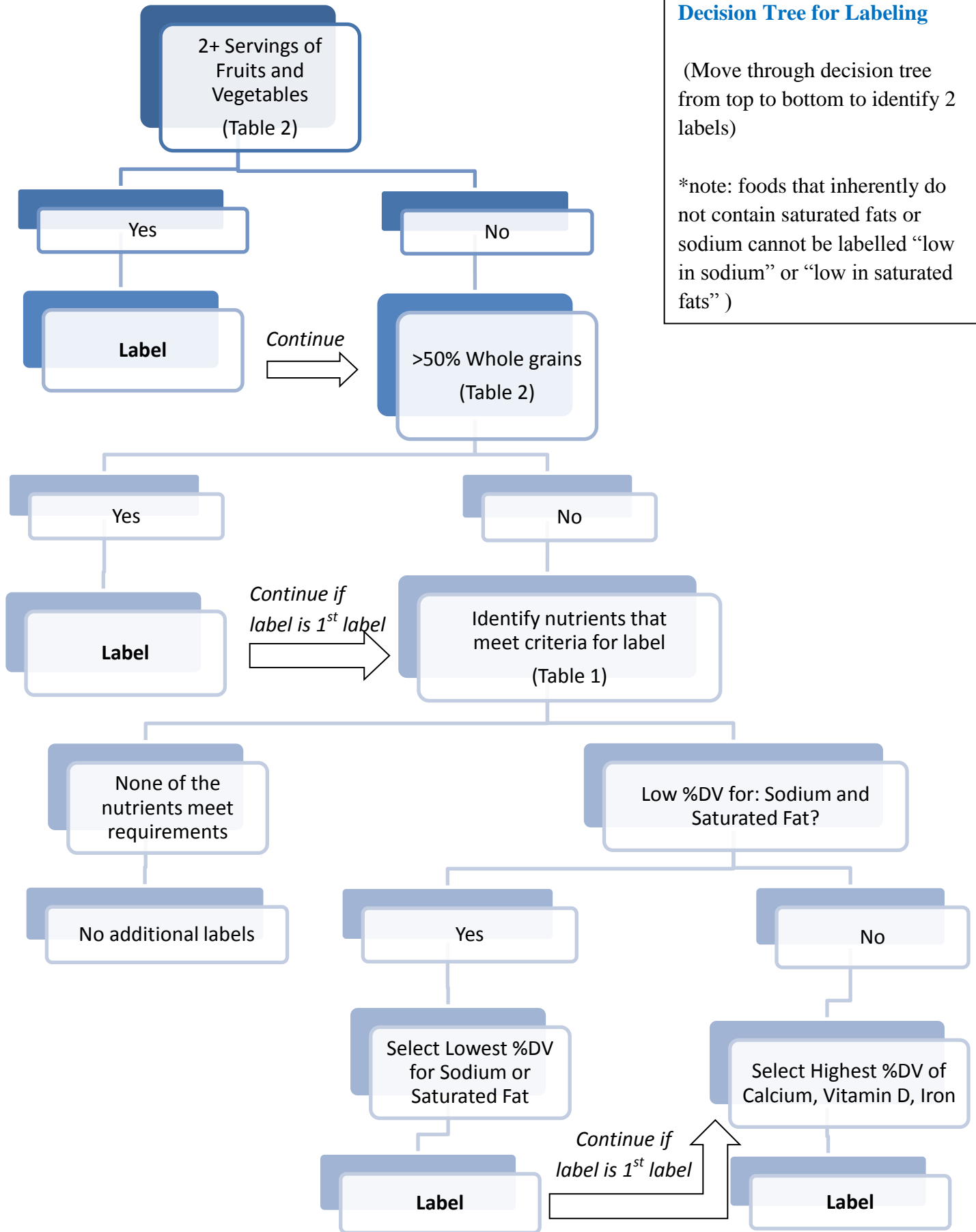
We suggest using only two statements maximum on the label to reduce cluttering.
Please read through the following Decision Tree for Labeling to assist in implementing a label system.

(Move through decision tree from top to bottom to identify 2 labels)

*note: foods that inherently do not contain saturated fats or sodium cannot be labelled "low in sodium" or "low in saturated fats")

2+ Servings of Fruits and Vegetables
(Table 2)

Yes

No

Label

Continue →

>50% Whole grains
(Table 2)

Yes

No

Label

Continue if label is 1ˢᵗ label →

Identify nutrients that meet criteria for label
(Table 1)

None of the nutrients meet requirements

Low %DV for: Sodium and Saturated Fat?

