

**The impact of adding front-of-package sodium content labels to grocery products:**

**an experimental study**

by

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## **AUTHOR'S DECLARATION**

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

## Abstract

A high sodium diet is a predominant risk factor for hypertension, which is in turn a major risk factor for cardiovascular disease. Canadians consume approximately twice the daily Adequate Intake of sodium, most of which comes from processed foods. Enhancing nutrition labelling for sodium in the form of front-of-package (FOP) labels may help consumers select healthier products. This experimental study examined the efficacy of 4 types of FOP nutrition labels on participant selection of low versus high sodium products. 430 adults from the Waterloo Region were randomly assigned to one of 5 experimental conditions: (1) a control condition with no FOP label; (2) a basic numeric FOP label; (3) a numeric FOP label with “high” and “low” sodium content descriptors; (4) a detailed Traffic Light (TL) label with colour coding, content descriptors and numeric information; and (5) a simple TL label that did not include numeric information. Participants were shown pairs of grocery products that varied primarily in sodium content, and asked to select a free product. Selection of the low versus high sodium product served as the primary behavioural outcome; rankings and ratings of the experimental labels were also examined. Regression models were used to determine the relative efficacy of the 4 labelling formats, as well as the socio-demographic and diet and health-related predictors of these outcomes. Results indicated that participants in the FOP conditions with “low” and “high” sodium content descriptors (conditions 3, 4 and 5) were significantly more likely to choose the low sodium product compared to the control group. The detailed TL was ranked as the most effective at helping participants select low sodium products; this label was also rated significantly higher than other formats in liking, understanding and believability. Product selection did not differ significantly across socio-demographic groups, suggesting that FOP labelling might reduce the disparity in the use and understanding of nutrition labels among groups of varying socioeconomic status. This study has important policy implications. Results suggest that FOP labels should include content descriptors, which add prescriptive value and may help consumers select healthier products by improving understanding. TL labels, which incorporate content descriptors and colour coding, are recommended for future FOP labelling initiatives.

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## 1.0 INTRODUCTION AND OVERVIEW

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A high sodium diet is a primary risk factor for hypertension, raised blood pressure and cardiovascular disease.<sup>1</sup> According to the Institute of Medicine, teens and adults require about 1500mg sodium per day for optimal health.<sup>2</sup> However, Canadians consume more than twice this amount (about 3100 mg excluding added salt) on an average daily basis.<sup>3</sup> This high sodium intake is largely due to the high levels of sodium present in our food supply<sup>4</sup> and food consumed outside the home.<sup>3</sup> Many prepared or pre-packaged food products on the Canadian market contain more sodium per serving than an adult requires in an entire day. Given that cardiovascular disease accounts for the death of more Canadians annually than any other disease,<sup>11</sup> high sodium diets represent a major public health challenge.

Nutrition labelling has emerged as an important tool with which to communicate dietary information to consumers. International evidence suggests that adding front-of-package (FOP) nutrition labels to pre-packaged products may be more effective at helping consumers make a healthy choice than the Nutrition Facts table or other back-of-package nutrition labels alone.<sup>5,6,7</sup> In fact, this strategy has been used as an effective component of sodium reduction campaigns in other nations.<sup>8</sup>

Although there are regulations surrounding the Nutrition Facts table and health claims on Canadian food products, FOP nutrition labels are currently unregulated.<sup>9</sup> A range of FOP health logos currently appear on the Canadian market, making the selection of “healthy” products somewhat confusing for consumers. Indeed, a desire for clear and accessible nutrition labels has been expressed in qualitative research studies.<sup>9</sup> Studies examining the effectiveness of various FOP labelling formats have been conducted in other nations – especially the UK. However, little research on this topic has been conducted in Canada.

## 2.0 LITERATURE REVIEW

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### 2.1 Cardiovascular Disease & Hypertension

Cardiovascular disease (CVD) is the leading global cause of death and disability<sup>1</sup>, accounting for about 7.6 million annual deaths worldwide<sup>10</sup>. In Canada, cardiovascular disease (including heart disease, diseases of the blood vessels, and stroke) accounts for the death of more Canadians than any other disease. In fact, according to Statistics Canada (2005), over 71,000 deaths – or 31% of all deaths in Canada, were due to cardiovascular disease.<sup>11</sup> According to a report by the steering committee of the Canadian Heart Health Strategy, heart disease and stroke costs the Canadian economy more than \$22.2 billion each year in physician services, hospital costs, lost wages and decreased productivity.<sup>12</sup> Estimated projections suggest that this cost may reach \$28.3 billion by 2020.<sup>13</sup>

Hypertension is the leading risk factor for cardiovascular disease,<sup>1,14</sup> and has been estimated to account for 62% of strokes and 49% of coronary heart disease.<sup>1</sup> Hypertension is defined as systolic blood pressure above 140 mm Hg and/or diastolic blood pressure above 90 mm Hg (or above 130/80 mm Hg in individuals with diabetes or chronic kidney disease).<sup>15</sup> According to the 2007-2009 Canadian Health Measures Survey, approximately 65% of Canadians aged 40-79 have been diagnosed with hypertension or are currently taking hypertension medication.<sup>16</sup> Two recent population studies also suggest that in Ontario, over 50% of adults aged 60-79<sup>17</sup>, and 21-24% of the adult population has hypertension.<sup>17,18</sup> There has been a dramatic increase in hypertension in recent years: the prevalence of hypertension in Ontario increased by 60% between 1995 and 2005.<sup>18</sup> It has been estimated that by 2025, the prevalence of hypertension worldwide will increase by 24% in developed countries and 80% in developing nations.<sup>19</sup>

### 2.2 Sodium, Blood Pressure, and Cardiovascular Disease

There is a growing body of evidence indicating that high consumption of sodium is one of the predominant factors leading to raised blood pressure (BP), hypertension and CVD.<sup>1</sup> A recent meta-analysis of 13 prospective cohort studies indicated that a higher salt intake was associated with a

significantly higher risk of stroke and total cardiovascular disease.<sup>20</sup> The evidence linking high salt intake and raised blood pressure has been demonstrated by randomized trials, as well as in animal, human genetic, epidemiological, migration, population-based intervention and prospective cohort studies.<sup>8</sup>

Contrary to common belief, the risk of developing high blood pressure is not limited to older adults or those with risk factors for CVD. Studies suggest that a diet high in sodium has adverse effects for infants, children, teens, adults and elderly individuals.<sup>8</sup> A double-blind study conducted in the 1980s among Dutch newborns systematically decreased salt intake in the intervention group by 30% for the first six months of life. Results indicated that compared to the control group, the reduced-salt infants had lower systolic blood pressure both at 6 months<sup>21</sup> and at a 15-year follow-up.<sup>22</sup> A recent meta-analysis of ten salt reduction trials showed that a modest reduction in salt intake significantly reduced blood pressure among children and adolescents.<sup>23</sup> Among older individuals, reductions in salt consumption are associated with even more marked decreases in BP.<sup>24,25</sup> Evidence suggests that the effect of reducing salt intake on BP increases with age.<sup>26</sup> Finally, a positive association has been demonstrated between BP levels in childhood and adulthood.<sup>27</sup> This finding highlights the importance of reducing salt intake at a population level, so that infants and children are targeted as well as adults.

### **2.3 Other Health Consequences of a High Sodium Diet**

A high sodium diet has been linked to a variety of other health problems, including vascular and cardiac damage, kidney disease, renal stones, osteoporosis, gastric cancer and increased severity of asthma symptoms.<sup>8,10</sup> Furthermore, it has been suggested that a high sodium diet may be an indirect cause of obesity through its effects on increased soft drink consumption.<sup>28</sup>

### **2.4 Recommendations for Sodium Consumption**

#### **2.4.1 North American Guidelines**

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The United States Institute of Medicine (IOM) was commissioned by the governments of USA and Canada to establish recommended daily intakes for sodium. Typically, an Estimated Average Requirement (EAR) is set for individual nutrients, which is a level that meets the needs of a specified indicator of adequacy for half the members of an age-sex group. In turn, the EAR can be used to set a Recommended Dietary Allowance (RDA); an intake level that meets or exceeds the requirements of nearly all healthy individuals. However, the IOM was unable to establish an EAR for sodium, as the required dose-response data for an indicator of adequacy were unavailable. Using the minimum intake for sodium would have led to a very low RDA for sodium, which was a concern. Instead, the IOM established an Adequate Intake (AI), which represents an intake thought to meet or exceed the needs of almost all healthy individuals, but cannot be used to assess inadequacy. The AI was set at 1500 mg per day for teens and young adults aged 9-50 years. These recommendations are lower for infants (AI = 120 and 370 mg for infants 0-6 and 7-12 months, respectively), children (AI = 1000 and 1200 mg for children aged 1-3 and 4-8 years), and older adults (AI=1200 and 1300mg for adults aged 51-70 and above 70 years). In addition, the IOM established a Tolerable Upper Intake Level (UL); the highest daily intake thought to pose no risk of adverse health effects to almost all individuals in the general population. The UL for sodium was set at 2300 mg per day for teens and adults. In children, the UL is 1500 and 1900 mg for children ages 1-3 and 4-8 years, respectively.<sup>2</sup>

## **2.4.2 International Guidelines**

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In the European Union, the Guideline Daily Amount (GDA) is set at 6g of salt per day (equivalent to 2400mg sodium) for most adults. The level for children 5-10 years is 4g of salt (1600mg sodium).<sup>29</sup> The WHO has set a worldwide target of less than 5g of salt (2000mg sodium) per day.<sup>30</sup>

## **2.5 Salt: Consumption and Presence in Food Supply**

### **2.5.1 Canadian Consumption**

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Canadians of all ages consume far too much sodium. According to the 2004 Canadian Community Health Survey (CCHS), Canadians consume about 3100mg sodium per day on average, excluding salt added at the table or during cooking. Including added salt, Canadians are thus estimated to consume about 3400mg sodium daily. This is more than double the adequate intake level of 1200-1500mg recommended by the IOM. Most alarming is the large proportion of Canadians who regularly exceed the upper limit for sodium consumption: among adults aged 19 to 70, over 85% of men and 60% of women had sodium intakes exceeding the upper limit. Males consume the most sodium overall: 97% of males aged 9-18 and 90% of men above 19 years exceeded the UL for sodium consumption. In comparison, 82% of female youth aged 9-18 and 66% of women above 19 years exceeded the UL for sodium. It is also disconcerting to note that 77% of toddlers (aged 1-3) and 93% of children aged 4-8 exceeded the upper limits established for their age categories.<sup>3</sup>

### **2.5.2 International Consumption**

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The average salt consumption in most countries ranges from 9-12g per day (equivalent to 3600mg-4800mg sodium), with average intakes of more than 12g per day in many Asian countries.<sup>8</sup> In the USA, average sodium consumption is about 3400mg per day, greatly exceeding the tolerable upper limit of 2300mg set by the IOM.<sup>31</sup> Average salt consumption in the UK is similar that of the USA, at 8.6g per day (3440 mg sodium) in 2008.<sup>32</sup>

### **2.5.3 Presence in Food Supply**

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In North America, most sodium is consumed in the form of sodium chloride, also known as “table salt”. Salt is composed of about 40% sodium and 60% chloride; 1g of salt is therefore equivalent to approximately 0.4g (400mg) sodium. Sodium is present in high quantities in our food supply. In North American and Europe, it has been estimated that 75%-80% of dietary sodium is added during food processing.<sup>4,33</sup> In comparison, 10-12% is naturally present in food and another 10-12% is added during cooking or at the table.<sup>4</sup> According to analyses of the 2004 CCHS data, 19% of the total Canadian sodium

intake came from a single food category including pizza, sandwiches, submarines, hamburgers and hotdogs.<sup>34</sup> It is important to note that, while some foods are quite high in sodium (e.g. processed meats, pickles, soups, sauces), they are consumed in smaller quantities than other foods that are lower in sodium but are consumed in large amounts, such as bread products. Indeed, when broken down into separate food categories, the primary contributor of sodium in Canada was bread (13.9%).<sup>35</sup> Many Canadian brands contain moderate to high amounts of sodium. For example, two slices of *Dempster's* 100% Whole Wheat Bread or one 100% Whole Wheat Bagel both contain 350mg sodium,<sup>36</sup> and one *Selections* (Metro store brand) Sun-Dried Tomato Tortilla contains 500mg. This is problematic since research suggests that consumers tend to perceive foods that are visibly or topically salted (e.g. potato chips, French fries) as being higher in sodium than many foods with hidden salt, such as a plain bagel.<sup>37</sup> Consumers may therefore not be aware of the high sodium content in many foods they consume on a regular basis.

According to the CCHS data, the next highest contributors to Canadian sodium intake were processed meats (8.9%), soups (7.4%), tomatoes and vegetable juice (7.6%), pasta dishes (5.7%), and cheese (5.4%).<sup>35</sup> In addition, although the CCHS salt consumption data do not include salt added at the table or during cooking, it is interesting to note that individuals with the highest levels of sodium consumption were also much more likely to report adding salt at the table “very often”. These individuals consumed an average of 3,396 mg sodium per day (excluding added salt), whereas those who reported “never” adding salt at the table consumed an average of 2,927mg per day.<sup>34</sup>

The fact that such a large proportion of sodium consumption comes from foods such as pizza, submarines, and hamburgers reflects the large proportion of Canadians who regularly eat outside the home at fast-food venues and restaurants. In fact, according to the 2004 CCHS data, 16% of foods consumed daily are eaten at food services establishments, and this food provides 18% of the average daily sodium intake.<sup>3</sup> A recent nationwide study also found that over half of Canadians eat at least one meal prepared out of the home each day, while young Canadians and youth are the most likely to eat out or order take-out at least twice per week.<sup>38</sup> This is problematic given the alarming amounts of sodium in

meals offered at many Canadian restaurants and fast-food venues. For example, a serving of Boston Pizza's Jambalaya Fettuccini contains 3,270mg sodium, Kelsey's Barbecue Chicken Pizza contains 3800mg<sup>39</sup> and Milestones Shanghai Noodle Stirfry contains 4380mg.<sup>40</sup> The first two meals contain more than double the adult adequate daily intake (AI) of sodium and the latter contains close to twice the tolerable upper limit (UL) considered safe by the IOM. Even at Tim Hortons, a leading Canadian fast-food chain that prides itself in offering "a variety of nutritious and great tasting food choices",<sup>41</sup> there are few low sodium options. A bowl of Tim Hortons' chilli contains 1320mg sodium; adding a Wheat 'n Honey Bagel (600mg) to that meal means the consumer has surpassed their adequate intake of sodium for the entire day.<sup>42</sup> Unfortunately, many consumers vastly underestimate the amount of sodium in fast food meals. A recent study by Bates and colleagues (2011) examined consumer estimates of calories, fat and sodium in meals purchased at an American mall food court. They found that 93% of consumers underestimated the amount of sodium in their meals, with an average underestimate of 945mg per meal.<sup>43</sup>

Sodium levels in Canadian pre-packaged foods are often much higher than those of other countries. Indeed, a recent international analysis conducted by the World Action on Salt and Health (WASH) found that sodium levels in many pre-packaged Canadian food products were higher than the same products in other countries. For example, a 100g serving of *Kellogg's Special K* cereal contains 931mg of sodium in Canada, compared to 400mg in Turkey.<sup>44</sup> Furthermore, a recent study analyzing baby and toddler foods in Canada found that over 12% of these products contained either moderate or high levels of sodium.<sup>45</sup> Given the demonstrated correlation between BP levels in childhood and adulthood,<sup>27</sup> this issue represents a considerable public health concern.

## **2.6 Benefits of Decreased Sodium Consumption**

Several studies have demonstrated that reducing sodium intake at the population level would be greatly advantageous to public health, both in terms of health dollars and lives saved.

### **2.6.1 Health Benefits**

A recent Canadian study estimated that reducing Canadian sodium intakes by 1840mg per day (a reduction of more than 50%) would prevent up to 11,550 cardiovascular events per year, or 8.6% of total cardiovascular events. Of course, the number of CVD events prevented depends on the degree of reduction: a decrease of 2400mg sodium per day would result in the prevention of 16,775 annual CVD events, while a more modest reduction of 1200mg per day would still prevent 8,314 CVD events per year.<sup>46</sup> Another study analyzed the effectiveness of interventions to lower BP and cholesterol. The researchers demonstrated that population-level interventions that included government legislations to reduce the salt levels of processed foods could avert over 21 million disability-adjusted life years annually worldwide.<sup>47</sup> Finally, a study by Asaria and colleagues (2007) examined salt consumption in 23 low- and middle-income countries. The study demonstrated that a 15% reduction in average population salt intake over 10 years could avert 8.5 million CVD deaths, at a cost of US \$0.09 per person per year. In comparison, it was estimated that a higher (20%) reduction in smoking prevalence could avert fewer (3.1 million) CVD deaths, for a higher cost of \$0.26 per person per year. It seems that population-wide salt reduction programs could be equally or much more effective than tobacco control programs at reducing international rates of cardiovascular disease.<sup>48</sup>

### **2.6.2 Cost Benefits**

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According to a Canadian study, a decrease in the average sodium intake of about 1800mg per day would prevent 23,500 cardiovascular disease events per year, resulting in a savings of \$1.38 billion per year in direct health care costs, or \$2.99 billion per year including indirect costs.<sup>46</sup> A recent American study estimates that a reduction in American sodium consumption to 1500mg per day would result in US\$26.2 billion in health care savings and a 25.6% overall decrease in high BP.<sup>49</sup>

### **2.7 Population Level Interventions**

Based on the health and cost benefits described above, population-level interventions will be required to reduce the health and economic burden of hypertension and cardiovascular disease in North America.



### 2.7.1 What is a Population Health Intervention?

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As described by Hawe and Potvin (2009), “population-level health interventions are policies or programs that shift the distribution of health risk by addressing the underlying social, economic and environmental conditions.”<sup>50</sup> Rose (2001) describes the population approach as “an attempt to control the determinants of incidence, to lower the mean level of risk factors, to shift the whole distribution of exposure in a favourable direction” (p. 431).<sup>51</sup> Traditionally, medicine has followed a high-risk (clinical) approach, in which research and funding is focused on high-risk subgroups; such as targeting those with risk factors for hypertension in order to reduce rates of cardiovascular disease. As noted by Rose, although the high-risk approach has its advantages, it is also has several drawbacks. The high-risk approach is limited due to the unreliability of screening procedures, and it is in many ways a temporary solution since it does not address the root of the problem. In contrast, a population approach is more extreme and has large potential for the population as a whole.<sup>51</sup> As explained by Rose, “a large number of people at a small risk may give rise to more cases of disease than the small number at high risk” (p. 431).<sup>51</sup> Given the high prevalence of hypertension and high BP in North America, this observation is highly relevant. An American study found that a daily reduction of 3g salt (1200mg sodium) would have about the same effect on rates of coronary heart disease as the use of statins to treat those at low or intermediate risk of coronary heart disease.<sup>52</sup> As similar reductions could be expected in Canada, it seems that a sodium reduction strategy would be more cost-effective than the use of medication to lower BP in all hypertensive patients. It is also estimated that a successful nationwide salt reduction program would reduce the number of patients still requiring hypertension medication by 16-24% for women and by 22-34% for men.<sup>52</sup> A well-designed population intervention thus has the potential to benefit the population as a whole and save the Canadian economy billions of dollars in health care costs related to the treatment of cardiovascular disease.<sup>12</sup>

### 2.7.2 Need for Population Interventions

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National and international agencies have also highlighted the need for population level interventions to reduce salt consumption. In April 2010, the IOM released a report outlining strategies to reduce sodium intake in the US. According to the report, “The Secretary of Health and Human Services should act in cooperation with other government and non-government groups to design and implement a nationwide campaign to reduce sodium intake and should set a timeline for achieving the sodium intake levels established by the Dietary Guidelines for Americans” (p. 3). The report stressed the need for nationwide interventions to reduce the burden of dietary sodium-related health costs in the US. The IOM recommends setting mandatory national standards for the sodium content of foods, and modifying the Generally Recognized as Safe (GRAS) status of sodium chloride in order to gradually reduce the salt content in the food supply.<sup>53</sup> Similarly, a World Health Organization (WHO) report entitled “Reducing Salt Intake in Populations” (2006) indicated that population-wide reductions in dietary sodium consumption are highly cost-effective, and highlighted the need to give priority to the implementation of national strategies, policies and programs aiming to reduce dietary salt consumption.<sup>54</sup> Finally, in July 2010, Health Canada released a Sodium Reduction Strategy for Canada, which recommends collaboration across all levels of government, health professional organizations, non-governmental organizations, media, industry and academia in order to reach specific sodium reduction goals.<sup>55</sup>

## **2.8 Successful Sodium Reduction Programs**

Studies have demonstrated that population-based efforts to reduce sodium consumption can have considerable positive effects on the health of a nation, especially when these efforts involve policy regulations. Two countries that have been particularly successful at reducing nationwide sodium consumption are the United Kingdom and Finland.

### **2.8.1 United Kingdom**

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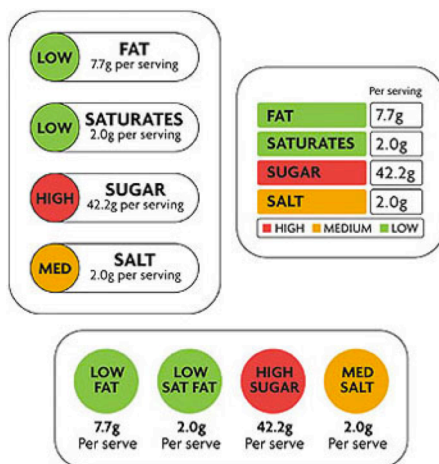
The United Kingdom is an excellent example of a nation that has been successful at reducing nationwide salt intake. In 1994, the Committee on Medical Aspects of Food and Nutrition Policy recommended that

salt intake be reduced to less than 6g per day. Following government rejection of this recommendation, an action group known as Consensus Action on Salt and Health (CASH) was established in 1996. The group, comprised of 22 experts on salt and BP, initiated a public health campaign aimed at increasing public awareness regarding the dangers of excess salt consumption, reducing the amount of salt added to foods and informing public health policy. As a result, the chief medical officer of the UK Department of Health eventually endorsed the recommendation to reduce salt intake to less than 6 g per day for adults. Following this decision, a nationwide salt reduction strategy was developed in order



**Figure 1: Sid the Slug – UK Salt Reduction Strategy**  
**Source: Food Standards Agency**

to reduce salt intake to this level by 2012. As it was estimated that 80% of salt intake in the UK was added by the food industry, the Food Standards Agency (FSA) set target amounts of salt for each food category that the food industry needed to achieve within a certain time frame. The goal was to reduce salt added to processed foods by 10 to 20% at repeated intervals of 1 to 2 years. The UK salt reduction strategy, which started in 2003/2004, was a fairly comprehensive program which included collaboration with the food industry, a mass media campaign involving public education and a mascot named “Sid the Slug” which appeared in a series of TV, print advertisements and posters (see Figure 1). The mascot represented the idea that salt kills slugs, and is harmful to humans as well.<sup>56</sup>



**Figure 2: Traffic Light labelling**

The use of clear, accessible nutritional labelling to indicate the salt content of food products was also key to the strategy.<sup>8</sup> A front-of-package (FOP) labelling system known as the Traffic Light (TL) system was developed by the Food Standards Agency and voluntarily adopted by many major food manufacturers across the UK, including Sainsbury’s, Waitrose,

Boots, and Marks and Spencer. The TL label lists total fat, saturated fat, sugar, and salt using a colour-coded system in which red, amber and green “lights” represent high, medium and low levels of each nutrient, respectively (see Figure 2). In combination with the mass media campaign and voluntary reductions by the food industry, the use of this labelling system in the UK has resulted in a modest decrease in sodium consumption from 9.5 g (3800 mg) to 8.6 g (3440 mg) per day from 2004 to 2008.<sup>8,10</sup>

### 2.8.2 Finland

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In Finland, a population-based sodium reduction strategy was initiated in the 1970s. The strategy involved intervention at various levels, including policy regulations, public education through the media, and collaboration with the food industry. Since program initiation, Finland has seen a 40% decrease in national sodium consumption, a decrease of over 10 mm Hg in BP, a 70% reduction in deaths related to stroke and coronary artery disease,<sup>10</sup> and a 5-6 year increase in life expectancy.<sup>57</sup>

Not unlike the UK, policies surrounding food labelling have played a key role in the success of this program. Since 1993, Finnish labelling regulations have required food manufacturers to include a “high salt content” warning on products that are considered high in salt. A “high salt content” label is required if the salt (NaCl) content is higher than 1.3% in bread, 1.8% in sausages, 1.4% in cheese, 2.0% in butter, and 1.7% in breakfast cereals or crisp bread. As a result of this policy, the average salt content has been reduced by approximately 20% in breads and 10% in sausages.<sup>57</sup> Many companies have chosen to reduce the amount of sodium in their products by substituting conventional table salt with a sodium-reduced, magnesium and potassium-enriched alternative called “Pansalt”.<sup>1</sup> In order to encourage voluntary salt reductions by manufacturers, the legislation also permits companies to place a “low salt” label on foods that are considered low in sodium. A “low salt” label is permitted if the NaCl content is no more than 0.7% in breads, 1.2% in sausages, 0.7% in cheese, 1.0% in fish products, breakfast cereals or butter, 0.5% in soups, sauces and ready-made dishes, and 1.2% in crisp bread. Unfortunately, this approach has been

less widely adopted by manufacturers, as many consumers continue to associate “low salt” with a lack of taste.<sup>57</sup>

Use of the “Pansalt” logo has emerged as an effective marketing technique for the promotion of low sodium products. Many companies, including McDonald’s, have placed this logo on products that contain Pansalt as a sodium substitute. As a result, consumers have come to associate this logo with products that represent a lower sodium choice without compromising taste. In addition, the Finnish Heart Association introduced the “Better Choice” label in January 2000; companies may purchase the right to display this label if their products meet certain standards. These requirements include a lower sodium content and improved fat composition compared with average market products of the same type. Many of the healthier options on the Finnish market display both the “Pansalt” and the “Better Choice” labels.<sup>57</sup>

## **2.9 Sodium: The Canadian Context**

In Canada, sodium has not received the same level of attention as it has in nations such as Finland or the UK. In comparison to other nutrients that are often conceived as “negative” or “unhealthy” such as saturated fat, sugar, and cholesterol, sodium has traditionally been placed on the back burner in terms of primary health concerns. A 2008 report issued for Health Canada found that Canadians who generally use nutrition labels when grocery shopping tend to look primarily at total fat content, calories, or sugar content. Sodium content was mentioned by 29% of respondents, but only as a secondary concern.<sup>59</sup>

Despite this lack of attention, concerns about sodium are slowly on the rise in Canada. A recent national study entitled “Tracking Nutrition Trends” (TNT) asked Canadians how often they selected food products based on the content of specific nutrients. The survey found that the number of Canadians who “sometimes” or “often” chose foods based on sodium content increased significantly from 2004 to 2008. Notably, sodium was one of only two nutrients (sodium and trans fat) to increase significantly over this time period.<sup>58</sup> Similarly, research conducted by the Public Health Agency of Canada reported that while 89% of respondents thought that others were consuming too much sodium, only 41% thought they were

personally consuming too much.<sup>59</sup> In 2008, the TNT survey found that only 12% of Canadians had made efforts to reduce their salt intake in the past year.<sup>38</sup> It seems that Canadian consumers see sodium as “everyone else’s problem” and not their own.