No additional labels

Yes

No

Select Lowest %DV for Sodium or Saturated Fat

Select Highest %DV of Calcium, Vitamin D, Iron

Label

Continue if label is 1ˢᵗ label ↗

Label

Justification for Label Design Tree:

We recommend that labeling foods or meals with 2+ servings of fruits and vegetables, and foods or meals containing >50% whole grains should be the first priority as these are generally nutrient dense foods. We want to encourage students to select whole foods as much as possible. Whole foods have greater potential to include many nutrients[39] in addition to vitamin D, iron, and calcium, and are associated with a reduced risk of cancer and heart disease [7].

We recommend labeling as low in sodium and/or low in saturated fat as a priority over high in calcium, vitamin D, and iron because targeting sodium and saturated fat helps address a wider scope of chronic diseases. Heart disease, stroke and diabetes were the second, third and sixth leading cause of death in Canada in 2009[40]. Obesity is a global health burden, and is a risk factor for heart disease, stroke and diabetes[9]. Reducing fat, sugar and salt, and increasing consumption of fruits, vegetables and whole grains are choices individuals can make to prevent obesity[9], and consequently prevent the diseases associated with obesity.

4. Allergens:
We suggest providing a separate binder in a visible, easily accessible location at each establishment that includes a complete listing of allergens for all the foods offered that day. We also recommend listing the allergens on the standardized recipes themselves to ensure accurate information is given to the students.

5. What foods should be labeled?
Only the foods that meet the threshold amounts described in Table 1 and Table 2 will contain labels. Foods containing 50% or more whole grains, 2 or more servings of vegetables and fruits, threshold amounts of calcium, vitamin D or iron, or low in saturated fat or sodium will be labeled under this labeling system. If foods fulfil greater than 2 aspects of this criteria, whole grains and fruits and vegetables will be given priority in labelling. Use the labeling decision tree to prioritize labels.

6. *Label design:*
We recommend that the labels be optimized for simplicity and attractiveness[14], and that they be culturally appropriate and gender-neutral[14]. Studies have shown that people respond best to labels that they understand and like[15], and especially with UBC's diversity, compatibility with the students' characteristics (culture and gender) would increase the chances of them 'liking' the labels.

7. *The importance of an Educational Campaign:*
We recommend that an educational campaign be implemented to complement the labeling initiative. Studies have shown that nutrition labeling initiatives are often not very successful on their own at changing food choice behaviours, but their success increases significantly when in combination with an accompanying educational campaign[11,15,39]. In addition, studies show that

females are more interested in low calorie and low fat foods, and males are interested in high protein foods[2]. These nutrients are not the same as the nutrients of concern in this population according to Health Canada[1] so an educational campaign targeting why the targeted nutrients should be of concern to students could increase the labels compatibility with students' food choice desires. We recommend continuing with positive messaging theme and using simple, informative posters in visible areas around where students choose their meals.

Title/Citation	Type of Study	Sample Population	Intervention/ Labelling Program	Results - Effectiveness/Impact of program	Relevance to UBC Students	Strengths/Limitations of Study
Kim S, Nayga RM, Capps O. The effect of food label use on nutrient intakes: an endogenous switching regression analysis. *Journal of Agricultural and Resource Economics.* 2000; 25: 215-231.	Retrospective quantitative study (applied regression equations to survey data)	Survey used (USDA 1994-1996 Continuing Survey of Food Intake) included a representative sample of the entire US population at that time.	-This study examined the consumer's intake of select nutrients before and after label use. It was shown that: -Intakes of cholesterol sodium, saturated fat are reduced when they used nutrition labels and intake of fibre increased.	Importance of Educational Campaign: study revealed that individuals who are more educated on the link between diet and health issues are more likely to use information about calories, saturated fat, total fat, sodium and dietary fibre compared to those who are not educated on this topic.	-This study looked at the before and after effects of no label use to label use. -Label use lead to reduced intake of cholesterol, sodium and saturated fats and increased intake of fibre compared to not using a label.	Older data from the United States. The population of UBC is not the same as the United States. In addition, nutrition concerns and awareness have changed since 1994-1996.
The International Food Information Council. Front of pack labeling consumer research project. http://www.foodinsight.org/Resources/Detail.aspx?t	Quantitative Survey (Cross-sectional)	Included people between ages 18-70. Study sample was similar to 2007-2008 census estimates in the USA. 67% of respondents	Four different representation systems tested through a survey: 1. No front of label packaging (control)-Phase 1. 2. FOP kcal only-Phase 2	-This study showed that increasing the amount of nutrition information on the front of a package (Phase 4) strengthened consumers understanding and comfort level with the product's nutrition. -Fewer consumers could	-The largest age group of respondents was between the age of 18 and 26 (26% of entire sample). -Increasing the amount of nutrition information on	Limitation in that different people were used in different phases so direct comparisons cannot be made (although the tried to keep each group demographically similar).