### **2.9.1 Sodium Working Group**

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The Sodium Working Group (SWG) was established in 2007 with a mandate to create guidelines that would help Canadians reduce their sodium intake. The SWG is chaired by Health Canada and consists of representatives from food manufacturers and food service industry groups, health-focused non-governmental organizations, the scientific community, consumer advocacy groups, health professional organizations and government representatives.<sup>60</sup> In July 2010, the working group released its Sodium Reduction Strategy, with a primary goal of reducing average nationwide sodium intake to 2300mg per day by 2016. The ultimate goal is to lower the population average sodium intake so that 95% of Canadians have a daily intake below the Tolerable Upper Intake Level (UL) of 2300mg; this would ultimately involve shifting the mean population intake much closer to the AI of 1500mg per day.<sup>55</sup> The report features 27 recommendations in four broad areas: (1) food supply, (2) awareness and education, (3) research, and (4) monitoring and evaluation. These recommendations include working with the food and restaurant industries to develop voluntary sodium reduction targets, amending nutrition labels, developing education programs and social marketing campaigns geared towards sodium reduction, encouraging sodium-related scientific research, and creating a sodium monitoring and evaluation plan in which Canadian sodium intake and long-term health outcomes of sodium-related diseases are monitored at regular intervals.<sup>55</sup> Unfortunately, the SWG was disbanded in early February 2011,<sup>61</sup> which will likely slow further progress on this front.

### **2.10 Nutritional Labelling**

Nutrition labels on pre-packaged food products have emerged as important policy tools for educating consumers and promoting a healthy diet.<sup>62</sup> Nutrition labels have the potential to help consumers make

healthier, more informed dietary choices. A recent systematic review on nutrition labelling found that individuals who read nutrition labels are more likely to have a healthier diet than those who do not, and are more likely to eat healthier alternatives of a variety of foods, have reduced sodium, cholesterol and calorie intake, as well as increased fibre, iron and vitamin C intake.<sup>63</sup> In nations with mandatory labelling regulations (such as Canada and the USA), labels represent a source of nutrition information that is accessible to all consumers. Cost-benefit analyses conducted in Canada, the USA, Australia and New Zealand have indicated that mandatory nutrition labelling is highly cost-effective. In fact, Health Canada estimated that nutrition labels could save \$5,300 million in 20 years in direct and indirect health-care costs.<sup>64</sup> As such, nutrition labels are unique among educational interventions for their cost-effectiveness, broad reach and frequency of exposure.

Nutrition labelling regulations have also been linked to improvements in the nutritional content of foods by manufacturers. Indeed, research shows that the trans fat content of pre-packaged products in Canada decreased following the addition of trans fat to the mandatory list of nutrient information disclosed on product labels in 2005.<sup>65</sup> Labelling has also helped in the battle against salt; the high salt content label lead Finnish manufacturers to lower the sodium content of their products<sup>57</sup> and the National Heart Foundation of New Zealand's "Pick the Tick" program resulted in an exclusion of approximately 33 tonnes of salt from food products through the reformulation of 23 breads, breakfast cereals, and margarine.<sup>66</sup>

### **2.10.1 Use of Nutrition Labels**

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A recent longitudinal study examining nutrition trends in Canada found that nutrition labels were consistently cited as the primary source of nutrition information for Canadians, and that the frequency of reading nutrition labels increased over the study period, from 2004 to 2008.<sup>58</sup> A post-campaign evaluation of Health Canada's Healthy Eating campaign in 2008 found that 72% of Canadians and 77% of parents with children age 2-12 usually look at nutrition information on food packages when grocery shopping.<sup>67</sup>

Additionally, more than four in ten Canadians (44%) “always” or “almost always” refer to the Nutrition Facts table when purchasing food products.<sup>58</sup>

In terms of the information sought from nutrition labels, a systematic review concluded that consumers tend to look more at nutrients they wish to avoid in their diet and are most interested in limiting nutrients such as fat, carbohydrates and sodium. The label components most commonly looked at were: fat, calorie content, protein, cholesterol, carbohydrates, vitamins and minerals, types of fat, serving size, additives, and sodium information.<sup>63</sup>

Use of food product labels as a source of nutritional information has been shown to vary according to socio-demographic and individual-level factors. Research findings indicate that product labels are a prominent source of nutrition information for individuals pursuing a healthy diet,<sup>58,68,69</sup> females,<sup>70,71,73</sup> those with higher levels of education and income,<sup>58,72,73,74,75</sup> greater nutritional knowledge<sup>70,73,76</sup> and healthier eating habits.<sup>77,78,79</sup> In general, label use also appears to be higher among older adults,<sup>58</sup> who may have a greater interest in nutrition information due to increased health concerns.<sup>68</sup> Unsurprisingly, label use is often higher among those with a chronic health condition such as diabetes.<sup>80</sup> On a related note, gender, socio-economic status,<sup>81,82</sup> ethnicity, and perceptions of economic barriers and nutritional benefits of food<sup>82</sup> have been demonstrated to influence dietary intake of certain nutrients,<sup>81,82</sup> including sodium consumption.<sup>82</sup> Further, nutritional knowledge and dietary beliefs have been demonstrated to modify the effects of the association between socio-economic status and diet quality.<sup>83</sup> A recent study examining nutritional knowledge and use and understanding of nutrition labels found that younger individuals and those in higher social grades displayed greater understanding of nutrition information on food labels. In general, this effect was largely related to levels of nutrition knowledge. The study also found that women, older adults, and those with higher SES tended to be most interested in healthy eating. However, this effect was completely mediated by interest in healthy eating. Thus, it may be important to examine both concern with healthy eating and nutrition knowledge when examining use and understanding of nutrition labels.<sup>84</sup>



## 2.11 Nutrition Labelling in Canada

In Canada, nutrition labelling on prepackaged products became mandatory in December 2005 for most manufacturers, with an implementation date of December 2007 for smaller manufacturers. Current legislations require all prepackaged food products to display the Nutrition Facts table, which lists the number of calories and amounts of 13 nutrients contained in one serving of the product.<sup>85</sup> This label is usually located on the side or back of the package, making it necessary for consumers to actively seek out nutrient information (including sodium content) when choosing a grocery product.

### 2.11.1 Limits of Back-of-Package Labelling

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Although nutrition labels were implemented in order to help consumers make healthier choices, international research indicates that back-of-package nutrition labels confuse many consumers.<sup>5,62,63,86,87,88,89,90,91</sup> In particular, older adults, those with lower levels of education and income tend to have difficulty understanding nutrition labels. Consumers may also have trouble converting information from ‘g per 100g’ to ‘g per serving’ and interpreting serving sizes.<sup>62</sup> According to a recent systematic review of nutrition labelling studies, difficulties performing calculations often arose when calculations involved reference values such as the Recommended Daily Amount, Percent Daily Value or other forms of reference information. Consumers also had difficulty with product comparisons and determining the number of calories per serving or per package.<sup>63</sup> In North America, reported issues with the Nutrition Facts panel include calculations involving the percent daily value or the nutritional content of various serving sizes,<sup>92,93</sup> as well as confusion regarding the content amounts listed next to vitamins and minerals, and the fact that the break-down listed under carbohydrates and fats does not always sum to the total for these nutrients.<sup>97</sup>

### 2.11.2 Explicit Health Claims

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In Canada, “explicit” health claims are regulated by the Canadian Food Inspection Agency (CFIA) and may fall under one of four categories: (1) disease risk reduction claims, (2) function claims, (3) nutrient

function claims (a subset of general function claims), or (4) general health claims. Detailed information about diet-related health claims in Canada can be found in Chapter 8 of the CFIA website.<sup>94</sup> Currently, the following disease-risk reduction claims regarding the link between sodium, potassium and high blood pressure are permitted in Canada:<sup>94</sup>

- 1) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is sodium-free."
- 2) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is low in sodium."
- 3) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is a good source of potassium and is sodium-free."
- 4) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is a good source of potassium and is low in sodium."
- 5) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is high in potassium and is sodium-free."
- 6) "A healthy diet containing foods high in potassium and low in sodium may reduce the risk of high blood pressure, a risk factor for stroke and heart disease. (Naming the food) is high in potassium and is low in sodium."

In order to display one of the aforementioned health claims regarding sodium, potassium and reduced risk of high blood pressure, the product must be: low in (or free of) sodium, low in saturated fatty acids, limited in alcohol, have more than 40 calories if the food is not a vegetable or a fruit, have a minimum amount of at least one vitamin or mineral, and may also be high in potassium.<sup>95</sup>

Although nutrient content claims are regulated by the CFIA,<sup>96</sup> they may not be fully understood or trusted by consumers. According to a qualitative study on use and understanding of nutrition labelling in Canada, many consumers did not know that health claims are regulated by Health Canada, and therefore did not fully trust them.<sup>97</sup> In addition, shoppers may not realize that there are different requirements for sodium content claims depending on whether a manufacturer wishes to designate their product as "sodium free" (less than 5 mg per serving), "low in sodium" (140 mg or less per serving), "reduced sodium" or "lower in sodium" (25% less sodium than the original product or a similar reference food), "lightly salted" (at

least 50% less sodium added than a similar reference food), or as a product with “no added sodium or salt” (no added salt, other sodium salts or ingredients that contain sodium that functionally substitute for added salt).<sup>96</sup> With the exception of “25% less sodium,” these reference amounts are rarely stated as part of the health claim on food packages. Labelling the sodium content on the front of a food product may provide consumers with quick access to the information required to make a healthy selection.

### 2.11.3 Unregulated “Health Claims”

In addition to the explicit health claims described above, other types of health logos and symbols that appear on the front of Canadian food packages are not government-regulated.<sup>9</sup> These labels, which are referred to as “implicit health claims” by Health Canada, are typically used by food companies to designate products that represent a “healthier choice”. Examples include *President’s Choice* “Blue Menu” products, *Kraft Canada’s* “Sensible

Solution” logo and the Heart and Stroke Foundation “Health Check” program (see Figure 3).

Although the Food and Drug Regulations (FDR) regulate all foods in Canada, there are currently

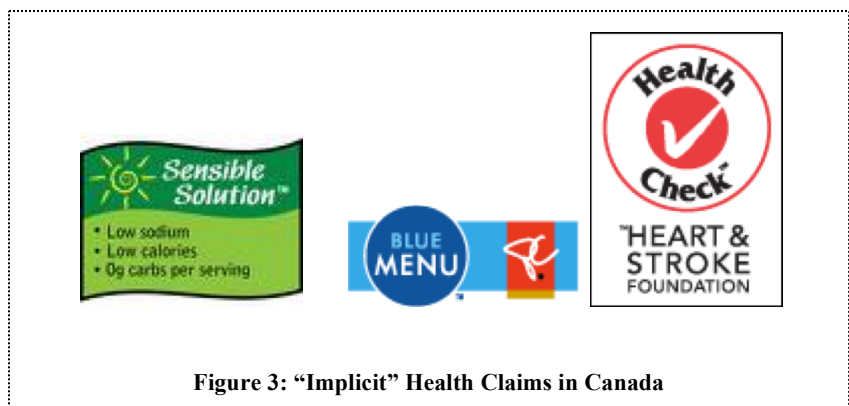


Figure 3: “Implicit” Health Claims in Canada

no set criteria to determine which foods may carry health claims<sup>98</sup> and no specific regulations regarding the use of implicit health claims.<sup>9</sup> The Health Check symbol, which can be found on over 1,700 foods in Canada, is self-regulated by the Heart and Stroke Foundation. Every product displaying the logo must meet specific nutrient standards based on Canada’s Food Guide, which are evaluated by a team of registered dietitians on the basis of total fat, saturated fat, trans fat, fibre, calcium, sugar, vitamins, minerals and sodium.<sup>99</sup> Despite this, qualitative research suggests that there is some level of distrust in this logo due to the fact that manufacturers must pay for its use.<sup>97</sup> In addition, while most Anglophone consumers were familiar with the logo, some consumers in Montreal were under the impression that the

Health Check symbol was the Health Canada “seal of approval”, rather than that of the Heart and Stroke Foundation.<sup>97</sup>

Due to the absence of government regulation, health claim symbols may also appear on products that are hardly considered healthy. For instance, *PepsiCo*’s Smart Spot logo appears on various snack foods and soft drinks sold throughout Canada, including Diet Pepsi, Gatorade, and Baked Doritos Nacho Cheese tortilla chips (see Figure 5).<sup>100</sup> Similarly, in 2009, the FDA reevaluated the Smart Choices Program (see Figure 4) as a FOP labelling system after it was criticized for appearing on unhealthy food products such



Figure 5: PepsiCo Smart Spot

as sugary breakfast cereals including Fruit Loops and Cocoa Puffs.<sup>101</sup> The lack of standardization surrounding implicit FOP health claims may confuse consumers and lead to distrust or lower perceived credibility of more strictly managed systems such as the Health Check program. This is especially true if the food product displaying the logo has negative attributes that are inconsistent with national dietary guidelines (i.e. Canada’s Food Guide).<sup>98</sup>



Figure 4: Smart Choices Logo

This lack of standardization represents a further problem when it comes to promoting a reduced sodium diet among Canadians. For example, although snack foods displaying the Health Check logo are permitted to contain a maximum of 480mg of sodium per 50g serving,<sup>99</sup> Frito-Lay’s Reduced Fat Munchies Snack Mix, which carries the Smart Spot logo, contains 510mg of sodium per 1 cup serving.<sup>100</sup> Such inconsistencies undoubtedly make it difficult for even the most conscientious Canadian consumer to

make healthy food choices. Canadians might benefit from a set of standardized criteria that would regulate the use of FOP health claim symbols, especially those regarding sodium.

## **2.12 Front-of-Package (FOP) Nutrition Labelling**

When shopping for groceries, consumers are faced with a variety of products to choose from, which vary widely in terms of nutritional quality. Selecting the most nutritious product from a range of options is not a simple task, as consumers must consider several nutrients and health-related factors simultaneously. For instance, a consumer might be trying to reduce fat and cholesterol, increase fibre and avoid certain ingredients due to an allergy. Furthermore, nutrition is not the only factor involved in product choice; taste and cost are important considerations for many consumers. Indeed, a recent study found that taste remained the most important factor influencing the food selection of Canadian consumers over a five-year study period.<sup>58</sup> Shoppers may also be distracted and/or pressed for time while shopping; research indicates that consumers make grocery purchase decisions in seconds rather than minutes.<sup>102</sup> A simple FOP label could help to alleviate these constraints by interpreting the overall healthiness of a product and/or summarizing key nutrients, thus reducing the processing time required to make a decision.<sup>6</sup>

Indeed, studies have indicated that adding a front-of-package label in addition to the traditional nutrition panel may be more effective at helping consumers make a healthy choice than back-of-package information alone.<sup>5,6,7</sup> Feunekes and colleagues (2008) investigated the impact of eight FOP labelling formats across four European countries: Germany, Italy, the UK, and the Netherlands. The study compared the effects of the labelling formats on “consumer friendliness” (comprehension, liking and credibility) and “decision-making” (usage intention and process time). The researchers concluded that overall, FOP labels are effective in helping consumers make healthier choices, and that they seem to work for the majority of individuals and across all countries, although slight differences were found between subgroups.<sup>6</sup> As mentioned earlier, implementing a FOP labelling scheme may also lead to improvements of food quality by manufacturers. In an analysis of New Zealand’s Pick the Tick program, it was

demonstrated that receiving the Tick logo is a strong incentive for food companies to make their products healthier, and resulted in a reduction of 33 tonnes of salt from the New Zealand food supply over a one-year period.<sup>66</sup>The logo had similar positive results in Australia: a case-study of the reformulation of *Kellogg* breakfast cereals to meet Pick the Tick program guidelines reported an annual reduction of 235 tonnes of salt from the Australian food supply. Only five out of twelve *Kellogg* breakfast cereals were eligible to carry the Tick after product reformulation, which accounted for 53% of the total salt reduction. Interestingly, an almost equal contribution came from the seven products that were not eligible to carry the logo, indicating that the program had positive carry-over effects on other products.<sup>103</sup>

Research suggests that FOP labels are both supported and desired by consumers. In a 2009 study examining the acceptability and effectiveness of FOP labels in Australia, participants indicated strong support for the placement of nutrient information on total fat, saturated fat, sugar and sodium on the FOP, as well as a consistent labelling format across all products.<sup>104</sup> A series of four research studies on front-of-package labelling was conducted on behalf of the British FSA from 2004 to 2005. Results indicated that overall, consumers supported the addition of fat, saturates, sugars and salt to the front of food packages. Consumers felt that FOP labels were particularly needed on processed foods, as these foods were seen as more difficult to assess in terms of nutritional quality.<sup>105</sup>In a series of workshops conducted by Health Canada in 2008, many consumers expressed the desire for a simple FOP health claim system to reduce consumer confusion.<sup>9</sup>

Front-of-package labelling systems vary in complexity from simpler to more detailed formats, as described in more detail in the following sections. Research evidence suggests that graphic labelling formats including symbols and/or colours may be more effective than labels that consist solely of text and numeric information. In their review of nine studies examining nutrition labelling formats, Geiger and colleagues (1991) found that four of nine studies examining the use of graphic labelling formats improved consumer comprehension of the nutrition information. Of these, three studies supported the use of bar

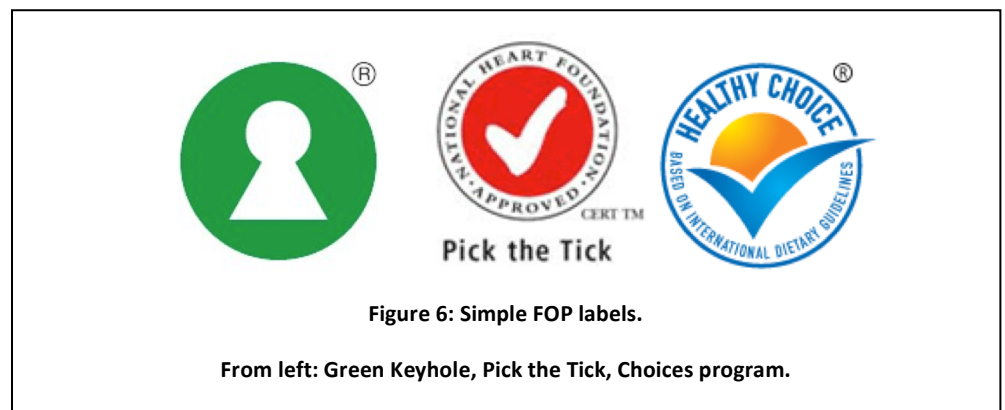
graphs, and one supported the use of a pie chart.<sup>7</sup> In Britain, research by the FSA found that most consumers preferred FOP labels that included colours and “high”, “medium” and “low” descriptors in addition to information on nutrient content. Colour-coded symbols were also preferred over monochrome versions of the same label.<sup>105</sup> In addition, graphic reference information (such as a bar graph) has been reported to help consumers apply reference information, especially for those who had not seen labels before.<sup>106</sup>

### 2.13 Simple FOP Labelling Formats

Simple FOP labelling formats provide an overall interpretation of the healthiness of a product. As a result, simple labels should be comprehensible to consumers without extensive nutritional knowledge<sup>6</sup> and require less cognitive effort and processing time than more detailed labelling formats.<sup>5,7</sup> Simple FOP labels range from “healthy choice” logos (such as the Heart and Stroke Health Check symbol described earlier) to nutritional profiling systems in which a numerical score ranks foods from least to most nutritious.

#### 2.13.1 Simple FOP Logos

Manufacturers often use colourful symbols or logos to indicate that a product represents a “healthier choice” compared to similar products in the same food



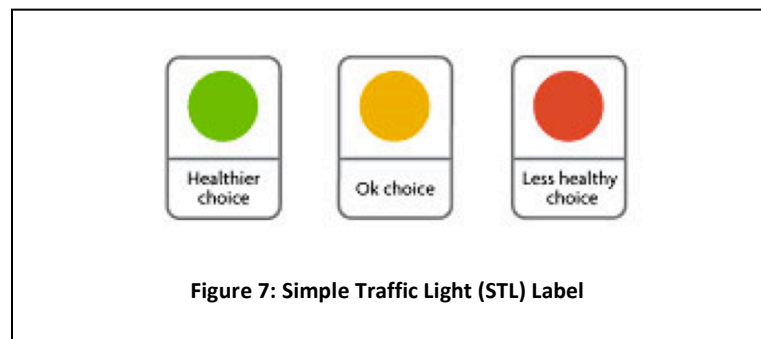
or beverage category. As shown in Figure 6, examples of simple nutrition labels include the Green Keyhole (Sweden), Pick the Tick (Australia and New Zealand), and the Choices logo (used in several countries internationally).

The Swedish National Food Administration introduced the Green Keyhole in 1989 to facilitate consumers in selecting foods that were lower in fat and higher in fibre, without having to read detailed nutritional labels. In order to carry the Keyhole, a food product must be an alternative to either a high-fat or low-fibre product. As such, vegetables, fruits, meat and fish that are naturally low in fat are not labelled with the Keyhole. Secondly, in order to carry the symbol, the food needs to meet specific criteria in terms of fat and fibre content. The food industry voluntarily places the symbol on food packages that meet these criteria; compliance with program regulations are monitored by the Swedish National Food Administration.<sup>107</sup>

The National Heart Foundation developed the Pick the Tick program in New Zealand in 1991. In order to carry the Pick logo, food products are independently analyzed and must be approved by the Heart Foundation according to a set of nutritional guidelines. In general, approved foods are lower in total fat, saturated fat, added sugar and sodium than comparable foods, and may be higher in fibre as well.<sup>108</sup>

The Choices logo, an initiative of the Choices International Foundation, was developed by an international scientific committee as a response to a food industry call to action by the World Health Organization. The program has national foundations in Belgium, Brazil, Czech Republic, Germany, Netherlands, Poland, South Africa, and Israel. Currently, the logo is displayed on over 4,000 food and beverage products from 130 companies across these nations. The aim of the program is to help consumers distinguish products that are a healthier choice. In order to carry the logo, products must meet a set of nutritional criteria for four key nutrients (trans fat, fat, sugar, and sodium), based on international dietary guidelines from the WHO.<sup>109</sup>

The Simple Traffic Light (STL), developed in the UK, is another





example of a simple FOP logo. As seen in Figure 7, the STL characterizes an entire product as a “healthier choice” (green), “ok choice” (amber) or “less healthy choice” (red). Further details regarding the criteria used in the traffic light system are provided in the section on detailed labelling formats (below).

### **2.13.2 Utility of Simple FOP Logos**

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Research evidence suggests that in many cases, consumers prefer simpler FOP labelling formats. A qualitative study conducted by van Kleef and colleagues (2008) examined eight types of FOP calorie labels among four European countries: Germany, the Netherlands, France and the UK. Results indicated that in comparison to more complex labels – such as reference to daily intake amounts or exercise, consumers preferred simpler labels that indicated only the number of calories per serving or per 100g.<sup>110</sup> Simpler labelling formats may also be more time-efficient; Feunekes et al. (2008) found that participants needed significantly less time to evaluate simpler FOP labels compared to more detailed formats. Simple labels may therefore be more effective in helping consumers make healthy choices, especially when pressed for time in a grocery store setting.<sup>6</sup>

A few studies have examined simple FOP labels that are currently in use by manufacturers. As mentioned earlier, due to its association with major salt reductions in the New Zealand food supply, the Pick the Tick program has been named the Heart Foundation’s most successful national nutrition initiative.<sup>66</sup> The Pick logo has also been recognized by consumers as a useful tool to highlight the nutritional strengths of food products.<sup>111</sup> Although one study found that shoppers did not regularly use the Pick logo when grocery shopping, the sample of Australian shoppers was extremely small (n=13) and was likely unrepresentative of the entire population.<sup>112</sup>

Two studies have examined the use of the Green Keyhole in Sweden. The first was a population-based study that examined understanding of the Keyhole symbol among women aged 38-74 years. This study demonstrated that three years after campaign initiation, the majority of women understood the meaning of

the Keyhole. Women with more knowledge of the symbol were found to weigh significantly more than those with less knowledge. However, no significant differences in fat or fibre intakes were found between women with more or less knowledge of the symbol.<sup>113</sup> The second study examined understanding of the Keyhole and food intake patterns among 732 men and 859 women six years after program initiation. Results indicated that over half (53%) of the men and over three quarters (76%) of the women understood the meaning of the Keyhole. Participants with more knowledge of the symbol were significantly younger (both sexes) and thinner (women only) than those who were less knowledgeable. Intake of low-fat food was significantly positively associated with knowledge of the Keyhole symbol among both men and women; intake of high-fibre foods was associated with greater Keyhole knowledge among women only.<sup>107</sup> Overall, it seems that the meaning of the Keyhole symbol is well understood among Swedish consumers, and that understanding of the symbol may relate to dietary patterns. Further studies are needed to determine the impact of this symbol on actual consumer product selection.

Vyth and colleagues (2009) examined the use and effectiveness of the Choices logo in the Netherlands. Study results indicated that older individuals, those with lower levels of education, and females interested in health paid most attention to the logo, while elderly and obese individuals expressed the most need for the logo. Further, women liked the logo more than men, and reported buying more products carrying the logo than their male counterparts.<sup>114</sup> A second study by Vyth et al. (2010) examined consumer product selection in nine Dutch grocery stores. Results indicated that participants who reported paying attention to their weight and looking at nutrition information on food packages not only reported higher use of the Choices logo, but actually purchased more products carrying the logo during observational analyses.<sup>115</sup>

One drawback of simple FOP logos is that while designed to encourage healthier choices, the products that carry these logos may not actually be considered healthy. As Lobstein and Davies (2009) note, logos such as the Keyhole may be misunderstood by consumers to indicate that the food is recommended as an important part of a healthy diet, which is not always the case. As these researchers so aptly put it, “healthier does not necessarily mean healthy per se” (p. 332).<sup>116</sup>

### 2.13.3 Single-Score Nutritional Profiling

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Nutritional profiling is a method of categorizing foods based on their nutritional quality. Nutritional indexes are essentially a form of simple FOP labelling, as they provide an overall interpretation of the healthiness of a product. However, single-score systems differ from the simple FOP logos described above in an important way. Rather than receiving a logo that designates the product as a healthy choice, foods are assigned a number on a scale that ranges from least to most healthy. Thus, while simple FOP labels such as the Keyhole logo designate a product as a healthy choice within a product category, nutritional profiling systems provide an interpretation of the healthiness of a food among the grand array of products on the market.

Various nutritional index systems have been proposed over the years, although the criteria for categorizing foods within each system have differed considerably. For instance, the Nutritional Quality Index (NQI) measures the amount of nutrient in a food in relation to its energy content, using the US Recommended Daily Allowance (RDA) for each nutrient and a 2000 kcal diet as the reference standard. The ratio of recommended to restricted (RRR) food score is based on the ratio of “good” nutrients (protein, calcium, iron, vitamin A, vitamin C, and fiber) to “bad” nutrients (energy, saturated fat, cholesterol, sugar and sodium) and the energy content of a food. The mean percentage DV for the good nutrients is divided by the mean percentage DV of the bad nutrients, resulting in an overall score for the food. The naturally nutrient rich (NNR) score is a ratio of nutrients to calories that calculates the percent DVs for 14 nutrients based on a 2000 kcal diet.<sup>117</sup>

Another such system is the Overall Nutritional Quality Index (ONQI), which was developed by a multidisciplinary group of nutrition and public health scientists and funded by a not-for-profit hospital affiliated with Yale University. The ONQI was developed with the intent of improving dietary patterns through well-informed choices, and is the basis for the *NuVal* Nutritional Guidance System.<sup>118</sup> In this system, food products receive a score from 1-100 (the higher the score, the healthier the product). The score is calculated by placing nutrients with generally favourable effects (e.g. fibre, vitamin A, vitamin C,

folate) in the numerator, and those with generally unfavourable effects (saturated fat, trans fat, sodium, sugar, and cholesterol) in the denominator. The division of these two numbers results in an overall “healthiness” score for the product.<sup>119</sup> Recent research indicates that ONQI scores were significantly associated with the 2005 Healthy Eating Index, a measure of dietary quality used by the USDA. Results from consumer focus groups indicate that approximately 80% of participants felt that the ONQI would influence their purchase decisions.<sup>118</sup>

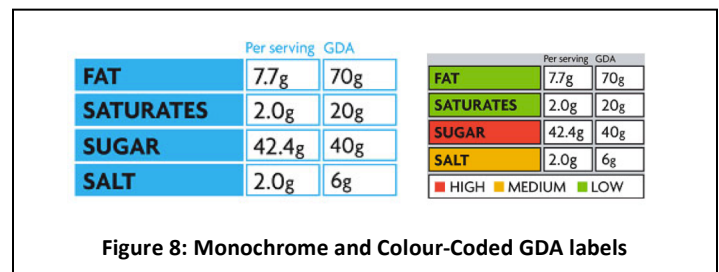
Currently, health professionals and researchers do not agree upon the vocabulary and criteria used to designate a “healthy” versus “unhealthy” or “nutrient dense “versus” nutrient poor food. The nutritional indexes that have been designed in the past have been based on different criteria and subjective decisions regarding which nutrients are considered “good”, “bad” or “essential” to a healthy diet.<sup>117</sup> Thus, even though nutritional indexes may provide a simple and understandable measure of product healthiness, the definitions surrounding how to label products as “healthy” or “unhealthy” are currently a drawback to this type of FOP labelling. Nevertheless, nutrient profiling represents a potentially valuable FOP labelling system that deserves future research.

## 2.14 Detailed Labelling Formats

In contrast to simpler labelling formats that evaluate the product as a whole, detailed FOP labels provide a judgment regarding certain major nutrients. Detailed FOP labels allow consumers to make an informed choice by providing nutrition information about key nutrients in a more accessible manner than the traditional nutrition panel,<sup>6</sup> thus reducing consumer processing load.<sup>5</sup> Three commonly used detailed FOP labels are Guideline Daily Amounts (GDAs), the Traffic Light (TL) symbol, and the Wheel of Health.

### 2.14.1 Guideline Daily Amounts (GDAs)

In June 2006, the Confederation of the Food and Drink Industries of the EU (CIAA) introduced a voluntary GDA nutrition labelling scheme as part of the EU



Platform for Action on Diet, Physical Activity and Health.<sup>120</sup> GDA labels display the amount of certain key nutrients (calories, sugar, fat, saturates and salt) contained in one serving of a product. The amounts are displayed in grams and as percentages, and are based on the GDAs for an average woman following a 2000 calorie diet (see **Appendix A**). This system was based on the CIAA recommendations for a common nutrition labelling scheme.<sup>121</sup> According to the CIAA, GDAs are a guide to the amount of

energy and key nutrients required for a healthy diet, and facilitate consumer understanding of how each food or drink product

	Amount per 100g			Per portion
	Green	Amber	Red	
Fat	≤ 3.0g	> 3.0g & ≤ 20.0g	> 20.0g	> 21.0g
Saturated fat	≤ 1.5g	> 1.5g & ≤ 5.0g	> 5.0g	> 6.0g
Sugar	≤ 5.0g	> 5.0g & ≤ 12.5g	> 12.5g	> 15g
Salt	≤ 0.3g	> 0.3g & ≤ 1.5g	> 1.5g	> 2.4g

**Figure 9: FSA Colour-Coding Criteria for Food Products**

contributes to their daily needs in terms of overall energy and various nutrients.<sup>120</sup> As shown in Figure 8, two types of GDA labels have been examined in the FSA research studies: (1) the monochrome GDA (MGDA); and (2) the colour-coded GDA (CGDA), in which nutrients are displayed in green, amber or red – similar to the TL system.<sup>105</sup> The FSA developed a set of criteria for manufacturers to follow when applying green, amber or red colours to GDA labels (see Figure 9). If the amount “per portion” is exceeded, the label for a specific nutrient will always be red, regardless of the amount per 100g.<sup>122</sup>



The GDA system caught on quickly in Europe. In July 2008, a representative survey of 2,026 food and drink producers (including multinational companies and family-owned enterprises) across France, Italy, Spain, the UK and the Netherlands was conducted to examine the use of GDA labelling. The study found that nearly half (44%) of the companies surveyed were voluntarily labelling their products with GDA information. While 65% of major companies were

either using or planned to implement GDA labelling, a significant proportion of medium and small companies were beginning to implement the system as well, at 58% and 34%, respectively.<sup>120</sup>

Figure 10 illustrates two examples of CGDA labels on food products in the UK.



Figure 11: Kellogg Canada's "Get the Facts" label

In Canada and the USA, the percent Daily Value (DV) follows the same as the European GDA. Similar to the EU system, percent DVs are based on a 2000 calorie diet, and are listed next to each nutrient included in the Nutrition Facts panel. Certain North American

manufacturers have introduced percent DV labels on the front of their food products. For instance, Kellogg Canada's "Get the Facts" program indicates the calories, total fat, sodium and sugar in one serving of cereal, as well as the percent DV for all nutrients listed, except sugar (for which a DV has not been set by Health Canada). The Kellogg's label also includes nutrients that are considered important for good health, such as fibre, iron and thiamine (see

Figure 11).<sup>123</sup> Recently, the Grocery Manufacturers of America and the Food Marketing Institute in the USA announced a new, voluntary FOP labelling system referred to as

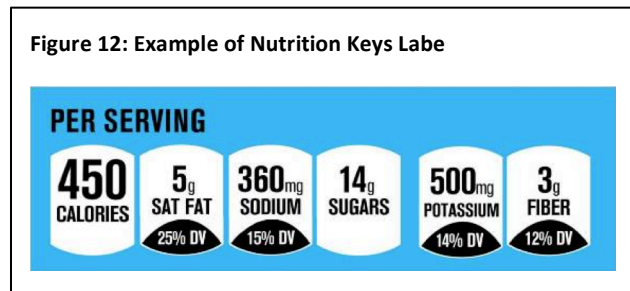


Figure 12: Example of Nutrition Keys Label

"Nutrition Keys". The Nutrition Keys system will resemble the GDA format, displaying the amount and percent daily value (when applicable) for calories, saturated fat, sodium, and sugar. Manufacturers will have the option to list two additional nutrients "to encourage" from the following list: potassium, fibre, protein, calcium, iron and vitamins A, C and D (see Figure 12).<sup>124</sup>

#### 2.14.1.1 Utility of GDA labels

Overall, it seems that the GDA system appeals to consumers. In their comparison of FOP labelling formats, Feunekes et al. (2008) found that GDAs were slightly more liked by participants than the other formats tested (“Healthier Choice Tick”, “Multiple Choice Tick”, and a stars rating system).<sup>6</sup> Grunert and Wills (2007) found that although Traffic Lights were simpler to understand, consumers liked the GDA format more in terms of its visual appeal and ability to provide information. Notably, consumers also preferred the CGDA to a monochrome version.<sup>68</sup> Similarly, the FSA studies indicated that the CGDA was the preferred label among those examined (preferred by 66% of consumers), as it was considered to contain the most information.<sup>105</sup> In a recent study conducted by Grunert and colleagues (2010), GDA labels were the most frequently mentioned source of nutrition information sought from labels.<sup>84</sup>

In ratings of understanding and utility, the GDA system did not fare quite as well. Studies indicate that consumers need significantly more time to evaluate GDA scores compared with simpler formats,<sup>6</sup> and that some individuals were put off by the perceived complexity of the GDA information.<sup>105</sup> Some participants in the FSA studies expressed confusion regarding whether the percentage represents the amount of a nutrient contained in the food, or the proportion that the food contributed to the GDA for each nutrient.<sup>105</sup>

#### **2.14.2 Traffic Light Labelling**

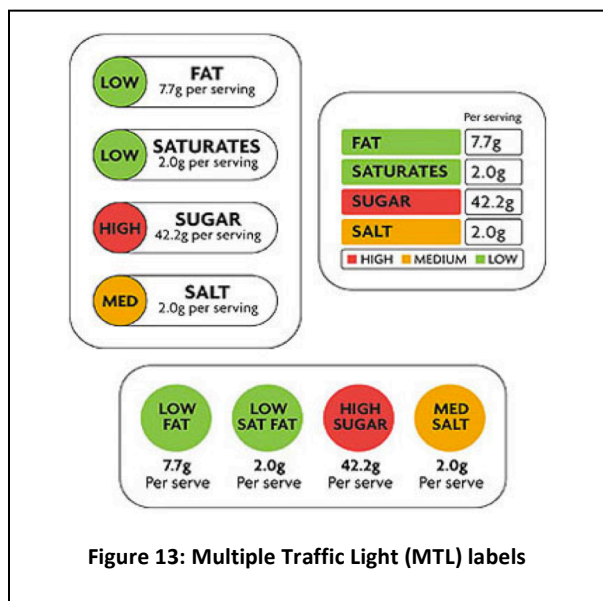
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As mentioned previously, the Traffic Light (TL) is a FOP labelling system developed in the UK, in which foods are characterized using a colour-coded system. The FSA colour-coding criteria for the green, amber and red levels of the TL are the same as those used for the GDA system. The major difference is that the TL interprets these levels for consumers with the adjectival descriptors “low”, “medium” and “high”. The FSA has typically examined two types of TL symbols in their qualitative and quantitative research studies: the Simple Traffic Light (described earlier) and the Multiple Traffic Light (MTL). In the MTL, nutrient amounts (fat, saturates, sugar, salt, and sometimes calories) are colour-coded such that green,

amber and red represent low, medium and high amounts of each nutrient, respectively (see Figure 13).<sup>105</sup>

For the purposes of this discussion, the term “Traffic Light” will refer to the MTL.

Several major UK food manufacturers have adopted some form of the MTL label as a FOP labelling



scheme. Although most systems follow the same general principles (such as colour-coding and the inclusion of fat, saturates, sugars and salt), the system is currently unregulated. As a result, labels vary considerably across brands. For instance, some labels include calorie amounts; others list only the four key nutrients. Many companies have chosen to include the words “low”, “medium” and “high”, while others rely on colour only to communicate this information.

The numerical information displayed in the TL labels also lacks a standard reference amount. Labels may display the amount of each nutrient contained in a single serving of the product, as indicated in the nutrition panel (e.g. “250g”, “per 2 uncooked sausages”, “per 7 cookies”, etc.) or per package for single-serving items, such as ready-to-eat sandwiches. Other labels indicate the amount contained in a set amount of the product (usually 100g), to facilitate comparison of similar products. A recent proposal set forth by the European Commission (EC) has suggested a combination of these formats, indicating that standardized FOP labels should display content amounts accompanied by GDAs and expressed per 100g or 100ml of a product.<sup>139</sup>

#### 2.14.2.1 Utility of the Traffic Light System

International studies indicate that the Traffic Light symbol increases consumer use and understanding<sup>104,105,125</sup> and allows consumers to retrieve nutrition information more efficiently.<sup>126</sup> Jones and Richardson (2007) found that the TL system helped guide consumer attention to important nutrients and improved the accuracy of the healthiness ratings of nutrition labels.<sup>126</sup> In comparison with the other



formats tested, Feunekes and colleagues (2008) found that the MTL scored highest on comprehension and liking. However, in its ability to help consumers differentiate between healthier and less healthy products, the MTL was inconsistent.<sup>6</sup> On the other hand, studies examining the TL system in Australia and New Zealand demonstrated positive results overall. In a study of ethnically diverse shoppers in New Zealand, Gorton and colleagues (2009) compared four label formats: MTL, STL, the Nutrition Information Panel, and percent Daily Intake (%DI). Of the four label formats tested, STL and MTL labels were best understood across all ethnic and income groups, and MTL labels were most often preferred.<sup>127</sup> In a randomized controlled study conducted in Germany, 420 adult participants were shown one of five label formats: (1) a simple "healthy choice" tick, (2) a MTL label, (3) an MGDA label, (4) a CGDA label and (5) a no label condition. In a paired-food task in which participants were asked to choose the healthier food item in each of 28 pairs, the MTL label resulted in the highest number of correct responses (an average of 24.8 correct responses out of 28 pairs).<sup>125</sup> Similarly, Kelly and colleagues (2009) found that the TL system was the most effective at helping Australian consumers identify healthier foods. Specifically, participants were five times more likely to identify healthier foods using the MTL system compared with a monochrome %DI system and three times more likely compared with a colour-coded %DI system. The researchers recommended mandatory TL labelling regulations to assist consumers in making healthy food choices.<sup>104</sup> Finally, a recent review of food labelling law and policy entitled "Labelling Logic" called for the voluntary use of MTL labels in Australia and New Zealand, specifying that MTL labels should be mandatory if the label displays health claims, endorsements or trade marks.<sup>128</sup>

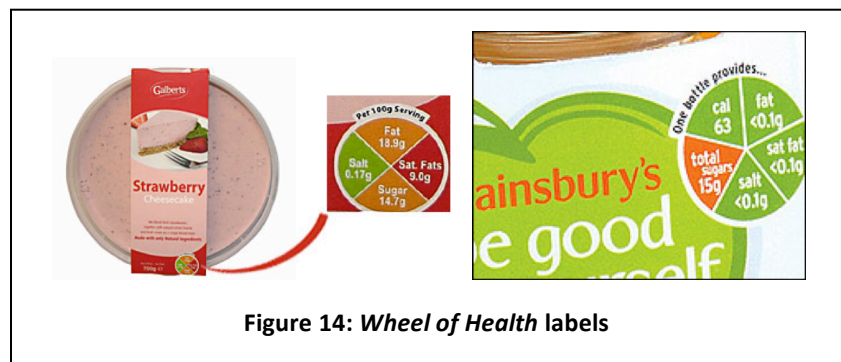
Results of the FSA studies indicated that both the colour coding and the "low", "medium" and "high" descriptors of the TL format appealed to British consumers. Consumers indicated that they would likely use the colour codes to help gauge the amount of a nutrient in a food 'at a glance', while referring to the nutrition panel only if they required more detailed information. These studies found that TL colour coding helped consumers to interpret and understand the nutrient content of foods. In terms of utility, the MTL was significantly more successful at indicating the nutritional value of a single product than the CGDA

(90% compared to 69%, respectively). When comparing two products, the MTL and CGDA formats were equally effective.<sup>105</sup>

In response to recent draft legislation by the European Commission that called for mandatory FOP labelling, European MPs decided against a proposal for a Traffic Light system that would be required on certain processed foods.<sup>139</sup> Despite this decision in the EU, the evidence regarding the effectiveness of the Traffic Light system is quite compelling.<sup>104,105,125</sup> The value of this labelling system in Canadian grocery stores is yet to be determined.

### 2.14.3 Wheel of Health

The ‘Wheel of Health’ is another detailed FOP labelling format used by certain manufacturers, such as Sainsbury’s in the UK. As shown in Figure 14, the Wheel of Health



Health is similar to the TL in that levels of fat, saturated fat, sugar and salt are displayed in a colour coded, symbolic format. Feunekes and colleagues (2008) found that in comparison with two other FOP systems (“Stars” and “Smileys”), the Wheel of Health and the MTL were rated the most credible and the most liked. However, the Wheel of Health was more difficult to understand for participants who never read labels and those who had lower perceived knowledge about health and nutrition.<sup>6</sup>

### 2.15 Other Labelling Formats

A variety of other FOP labelling formats have been examined in research studies. Feunekes et al. (2008) examined five FOP labels in addition to the MTL, CGA and Wheel of Health. The additional labelling formats included: (1) Healthier Choice Tick (a single tick given only to healthier products); (2) Multiple Choice Tick (products receive 0-3 ticks, according to healthiness); (3) Health Protection Factor (products receive a score from 1-5; modeled after the system used on sunscreen); two rating systems based on (4)

Stars; and (5) Smileys (products receive 1-5 stars or smiley faces, according to healthiness). Although there were slight differences between formats, the researchers found that there were no major differences between simple and complex formats in terms of consumer friendliness. All FOP formats helped consumers make healthier choices, however the simpler formats did have some advantages over more complex formats. Specifically, the Healthier Choice Tick and Stars required less time to evaluate than the GDA label, while Stars and Smileys were the most successful at helping consumers differentiate between healthier and less healthy options.<sup>6</sup>

Another type of FOP label available on the market displays only the calories in a single serving of the product; this is often listed both in kcal and as a percentage of an individual's average daily energy



Figure 15: *Casino* % Energy Requirement Label

requirements. This format is currently used by *Casino*, a major food manufacturer in France (see Figure 15). Another interesting design format that has been put forth refers to the amount of physical activity required to counteract the number of calories consumed in a serving of the food product. Van

Kleef and colleagues (2008) examined a label referring to exercise as one of eight FOP label formats. Qualitative analyses revealed that while some participants thought the symbol could make people more aware of exercise, many were sceptical of its effectiveness or thought its effects would wane over time. Many participants felt that this type of label could be demotivating, patronising or even evoke feelings of guilt, especially on foods such as chocolate, which are typically perceived as treats.<sup>110</sup>

## 2.16 FOP Labelling Formats: Summary

Overall, the literature regarding FOP labelling suggests that FOP labels are desired by consumers<sup>104,105</sup> and that they may aid shoppers in making healthier choices.<sup>5,6,7</sup> There is no question that consumers prefer colourful and graphic labelling formats,<sup>7,105</sup> especially in comparison to monochrome versions of the same label.<sup>68,105</sup> However, findings regarding consumer preferences and effectiveness of simple versus detailed labelling formats are mixed. Detailed labels such as the GDA and TL formats are well-liked and understood by consumers<sup>6,68,105,127</sup> and both have been shown to guide the selection of healthier food products.<sup>5,6, 104</sup> On the other hand, many consumers have reported the desire for simpler FOP labels<sup>9,110</sup> which have been associated with greater comprehension, less cognitive effort and reduced processing time compared to more detailed labelling systems.<sup>5,6,7</sup> A recent experimental study aiming to determine the influence of simple versus detailed FOP labels measured consumer product evaluations across three conditions: (1) a detailed TL-GDA label, (2) the “Smart Choices” logo (a simple FOP label; see Figure 4) and (3) a control condition with no FOP label. The researchers found that the Smart Choices logo led to more positive nutrient evaluations and ratings of product healthfulness compared to the TL-GDA or control conditions. The researchers suggested that simple FOP logos (which are often seen as a stamp of product healthiness) may lead to a “halo” effect, whereby consumers are more likely to perceive a product carrying this logo as healthy. This may lend support to the use of more detailed labelling formats that highlight amounts of nutrients that should be limited (such as fats, sodium and sugars).<sup>129</sup>

Finally, it is important to note that the use of nutrition information may depend on the perceived healthiness of a product.<sup>84,130</sup> For instance, recent data from in-store interviews conducted by Grunert and colleagues (2010) revealed that shoppers tend to look for nutrition information most when purchasing products with a healthy image (i.e. yogurt) and least when choosing confectionary (i.e. indulgence) products. The researchers suggest that different types of labels may therefore be needed for various food product categories.<sup>84</sup> As there has been little research on FOP labelling conducted in Canada, the relative effectiveness of these FOP labelling formats in Canada is currently unknown.