opic=Front_of_Pack_Labeling_Consumer_Research_Project. Accessed March 20, 2014.		were female and 33% were male. 26% of respondents were in the 18-26 age group (highest proportion of sample that responded). 82% were white.	3. FOP kcal and negative nutrients- Phase 3 4. FOP kcal, negative nutrients and positive nutrients- Phase 4	find and state positive nutritional information when Phase 3 was used (only kcal information and negative nutrients). -Front-of-package labeling in general allowed consumers to find and state nutrition content relevant to the food item. -Consumers who with calories, negative and positive nutrients were more likely to feel the information helped inform their decision making and understanding of the nutritional content of the food compared to those who were provided with calories only.	the front of the packaged allowed the consumer to feel most comfortable and informed with their choice.	
Holdsworth M, Haslam C. A review of point-of-choice nutrition labelling schemes in the workplace, public eating	Review article (critical review of 20 point-of-choice labeling schemes).	20 point-of-choice labelling schemes were reviewed in: 1. Workplace 2. University 3. Public eating places	HBA scheme: -Used prescriptive labels which directed customers to food items that were healthier (but did not say why).	-Healthy food choices were more likely to be chosen when the food was labeled as being a "healthy choice," but also having a descriptor of flavour -People liked a simple and easy to use system. Liked a single symbol denoting that	demonstrates factors that contribute to a successful labeling intervention. Also looked at some schemes used in	-Review that is not systematic. Older study. -Review of 20 point-of-choice labeling schemes, not just a few. -Lots of good information

places and universities. *Journal of Human Nutrition and Dietetics.* 1998; 11: 423-445.				the choice was healthy vs. coloured dots or numerical values on a separate pamphlet. -Marketing is important to educate people on how to use the new labeling scheme.	university settings and their success.	synthesized into one paper.
Pohlmeier A, Reed D, Boylan M, Harp S. Using focus groups to develop a nutrition labeling program within university food service. *Family & Consumer Sciences Research Journal.* 2012; 40: 431-443.	Qualitative study	-college students attending a major southern university -20 Females/20 males were randomly selected but only 30 of these students showed up for focus group discussions. -Due to lack of experience with dining on campus, freshmen, transfer, and graduate students were excluded from the study. Also, Nutrition	3 different nutritional labeling concepts were presented to the participants/students: nutrition facts poster, healthy dining location, and "stoplight" themed approach and they were asked which method would be most effective as which would be most useful to promote healthy eating on campus	-Important to develop nutrition education and wellness programs targeted to college students to help improve health behavior and slow the increased prevalence of obesity and T2DM. -Study showed that 50% of the men and 50% of the women always read nutrition labels, while 1 person reported never reading a nutrition label. -To understand content on nutrition posters, students in this study suggested that more nutrition education is necessary -Students in this study suggested various reasons behind the unhealthy eating pattern observed: lack of nutrition	This study was with university students -There are similar reasons for the unhealthy eating pattern observed in this study and with the UBC campus	Strength: -Detailed responses of the participants -Information is useful to help implement a nutrition program into this school Limitation: It is hard to take the voiced opinions of these students and make it suitable for the UBC campus -It was suggested to improve the school environment in order to help make healthier food chocies

		students were excluded from the study to help gain perspectives from other disciplines.		knowledge and awareness, lack of accessible nutrition labeling, and other barriers (i.e., healthy food accessibility, convenience, cost.) -Nutrition facts on food was seen an important factor for making informed choices; however, while with peers they won't interpret the "values"		
Buscher L, Martin K, & Crocker S. Point-of-purchase messages framed in terms of cost, convenience, taste, and energy improve healthful snack selection in a college foodservice setting. *Journal of the American Dietetic Association.* 2001; 101: 909– 913.	Quasi-experimental	-Potentially exposed to intervention: ~2,280 university students -72 students responded to the intercept survey.	-Point-of-Purchase messages were placed on a poster located at the cafeteria entrance, and two 4 signs placed next to the targeted food item. -Messages emphasized BEST: Budget-friendly, Energizing, Sensory/taste, Time efficient/convenient	In promoting consumption of healthy foods among university students, using the "BEST" properties in POP interventions may be beneficial. -Targeted foods should be priced comparably to less healthful foods -Intervention of these "BEST" messages had no effect on fruit basket and vegetable basket sales (P>.05); however whole fruit sales increased during the fruit basket intervention and follow-up (P<.05)		