## **2.17 Review of FOP Labelling Study Methodology**

The literature relating to front-of-package nutrition labelling is largely devoid of studies examining the effect of different labelling formats on behavioural change.<sup>6</sup> Several studies have examined the effectiveness of FOP labels by asking participants to rate the healthiness of products based on FOP labels,<sup>6,84, 126,127</sup> to perform calculations regarding calories, nutrient amounts or percent daily value,<sup>84,105,127</sup> or to choose the most nutritious product from a variety of options.<sup>84,104,125,131</sup> One study examined eye-tracking movements while consumers rated product healthiness, in order to determine the amount of time it took to evaluate two types of nutrition labels.<sup>126</sup> Other studies asked consumers how often they purchase products bearing a certain FOP logo,<sup>114</sup> or measured behavioural intentions by asking participants whether a particular labelling system would influence their purchase intention<sup>118</sup> or usage intention<sup>6</sup> for specific FOP labelling formats. A few studies have examined actual purchasing behavior using observational analysis<sup>84,115</sup> or grocery store scanning data.<sup>132,135,136,137</sup> However, as noted by Baltas (2001), most studies have examined cognitive outcomes using survey data or qualitative research<sup>105,110,114</sup> rather than behavioural outcomes using experimental or consumption data.<sup>133</sup> Similarly, a recent “Global Update on Nutrition Labelling” released by the European Food Information Council (EUFIC) noted that a few studies have examined intended purchasing behaviour, but evidence examining actual purchasing behaviour is limited, and is mostly from a few retailers in the USA and the UK.<sup>134</sup>

Analyzing post-sales data is another method used to measure the impact of nutrition labels in the absence of data on behavioural outcomes. Although research of this type is also scarce, certain independent retailers have released (unpublished) sales data following the implementation of store-brand FOP labels. For instance, Tesco (2007) reported that sales of lower fat and ready meals increased after the addition of GDA labels to these products, outselling higher fat and salt alternatives by over 7%. Seemingly, GDA labels also had positive effects on product reformulation. Analysis of sales of frozen ready meals over a one-year period indicate that the average “ready meal” purchased a year after the introduction of GDA labels contains lower levels of salt, fat and saturated fat than before these labels were introduced.<sup>135</sup> Sainsbury’s, a major UK retailer, also reported increased sales of healthier products after

the implementation of traffic light labelling. Sales data from 2007 indicate that ready meals and sandwiches displaying mostly green traffic lights increased by 46% and 5.8% respectively, while ready meals and sandwiches that displayed mostly red traffic lights decreased by 24% and 44%.<sup>136</sup> However, it is important to note that these data were not peer-reviewed and have been questioned by some researchers.<sup>136</sup> Sacks, Rayner and Swinburn (2009) analyzed sales data from a large (unnamed) UK retailer in 2007. Analyses indicated that in the month after traffic light labels were introduced, sales of ready meals increased by 2%, while sales of sandwiches did not change significantly. The researchers also found no association between changes in product sales and product healthiness, and concluded that the TL system had no apparent effect on the relative healthiness of consumer purchases. As this study examined a relatively small number of products over a short (one month) sales period, further studies are needed to replicate these findings.<sup>137</sup>

## **2.18 Summary**

Despite the current epidemic of hypertension and cardiovascular disease in North America, there has been relatively little action in the area of sodium reduction initiatives in Canada.<sup>138</sup> However, sodium reduction is clearly a pressing issue in Canada, and public awareness of the harmful effects of sodium is on the rise. The need for research in this area has been highlighted by recent media reports calling attention to the overconsumption of sodium in Canada and the recent release of the Sodium Reduction Strategy by the SWG. The Strategy includes recommendations on nutrition labelling, including an amendment to the Food and Drug Regulations that would decrease the Daily Value for sodium in the Nutrition Facts Table from 2400mg to 1500mg to reflect the Adequate Intake level rather than the Tolerable Upper Limit. Importantly, the Working Group also recommends that the current nutrition labelling system in Canada be improved to facilitate consumer understanding and use, particularly in relation to sodium. According to the report, some members of the Working Group agreed that these improvements should include FOP labelling of high sodium products.<sup>55</sup>

One way to improve the current system might be to add sodium information to the front of food packages. This may make sodium information more apparent and accessible to consumers, and would aid the public in making healthier decisions when purchasing food. Listing the sodium content on the FOP could also lead manufacturers to reduce the sodium content of their products, as has been the case in the UK,<sup>10,8</sup> Finland<sup>57</sup> and New Zealand.<sup>66</sup> This idea is supported by governmental bodies in other nations. Indeed, the Institute of Medicine recently released a report that included several strategies for sodium reduction. Included in this list was the recommendation that the US Department of Agriculture (USDA) should revise and update the requirements surrounding nutrition labelling and related sodium claims and criteria for disclosure of sodium content in foods.<sup>53</sup> Similarly, European MPs recently adopted a draft legislation proposed by the European Commission stating that fat, saturated fat, sugar, salt and energy content must be indicated on the front of food packages.<sup>139</sup> In Canada, a 2009 report on salt issued by the Centre for Science in the Public Interest (CSPI) recommended that Health Canada require simple front-of-package labelling to help consumers assess the healthfulness of foods. It was further recommended that these FOP ratings take into account “problematic” nutrients such as sodium and added sugars.<sup>140</sup> Improvements to the current nutrition labelling system are clearly warranted as a means of sodium reduction in Canada.

Although the need for clear and accessible FOP labels has clearly been recognized, Canadian FOP labels are currently unregulated and lack standardization.<sup>9</sup> As a result, consumers may be confused by the various implicit health claims that appear on Canadian food products.<sup>97</sup> Further, while studies have demonstrated that FOP labelling designs such as the CGDA and the TL symbol can improve consumer understanding and influence product selection in other countries,<sup>6,104,125,126</sup> the effectiveness of these designs in comparison to other formats has not been examined in the Canadian context. There is an urgent need for research evidence to guide policy decisions surrounding FOP labelling as a potential strategy for sodium reduction in Canada.

## **3.0 STUDY RATIONALE**

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### **3.1 Purpose**

The purpose of the current study was to examine the impact of FOP sodium content labels on consumer selection of low versus high sodium options. Specifically, the study investigated five labelling formats: 1) current nutrition label with no FOP label; 2) a FOP label which displays the sodium content in milligrams (mg) and percent Daily Value (%DV); 3) a label indicating the same sodium information, with the addition of either “high” or “low” descriptors; 4) a “detailed” Traffic Light symbol displaying sodium content in mg and %DV; and 5) a “simple” Traffic Light symbol with no numeric sodium content information. Participants conducted qualitative assessments (ratings and rankings) of the proposed labelling formats, including: liking, effectiveness, understanding, and believability. The extent to which socio-demographic factors are associated with the impact of nutrition labelling on consumer product selection was also tested.

### **3.2 Research Objectives**

The study had three primary research objectives:

- 1) To determine the impact of FOP sodium labels on consumer selection of low versus high sodium products.
- 2) To examine qualitative assessments (ratings and rankings) of the labelling formats presented, including liking, effectiveness, understanding, and believability.
- 3) To determine the influence of socio-demographic factors (age, gender, ethnicity, education and income levels) and diet and health-related factors (e.g. diet, health, physical activity) on label impact and assessment.



## 4.0 METHODS

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### 4.1 Study Design

The study was conducted using a between-subjects experimental research design. The study was integrated into a larger study examining the influence of placing nutritional information on fast-food menus,<sup>141</sup> described in further detail below.

Participants were assigned to view grocery products that displayed one of five types of FOP label. Upon completion of a larger study examining the influence of menu labelling, participants viewed a pair of low and high sodium products (a box of crackers) displaying one of the five FOP labels. Participants were presented with two boxes of crackers and asked to select one of the boxes to take home as a free sample as a token of appreciation for completing the study. The two boxes of crackers included a high and a low sodium option. The nutritional information appearing on the packages was systematically altered according to one of 5 experimental conditions (described in further detail below). Participant selection of the low versus high sodium option served as the primary behavioural outcome measure of the study.

### 4.2 Participants and Recruitment

The study was conducted with 430 adult participants from the Kitchener-Waterloo community. Subjects were recruited via newspaper, bus, and online advertisements, as well as local Farmer's Markets, for a study on lifestyles in the Waterloo Region (see **Appendix B**). To be eligible, participants were required to be 18 years of age or older, to be able to speak and read English, and could not have food allergies to gluten or other grain products. A brief telephone interview was conducted with interested individuals to determine study eligibility (see **Appendix C**). In order to minimize self-selection bias, participants were masked to the purpose of the study. Participants were told that the study was related to lifestyles in the Waterloo Region but neither sodium nor product labelling was mentioned as a research focus. Participants were told that they would receive a free Subway meal (a component of the larger study) as well as \$20 as

an incentive for completing the study. Ethics approval was granted by the Office of Research Ethics at the University of Waterloo.

After a participant was deemed eligible to participate in the study, he/she was booked for a study session. Study sessions were randomly assigned to one of five experimental conditions (described below). All study sessions occurred at the same time of day (6:00 pm) to eliminate time effects and to justify the offer of a free meal (i.e. because the study was conducted over the dinner hour). Data was stored in a secure location at the University of Waterloo and no identifying information was used. Each participant was assigned a unique subject ID, which was used for data analysis.

### 4.3 Study Protocol

The current study was part of a larger study examining the impact of adding nutritional information to fast-food menus. The study was advertised as a study relating to lifestyles in the Waterloo Region, as described above. Participants were given an information consent form upon arrival (please see **Appendix D**). During the “main” study, participants were offered a free Subway meal and told that the free meal was a token of appreciation for completing the study. In reality, participants were assigned to one of four menu conditions, which varied according to the format in which nutritional information was displayed beside meal items. After choosing their free meal, participants performed a filler task in which they read a passage and answered a questionnaire related to city planning and healthy lifestyles in the Waterloo Region. Participants then completed a socio-demographic questionnaire. Upon completion of this questionnaire, participants received their free Subway meal. Participants were given about ten minutes to eat their meal, after which the research assistants (RAs) removed any remaining food. Participants were run in groups of up to ten people per night. Participants were then brought individually into a separate room, where the protocol specific to the current study was followed:

- 1) **Behavioural task.** After being seated at a table, an RA explained to the participant that in addition to receiving the \$20 compensation, he/she could select a free sample box of crackers to take home at the

end of the study. Participants were offered a choice between two “new” brands of crackers. The RA explained that the brands were currently being test-marketed by the manufacturer and that responses and preferences were being collected as feedback on consumer preferences. This explanation served to distract participants from the true purpose of the selection task (i.e. to examine the influence of product labels). Please see Appendix E for an example image of the experimental cracker boxes.

Each participant was shown one box of crackers that was higher in sodium (375mg per serving) and one box that was lower in sodium

**Figure 16: Experimental Nutrition Facts Panels**

Nutrition Facts	
Per 20g serving	
Amount	% Daily Value
<b>Calories</b> 91	
<b>Fat</b> 3 g	5 %
Saturated 1 g	5 %
+ Trans 0 g	
<b>Cholesterol</b> 0 mg	
<b>Sodium</b> 20 mg	1 %
<b>Carbohydrate</b> 13 g	4 %
Fibre 0 g	0 %
Sugars 3 g	
<b>Protein</b> 3 g	
Vitamin A 0 %	Vitamin C 0 %
Calcium 0 %	Iron 6 %

Nutrition Facts	
Per 20g serving	
Amount	% Daily Value
<b>Calories</b> 88	
<b>Fat</b> 4 g	6 %
Saturated 2 g	10 %
+ Trans 0 g	
<b>Cholesterol</b> 0 mg	
<b>Sodium</b> 375 mg	25 %
<b>Carbohydrate</b> 11 g	4 %
Fibre 4 g	16 %
Sugars 2 g	
<b>Protein</b> 2 g	
Vitamin A 0 %	Vitamin C 0 %
Calcium 0 %	Iron 6 %

(20mg per serving). The nutritional information appearing on the boxes was systematically altered according to one of five conditions (see description of experimental conditions below). In the control condition, no nutritional information was provided on the front-of-package; however all boxes included

the Nutrition Facts table on the side of the package (see Figure 16). In the remaining four conditions, nutrition information was added to the front-of-package. All low sodium options listed a sodium content of 20mg (1%DV); high sodium options listed 375mg (25% DV). The sodium content (low vs. high) was the principal difference between the two products offered.

In an earlier iteration of the cracker boxes, the Nutrition Facts tables were identical except for the sodium levels (i.e. amounts of all other nutrients were identical). Results of pilot testing indicated that the vast majority of participants chose the low sodium option. Based on this finding, the Nutrition Facts table was revised so that the two options varied slightly in amounts of other nutrients (e.g. calories, fat, fibre) in addition to sodium. This revision was made in order to make the two options

different enough to be realistic, but not dissimilar enough to consistently sway participants in favour of one box. Two package designs and brand names were also used: a yellow box (“Kent’s”) and a red box (“Watt’s”). Pilot testing was carried out in order to ensure that participants found both package designs equally appealing. The sodium levels (low vs. high) were counterbalanced so that for half of participants, Kent’s was the low sodium option and for the other half, Watt’s was the low sodium option.

The RA recorded participant product selection of the low vs. high sodium product. The RA also recorded whether the participant picked up the box before making their product selection (yes/no). This selection task took less than five minutes. Participants were debriefed about the deceptive nature of the task at the conclusion of the study (see step 4).

- 2) **Diet and Lifestyle Questionnaire.** After the behavioural selection task, the participant was escorted back to the original room where they were asked to complete a survey related to diet and lifestyle. This questionnaire included questions related to diet, physical activity, and nutrition that could not be asked prior to the behavioural selection task without priming participants to the nature of the study. The questionnaire measured consumer perceptions of the experimental nutrition labels displayed on the packages used in the behavioural selection task. Participants were asked to recall some nutrition information displayed on the box of crackers they selected, as well as on the menu they saw earlier during the larger menu labelling study. Consumer liking, effectiveness at helping the participant choose healthier foods, understanding and believability of the experimental nutrition labels were also examined. Finally, participants answered a few questions regarding support for nutrition labelling policy. Please see the Measures section for a more detailed description of these measures.
- 3) **Weight & Height Measurement.** Upon completion of the diet and lifestyle questionnaire, an RA privately weighed and measured each participant in a separate room. These data were used to calculate the BMI of each participant, which was used as a separate predictor variable.

**4) Debriefing and Remuneration.** Participants were debriefed either individually or in small groups.

Participants were given a written debriefing letter in which the purpose of the study was clarified (see **Appendix F**). The nature of the deceptive task was explained, including the fact that the cracker boxes were designed for study purposes. Participant signatures were collected and participants received \$20 remuneration for completing the study.

## **4.5 Behavioural Task**

### **4.5.1 Nutritional Information**

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The nutritional information included on the packages used in this study was based on the nutrition information for Bretons Original crackers, and manipulated so that the two versions differed slightly for various nutrients. The sodium information was specifically manipulated for this study (low=20mg; high=375mg). Serving sizes were based on a common 20g serving. The percentage Daily Value for sodium was based on the Adequate Intake (AI) of 1500mg, rather than the Tolerable Upper Limit (UL) of 2400mg currently used on Canadian products. The decision to base the experimental %DV on the lower AI was based on the recommendation by the Sodium Working Group that the %DV used in the standard Nutrition Facts panel be reduced to reflect the AI of 1500mg.<sup>55</sup> The researchers felt that basing the %DV on the AI would more accurately reflect the relationship between the amount of sodium in a product and the daily intake level recommended by the IOM. In contrast, basing the %DV on the UL could lead consumers to underestimate the amount of sodium they should consume per day, which would be undesirable in a sodium reduction initiative.

### **4.5.2 Rationale for Behavioural Selection Product**

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Crackers were chosen for the behavioural selection task over other foods that might be higher in sodium (e.g. frozen dinners or canned soups) due the wide consumption of cereal and grain based products by Canadians. This decision was also based on the assumption that while certain individuals (such as those who are particularly health conscious) may avoid heavily processed foods such as frozen dinners,

crackers are a widely consumed snack product with broad appeal to many different types of people. The researchers also felt that it would be more plausible to offer a “free sample” of a snack item such as crackers than a ready-meal during a research study. Finally, as noted earlier, research evidence suggests that consumers tend to look at nutrition labels more often when buying products that are perceived to be generally healthy (such as yogurt) and less often when purchasing indulgence products (such as chocolate bars).<sup>84</sup> Since crackers are often perceived as a healthier alternative to snacks such as chips or cookies, crackers may be a product for which consumers would seek nutritional information. In line with this reasoning, the researchers chose a relatively neutral type of crackers that is not extremely unhealthy, yet that does not have any apparent nutritional benefits (e.g. fat free).

#### **4.5.3 Limitations of Behavioural Task**

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Restricting the behavioural selection task to a single type of food (i.e. crackers) has inherent limitations. Nutrition labels may carry more or less weight depending on the type of food product carrying the label. As noted earlier, research suggests that different types of labels may be needed on different food products.<sup>84</sup> Finally, choosing a food with more extreme values for sodium (such as frozen dinners, pre-prepared pasta meals or canned soups, which often contain over 1000 mg of sodium per serving), would have allowed for an even larger differences between the low and high sodium options. However, as noted before, these types of convenience foods were avoided due to the fact that health conscious consumers may not regularly purchase or consume these foods. In contrast, grain-based products such as crackers are widely consumed by most Canadians.

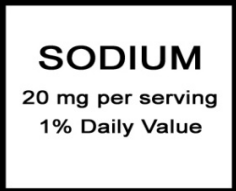
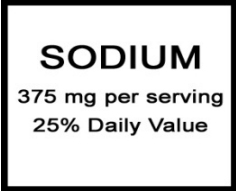

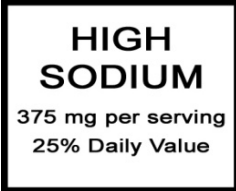




#### **4.6 Experimental Conditions**

The nutrition labels used in the behavioural selection task varied according to the five conditions described below. The four experimental FOP labels were placed in the top-right corner of the box, and comprised approximately 10% of the front panel. See Table 1 for images of the four experimental

conditions. In all conditions, nutrition information was displayed in the Nutrition Facts table (NFT) on the side of the package, as per standard Canadian nutritional regulations.

- 1) **Control Condition:** Individuals in the control condition were shown boxes of crackers with no FOP label.
- 2) **Basic FOP Condition:** Individuals in condition 2 were shown the same sodium information that is contained in the NFT (mg sodium and % daily value per serving) contained in a label on the top right hand corner of the FOP. This condition tested whether the location of the sodium information (i.e. side vs. FOP) would influence product selection.
- 3) **Descriptive FOP Condition:** Individuals in condition 3 were shown the same label as those in condition 2, with the addition of the words “high sodium” or “low sodium”. This condition tested whether adding text-based content descriptors to the FOP label would influence product selection.
- 4) **Detailed Traffic Light Condition:** Based on the idea of Traffic Light labelling in the UK, participants in condition 4 were shown the same sodium information, presented underneath colour-coded Traffic Light symbols that read “Low Sodium” (green Traffic Light) and “High Sodium” (red Traffic Light). This condition tested whether combining symbols, text-based content descriptors and colours to create a detailed TL label would influence product selection.
- 5) **Simple Traffic Light Condition:** Participants in condition 5 were shown the same red and green Traffic Light symbols used in condition 4, except that the numeric sodium information (mg and % daily value for sodium) was not included. This condition tested whether using a simple TL label with no numeric nutritional information would influence product selection.

**Table 1:** Experimental Conditions

Condition	Low Sodium	High Sodium
<b>1) Control Condition</b>	<i>No front-of-package label</i>	<i>No front-of-package label</i>
<b>2) Basic FOP Label</b>		
<b>3) Descriptive FOP Label</b>		
<b>4) Detailed Traffic Light</b>		
<b>5) Simple Traffic Light</b>		



## 4.7 Focus Group Testing

Focus group testing was conducted with approximately 15 participants in order to test the appeal of the box designs as well as the product labels. Package design testing was conducted using two actual boxes designed for the study, without added nutritional information (i.e. no FOP labels). This testing ensured that one box design was not inherently more appealing than the other due to extraneous factors (e.g. background colour) that could influence results of the behavioural selection task. Focus group testing was also used to determine overall appeal, effectiveness, understanding and believability of the FOP labels proposed. Alternate versions of conditions 4 and 5 (including a % daily value format) were shown to participants; the final designs used in the current study were based on participant feedback during these pre-tests. Please see **Appendix G** for focus group questions.

## 4.8 Questionnaire Measures

Please see **Appendix H** for full versions of questionnaire measures.

### 4.8.1 Socio-Demographic Measures

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This survey gathered background information on socio-demographic factors. Questions included **gender** (*1=male, 2=female, 3=prefer not to say*); **age** (*continuous scale*), **presence of children under 18 in the home** (*1=no, 2=yes, 3=prefer not to say*), **marital status** (*1= single/never married, 2=married/common-law, 3=divorced/separated, 4=widowed, 5=prefer not to say*), and **ethnicity** (*1=White/Caucasian, 2=Black, 3=Asian, 4=European, 5=Middle-Eastern, 6=Mixed, 7=other, 8=prefer not to say*). **Education level** was measured on a 7-point scale (*1=Some elementary school or less, 2=Some high school, 3=Completed high school, 4=Some college or university, 5=Completed college or university, 6=Graduate or professional school (e.g. MSc, MBA, PhD), 7=Prefer not to say*), and **annual household income before taxes** was measured on a 10-point scale (*1=below \$10,000; 10=\$100,000 and above*).

### 4.8.2 City Planning Measures

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This questionnaire was used as the filler task in the larger menu labelling study.<sup>141</sup> Participants were asked to read a passage related to city planning and park plans in the Waterloo Region, and to answer questions regarding the proposed plans. Data from this questionnaire were not analyzed in the current study.

### 4.8.3 Diet and Lifestyle Measures

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This questionnaire measured participant lifestyle patterns relating to diet, physical activity and general health. **Self-rated overall health** was measured with the question: “In general, would you say your health is...”, measured on a 5-point scale (*1=poor; 5=excellent*). This question was taken from the 2009 Canadian Community Health Survey (CCHS), a representative national survey administered by Statistics Canada.<sup>142</sup> **Physical activity** was measured using two questions adapted from a study by Wong, Leatherdale and Manske (2006), which validated a school-based physical activity questionnaire.<sup>143</sup> The two questions measured **moderate** and **intense** physical activity, respectively: “In the past 7 days, how many hours of *moderate* physical activity (such as walking, biking or recreational swimming) did you engage in?”; and “In the past 7 days, how many hours of *intense* physical activity (running, aerobic exercise, team sports, or any other activities that increase your heart rate and make you breathe hard and sweat) did you engage in?”. These questions were measured on an 8-point scale (*1=none; 8= 8 or more hours per week*). Information on any **medical conditions** that participants might suffer from were gathered using the question: “Which, if any chronic medical conditions do you suffer from?”, followed by a list of 20 possible medical conditions adapted from the 2009 CCHS.<sup>142</sup> **Perceived diet healthiness** was measured using the following question from the FOP nutrition labelling study conducted by Feunekes et al. (2008): “How would you describe your overall diet?”, which was measured on a 5-point scale (*1=poor; 5=excellent*).<sup>6</sup> Frequency of **eating outside the home** was measured using the question: “In a typical week, how often do you eat outside the home at a sit-down or fast-food restaurant?”, using a 5-point scale (*1=never; 5=four or more times per week*). **Dieting** was measured using the question: “During the past year, have you been on a diet (such as Weight Watchers, Atkins Diet, South Beach Diet, etc.) or

actively tried to lose weight?” (*1=no, 2=yes, 3=prefer not to say*). Finally, the following question confirmed that the participant does not suffer from any **food allergies** to gluten or other cereal-based products (this might influence their choice of meal in the main study or lead them to decline the free crackers in the current study): “Do you have any food allergies?” (*1=no, 2=yes, I am allergic to the following foods..., 3=prefer not to say*).

#### 4.8.4 Nutrition Use and Understanding

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This survey measured variables related to use and understanding of nutrition information. **Frequency of reading nutrition labels** was measured using the following question, taken from the Tracking Nutrition Trends (TNT) VII survey conducted by the Canadian Council of Food and Nutrition<sup>38</sup>: “Thinking specifically about labels on the various food products you buy (other than brand name or flavour), how often do you read the labels?” (*1=never, 2=sometimes, 3=usually, 4=always, 5=only the first time I buy a product, 6=don’t know*). The **type of nutrition information sought from labels** was measured using the following question adapted from the 2008 Post-Campaign Evaluation – Healthy Eating report prepared for Health Canada<sup>67</sup>: “When shopping for food for you and your family, what types of nutrition information provided on the food package do you usually look for?”; followed by a list of 18 possible items (e.g. Nutrition Facts table, number of calories, fat content). **Self-reported nutritional knowledge** was measured using the following question from the FOP labelling study by Feunekes et al. (2008): “I am knowledgeable about health and nutrition issues” (*1=strongly disagree, 5=strongly agree*).<sup>6</sup> Finally, a condensed version of the Newest Vital Sign, which was designed and validated by Weiss et al. (2005) to measure general health literacy using a pre-packaged food label,<sup>144</sup> was used to examine participant understanding of the NFT. Participants were shown a NFT relating to a fictitious food product and asked two questions corresponding to the nutrition information shown (e.g. “If you eat half the container of ice cream, how many calories will you eat?”). This measure was adapted for the current study by transferring the nutrient information from an American to a Canadian version of the NFT and by reducing the survey

to two questions from the original six. Please note that the original questions were designed for oral administration by the interviewer; in the current study they were answered by the participant on paper.

#### 4.8.5 Sodium Recall and Perceptions on Labelling

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This questionnaire gathered information related to recall of the nutrition information presented during the behavioural selection task, as well as participant perceptions of the experimental labelling formats.

Participants answered a series of questions indicating whether they noticed the nutritional information on the box of crackers they selected. Specific items included **noticing of nutrition label** (*1=no, 2=yes, 3=don't know*), **noticing of sodium information** (*open-ended*), **location of label** (*open-ended*), and **impact of sodium label**; measured by the question “How much, if at all, was your choice of crackers influenced by the nutritional information?” (*1=not at all, 4=a lot*). **Recall of sodium content** was measured using the question: “Thinking about the box of crackers you selected, would you say the crackers were low, medium or high in sodium?” (*1=low, 2=medium, 3=high, 4=don't know*), while **perceived product healthiness** was measured by the question: “In your opinion, how healthy are the crackers you chose?” (*1=not at all healthy, 5=very healthy*).

Participants were also asked to rate **liking**, **effectiveness**, **understanding**, and **believability** of the experimental label they were shown earlier during the behavioural selection task. An image of the label corresponding to the participant's experimental condition (e.g. Simple Traffic Light) was included in this section of the questionnaire. Participants in the control condition answered these questions in reference to the NFT, since they were not shown a FOP label during the behavioural selection task. Responses to these four perception questions were scored using a 10-point Likert scale with the same response range. For example, **liking** was measured using the question: “How much did you **like this** sodium content label?” (*1=disliked it extremely, 10=liked it extremely*).

#### 4.8.6 Menu Recall

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This questionnaire examined participant recall of the calorie and nutrition information presented on the Subway menu during the larger menu labelling study. This information was not analyzed in the current study.

#### 4.8.7 Support for Labelling Policy

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This two-item survey examined support for national policies surrounding the addition of nutrition information on menus and the front of grocery packages. Participants were asked the following two questions: “In your opinion, should the government require food companies to put nutrition information on **menus at restaurants?**” and “In your opinion, should the government require food companies to put nutrition information on the **front of food packages?**” These questions were scored using the same response range (*1=no, 2=yes, 3=maybe, 4=prefer not to say*).

#### 4.9 Hypotheses

- 1) The addition of a FOP label will influence product selection, such that participants in any of the four experimental FOP conditions (conditions #2-5) are expected to choose the low sodium product more frequently than those in the control condition (#1).
- 2) Adding text (high/low content descriptors) will influence product selection, such that participants in the descriptive FOP label condition (#3) or the TL conditions (#4 and 5) are expected to choose the low sodium product more frequently than those in the conditions without text-based descriptors (#1 and 2).
- 3) The addition of symbols and/or colours will influence product selection, such that participants in the TL conditions (#4 and 5) will choose the low sodium product more frequently than those in the remaining conditions (#1- 3).
- 4) In terms of consumer perceptions, the labels that include symbols (conditions #4-5) are hypothesized to score higher in liking, effectiveness and understanding compared to those with text only (conditions #1-3).

- 5) Product selection is hypothesized to differ according to socio-demographic and diet and health-related factors; low sodium products are expected to be chosen more frequently by females, individuals with higher income, education and self-rated nutritional knowledge, as well as those with healthier dietary habits.

## **4.10 Analysis**

### **4.10.1 Sample Characteristics**

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Statistical analyses were conducted using SPSS 19.0 statistical software. Univariate statistics were used to examine the distribution of data for all relevant measures, as well as to characterize the sample profile. Chi-square tests were used to analyze possible differences in key socio-demographic factors between experimental conditions to ensure that randomization was effective at equally distributing participants of various demographics across the five conditions.

### **4.10.2 Summary of Analyses**

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Regression models were used to examine differences between the five experimental conditions. Logistic regression models were used for binary outcomes and linear regression models were used for continuous outcomes. Odds ratios (OR) are reported for all logistic regression models; unstandardized beta coefficients are reported for linear regression models. 95% confidence intervals (CI) are reported for all outcomes. A significance level of  $p < 0.05$  was used as the threshold for statistical significance in all analyses. Regression models were conducted in steps or “blocks”. Experimental condition was coded as a categorical variable (range 1-5, with the number corresponding to each experimental condition). In models with more than one block, the 1<sup>st</sup> block served as the “main effects” (unadjusted) model and only included the experimental condition variable. In the 2<sup>nd</sup> block (adjusted model), the following 5 socio-demographic variables were added to the model: age, gender, ethnicity, education, and income. Two-way interactions between each of these 5 variables and experimental condition were also tested in the second block. For models examining behavioural outcomes, a series of diet and health-related variables were

included in the 2nd block (see section Results section for further details). Adjusted models (i.e. results from the 2<sup>nd</sup> block) are reported, unless otherwise noted.

#### **4.10.3 Socio-demographic Predictors**

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The following principal socio-demographic predictors were examined: gender (1=male; 2=female), ethnicity (1=White/Caucasian; 0=other ethnicity), age (1=18-25; 2=25-34; 3=35-64; 4=65 and older), education (1=completed high school or less; 2= some or completed college or university; 3=graduate or professional school), income level (1=below \$40,000; 2=\$40,000-\$79,999; 3=\$80,000 and above). These five socio-demographic factors were added into the 2<sup>nd</sup> block of all models.

## 5.0 RESULTS

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### 5.1 Sample Characteristics

**Table 2** presents the demographic characteristics of the sample (N=430). Chi-square tests were used to analyze possible differences in key socio-demographic factors between experimental conditions. Results indicated that there were no statistically significant differences between experimental condition for gender ( $\chi^2(4)=2.56, p=0.634$ ), age ( $\chi^2(12)=15.28, p=0.227$ ), education ( $\chi^2(8)=5.44, p=0.710$ ), income ( $\chi^2(12)=6.51, p=0.888$ ), ethnicity ( $\chi^2(4)=4.77, p=0.312$ ), marital status ( $\chi^2(12)=17.03, p=0.149$ ), presence of children under 18 in the home ( $\chi^2(4)=3.47, p=0.483$ ), or BMI ( $\chi^2(12)=14.41, p=0.275$ ).

The study sample was compared to statistics from the Community Profile for Waterloo, Ontario (Regional Municipality) in the 2006 Canadian Census.<sup>145</sup> Statistics for marital status in the study sample were similar to those of Waterloo Region. Specifically, according to the 2006 census, 32% were single and 53% were legally married, compared to 35% and 53% of the study sample, respectively. The study sample was more educated overall, with about 19% of study participants having completed “high school or less” and 81% having completed at least some college, university, graduate or professional school; compared to the Community Profile, in which about half the population (52%) had high school or less (“no certificate, diploma or degree” or “high school certificate or equivalent”) and 48% had some sort of college, trades or university education (“apprenticeship or trades certificate or diploma”, “college, CEGEP or other non-university certificate or diploma”, “university certificate or diploma below the bachelor level” or “university certificate, diploma or degree”). Levels of employment differed slightly as well. In the 2006 Community Profile, about 68% reported being employed, whereas 50% of the study sample reported being employed. The study sample was about 70% White/Caucasian and 30% other ethnicities; in comparison, about 87% of the Community Profile was “not a visible minority”, and 13% was classified as a “visible minority”. Finally, similar proportions of individuals were identified as overweight or obese; 52% of individuals in the 2011 Health Profile for Waterloo Health Unit<sup>146</sup> were



overweight or obese compared to about 57% of the study sample. Overall, the current sample seems to be similar to the Region on most socio-demographic variables measured. The current sample does appear to be somewhat more educated, although the 2006 census statistics do not account for population changes since 2006 in the Waterloo Region.

**Table 2:** Sample Characteristics

<b>Variable</b>	<b>Overall (N=430)</b>	<b>Control (n=82)</b>	<b>Basic FOP (n=99)</b>	<b>Descriptive FOP (n=84)</b>	<b>Detailed TL (n=84)</b>	<b>Simple TL (n=81)</b>
<b>Sex</b>						
Male	46.3%	41.5%	49.5%	41.7%	48.8%	49.4%
Female	53.5%	58.5%	49.5%	58.3%	51.2%	50.6%
Prefer not to say	0.2%	0%	1.0%	0%	0%	0%
<b>Age</b>						
18-24	22.1%	29.3%	25.3%	22.6%	20.2%	12.3%
25-34	17.0%	19.5%	15.2%	20.2%	14.3%	16.0%
35-64	47.2%	37.8%	51.5%	45.2%	46.5%	54.3%
65 and older	13.7%	13.4%	8.0%	12.0%	19.0%	17.4%
<b>Ethnicity</b>						
White/Caucasian	69.8%	61.0%	71.7%	69.0%	73.8%	72.8%
Other	29.7%	39.0%	28.3%	31.0%	25.0%	26.0%
Prefer not to say	0.5%	0%	0%	0%	1.2%	1.2%
<b>Education</b>						
Completed high school or less	18.6%	14.6%	21.2%	20.2%	19.0%	17.3%
College/university (some or completed)	61.6%	64.6%	63.6%	61.9%	62.0%	55.6%
Graduate/professional school (some or completed)	19.6%	19.5%	15.2%	17.9%	19.0%	27.1%
Prefer not to say	0.2%	1.3%	0%	0%	0%	0%
<b>Household Income (before taxes)</b>						
<\$40,000	37.7%	32.9%	42.4%	39.3%	39.3%	33.3%
\$40,000-\$79,999	25.6%	22.0%	27.3%	26.2%	25.0%	27.2%
\$80,000 and above	22.3%	30.5%	18.2%	19.0%	21.4%	23.5%
Prefer not to say	14.4%	14.6%	12.1%	15.5%	14.3%	16.0%
<b>Marital Status</b>						
Single/Never married	35.3%	39.0%	42.4%	33.3%	32.1%	28.4%

Married/Common-law	50.5%	52.4%	45.5%	50.0%	46.4%	59.3%
Divorced/Separated	9.1%	2.4%	6.1%	11.9%	15.5%	9.9%
Widowed	3.7%	5.0%	3.0%	4.8%	4.8%	1.2%
Prefer not to say	1.4%	1.2%	3.0%	0%	1.2%	1.2%
<b>Presence of Children &lt;18 in the Home</b>						
No	80.5%	79.3%	79.8%	78.6%	77.4%	87.7%
Yes	19.5%	20.7%	20.2%	21.4%	22.6%	12.3%
<b>Employment Status<sup>†</sup></b>						
Working full time (35+ hrs/week)	27.2%	25.6%	34.3%	25.0%	23.8%	25.9%
Working part-time (<35 hrs/week)	14.4%	15.9%	17.2%	16.7%	7.1%	14.8%
Self-employed	9.3%	9.8%	9.1%	6.0%	13.1%	8.6%
Unemployed; looking for work	9.8%	11.0%	9.1%	10.7%	11.9%	6.2%
Student	18.1%	24.4%	19.2%	17.9%	15.5%	13.6%
Retired	17.2%	14.6%	11.1%	16.7%	19.0%	25.9%
Not in workplace; not looking for work	5.3%	3.7%	3.0%	6.0%	7.1%	7.4%
Other/prefer not to say	5.3%	6.1%	4.0%	4.8%	8.3%	3.7%
<b>BMI</b>						
Underweight (<18.5)	2.1%	4.9%	1.0%	1.2%	0.0%	3.7%
Normal weight (18.5-24.9)	41.4%	42.7%	35.4%	39.3%	47.6%	43.2%
Overweight (25-29.9)	30.7%	34.1%	30.3%	31.0%	26.2%	32.1%
Obese (≥30)	25.8%	18.3%	33.3%	28.5%	26.2%	21.0%

<sup>†</sup>Percentages for employment status total greater than 100% because some participants fit into more than one category (e.g. student and working part time).

## 5.2 Diet and Lifestyle Factors

### 5.2.1 Self-Reported Overall Health

Self-reported overall health was coded as a continuous variable and entered in a linear regression model as the dependent variable, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also used as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

Overall, one fifth (20%) of participants rated their health as “excellent”, 32% as “very good”, 34% as “good”, 13% as “fair” and 1% as “poor”. Thus, over half (52%) of participants were quite satisfied with their health, responding “very good” or “excellent”; this proportion was a bit lower than the 62% of individuals who rated their health as “very good” or “excellent” in the 2011 Health Profile for Waterloo Health Unit.<sup>145</sup>

Linear regression modelling indicated that ratings of perceived overall health were significantly higher among adults aged 65+ compared to adults aged 18-24 ( $\beta=0.61$ , 95% CI=0.29-0.94,  $p<0.001$ ), 25-34 ( $\beta=0.64$ , 95% CI=0.32-0.97,  $p<0.001$ ) and 35-64 ( $\beta=0.58$ ,  $p<0.001$ ). Those with a college/university ( $\beta=0.42$ , 95% CI=0.18-0.66,  $p=0.001$ ) or graduate/professional education ( $\beta=0.61$ , 95% CI=0.31-0.91,  $p<0.001$ ) had significantly higher ratings of overall health compared to those with a high school education or less. Individuals in the highest income bracket also rated their health significantly better overall compared to those in the lowest income bracket ( $\beta=0.26$ , 95% CI=0.01-0.52,  $p=0.04$ ). Gender and ethnicity were not significant predictors of self-rated health.

### 5.2.2 Diet-Related Medical Conditions or Allergies

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Presence of diet-related health conditions and food allergies were examined due to their potential relevance to product selection. These measures were each coded as binary variables (0=no; 1=yes) and entered in two separate logistic regression models as the dependent variable, with the 5 principal socio-demographic variables, as well as BMI, entered in the 1<sup>st</sup> block.

Diet-related health conditions included the following 15 conditions, plus additional health problems listed by participants under “other”:

- 1) Diabetes
- 2) Hypertension or high blood pressure
- 3) Crohn’s Disease
- 4) Ulcerative Colitis
- 5) Irritable Bowel Syndrome
- 6) Osteoporosis

- 7) Cardiovascular disease or heart disease
- 8) Cancer
- 9) Gastro esophageal reflux disease (GERD)
- 10) Stomach ulcers
- 11) Stroke
- 12) Hyperglycemia or diagnosed high blood sugar
- 13) Hypoglycemia or diagnosed low blood sugar
- 14) Anemia or Iron Deficiency
- 15) Other: B12 deficiency, celiac disease, high cholesterol, heart bypass surgery, heartburn, thyroid problems (including hypothyroidism; due to effects on metabolism and weight), insulin resistance, kidney problems, polycystic ovarian syndrome (due to its effects on weight), and thalassemia minor.

Overall, 52% (n=225) of participants had a diet-related medical condition, and approximately 12% of the sample (n=126) reported having at least one food allergy. Results of logistic regression modelling indicated that females were significantly more likely to have a diet-related medical condition than males (OR=1.75, 95% CI=1.15-2.65,  $p=0.009$ ), and adults aged 65 and older were significantly more likely than those aged 18-24 (OR=2.24, 95% CI=1.05-4.78,  $p=0.04$ ). Those who preferred not to state their income were significantly less likely compared to those in the lowest income bracket (OR=0.46, 95% CI=0.24-0.89,  $p=0.02$ ). Overweight or obese individuals were significantly more likely to have a diet-related medical condition compared to those who were underweight or normal weight (OR=2.28, 95% CI=1.47-3.53,  $p<0.001$ ). Ethnicity and education were not significant predictors of this outcome. There were no significant differences between groups in the presence of food allergies.

### 5.2.3 Self-Reported Physical Activity

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Self-reported physical activity was coded as two continuous variables, which were entered as the dependent variable in separate linear regression models (moderate and intense physical activity). This analysis was conducted in order to characterize the sample in terms of self-reported physical activity levels. In addition to the five main socio-demographic variables, BMI was entered as a covariate in the 1<sup>st</sup> block as the researchers considered it to be conceptually relevant to the dependent variable.

#### 5.2.3.1 Moderate Physical Activity

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Self-reported levels of moderate physical activity for the entire sample were as follows: “8 or more hours per week”: 23%, “6-7 hours per week”: 20%, “3-5 hours”: 32%, “1-2 hours per week”: 18%, “less than 1 hour per week”: 5%, “none”: 2%. The most frequent response (mode) to this question was “3-5 hours per week” (n=138). Linear regression modelling indicated that those of any other ethnicity reported engaging in significantly less moderate physical activity compared to White/Caucasian participants ( $\beta = -0.46$ , 95% CI =  $-0.73 - -0.19$ ,  $p=0.01$ ). Overweight/obese individuals also engaged in significantly less moderate physical activity compared to underweight/normal weight individuals ( $\beta = -0.33$ , 95% CI =  $-0.58 - -0.74$ ,  $p=0.01$ ). Adults 65+ reported engaging in significantly more moderate physical activity compared to those aged 25-34 ( $\beta=0.49$ , 95% CI =  $0.05-0.93$ ,  $p=0.03$ ). Gender, education and income were not significant predictors of moderate physical activity.

#### *5.2.3.2. Intense Physical Activity*

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Levels of intense physical activity for the entire sample were somewhat lower: “8 or more hours per week”: 5%, “6-7 hours per week”: 8%, “3-5 hours”: 20%, “1-2 hours per week”: 25%, “less than 1 hour per week”: 17%, “none”: 25%. The most frequent responses to this question were “none; I did not engage in any intense physical activity” (n=107), and “1-2 hours per week” (n=106). Linear regression modelling indicated that females reported engaging in significantly less intense physical activity compared to males ( $\beta = -0.71$ , 95% CI =  $-0.98 - -0.43$ ,  $p<0.001$ ). Those with a college/university education reported engaging in significantly more intense physical activity compared to those with a graduate/professional school education ( $\beta=0.39$ , 95% CI =  $0.03-0.75$ ,  $p=0.04$ ). A general trend also indicated that the youngest adults (18-24) engaged in more intense physical activity compared to those aged 65+, however this finding did not meet statistical significance ( $\beta=0.47$ , 95% CI =  $-0.32-0.97$ ,  $p=0.07$ ). Ethnicity and income did not significantly predict levels of intense physical activity.

#### **5.2.4 Self-Reported Knowledge of Health and Nutrition Issues**

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Self-reported knowledge of health and nutrition issues was coded as a continuous variable with 5 levels and entered in a linear regression model as the dependent variable, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also tested as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

Overall frequency of responses to the question “I am knowledgeable about health and nutrition issues” were as follows: strongly agree: 41%; agree somewhat: 48%; neutral/no opinion: 6%; disagree somewhat: 3%; strongly disagree: 1%. Thus, the majority (89%) of the sample “somewhat” or “strongly” agreed with the statement. In comparison, the 2008 TNT survey found that 78% of Canadians felt they were “somewhat” or “very” knowledgeable about nutrition.<sup>38</sup>

Linear regression modelling indicated that levels of agreement with this statement were significantly higher among females compared to males ( $\beta=0.19$ , 95% CI=0.03-0.34,  $p=0.02$ ). Middle-aged adults (aged 35-64) were significantly more likely to agree with this statement compared to adults aged 25-34 ( $\beta=0.23$ , 95% CI =0.18-0.45,  $p=0.03$ ). Ethnicity was not a significant predictor of this outcome.

Individuals with a college/university ( $\beta=0.24$ , 95% CI=0.03-0.44,  $p=0.02$ ) or graduate/professional ( $\beta=0.38$ , 95% CI=0.12-0.64,  $p=0.004$ ) education also agreed significantly more strongly with this statement compared to those with high school or less. Those in the lowest income bracket had lower levels of agreement with this statement compared to those in the middle-income bracket; this finding verged on significance ( $\beta= -0.20$ , 95% CI= -0.40-0.00,  $p=0.05$ ).

### **5.2.5 Self-Reported Overall Diet**

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Self-reported overall diet was coded as a continuous variable and entered in a linear regression model as the dependent variable, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also used as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

Overall, 17% of participants reported that their overall diet was “excellent”, 44% rated it as “good”, 25% as “average”, 9.5% as “fair”, and 5% as “poor”. Thus, over half the sample (61%) rated their diet as “good” or “excellent”. In comparison, the 2008 TNT survey found that 74% of Canadians rated their eating habits as “good”, “very good” or “excellent”.<sup>38</sup>

Linear regression modelling indicated that adults aged 65+ rated their diet as significantly healthier compared to adults aged 18-24 ( $\beta=0.76$ , 95% CI=0.42-1.10,  $p<0.001$ ), 25-34 ( $\beta=0.72$ , 95% CI=0.38-1.06,  $p<0.001$ ) and 35-64 ( $\beta=0.59$ , 95% CI=0.30-0.87,  $p<0.001$ ). Those with a college/university ( $\beta=0.32$ , 95% CI=0.70-0.57,  $p=0.01$ ) or graduate/professional school ( $\beta=0.48$ , 95% CI=0.16-0.80,  $p=0.003$ ) education also rated their diet as significantly healthier compared to those with a high school education or less. Those in the middle-income bracket rated their diet as significantly healthier compared to those in the lowest income bracket ( $\beta=0.28$ , 95% CI=0.28-0.53,  $p=0.03$ ). Gender and ethnicity were not significant predictors of this outcome.

### 5.2.6 Frequency of Eating Outside the Home

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Frequency of eating outside the home was coded as a continuous variable with 5 levels and entered in a linear regression model as the dependent variable, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also used as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

Overall, 11% of participants reported “never” eating outside the home, 43% ate outside the home “less than once per week”, 19% responded “once per week”, 23% responded “two or three times per week” and 4% responded “four or more times per week”. Thus, almost half (46%) reported eating out at least once per week. Similarly, the 2008 TNT survey found that more than half of Canadians eat at least one meal prepared out of the home each day.<sup>38</sup>

Linear regression modelling indicated that females reported eating outside the home significantly less frequently compared to males ( $\beta= -0.27$ , 95% CI= -0.47- -0.66,  $p=0.01$ ). Middle-aged (35-64) adults

reported eating outside the home significantly less frequently compared to those aged 18-24 ( $\beta = -0.63$ , 95% CI= -0.91- -0.35,  $p < 0.001$ ) and 25-34 ( $\beta = -0.38$ , 95% CI= -0.66- -0.09,  $p = 0.01$ ). Older adults (65+) reported eating outside the home significantly less frequently compared to those aged 18-24 ( $\beta = -0.41$ , 95% CI= -0.78- -0.05,  $p = 0.03$ ). Ethnicity, education and income were not significant predictors of frequency of eating outside the home.

### 5.2.7 Weight Loss/Dieting

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Attempts at weight loss/dieting in the past year was coded as a binary variable (no=1; yes=2) and entered in a logistic regression model as the dependent variable, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also used as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

Approximately 30% (n=126) of the sample reported being on a diet or actively trying to lose weight in the past year. Far fewer (9%) of Canadians in the 2008 TNT survey reported that they had tried or been on a “popular diet” in the past year.<sup>38</sup> This discrepancy might reflect true differences between the 2008 national survey and the study sample, which was conducted in 2010-2011 and sampled residents of Waterloo Region only. However, it may also be due to differences in measurement, since the current study asked participants whether they had “been on a diet or actively tried to lose weight” (which might include weight loss through physical activity). In contrast, the TNT survey asked specifically about “popular diets”.

Logistic regression modelling indicated that females were significantly more likely to have been on a diet in the past year compared to males (OR=1.86, 95% CI=1.19-2.91,  $p = 0.007$ ). Adults aged 35-46 were significantly more likely to have been on a diet compared to adults aged 65+ (OR=2.33, 95% CI=1.12-4.87,  $p = 0.02$ ). Those with a college/university education were significantly more likely to have been on a diet compared to those with a high school education or less (OR=1.96, 95% CI=1.03-3.72,  $p = 0.04$ ) or



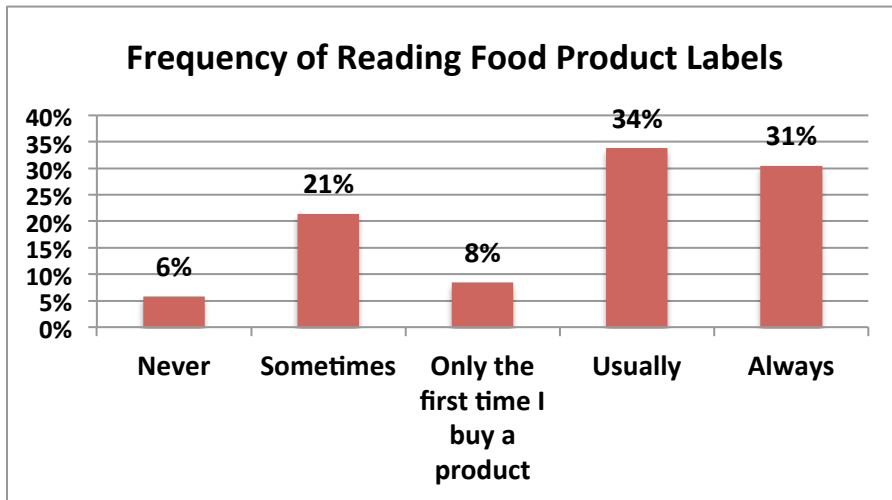
those with a graduate/professional school education (OR=1.85, 95% CI=1.01-3.37,  $p=0.047$ ). Income and ethnicity were not significant predictors of dieting.

### 5.3 Use, Understanding and Support of Nutrition Labels

#### 5.3.1 Frequency of Reading Nutrition Labels

Participants were asked how often they read food product labels on the products they buy. The overall frequency of reading food product labels is shown in Figure 17.

Figure 17: Frequency of Reading Food Product Labels (n=429)



Frequency of reading food product labels was recoded as a binary variable, where 1=“usually or always” (64%) and 0=“never, sometimes, or only the first time I buy a product” (36%). In order to examine socio-demographic predictors of label use, frequency of reading nutrition labels was entered into a logistic regression analysis as the dependent variable; the five principal socio-demographic variables were entered in the 1<sup>st</sup> block. Results indicated that females were significantly more likely to “usually or always” read product labels compared to males (OR=1.86, 95% CI=1.23-2.81,  $p=0.003$ ). No other socio-demographic predictors were significant predictors of this outcome.