American College Health Association. Reference group executive summary spring 2013. http://www.acha-ncha.org/docs/ACHA-NCHA-II_ReferenceGroup_ExecutiveSummary_Spring2013.pdf. Accessed March 8, 2014.	Survey (quantitative and cross-sectional)	Data gathered through the National College Health Assessment II for Spring 2013 (123 078 respondents from 153 different institutions)	N/A	-Only about 6% of students were consuming 5 or more servings of fruits and vegetables per day. -About 34% of students were considered overweight or obese. -In the past 12 months 3.3% of students had been diagnosed or treated for high blood pressure and 3.1% for high blood cholesterol. -In the past 12 months 15% of students surveyed responded that having a cold/flu/sore throat affected their academic performance in some way	-Recent data. Not from a Canadian population, but the US is thought to be most similar to Canada. -Large sample size and multiple institutions could balance out large discrepancies due to location. -Data is collected from a population that is similar age and educational status.	-these are American institutions. Post-secondary institutions in the states may not be generalizable to those in Canada.
Graham DJ, Laska MN. Nutrition label use partially mediates the relationship between attitude toward healthy eating and overall dietary quality among college students. *J Acad Nutr Diet*.	Cohort study	Using cross-sectional online survey data collected in 2010 from a convenience sample in Minneapolis/St Paul, MN (598 attending a 2-year community college; 603 attending a	χ^2 tests and linear regression were used to test associations of baseline characteristics with dietary change.	-Students who reported reading nutrition labels more frequently had significantly healthier dietary intakes than those who reported reading them only sometimes or rarely. Healthier dietary intake was defined as the consumption of less fast food and sugar and more	-Looked at college students that are in the same age range as UBC students.	-May not be able to generalize to UBC as the students surveyed came from a different country and university/college.

2012;112:414-418.		public 4-year university; mean age 21.5 years; 53.4% nonwhite; 52.5% women		fibre, fruits and vegetables. -Those who frequently look at labels had a significantly lower intake of added sugars and fast food and had a significantly higher intake of fibre, fruits and vegetables and vegetarian options compared to those who read labels only sometimes or rarely.		
Marquis M. Exploring convenience orientation as a food motivation for college students living in residence halls. *International Journal of Consumer Studies.* 2005;29:55-63.	Self-administered questionnaire	Students living in residence. 319 students filled out the survey	Method: Compared associations between convenience, time and energy. Also compared associations between food-related health behaviours, food choices and the quest for convenience.	-Convenience appears to be the most important food motivation followed by price, pleasure, health and concern about weight	Completed at a University of Montreal, Canada.	Self-selected sample is subject to bias.

Appendix E: CFIA Nutrition Labeling and Nutrient Content Claims

- Fat Claims:
    - Low in fat: The food contains:
        - (*a*) 3 g or less of fat per reference amount and serving of stated size and, if the reference amount is 30 g or 30 mL or less, per 50 g; or
        - (*b*) 3 g or less of fat per 100 g and 30% or less of the energy is from fat, if the food is a pre-packaged meal.
    - Lower in fat: (1) The food contains at least 25% less fat
- Vitamin and mineral claims:
    - "contain", source of, - food provides ≥5% of DRI
    - Good source of/high in = >15% of DRI (≥30% for vitamin C)
    - Excellent source/very high in = >25% of RDI

*Foods that are exempted from labeling include: fresh vegetables and fruits without added ingredients, raw meat and fish, baked goods that are individually wrapped and sold on-site, and food sold only in a retail establishment. Individual servings of foods that are sold for immediate consumption that are not packaged and pre-packaged individual portions of food that are solely intended for restaurant service are not required to be labeled. **Priority allergens are also not required to be listed on these foods.

* Additional claims can be found on the CFIA Website:

http://www.inspection.gc.ca/food/labelling/food-labelling-for-industry/nutrient-content/specific-claim-requirements/eng/1389907770176/1389907817577