## 5.3.2 Information Sought on Package

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### 5.3.2.1 Sodium

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Whether or not participants usually look for sodium information on food products was coded as a binary variable (0=no; 1=yes) and served as the dependent variable in a logistic regression model with the five socio-demographic covariates entered in the 1<sup>st</sup> block. This measure was also used as a covariate in logistic regression analyses used to examine behavioural outcomes (see below).

Overall 69% (n=296) of individuals indicated that they “usually” look for sodium on the food package when grocery shopping. Logistic regression analyses indicated that females were significantly more likely to report looking at sodium information on the package compared to males (OR=1.58, 95% CI=1.02-2.44,  $p=0.04$ ). Middle-aged adults (35-64) and those aged 65+ were significantly more likely to report looking at sodium information on the package compared to the youngest adults (18-24) (OR=2.63, 95% CI=1.49-4.63,  $p=0.001$ ; OR=3.30, 95% CI=1.46-7.30,  $p=0.004$ , respectively). Ethnicity, education and income were not significant predictors of likeliness of looking at sodium information when grocery shopping.

### 5.3.2.2 Health Logos/ Claims

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Whether or not participants usually look for health logos and/or claims on food products was coded as a binary variable (0=no; 1=yes) and served as the dependent variable in a logistic regression model with the five socio-demographic covariates entered in the 1<sup>st</sup> block. This measure was also used as a covariate in logistic regression analyses used to examine behavioural outcomes (see below).

Overall 35% (n=151) of individuals indicated that they “usually” look for health logos and/or health claims on the food package when grocery shopping. Results of logistic regression analyses indicated that middle-aged adults (35-64) were significantly more likely to report looking for health logos/health claims compared to the adults aged 25-34 (OR=1.86, 95% CI=1.01-3.45,  $p=0.048$ ). Gender, ethnicity, education

and income were not significant predictors of the likelihood of looking for health logos/claims on food packages.

### 5.3.3 Understanding of Nutrition Facts Panel

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The two items measuring understanding of the Nutrition Facts panel (modified version of the Newest Vital Sign) were coded as binary variables (0=incorrect response; 1=correct response). For question 1 (number of calories consumed), the correct response was 500 calories. For question 2 (% Daily Value), the correct response was 10% daily value. These outcomes were used as the dependent variable in two separate logistic regression models, with the 5 principal socio-demographic variables entered in the 1<sup>st</sup> block. This measure was also used as a predictor variable in the logistic regression analyses examining the behavioural outcomes (see below).

#### 5.3.3.1 Question 1: Number of Calories

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Overall, 71% of participants (n=305) calculated the correct number of calories that one would consume if they ate half the container of ice cream (500 calories). Logistic regression modelling indicated that adults aged 65+ were significantly less likely to answer this question correctly compared to adults aged 18-24 (OR=0.44, 95% CI=0.21-0.94,  $p=0.04$ ) and 25-34 (OR=0.28, 95% CI=0.12-0.66,  $p=0.004$ ). Those with a college or university education were significantly more likely to answer this question correctly compared to those with a high school education or less (OR=1.97, 95% CI=1.12-3.46,  $p=0.02$ ). Those with a graduate or professional school education were also somewhat more likely to respond correctly to this question compared to those with high school or less, this finding approached statistical significance (OR=2.00, 95% CI=0.95-4.18,  $p=0.07$ ). Gender, ethnicity and income did not significantly predict correct responses to this question.

#### 5.3.3.2 Question 2: Percent Daily Value

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Overall, 62% of participants (n=268) indicated the correct daily value for calories that one would consume if they consumed one serving of the product (10% daily value). Logistic regression modelling

indicated that compared to White/Caucasian participants, those of any ethnicity were significantly less likely to respond correctly to this question (OR=0.58, 95% CI=0.36-0.94,  $p=0.03$ ). Age and gender were not significant predictors of this outcome.

More educated individuals were more likely to respond correctly to this question; those with a college/university education (OR=2.72, 95% CI=1.57-4.70,  $p<0.001$ ) or a graduate/professional school education (OR=5.14, 95% CI=2.42-10.93,  $p<0.001$ ) were significantly more likely to respond correctly compared to those with a high school education or less. Those with a graduate/professional education were also significantly more likely to respond correctly compared to those with a college/university education (OR=1.89, 95% CI=1.01-3.55,  $p=0.047$ ). Finally, those in the highest income bracket were significantly more likely to respond correctly compared to those in the lowest income bracket (OR=2.33, 95% CI=1.24-4.40,  $p=0.009$ ).

#### 5.3.4 Support for Labelling Policy

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Support for labelling policy was measured by the question: “Should the government require food companies to put nutrition information on the front of food packages?” Responses were coded as a binary variable (0=no; 1=yes or maybe) to compare participants who expressed at least some support for FOP labelling policy to those who did not. This item was entered into a logistic regression model as the dependent variable; the five principal socio-demographic variables were entered as predictors of support for labelling policy in the 1<sup>st</sup> block.

Results indicated that overall, 42% of participants answered “yes”, 25% answered “maybe” and 33% answered “no”. Responses of either “yes” or “maybe” (67%) were considered supportive of labelling policy for analysis purposes. Logistic regression modelling indicated that older adults were more supportive of FOP labelling policy than younger adults. Specifically, participants aged 35-64 and 65+ were significantly more likely to support FOP labelling compared to those aged 18-24 (OR=2.53, 95% CI=1.42-4.50,  $p=0.002$ ; OR=5.20, 95% CI=2.20-12.27,  $p<0.001$ , respectively) and those aged 25-34

(OR=1.99, 95% CI=1.12-3.56,  $p=0.02$ ; OR=4.10, 95% CI=1.76-9.56,  $p=0.001$ , respectively). Similarly, those aged 65+ were more likely to support labelling policy compared to those aged 35-64; this finding approached but did not meet statistical significance (OR=2.06, 95% CI=0.96-4.39,  $p=0.06$ ).

In regards to socio-economic status, education was not a significant predictor of support for FOP labelling policy, however significant differences were found across income levels. Specifically, those in the lowest income bracket (<\$40,000) were significantly more likely to support FOP labelling policy compared to those in the highest income bracket (OR=1.90, 95% CI=1.04-3.46,  $p=0.04$ ). Neither ethnicity nor gender was a significant predictor in this model.

## **5.4 Behavioural Outcome Variables**

### **5.4.1 Did the participant pick up the box?**

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Results indicated that overall, approximately 72% of participants picked up at least one of the cracker boxes before making their product selection ( $n=308$ ). Logistic regression analyses were used to test the impact of experimental condition on the proportion of participants who picked up the box before making their product selection. The proportion of participants who picked up the box served as the dependent variable in Block 1 of the logistic regression model, where 0=did not pick up the box and 1=picked up the box. Logistic regression modelling indicated that whether or not participants picked up the box varied according to package design; specifically, participants were significantly less likely to pick up the box when Kent's was the low sodium option compared to when Watt's was the low sodium option (OR=0.65, 95% CI=0.42-1.00,  $p=0.047$ ). This variable was therefore added to the first block of the regression model for subsequent analyses measuring this outcome. Two-way interactions were tested between experimental condition and each of the 5 socio-demographic variables; no significant interactions were found and these terms were therefore excluded from the model. The 2<sup>nd</sup> block of the model included the 5 principal socio-demographic variables (gender, ethnicity, age, education and income), as well as the 9 diet and health-related variables that were included in the model used for the product selection outcome (see below).

Results of the adjusted model (Block 2) indicated that whether or not participants picked up the box varied significantly across experimental condition. Those in the detailed TL and the simple TL conditions were significantly less likely to pick up the box compared to the control condition (62%, OR=0.42, 95% CI=0.19-0.89,  $p=0.02$ ; 63%, OR=0.39, 95% CI=0.18-0.85,  $p=0.02$ , respectively) and compared to the descriptive FOP condition (OR=0.32, 95% CI=0.15-0.70,  $p=0.005$ ; OR=0.30, 95% CI=0.13-0.67,  $p=0.003$ , respectively). Those in the basic FOP (71%) and descriptive FOP conditions (82%) were not significantly more likely to pick up the box compared to the control condition (OR=0.74, 95% CI=0.34-1.58,  $p=0.43$ ; OR=1.30, 95% CI=0.55-3.06,  $p=0.55$ ). Gender, age, ethnicity, education and income did not significantly predict whether participants picked up the box.

In regards to diet and health-related predictors, those with higher levels of self-reported overall health were significantly less likely to pick up the box compared to those with lower levels (OR=0.66, 95% CI=0.49-0.89,  $p=0.007$ ). In contrast, those with higher levels of self-reported knowledge of health and nutrition issues were *more* likely to pick up the box; this finding approached but did not meet statistical significance (OR=1.34, 95% CI=0.99-1.81,  $p=0.058$ ). Frequency of eating outside the home, attempts at weight loss/dieting, frequency of reading product labels, looking for sodium on food packages when grocery shopping, and understanding of the Nutrition Facts panel were not significant predictors of this outcome.

## 5.4.2 Product Selection

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### 5.4.2.1 Test for Effects of Package Design

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Logistic regression modelling was conducted to determine whether product selection outcomes differed significantly according to package design. Results indicated that there was no significant difference in product selection when the Kent's crackers were the low sodium option compared to Watt's crackers (OR=0.90, 95% CI=0.56-1.46,  $p=0.67$ ). These results suggest that counterbalancing the boxes

successfully eliminated any significant influence of package design on product selection. This variable was therefore not included in subsequent regression models for this outcome.

#### *5.4.2.2 Test for Effect of Larger Study on Behavioural Outcome*

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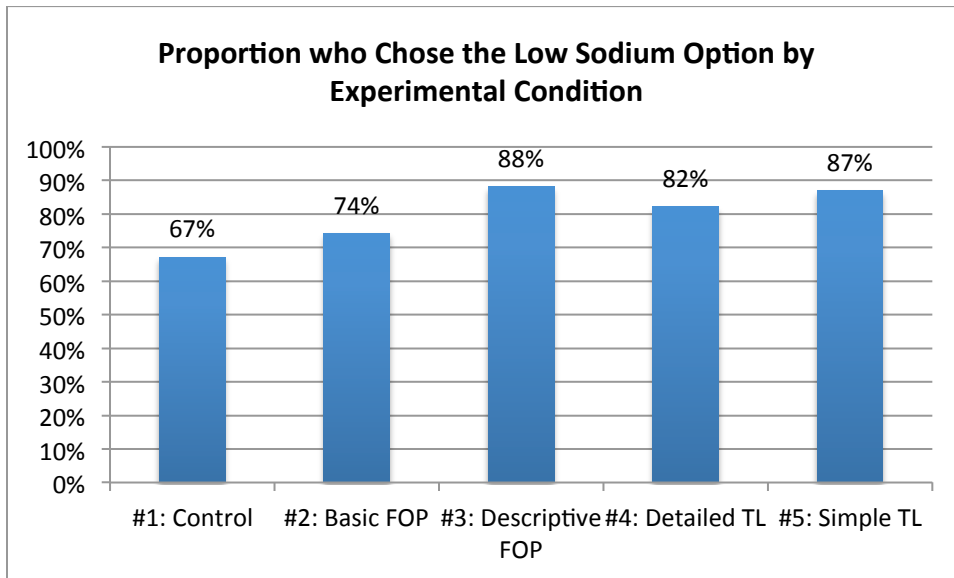
Logistic regression analyses were also conducted to determine the effect of the experimental “menu” condition from the larger study on the behavioural outcome of the current study (i.e. product selection). Menu condition served as the independent variable, and the proportion of participants selecting the low sodium product served as the dependent variable, where 0=selection of high sodium product, and 1=selection of low sodium product. Results indicated that product selection outcomes did not vary significantly by menu condition. These results indicate that the experimental condition in which participants were placed for the larger study did not influence their decision during the product selection task. This variable was therefore not included in subsequent regression models for this outcome.

#### *5.4.2.3 Results of Product Selection Task*

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Overall, 78% (n=335) of participants chose the low sodium crackers, 20% (n=86) chose the high sodium and 2% (n=9) refused the crackers (i.e. selected neither the low nor high sodium option). The participants who refused the crackers were excluded from subsequent analyses; resulting in final proportions of 79.6% and 20.4% for low and high sodium selections, respectively. The results reported in the following regression models therefore reflect differences between groups of participants that selected either the low or high sodium product. The proportion of individuals who chose the low sodium option in each condition is displayed in Figure **18**.

Figure 18: Product Selection by Condition (n=421)



Logistic regression analyses were used to test the impact of experimental condition on product selection.

The proportion of participants choosing the low sodium option served as the dependent variable in the logistic regression model, where 0=selection of high sodium product and 1=selection of low sodium product. Experimental condition was entered as the independent variable in the 1<sup>st</sup> block of this model.

Results of the unadjusted model (i.e. Block 1) are shown in Table 3. Results indicated that product selection varied by experimental condition. Specifically, those in the descriptive FOP condition were significantly more likely to choose the low sodium option compared to both the control condition (OR=3.39, 95% CI=1.44-8.00,  $p=0.005$ ) and the basic FOP condition (OR=2.44, 95% CI=1.05-5.69,  $p=0.04$ ). Those in the detailed TL condition were significantly more likely to choose the low sodium option compared to the control condition (OR=2.18, 95% CI=1.02-4.68,  $p=0.046$ ). Finally, those in the simple TL condition were significantly more likely to choose the low sodium option compared to the control condition (OR=3.24, 95% CI=1.37-7.66,  $p=0.007$ ) and the basic FOP condition (OR=2.34, 95% CI=1.00-5.45,  $p=0.049$ ). In summary, 3 out of the 4 FOP conditions were more likely to choose the low



sodium option compared to the control group. However, contrary to hypotheses, the basic FOP condition was no more effective than the control group at guiding product selection towards low sodium products.

**Table 3: Logistic Regression Outcomes for Product Selection Task: Block 1 (n=394)**

Block 1 (Unadjusted Model) <sup>a</sup>		
Overall Model	$\chi^2(df)$	Sig.
	13.15(4)	p=0.01
Condition	Odds Ratio (95% CI)	Sig.
Control ( <i>ref</i> ) vs. Basic FOP	1.39 (0.69-2.78)	p=0.36
Control ( <i>ref</i> ) vs. Descriptive FOP	<b>3.39<sup>**</sup></b> (1.44-8.00)	p=0.005
Control ( <i>ref</i> ) vs. Detailed TL	<b>2.18<sup>*</sup></b> (1.02-4.68)	p=0.046
Control ( <i>ref</i> ) vs. Simple TL	<b>3.24<sup>**</sup></b> (1.37-7.66)	p=0.007
Basic FOP ( <i>ref</i> ) vs. Descriptive FOP	<b>2.44<sup>*</sup></b> (1.05-5.69)	p=0.04
Basic FOP ( <i>ref</i> ) vs. Detailed TL	1.57 (0.74-3.33)	p=0.24
Basic FOP ( <i>ref</i> ) vs. Simple TL	<b>2.34<sup>*</sup></b> (1.00-5.45)	p=0.049
Descriptive FOP ( <i>ref</i> ) vs. Detailed TL	0.64 (0.26-1.59)	p=0.34
Descriptive FOP ( <i>ref</i> ) vs. Simple TL	0.96 (0.36-2.56)	p=0.93
Detailed TL ( <i>ref</i> ) vs. Simple TL	1.49 (0.60-3.67)	p=0.39

<sup>a</sup> Significant results are bolded and indicated with asterisks.

The 5 principal socio-demographic variables (gender, ethnicity, age, education and income) were added into the model in the 2<sup>nd</sup> block of the regression model. In order to determine which of the remaining diet and health-related predictor variables should be included in the 2<sup>nd</sup> block of the model, bivariate correlations were tested between product selection outcome and the following 16 variables: presence of children under 18 in the home, BMI, presence of a diet-related health condition, self-reported overall

health, moderate physical activity, intense physical activity, self-reported overall diet, frequency of eating outside the home, attempts at weight loss/dieting in the past year, presence of food allergies, frequency of reading product labels, “usually” looking for sodium on food packages when grocery shopping, “usually” looking for health logos/claims on food packages when grocery shopping, of health and nutrition issues, and the two items from the Newest Vital Sign (which measure understanding of the Nutrition Facts panel). Variables that were significantly correlated with product selection outcome were selected for inclusion in the final model; a value of  $p < 0.10$  was used as the entry criterion for inclusion.

Based on this criteria, the following 7 variables were excluded from the model: presence of children under 18 in the home, BMI, presence of a diet-related health condition, level of moderate physical activity, level of intense physical activity, presence of food allergies, and “usually” looking for health logos/claims when grocery shopping.

The final model thus included experimental condition, gender, ethnicity, age, education and income, as well as the following 9 diet and health-related variables: self-reported overall health ( $r(416)=0.12$ ,  $p=0.01$ ), self-reported overall diet ( $r(419)=0.18$ ,  $p < 0.001$ ), frequency of eating outside the home ( $r(419)=-0.18$ ,  $p < 0.001$ ), attempts at weight loss/dieting ( $r(415)=0.10$ ,  $p=0.047$ ), frequency of reading product labels ( $r(418)=0.16$ ,  $p=0.001$ ), “usually” looking for sodium on packages when grocery shopping ( $r(417)=0.25$ ,  $p < 0.001$ ), self-reported knowledge of health and nutrition issues ( $r(416)=0.14$ ,  $p=0.004$ ), and the two items of the Newest Vital Sign measuring understanding of the Nutrition Facts panel: number of calories ( $r(407)=0.11$ ,  $p=0.03$ ), and % daily value ( $r(406)=0.13$ ,  $p=0.01$ ).

Finally, two-way interactions between experimental condition and each of the 5 socio-demographic variables were tested in the 2<sup>nd</sup> block. Interaction terms were included only if they were significant in the 2<sup>nd</sup> block of the model, and remained significant in the full model. No two-way interactions met these criteria.

As can be seen in Table 4, experimental condition remained significant in the adjusted model (Block 2). Specifically, those in the descriptive FOP, detailed TL and simple TL labels were significantly more likely to choose the low sodium product compared to those in the control group. Results indicated that none of the 5 principal socio-demographic variables (gender, age, ethnicity, education, income) were significant predictors of product selection.

In regards to diet and health-related predictors, those who reported “usually” looking for sodium information when grocery shopping were significantly more likely to choose the low sodium option compared to those who did not (OR=3.00, 95% CI=1.63-5.53,  $p<0.001$ ). Those who reported eating outside the home more frequently were less likely to choose the low sodium option compared to those who ate outside the home less frequently; this finding verged on significance (OR=0.76, 95% CI=0.57-1.00,  $p=0.05$ ). Self-reported overall health, self-reported diet, attempts at weight loss/dieting, frequency of reading food product labels, knowledge of health and nutrition, and understanding of the Nutrition Facts panel were not significant predictors of product selection.

**Table 4: Logistic Regression Outcomes for Product Selection Task: Block 2 (n=394)**

<b>Block 2 (Adjusted Model)<sup>a</sup></b>		
<b>Overall Model</b>	<b><math>\chi^2(df)</math></b>	<b>Sig.</b>
	70.00(23)	$p<0.001$
<b>Condition</b>	<b>Odds Ratio (95% CI)</b>	<b>Sig.</b>
Control ( <i>ref</i> ) vs. Basic FOP	1.85 (0.82-4.18)	$p=0.14$
Control ( <i>ref</i> ) vs. Descriptive FOP	<b>3.76**</b> (1.46-9.68)	$p=0.006$
Control ( <i>ref</i> ) vs. Detailed TL	<b>2.44*</b> (1.03-5.80)	$p=0.04$
Control ( <i>ref</i> ) vs. Simple TL	<b>4.20**</b> (1.52-11.61)	$p=0.006$
Basic FOP ( <i>ref</i> ) vs. Descriptive FOP	2.03 (0.79-5.20)	$p=0.14$
Basic FOP ( <i>ref</i> ) vs. Detailed TL	1.32 (0.57-3.06)	$p=0.52$
Basic FOP ( <i>ref</i> ) vs. Simple TL	2.27 (0.85-6.08)	$p=0.10$
Descriptive FOP ( <i>ref</i> ) vs. Detailed TL	0.65 (0.24-1.74)	$p=0.39$
Descriptive FOP ( <i>ref</i> ) vs. Simple TL	1.12 (0.37-3.36)	$p=0.84$
Detailed TL ( <i>ref</i> ) vs. Simple TL	1.72 (0.61-4.87)	$p=0.31$
<b>Socio-demographic Variables</b>	<b>Odds Ratio (95% CI)</b>	<b>Sig.</b>

<b>Gender</b>		
<i>Male (ref)</i>		
Female	0.91 (0.50-1.66)	<i>p</i> =0.77
<b>Ethnicity</b>		
<i>White/Caucasian (ref)</i>		
Other	0.77 (0.41-1.45)	<i>p</i> =0.41
<b>Age</b>		
<i>18-25 (ref)</i>		
25-34	1.68 (0.66-4.32)	<i>p</i> =0.28
35-64	1.35 (0.63-2.88)	<i>p</i> =0.44
65 and older	1.84 (0.61-5.59)	<i>p</i> =0.28
<b>Education</b>		
<i>High school or less (ref)</i>		
College/University	1.01 (0.45-2.26)	<i>p</i> =0.98
Graduate/Professional School	0.88 (0.30-2.55)	<i>p</i> =0.82
<b>Income</b>		
<i>Under \$40,000 (ref)</i>		
\$40,000-\$79,999	0.98 (0.46-2.13)	<i>p</i> =0.97
\$80,000 and above	0.91 (0.40-2.08)	<i>p</i> =0.82
Prefer not to say	1.33 (0.51-3.47)	<i>p</i> =0.56
<b>Diet &amp; Health-Related Predictors</b>	<b>Odds Ratio (95% CI)</b>	<b>Sig.</b>
Self-reported overall health	1.09 (0.75-1.56)	<i>p</i> =0.66
Self-reported overall diet	1.11 (0.78-1.59)	<i>p</i> =0.56
Frequency of eating outside the home	<b>0.76*</b> (0.57-1.00)	<i>p</i> =0.05
Weight loss/dieting	1.53 (0.77-3.04)	<i>p</i> =0.22
Frequency of reading product labels	1.32 (0.73-2.41)	<i>p</i> =0.37
“Usually” looking for sodium on food packages	<b>3.00***</b> (1.63-5.53)	<i>p</i> <0.001
Self-reported knowledge of health and nutrition issues	1.37 (0.96-1.96)	<i>p</i> =0.08
Newest Vital Sign: # of Calories	1.26 (0.66-2.39)	<i>p</i> =0.49
Newest Vital Sign: % Daily Value	1.73 (0.91-3.28)	<i>p</i> =0.09

<sup>a</sup> Significant results are bolded and indicated with asterisks.

## 5.5 Recall of Label Information

### 5.5.1 Noticing of sodium information

Logistic regression analyses were used to examine the impact of experimental condition on the proportion of participants who reported noticing “sodium” or “salt” information on the cracker boxes (0=no; 1=yes). Overall, 70% of participants (n=292) mentioned noticing sodium information on the cracker boxes. The frequency of noticing sodium information varied significantly across experimental conditions. Participants in all four FOP conditions: basic FOP (OR=3.98, 95% CI=2.05-7.73,  $p<0.001$ ), descriptive FOP (OR=15.12, 95% CI=6.25-36.56,  $p<0.001$ ), detailed TL (OR=3.91, 95% CI= 1.96-7.81,  $p<0.001$ ), and simple TL (OR=6.77, 95% CI=3.19-14.34,  $p<0.001$ ) were significantly more likely to report noticing sodium information on the boxes compared to the control (no FOP) condition. Participants in the descriptive FOP were also significantly more likely to report noticing sodium information compared to the basic FOP condition (OR=3.80, 95% CI=1.61-8.97,  $p=0.002$ ) and the detailed TL (OR=3.87 95% CI =1.60-9.35,  $p=0.003$ ). Age, gender, ethnicity, education and income were not significant predictors of this outcome.

### 5.5.2 Location of Nutrition Information

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Logistic regression analyses were used to examine the impact of experimental condition on the proportion of participants who reported noticing sodium information on “front” or “top right-hand corner” of the cracker boxes (0=no; 1=yes).

Overall, 36% (n=145) of individuals indicated that the nutrition information they noticed was located on the front or top right-hand corner of the package (referred to as “FOP” from here on). Logistic regression modelling indicated that frequency of identifying that the nutrition information was on the FOP did not vary significantly by experimental condition. Adults aged 18-24 and 25-34 were significantly more likely to report seeing nutritional information on the FOP compared to those aged 35-64 (OR=2.12, 95% CI=1.12-4.02,  $p=0.02$ ; OR=2.16, 95% CI=1.10-4.23,  $p=0.03$ , respectively). Those with a graduate or professional school education were significantly more likely to report seeing nutritional information on the FOP compared to those with high school or less (OR=2.52, 95% CI=1.13-5.63,  $p=0.03$ ) or

college/university (OR=2.56, 95% CI=1.40-4.70,  $p=0.002$ ). Gender, ethnicity and income were not significant predictors of this outcome.

### 5.5.3 Influence of Nutrition Information

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Results indicated that 69.1% of individuals reported that the nutrition information influenced their cracker selection “a lot”; 13.5% reported that it influenced their selection “a little”, 14.7% responded “not at all” and 2.6% “did not notice any nutrition information”.

Logistic regression analyses were used to examine the impact of experimental condition on the proportion of participants who reported being influenced by the nutrition information on the cracker boxes. The responses were recoded as a binary variable to reflect differences between those who reported being influenced *at all* versus those who reported not being influenced by the nutrition information (0=“not at all”; 1=“a little” or “a lot”). Individuals who did not select either box of crackers were eliminated (i.e. coded as “missing”) from this analysis. The regression model therefore compared those who indicated that the nutrition information had at least *some* influence on their product selection (“a little” or “a lot”; 83%), compared to those who indicated that it did not influence them (“not at all”; 15%).

The proportion of individuals who reported that the nutrition information influenced their product selection differed significantly across conditions; those in the basic FOP (OR=2.59, 95% CI=1.13-5.94,  $p=0.03$ ) and descriptive FOP (OR=5.77, 95% CI=1.99-16.75,  $p=0.001$ ) were significantly more likely to report being influenced by the nutrition information compared to those in the control condition. Those in the simple TL were also more likely to be influenced by the nutrition information compared to the control condition; this finding approached significance (OR=2.27, 95% CI=0.94-5.46,  $p=0.07$ ). Females were significantly more likely to report being influenced by the nutrition information compared to males (OR=3.32, 95% CI=1.29-4.20,  $p=0.005$ ). Middle-aged adults (35-64) were significantly more likely to report being influenced compared to adults in the youngest (18-24) age category (OR=2.21, 95% CI=1.01-4.84,  $p=0.047$ ); older adults (aged 65+) were also more likely to report being influenced

compared to the youngest adults; this finding approached significance (OR=2.86, 95% CI=0.95-8.64,  $p=0.06$ ). No other socio-demographic variables were significant predictors of this outcome.

#### 5.5.4 Perceived Sodium Level of Crackers

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Perceived sodium level of the crackers selected was measured by the question: “How much sodium do you think was in the crackers you selected?” Responses were recoded as a binary variable where 1=“low” and 0=other (“medium”/ “high”). This variable was entered as the dependent variable in a logistic regression analysis, where product selection outcome was the independent variable. This analysis tested whether participants were in fact aware of the sodium levels of the crackers they selected. Individuals who did not select either box of crackers were eliminated (i.e. coded as “missing”) from this analysis.

Overall, 61% of participants reported that the crackers they selected were “low” in sodium, while 32% indicated that the crackers were either “medium” or “high” in sodium. Logistic regression modelling indicated that those who chose the low sodium product were significantly more likely to report that the crackers they selected were low in sodium (80.8%) compared to those who chose the high sodium product (11.3%), OR=33.08, 95% CI=15.05-72.71,  $p<0.001$ . This analysis served as an additional verification that participants were, in fact, cognizant of the sodium levels in the crackers they selected.

#### 5.5.5 Perceived Healthiness of Crackers

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Perceived healthiness of crackers was coded as a continuous variable and entered as the dependent variable in a linear regression analysis, with product selection outcome as the independent variable. Individuals who did not select either box of crackers were eliminated (i.e. coded as “missing”) from this analysis. Mean ratings of cracker healthiness varied according to whether participants had chosen the low sodium crackers ( $\mu=3.02$ ,  $SD=1.08$ ) or the high sodium crackers ( $\mu=2.77$ ,  $SD=1.11$ ). Those who chose the low sodium option rated the crackers they selected as healthier compared to those who chose the high sodium crackers; this finding approached significance ( $\beta=0.25$ , 95% CI= -0.01-0.51,  $p=0.06$ ).

## 5.6 Quantitative Assessment of Labels

### 5.6.1 Ratings of Labelling Formats

Linear regression modelling was used to examine consumer ratings of the experimental labelling formats on four measures: 1) liking, 2) effectiveness, 3) understanding, and 4) believability. The mean score from each of these four continuous variables served as the dependent variable in separate linear regression models, where experimental condition was the independent variable.

Mean ratings for each FOP label condition on the four outcomes (liking, effectiveness of the label at helping choose healthier foods, understanding and believability) are shown in Table 5. Participants in the control condition rated the Nutrition Facts panel on these measures, since they were not exposed to a FOP label during the product selection task. Two-way interactions between experimental condition and ratings on each of the four measures were also examined; no significant interactions were found.

**Table 5: Mean Ratings of Labelling Formats (n=430)**

<b>Dependent Variable</b>	<b>All Conditions</b>	<b>Control (Nutrition Facts table)</b>	<b>Basic FOP</b>	<b>Descriptive FOP</b>	<b>Detailed TL</b>	<b>Simple TL</b>
<b>Mean (SD) (range = 1-10)</b>						
<b>Liking</b> (n=430)	6.60 (2.64)	6.85 (2.43)	6.17 (2.74)	6.44 (2.93)	7.17 (2.45)	6.46 (2.50)
<b>Effectiveness</b> (n=430)	7.41 (2.48)	7.67 (2.36)	7.24 (2.55)	7.48 (2.54)	7.75 (2.23)	6.95 (2.64)
<b>Understanding</b> (n=430)	8.22 (2.17)	8.20 (2.05)	7.83 (2.34)	8.39 (2.13)	8.65 (1.92)	8.10 (2.30)
<b>Believability</b> (n=429)	6.19 (2.37)	6.56 (1.99)	6.10 (2.55)	6.42 (2.35)	6.42 (2.33)	5.47 (2.46)

#### 5.6.1.1 Liking of Label

Linear regression modelling indicated that mean ratings for liking were significantly higher for the detailed TL label compared to both the basic FOP label ( $\beta=0.85$ , 95% CI=0.12-1.59,  $p=0.02$ ) and the



simple TL ( $\beta=0.83$ , 95% CI=0.06-1.60,  $p=0.04$ ). Adults aged 35-64 liked the labels significantly more overall compared to adults aged 18-24 ( $\beta=1.35$ , 95% CI=0.68-2.02,  $p<0.001$ ) and 25-34 ( $\beta=0.86$ , 95% CI=0.17-1.55,  $p=0.02$ ). Adults aged 65+ liked the labels significantly more overall compared to those aged 18-24 ( $\beta=2.41$ , 95% CI=1.53-3.28,  $p<0.001$ ), 25-34 ( $\beta=1.92$ , 95% CI=1.03-2.80,  $p<0.001$ ), and 35-64 ( $\beta=1.01$ , 95% CI=0.32-1.79,  $p=0.005$ ). Those in the middle-income bracket rated the labels higher in liking compared to those in the lowest income bracket ( $\beta=0.68$ , 95% CI=0.05-1.32,  $p=0.04$ ). Gender and ethnicity were not significant predictors in this model.

#### *5.6.1.2 Effectiveness of Label*

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Mean ratings in effectiveness of the label at helping choose healthier foods were significantly higher for both the Nutrition Facts panel ( $\beta=0.79$ , 95% CI=0.16-1.56,  $p=0.045$ ) and the detailed TL ( $\beta=0.80$ , 95% CI=0.04-1.55,  $p=0.04$ ) compared to the simple TL label. Middle-aged adults (35-64) rated the labels significantly higher in effectiveness overall compared to adults aged 18-24 ( $\beta=0.74$ , 95% CI=0.09-1.40,  $p=0.03$ ). Adults 65+ rated the labels significantly higher in effectiveness compared to all adults: 18-24 ( $\beta=1.55$ , 95% CI=0.69-2.40,  $p<0.001$ ), 25-34 ( $\beta=1.20$ , 95% CI=0.33-2.06,  $p=0.007$ ) and 35-64 ( $\beta=0.81$ , 95% CI=0.09-1.53,  $p=0.03$ ). Gender, ethnicity, income and education were not significant predictors of effectiveness ratings.

#### *5.6.1.3 Ease of Understanding the Label*

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Ratings of ease of understanding the label were significantly higher for the detailed TL compared to the basic FOP label ( $\beta=0.76$ , 95% CI=0.12-1.40,  $p=0.02$ ). Mean ratings for the remaining label conditions were not significantly different. Those in the middle-income bracket rated the labels significantly easier to understand compared to those in the lowest income bracket ( $\beta=0.76$ , 95% CI=0.21-1.31,  $p=0.007$ ). Gender, ethnicity and education were not significant predictors of overall ratings of understanding.

#### *5.6.1.4 Believability of Label*




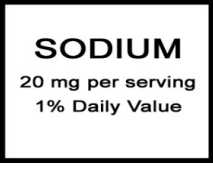
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Mean ratings for believability were lower for the simple TL label compared all other formats: the Nutrition Facts panel ( $\beta = -1.12$ , 95% CI= -1.86- -0.37,  $p=0.003$ ), the descriptive FOP label ( $\beta = -0.97$ , 95% CI= -1.70- -0.24,  $p=0.009$ ), the detailed TL ( $\beta = -0.98$ , 95% CI= -1.71- -0.25,  $p=0.008$ ) and the basic FOP label, which verged on significance ( $\beta = -0.70$ , 95% CI= -1.41-0.01,  $p=0.05$ ). Gender, ethnicity, age, education and income were not significant predictors of ratings of label believability.

### 5.6.2 Rankings of Experimental FOP Labels

Finally, participants were shown all four experimental labels and asked to rank them in order of effectiveness at helping people select low sodium products. The Friedman Test was used to determine a mean rank (range=1-4) for each of the four FOP labelling formats. Because the labelling formats were ranked from 1-4, lower rankings indicate higher ratings of effectiveness (i.e. the lowest ranking denotes “first place”). Mean rankings for the four FOP labels are shown in Table 6. The detailed TL was ranked as the most effective, followed by the descriptive FOP label. The simple TL label was ranked third most effective and the basic FOP label was ranked as the least effective. The Friedman test indicated a statistically significant difference between the four rankings overall,  $\chi^2(3)=539.107$ ,  $p<0.001$ .

**Table 6: Mean Effectiveness Rankings of FOP Labels (n=414)**

Condition	Detailed TL Label	Descriptive FOP Label	Simple TL Label	Basic FOP Label
				
Mean Rank $\mu$ (SD)	1.38 (0.73)	2.34 (0.72)	2.93 (1.07)	3.35 (0.80)

*Post-hoc* tests were conducted using the Wilcoxon-Signed Rank Test, in order to determine whether mean rankings were significantly different from each other. Results indicated that differences in ranking between all contrasts were statistically significant. Specifically, the descriptive FOP label was ranked

significantly higher in effectiveness compared to the basic FOP label ( $Z=-14.33, p<0.001$ ); the detailed TL label was ranked significantly higher in effectiveness compared to both the basic FOP label ( $Z=-16.14, p<0.001$ ) and the descriptive FOP label ( $Z=-12.80, p<0.001$ ); and the simple TL was ranked significantly higher in effectiveness compared to the basic FOP label ( $Z=-5.61, p<0.001$ ). In contrast, the simple TL label was ranked significantly lower in effectiveness compared to both the descriptive FOP label ( $Z=-7.31, p<0.001$ ) and the detailed TL ( $Z=-14.93, p<0.001$ ).

## 6.0 DISCUSSION

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This study was among the first in Canada to experimentally test the impact of FOP labelling on consumer product selection. The elevated sodium levels in the Canadian diet and the multitude of associated negative health effects underscore the importance of examining ways to reduce sodium consumption. Results of the current study indicate that FOP labelling has the potential to help consumers make healthier choices, and may thus be an effective sodium reduction tool.

### 6.1 Behavioural Outcomes

#### 6.1.1 Product Selection Task

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Results indicated that participants in the descriptive FOP, detailed Traffic Light and simple Traffic Light conditions were significantly more likely to select the low sodium option compared to the control condition, in which no FOP label was displayed. In the unadjusted model, those in the descriptive FOP condition and the simple TL condition were also significantly more likely to choose the low sodium option compared to the basic FOP condition, which displayed the same information for sodium (mg and % daily value) that is present in the Nutrition Facts table. As hypothesized, the FOP labels with “high” and “low” sodium content descriptors were more effective at guiding product selection compared to those without content descriptors; this feature was common to the 3 label conditions that led to lower sodium choices. These results are consistent with international data from Finland, where the addition of “high” and “low” salt content labels contributed to a significant reduction in salt intake of the Finnish population.<sup>1</sup>

Results of the selection task also highlight the effectiveness of the Traffic Light label at guiding product selection. As hypothesized, both the detailed and simple TL labels, which include symbols and colours, led to the selection of lower sodium choices – despite the fact that the study did not include any educational materials to support its use. Most Canadian consumers would be largely unfamiliar with the Traffic Light system, which has mainly been implemented in the UK.<sup>1</sup> It seems that the red and green

colour coding, which signifies high and low amounts of a nutrient, is both appealing and intuitive to consumers – even without supplementary educational materials. These results are consistent with previous studies showing that the Traffic Light symbol increases consumer use and understanding,<sup>104,105,125</sup> allows consumers to retrieve nutrition information more efficiently,<sup>126</sup> and that the multiple TL label was the most effective FOP label at helping consumers identify healthy foods.<sup>104,125</sup>

Contrary to hypotheses, none of the principal socio-demographic variables measured were significant predictors of product selection. Thus, regardless of differences in gender, age, ethnicity, education or income levels, those in 3 of the 4 experimental FOP conditions were significantly more likely to select the low sodium option compared to those in the control group. In their study examining the effectiveness of FOP labelling formats in four European countries, Feunekes et al. (2008) found similar results, reporting no substantial differences between demographic groups in each country.<sup>6</sup> However, numerous studies have documented lower use and understanding of nutrition labels in groups of varying education and income levels.<sup>58,72,73,74,75</sup> The absence of differences in product selection among these groups is therefore worthy of note. Study results suggest that using simple “high” and “low” content descriptors and TL labels may address this disparity in the effectiveness of nutrition labels across various socio-economic groups.

In regards to diet and health related variables, it is unsurprising that those who reported “usually” looking for salt/sodium on packages when grocery shopping were significantly more likely to choose the low sodium option than those who did not. These individuals were presumably more concerned about the sodium content of the foods they consumed. Interestingly, self-reported overall health, self-reported diet, attempts at weight loss/dieting, frequency of reading food product labels, knowledge of health and nutrition, and understanding of the Nutrition Facts panel were not significant predictors of product selection. However, those who reported eating outside the home less frequently were significantly more likely to choose the low sodium option compared to those who ate out more. This variable may have served as a proxy measure for overall diet/healthy eating. Individuals who eat at home more frequently

may eat healthier in general; home-cooked meals also tend to be lower in sodium than processed or restaurant-prepared meals.<sup>3</sup>

### **6.1.2 Did the participant pick up the box?**

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Results indicated that regardless of gender, age, ethnicity, education or income levels, those in the detailed TL and simple TL conditions were significantly less likely to pick up the box compared to the control condition and the descriptive FOP condition. Presumably, the TL labels provided enough information (at least in regards to the differences in sodium between the two products), that participants did not feel the need to pick up the box to seek more information.

Those with better self-reported overall health were significantly less likely to pick up the box compared to those who rated their health more poorly. A possible explanation is that individuals who consider themselves to be in poorer health may have been more concerned with the nutritional contents of the product they were selecting than those who felt they were already in good health.

## **6.2 Recall of Label Information**

Results indicated that 70% of participants mentioned noticing sodium or salt on the cracker boxes; participants in all 4 FOP conditions were more likely to mention sodium/salt than those in the control group. This finding suggests that the FOP labels were effective at informing participants of the sodium levels of the crackers. Despite this finding, when asked about the location of the nutrition information, only 36% of participants mentioned that the nutrition information was located on the “front” or “top right hand corner” of the box. Furthermore, regression models indicated that the frequency of identifying that the nutrition information was on the front/top right hand corner did not vary significantly by experimental condition. This finding may be due to the open-ended nature of the question and the use of the words “nutrition information” rather than “sodium information”. This wording was used to prevent cueing participants to the presence of the FOP labels. As a result, many participants may have been referring to the Nutrition Facts panel when they described the location of the “nutrition information”, indicating that

the information was on the side of the box – even if they noticed the FOP label. Of course, some participants may simply not have noticed the nutritional information, and selected their crackers based on other factors.

Despite the fact that many participants did not specifically mention noticing sodium information on the cracker boxes, the vast majority reported being influenced by the nutritional information. In fact, 83% said the nutrition information influenced their decision “a little” or “a lot”. Those in the basic FOP and descriptive FOP conditions were significantly more likely than the control group to report being influenced by the nutrition information. It is unsurprising that those in the descriptive FOP condition reported being influenced by the nutrition information, since individuals in this condition were significantly more likely to choose the low sodium option during the selection task. However, those in the simple and detailed TL conditions were also significantly more likely to choose the low sodium option during the product selection task, whereas those in the basic FOP condition were not. It is interesting then that those in the basic FOP condition were more likely to report being influenced by the nutrition information, whereas those in the TL conditions were not.

Again, this finding may be partly due to the ambiguous wording of the question (i.e. the use of the words “nutrition information” instead of “sodium information”). As mentioned above, some participants may not have regarded the FOP labels as a source of “nutrition information”. Those in the simple and detailed TL conditions were significantly less likely to pick up the box before selecting a product. It is therefore conceivable that those who did not pick up the box to examine the Nutrition Facts panel and/or ingredient list may have reported that the “nutrition information” did not influence their decision. Interestingly, females and middle or older-aged adults were also more likely to report being influenced by the nutrition information, suggesting that these groups may be particularly receptive to FOP nutrition labelling.

In regards to the perceived healthiness and sodium levels of the crackers, those who chose the low sodium product were significantly more likely to report that the crackers they selected were low in sodium (as

opposed to “medium” or “high”) and to rate them as healthier compared to those who chose the high sodium product. These results confirm that participants were cognizant of the sodium levels in the crackers they selected. This finding also suggests that for many participants, product selection was based at least partly on sodium, especially since the ingredient lists for the two options were identical and other nutrients varied minimally.

### **6.3 Quantitative Assessment of Labels**

Results from the follow-up questionnaire indicated that as hypothesized, the detailed TL scored highly on a range of survey measures; however the simple TL did not. Participants reported “liking” the detailed TL label significantly more than those in the basic FOP or simple TL conditions. The detailed TL was also rated as “easier to understand” compared to the basic FOP label. These findings are supported by previous research. An experimental study by Feunekes et al. (2008) found that the TL label was rated highest in liking and comprehension compared to other FOP labelling formats examined,<sup>6</sup> while research from New Zealand indicated that simple and multiple TL labels were best understood across all ethnic and income groups, and that multiple TL labels were most often preferred.<sup>127</sup>

The detailed TL was also rated higher in “effectiveness at helping consumers choose healthier foods” compared to the simple TL label. Further, participant rankings of the four FOP labels indicated that the detailed TL was ranked as the most effective at helping participants choose low sodium products. In comparison, the descriptive FOP label was ranked in second place; the simple TL label was ranked as the third most effective, and the basic FOP label was ranked as the least effective. As mentioned earlier, previous research has identified the multiple TL label as the most effective at helping consumers identify healthy foods.<sup>104,125</sup> These qualitative results are thus in line with previous research.

It is interesting to note that the simple TL label was rated as less believable compared to all other label conditions, including the Nutrition Facts table. This may be due to the fact that the simple TL included only “high” and “low” sodium descriptors, whereas the other 3 FOP labels included numeric information



for sodium. As a result, participants may have regarded the simple TL as a health claim or logo, rather than a concrete source of nutrition information. Including supplemental information or educational materials relating to TL labelling might address this issue. The Nutrition Facts table may have been perceived as more credible than the simple TL due to the fact that it a) includes numeric content information for a variety of nutrients, and b) is a government-regulated source.

#### **6.4 Experimental FOP Labels: Summary of Findings**

Overall, results indicate that the detailed TL was well liked by consumers, scoring highly on a variety of measures including overall effectiveness, liking, understanding and believability. Given that this label combines a variety of key features – numeric information, colour coding and “high” and “low” content descriptors, it is unsurprising that participants found this label to be appealing, effective and easy to understand. Consumer behaviours were consistent with survey results; participants in the detailed TL condition were more likely than the control group to choose the low sodium product during the behavioural task, suggesting that it was effective at helping consumers choose lower sodium products. However, it is important to consider that the descriptive FOP and the simple TL labels were equally effective at guiding product selection.

Based on this information, two general conclusions can be drawn. First, given that “high” and “low” sodium labels were the common denominator between the 3 labelling formats found to be effective in the selection task, content descriptors are an essential feature of effective FOP labels. Secondly, supplementing numeric information with symbols and colour coding (as in the detailed TL) increases the perceived effectiveness and appeal of a FOP label, and improves consumer understanding. Overall, it seems that content descriptors, symbols and colour coding add prescriptive value, ‘qualifying’ nutrient information in a way that consumers can easily understand.

These conclusions are consistent with previous research. Past research suggests that graphic labelling formats including symbols and/or colours may be more effective than labels that consist solely of text and

numeric information. In fact, studies conducted by the FSA in Britain found that most consumers preferred FOP labels that included colours and “high”, “medium” and “low” descriptors in addition to information on nutrient content, and that colour-coded symbols were preferred to monochrome versions of the same label. These studies concluded that TL colour coding helped consumers to interpret and understand the nutrient content of foods.<sup>105</sup>

## **6.5 Use, Understanding and Support of Nutrition Labels**

In regards to the utilization of nutrition labels, 65% of participants reported regularly (“usually” or “always”) reading nutrition labels on the products they buy. This represents an increase in the frequency of reading product labels since the 2008 TNT survey, in which 57% of Canadians responded “usually” or “always” to this question.<sup>38</sup> Of course, the current study was not a nationally representative sample, and some of this difference may be due to sampling. Females in the current study reported reading food product labels more frequently than males, a finding consistent with the 2008 TNT survey<sup>38</sup> and other literature indicating that females are more likely to read product labels.<sup>70,71,73</sup> However, previous research has also indicated that label use is higher among older adults,<sup>58</sup> a finding that did not emerge in the current study. Furthermore, only 8% of participants selected the response “only the first time I buy a product”, which may be an underestimate. Social desirability bias may have led some participants to select “usually” or “always”, even if they actually tend to read product labels only the first time they try a new product. Future studies might consider wording this question differently; perhaps by asking participants about the frequency with which they read nutrition labels *the first time* they buy a product.

Over two-thirds (69%) of the sample indicated that they “usually” look for sodium information on food packages when grocery shopping, suggesting that sodium is ‘on the radar’ for the majority of individuals in this sample. In comparison, a 2008 report by Health Canada found that of those who “usually look at nutrition information on the package”, only 27% indicated that salt/sodium was a nutrient of primary or secondary interest.<sup>67</sup> Although one cannot disregard differences in measurement and data collection, it

seems that interest in sodium has increased in recent years. Indeed, a longitudinal study examining results of the Tracking Nutrition Trends surveys from 2004 to 2008 found that the number of Canadians who “sometimes” or “often” chose foods based on sodium content increased significantly from 2004 to 2008.<sup>58</sup> The heightened interest in sodium may be due to increased media attention surrounding sodium, such as the Sodium Working Group’s release of the Sodium Reduction Strategy for Canada in July 2010.<sup>55</sup> Results also indicated that females, middle-aged and older adults were more likely to report looking for sodium information than males and younger adults. This is unsurprising given that females reported reading nutrition labels more frequently overall, and that the oldest adults were more likely than the younger participants to report having a diet-related health condition, which might relate to sodium consumption.

Only 35% of individuals reported looking at health logos and/or health claims on packages when grocery shopping. The true proportion may be higher given that this was a self-report measure and the fact that many consumers may see and/or be unconsciously influenced by health logos and claims on packages without actively looking for them. However, this estimate is comparable to figures from the 2008 TNT survey, in which 18-23% of Canadians reported looking at health claims, nutrient claims or healthy/better choice logos or symbols on food packages.<sup>38</sup>

In terms of consumer understanding of the Nutrition Facts panel (measured by the modified 2-item version of the Newest Vital Sign), almost three quarters of the sample (71%) correctly answered the first question relating to number of calories consumed. Fewer participants (62%) correctly answered the second question relating to percent daily value for calories. These results indicate that many consumers still struggle with understanding the Nutrition Facts table, especially when it comes to calculating the percent daily value for calories or nutrients listed. This is unsurprising; several studies have shown that consumers have difficulty understanding nutrition labels. A study examining health label literacy found that patients were able to answer 69% of food label questions correctly, with common reasons for incorrect responses being misapplication of serving size and incorrect calculations.<sup>147</sup> According to a

recent systematic review of nutrition labelling studies, difficulties often arose when calculations involved reference values such as the Recommended Daily Amount, % daily value or other forms of reference information. Consumers also had difficulty with product comparisons and determining the number of calories per serving or per package.<sup>63</sup> A study using the Newest Vital Sign found that only 48% of individuals could answer half of the questions correctly.<sup>148</sup> Evidently, consumers consistently have difficulty understanding the Nutrition Facts table. This provides further justification for the use of FOP labels, which highlight the amounts of key nutrients per serving in a manner that is accessible and easy for consumers to understand.

Finally, about two-thirds (67%) of participants were at least somewhat supportive of FOP labelling policy, responding “yes” or “maybe” when asked whether the government should require food companies to put nutrition information on the FOP. Indeed, previous research indicates that consumers desire simpler, FOP nutrition labels.<sup>9,104,105</sup> Further, it is possible that the wording of this question may have affected participant responses. If the question had simply asked whether participants would like to see FOP nutrition information on food packages, rather than referring specifically to government requirements, a higher proportion of individuals may have expressed support. Interestingly, the likelihood of supporting FOP labelling was higher among older adults and those in the lowest income bracket, suggesting that older and less financially privileged individuals may be particularly receptive to FOP labelling initiatives. Considering that participants in the lowest income bracket rated their diets as poorer overall than those in the middle-income bracket, not to mention the well-documented association between health and SES,<sup>149</sup> this is an important and encouraging finding.

## **6.6 Strengths and Limitations**

### **6.6.1 Limitations**

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The current study had certain limitations common to experimental research, including selection bias and/or sampling bias, and the inherent constraints of using self-report measures. As mentioned above, the

sample was generally more highly educated than the Region of Waterloo, as measured by the 2006 Canadian Census. An effort was made to recruit participants from a variety of sources (e.g. advertising in newspapers, laundromats, city buses, employment centre, and online) in order to ensure a heterogeneous sample. Nevertheless, this difference could be due to a self-selection bias in which more educated individuals were more likely to volunteer their time to complete a research study. Given this information and the fact that the sample was not nationally representative, study results may not be generalizable to the entire Canadian population. However, sample characteristics revealed a fairly even distribution of individuals in the lower and higher income brackets, which provides some assurance that the sample included participants from a range of SES levels. Furthermore, many outcomes (most notably, product selection) did not differ significantly by education or income levels, indicating that a different distribution of participants may have had little effect on the results.

As is the case with most survey research, there are inherent limitations associated with using self-report measures, including social desirability effects and recall bias. These effects may have been at play in responses to certain measures that tested health and dietary factors, including: self-reported overall health, overall diet, levels of physical activity, and knowledge of health and nutrition issues. It is therefore quite possible that some participants over or underestimated the quality of their health, diet, and/or physical activity levels. However, these questions were included in order to provide a general idea of the types of lifestyle factors that predict product selection, rather than to provide comprehensive assessments of each factor, which was beyond the scope of the current study. Future research aiming to more accurately assess these variables could use measures that require more time and resources than were available in the current study, such as weekly food diaries to measure dietary patterns, and exercise journals to track levels of physical activity.

The behavioural selection task was also subject to limitations; including the fact that only one grocery product was used to test product selection. As mentioned earlier, research suggests that the effects of nutrition labelling may vary depending on the type of product and whether it is considered healthy or

unhealthy by the consumer.<sup>84</sup> In order to address this issue, crackers were selected for the product selection task given that crackers typically fall within the “mid-range” in nutritional value compared to other packaged snack foods that might be considered unhealthy (e.g. chips or cookies) or fairly healthy (e.g. yogurt). Nevertheless, it is conceivable that results might differ if the study was replicated with a different food product. Secondly, since the current study aimed to address the issue of high sodium consumption in Canada, sodium was the only nutrient listed on the FOP labels. Again, results might differ if other key nutrients (e.g. calories, fat, sugar) were listed on the FOP. Future research might therefore test the impact of FOP labelling on different food products, and/or opt to label more than one nutrient on the FOP. This would help to determine whether the labels deemed effective in the current study are equally as effective when used to label other foods and nutrients.

Finally, like any experimental study, the product selection task was conducted in a laboratory environment and may therefore not be completely generalizable to the ‘real world’. Research indicates that people act differently in a research setting than they would otherwise (a phenomenon known as ‘participant bias’),<sup>150</sup> it is thus possible that different results might be obtained if the study was conducted in a real consumer setting. Nevertheless, the researchers aimed to increase the authenticity of the product selection task by informing participants that they would actually receive a free box of crackers and asking them to select a product to take home, rather than simply gathering information on consumer preferences or opinions. More importantly, because between-group differences were measured, the aforementioned biases would have been consistent across experimental conditions, influencing all participants equally. Since significant differences between conditions were identified, it seems that the FOP labels were genuinely influencing product selection.

### 6.6.2 Strengths

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As mentioned earlier, the majority of research studies thus far have examined cognitive outcomes using survey data or qualitative research to determine the influence of FOP labelling, rather than utilizing

experimental study designs and/or behavioural outcomes.<sup>133</sup> The main strengths of this study were the between-subjects experimental design and the use of a behavioural outcome to measure the impact of FOP labelling on product selection.

Given the finding that qualitative assessments (i.e. ratings and rankings) of the experimental labels differed somewhat from outcomes of the product selection task, incorporating the behavioural task was essential to the validity of this study. In fact, had the study relied solely on survey measures, the detailed TL would have been considered the ‘best’ FOP label with which to communicate sodium information. The experimental selection task was critical in determining that 3 of the 4 FOP labels influenced consumer behaviours. Examining the results of both the behavioural task and the qualitative assessments revealed that while the detailed TL is preferred on a variety of levels, the descriptive FOP label and the simple TL are also effective at influencing the selection of lower sodium products.

This study was also the first to our knowledge to test the impact of FOP sodium content labels among Canadians. Evidence from the UK,<sup>8,10</sup> Finland<sup>10,57</sup> and New Zealand<sup>66</sup> indicates that FOP labels have played an important role in sodium reduction initiatives in other nations, both by influencing consumer product selection and by leading manufacturers to reduce the sodium levels of their products. Results of the current study suggest that FOP labels may be useful in Canada as well, given their apparent ability to guide consumers towards the selection of lower sodium products. The present study therefore addressed two important gaps in the literature, by: a) providing evidence generated from a behavioural measure, and b) examining FOP labelling as a potential sodium reduction strategy in Canada.

## **6.7 Conclusions & Implications**

Nutrition labelling is an important policy tool used to communicate nutrition information. Given that nutritional information is mandatory on all pre-packaged food products in Canada, product labels have wide reach as a source of nutrition information that is accessible to all consumers. Previous research has

shown that FOP labels may be more effective at helping consumers make healthy choices than back-of-package information alone,<sup>5,6,7</sup> and that they are helpful for the majority of individuals.<sup>6</sup>

The results of the current study provide evidence in support of the effectiveness of front-of-package labelling. Study findings suggest that certain FOP labelling formats may be more effective than others at helping consumers choose lower sodium products. Specifically, text-based content descriptors (i.e. “low”, “high”) seem to help consumers select lower sodium products, perhaps by communicating numeric information in a manner that is easily understandable and that allows for quick product comparisons. Participants in this sample also preferred FOP labels that included a combination of numeric information, text-based descriptors, and colour coding to communicate higher and lower amounts of a nutrient.

These findings have important policy implications, both for a Canadian sodium reduction strategy and for FOP nutrition labelling in general. In terms of sodium reduction initiatives, FOP labelling seems to be an effective tactic with which to guide healthy product choices, both in Canada (as seen in the current study) and elsewhere.<sup>10</sup> As mentioned earlier, one of the key recommendations by the Sodium Working Group was improved labelling for sodium, with a specific request for FOP labelling.<sup>55</sup> The current study suggests that developments to the nutrition labelling system in Canada should incorporate FOP labelling to increase consumer awareness of sodium levels. In fact, given that over half of the study sample reported being at least somewhat supportive of FOP labelling policy, the Canadian government might be wise to consider mandating the use of FOP labels on pre-packaged food products. Amounts of other key nutrients (such as calories, fats, and sugars) could be listed in addition to sodium, similar to the Traffic Light labels implemented in the UK.<sup>8,10</sup> Based on findings of the current study, the researchers would recommend that FOP labels include descriptors such as “low”, “medium” and “high”, that help consumers quantify the amount of each nutrient included in one serving of the product. Colour coding (perhaps in the form of a TL label) would be a useful addition, given that participants found the detailed TL label appealing, effective, and easy to comprehend.



Introducing mandatory FOP labelling in Canada would have important implications for public health. Evidence from Finland and New Zealand suggests that manufacturers may reduce the sodium levels of their products in response to mandatory FOP sodium content labels.<sup>57,66</sup> As mentioned earlier, sodium levels in Canadian processed foods are higher than those of many other countries.<sup>44</sup> In conjunction with FOP labels that provide consumers with the information they need to make healthy choices, lowering levels of sodium in pre-packaged products has the potential to dramatically reduce the amount of sodium consumed by Canadians. Lowering sodium consumption, in turn, could lead to meaningful decreases in levels of hypertension and cardiovascular disease at the population level.<sup>46,47</sup>

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## APPENDICES

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### Appendix A: GDA Values

Guideline Daily Amount Values			
Typical values	Women	Men	Children (5-10 years)
Calories	2,000 kcal	2,500 kcal	1,800 kcal
Protein	45 g	55 g	24 g
Carbohydrate	230 g	300g	220 g
Sugars	90 g	120 g	85 g
Fat	70 g	95 g	70 g
Saturates	20 g	30 g	20 g
Fibre	24 g	24 g	15 g
Salt	6 g	6 g	4 g

**Source:** Food and Drink Federation. Guideline Daily Amounts. (2010). Available at:

[http://www.gdalabel.org.uk/gda/gda\\_values.aspx](http://www.gdalabel.org.uk/gda/gda_values.aspx)



## Appendix B: Recruitment Ad

**UNIVERSITY OF  
WATERLOO** Research Study

The Department of Health Studies & Gerontology needs your help for a 90-minute study about lifestyles in the Waterloo Region. You will be asked to read materials and answer a few short questionnaires at the University of Waterloo.

All information will be kept confidential.

Volunteers will receive a free meal during the study, as well as \$20 for participation.

Participants must be at least 18 years of age and must be able to read and speak English.

Please call: 519-888-4567 ext. 36525.

This study has received clearance through the Office of Research Ethics, University of Waterloo.

## Appendix C: Telephone Screening Interview

### Lifestyles Study — Telephone Screening Script

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#### Introduction

Hello, can I please speak to *[insert potential participant name]*?

Hello, my name is \_\_\_\_\_ from the Department of Health Studies at the University of Waterloo. I'm calling in regards to a study that we are conducting on lifestyles in the community. You responded to our newspaper advertisement and indicated that you would be interested in participating in this study. Is this a convenient time for you? *[If not, arrange to call back.]*

Thank you for the opportunity to tell you about our present study. I'd like to give you some background information on the study, but first can I ask you a few questions to see if you are eligible? ... Thanks.

Screener Questionnaire
First off, could I please confirm your first and last name? Name: _____
How old are you? _____ ➤ <b>If over 18, continue</b>
Can you read and write in English? _____ ➤ <b>If Yes, continue</b>
Do you have any food allergies? _____ ➤ If no, continue ➤ If yes, ask "what are you allergic to?" _____ ➤ Ineligible if allergic to gluten, wheat/corn/rice or other cereal ingredients. (depending on severity of allergy to other elements used there, may not be able to eat there) ➤ If yes, are you able to eat sandwiches from Subway restaurants?

#### If Ineligible based on any of the above:

We can only conduct the study with people over the age of 18 who can read and speak English, and those who are able to eat at Subway restaurants.

I'm sorry we can't invite you to participate—thank you again for your interest. Goodbye.

#### If Eligible:

Great — it looks like you're eligible for the study. I'd like to give you some more information before asking whether you'd like to participate. The purpose of the study is to gather information on opinions related to lifestyle factors from members of the Kitchener-Waterloo community.

To do this, we're asking participants to come to the University of Waterloo for a one-hour session over the dinner hour.

During the visit, we will ask you to read and answer questions related to some material on various elements of a lifestyle in the Waterloo community. We will also ask you to answer a short demographic survey, and measure your height and weight.

The visit will take approximately 1.5 hours and will be conducted at 6:00pm any evening from Monday to Friday. As a token of our appreciation, you will receive \$20 at the end of the visit. In addition, since the study will take place over the dinner hour, you will receive a free dinner from Subway.

Do you have any questions about the study?

Would you like to participate in the study?

**If no:** Thank you and goodbye.

**If yes:** Great.

Can I confirm the best way to reach you? Phone number: \_\_\_\_\_

I mentioned that the visit needs to occur sometime within the next couple of weeks, between the hours of 6-7:30pm. Is there an evening that works best for you? [book date]

Date: \_\_\_\_\_ Time: \_\_\_\_\_

### **Directions**

You'll need to come to our research lab at the University of Waterloo. Do you know how to get here?  
*Provide instructions to lab – email is an option.*

Email address: \_\_\_\_\_

### **Parking Information**

Parking is available in Lot R on the north side of ring road, across the street from the Lyle Hallman building where the study will be conducted, or Lot W which is on the north side of Columbia Street with an entrance off of Hagey Boulevard. Please park anywhere in either of these lots and proceed to the doors of the Lyle Hallman building. Enter the building through the main doors facing Columbia Street, near the GRT bus stop. Once you go through the doors, go right through another set of doors, and the study room is just around the bend to your left (room 1703).

**\*Note: The study does not take place in the Manulife Wellness Centre. If you're facing the Manulife Wellness Centre, the Lyle Hallman building is directly to your left.**

Please bring \$3 in change for parking, if you're driving to your study appointment.

### **Instructions**

Just as a reminder, we will be providing you with a free dinner as a token of appreciation for completing the study, so there is no need to eat before coming to the lab.

Finally, please give us a call should you have to cancel or reschedule. My name is \_\_\_\_\_ and I can be reached at 519-888-4567 ext.36525 (Samantha, project manager).

Do you have any final questions? We'll see you on [insert date] at [insert time]. Good bye.

## Appendix D: Information Consent Form



Department of Health Studies & Gerontology University of  
Waterloo

Faculty of Applied Health Sciences

200 University Ave West

Waterloo, ON,  
CANADA

N2L 3G1

### INFORMATION LETTER

**Title of Project:** Lifestyles Study

**Principal Investigator:** Dr. David Hammond, Dept. of Health Studies, Univ. of Waterloo  
(519) 888-4567, x36462

**Co-Investigators:** Dr. Rhona Hanning, Dept. of Health Studies, Univ. of Waterloo;  
Samantha Goodman, Dept. of Health Studies, Univ of Waterloo

#### 1. PURPOSE OF THIS RESEARCH STUDY

You are being asked to take part in a research study that will involve adults from the Waterloo Region. This study will examine opinions about various factors that affect the lifestyles of community members in the Waterloo Region. These include individual factors such as health and physical activity, as well as regional factors such as the design of parks and neighbourhoods.

#### 2. PROCEDURES

This study will examine opinions on healthy lifestyle factors. Approximately 660 people will take part in the study. If you participate in this study, we will ask you to visit the Health Behaviour Laboratory at the University of Waterloo for a total of one hour. As the study session will take place over the dinner hour, you will be provided with a free meal of your choice from Subway.

During the laboratory visit, you will be asked to do the following:

1. You will have the opportunity to order your free meal provided by Subway.

2. You will read a passage about development plans in the Waterloo Region, and answer a series of questions related to city planning and lifestyle factors.
3. Answer a short questionnaire about your personal background, such as age and education, as well as lifestyle factors such as diet and exercise.
4. You will be provided time to eat your free meal in the Health Behaviour Lab. Please note that this meal must be eaten on-site in the lab.
5. You will be offered a grocery product as a token of appreciation.
6. We will ask you to answer a few final follow-up questions.
7. Finally, we will ask to measure your height and body weight. This information will be kept confidential and stored in a secure location.
8. You will be given \$20 as a token of our appreciation.

### **3. POSSIBLE RISKS OR DISCOMFORT**

There are no known risks or discomforts in relation to this study.

### **4. POSSIBLE BENEFITS**

By participating in this study, you will be contributing to a large body of research on aspects of a healthy lifestyle in the Waterloo Region. By doing so, you will be making a valuable contribution to the local community. We think that some people taking part in this study will find the research interesting.

### **5. FINANCIAL CONSIDERATIONS**

In appreciation of your time and any inconvenience, you will receive \$20 upon study completion. In addition, since the study will take place over the dinner hour, you will receive a free dinner of your choosing from Subway.

Other than your transportation to the laboratory and parking fees at the University, no additional cost to you is expected to result from taking part.

### **6. CONFIDENTIALITY**

There is always a concern about keeping your privacy when you provide information about yourself, such as personal opinions and demographic data. Of course, you are free to decline any questions that you do not feel comfortable answering. For your protection, we will assign you a number that will be used to label all survey materials. Personal information, such as your name and contact information will be kept in a separate locked file. Any personal information about you will be locked in our lab at the University of Waterloo. Electronic copies of your data will not contain any personal identifiers and will be stored indefinitely on a password protected computer at the University of Waterloo.

Your identity in this study will be treated as confidential. The results of the study, including laboratory and other data, may be published for scientific purposes but will not give your name or include information that will identify you.

### **7. WITHDRAWAL FROM STUDY PARTICIPATION**

You are free to choose whether or not to take part in this study. You can choose to stop participating in the study at any time. You will be compensated \$20 even if you choose to terminate the study before completion.

## **8. ETHICS REVIEW**

This study has been reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo. Should you have any comments or concerns resulting from your involvement in this study, please contact Dr. Susan Sykes in the Office of Research Ethics at (519) 888-4567, x36005 or by email at [ssykes@uwaterloo.ca](mailto:ssykes@uwaterloo.ca).

## **9. AVAILABLE SOURCES OF INFORMATION**

**If you have any questions after you leave the lab, or if you require additional information about the study, please feel free to contact the researcher listed at the beginning of this information letter.**

Department of Health Studies & Gerontology  
University of Waterloo  
Faculty of Applied Health Sciences  
200 University Ave West  
Waterloo, ON, CANADA

N2L 3G1

**CONSENT FORM**

I agree to participate in this research study being conducted by Dr. David Hammond and Dr. Rhona Hanning at the University of Waterloo, Ontario, Canada.

I have made this decision based on the information I have read in the information letter. All the procedures and any risks and benefits relating to my participation have been explained to me. I have had the opportunity to ask any questions and to receive any additional details I wanted about the study. If I have questions later about the study, I can ask:

Dr David Hammond: (519) 888-4567, x36462 (office)

(Principal Investigator) email: dhammond@uwaterloo.ca

I understand that I may withdraw from the study at any time without penalty by contacting the researcher listed above.

This project has been reviewed by, and received ethics clearance through the Office of Research Ethics at the University of Waterloo. I am aware that I may contact Dr. Susan Sykes (519-888-4567, x 36005 or ssykes@uwaterloo.ca) if I have any concerns or questions regarding my involvement in this study.

\_\_\_\_\_  
Printed name of Participant

\_\_\_\_\_  
Signature of Participant

\_\_\_\_\_  
Date

\_\_\_\_\_  
Witness

Appendix E: Experimental Cracker Boxes (Simple Traffic Light Condition)





## Appendix F: Debriefing Form



David Hammond

Department of Health Studies & Gerontology  
University of Waterloo

200 University Ave West

Waterloo, ON N2L 3G1 CANADA

Tel: (519) 888-4567 ext.36462

Email: [dhammond@uwaterloo.ca](mailto:dhammond@uwaterloo.ca)

### LIFESTYLES STUDY FEEDBACK LETTER

Thank you for your involvement in this study; your participation is much appreciated.

Although we told you that the study focused on city planning in the Waterloo Region, the primary goal of the study was to examine the impact of including nutrition information on fast-food menus and grocery products. All of the participants in this study were provided with a menu to order their complementary Subway meal; however, some participants were shown different menus. Some menus included no nutritional information, some menus included calorie information, some menus included calorie information using a “Traffic Light” format (which displays calorie content in a coloured circle where red indicates “high” content, yellow indicates “moderate” content and green indicates “low” content) , while other menus included “Traffic Lights” for calories, fat, sugar, and salt. We are interested in examining whether the type of nutrition information displayed changes the type of meal a participant orders and how many calories are consumed.

The information you provided related to lifestyle factors such as nutrition and physical activity will be analysed. We will also examine the information you provided about the box of crackers you were shown. All participants were given the choice between two boxes of crackers, one of which had a high level of sodium, while the other had a lower level of sodium. Some participants saw boxes with no nutrition information on the front of the box, while others saw boxes with a nutrition symbol or information on the front. We are interested in whether the nutrition information on pre-packaged foods influences people’s awareness and choices about high versus low sodium foods. You will not actually be given a free box of crackers to take home – these product packages were designed for study purposes. We apologize for any inconvenience or confusion this part of the study may have caused.

Our main research interest is the impact of different types of nutrition labelling on choices people make and how this can affect their health. However, we could not tell participants the real purpose of the study at the beginning because this information might have influenced their responses in a way that would have made it impossible to interpret the data. For example, if participants knew the study was focused on nutrition labelling, some might have felt the need to make a more “healthy” choice, which wouldn’t help to assess how people might react to nutrition labelling in the general population. In addition, if our recruitment materials had mentioned a nutrition study, a greater proportion of people interested in nutrition might have volunteered including people who are already making healthier eating choices. This wouldn’t give us information about how nutrition labelling works with a diverse sample of people.

Instead we provided participants with a somewhat different description of the purpose of the study. This is often done in social psychology research to ensure that participants' responses are as "natural" as possible and not inadvertently affected by knowing the real study purpose. We realize that some participants may have volunteered for our study thinking it was about urban planning, and may be disappointed to learn that this is not the main purpose. We apologize for this, and hope that with our explanation, you understand why this approach was important to the design of our study.

The information you provided will be kept confidential; your name will not be associated with your responses. The data will be stored with all identifying or potentially identifying information removed. Electronic data will be stored indefinitely on a password protected computer in the **Lyle Hallman Institute**.

If any of the questions or exercises in this study caused you to feel discomfort, please feel free to contact Dr. David Hammond, anytime at (519) 888-4567, x36462 or email at [dhammond@uwaterloo.ca](mailto:dhammond@uwaterloo.ca). Also please feel free to contact Dr. Susan Sykes, the Director of the Office of Research Ethics at 519-888-4567, Ext. 36005 or by email at [ssykes@uwaterloo.ca](mailto:ssykes@uwaterloo.ca), if you have concerns or comments resulting from your participation.

As a reminder, all the information you provided during the survey will be kept strictly confidential. This project has been reviewed by, and received ethics clearance through the Office of Research Ethics at the University of Waterloo. If you would like any further information about the study, including a copy of our findings when they become available, please contact us at the number below.

Thank you again for your help.

---

*Sincerely,*

---

Dr. David Hammond

Dept. of Health Studies, University of Waterloo

(519) 888-4567, Ext 36462      Email: [dhammond@uwaterloo.ca](mailto:dhammond@uwaterloo.ca)

**POST-DEBRIEFING CONSENT FORM**

**Study Title: Lifestyles in the Waterloo Region**

**Faculty Supervisor:** David Hammond, Dept. of Health Studies, University of Waterloo

(519) 888-4567, ext. 36462; [dhammond@uwaterloo.ca](mailto:dhammond@uwaterloo.ca)

**Co-Investigators:** Dr. Rhona Hanning, Dept. of Health Studies, University of Waterloo

(519) 888-4567, ext. 35685, [rhanning@uwaterloo.ca](mailto:rhanning@uwaterloo.ca)

Samantha Goodman, Dept. of Health Studies, University of Waterloo

(519) 888-4567, ext. 38549, [s3goodma@uwaterloo.ca](mailto:s3goodma@uwaterloo.ca)

During the debriefing session, I learned that it was necessary for the researchers to disguise the real purpose of this study. I realize that this was necessary since having full information about the actual purpose of the study might have influenced the way in which I responded to the tasks and this would have invalidated the results. Thus, details about the purpose of the study initially were not provided (or were provided in a manner that slightly misrepresented the real purpose of the study). However, I have now received a complete written explanation as to the actual purpose of the study and have had an opportunity to ask any questions about this and to receive acceptable answers to my questions.

I have been asked to give permission for the researchers to use my data (or information I provided) in their study, and agree to this request. I am aware that I may withdraw this consent by notifying the Faculty Supervisor of this decision.

I am also aware that I may contact Dr. Susan Sykes, Director, Office of Research Ethics at 519-888-4567 Ext. 36005 or by email at [ssykes@uwaterloo.ca](mailto:ssykes@uwaterloo.ca) if I have any concerns or comments resulting from my involvement in this study.

**Participant's Name:** \_\_\_\_\_

**Participant's Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_

**Witness' Name:** \_\_\_\_\_

**Witness' Signature:** \_\_\_\_\_

## Appendix G: Focus Group Questions

	<p><b>Package Design Questions</b></p> <p><i>*Please note: the questions below correspond to two package designs, which will be shown to participants.</i></p>
<b>Design Preference</b>	<p>Looking at these 2 products, which <b>package design</b> do you most prefer?</p> <p>Pre-coded RA list:</p> <p>1) Box A 2) Box B</p>
<b>Colour Preference</b>	<p>Looking at these 2 products, which <b>background colour</b> do you most prefer?</p> <p>Pre-coded RA list:</p> <p>1) Box A 2) Box B</p>
<b>Product Name Preference</b>	<p>Looking at these 2 products, which <b>product name</b> do you most prefer?</p> <p>Pre-coded RA list:</p> <p>1) Box A 2) Box B</p>
<b>Feedback</b>	<p>Do you have any other comments regarding the products we have shown you today? (<i>open-ended</i>)</p> <p>_____</p>
	<p><b>Label Questions</b></p> <p><i>*Please note: the following questions will be asked for each of the experimental labels being tested. An image of the corresponding label will be presented along with the questions. The Traffic Light label (condition #5) has been included here as an example.</i></p>
<b>Appeal</b>	<p>How much do you <b>like this</b> sodium content label?</p> <p>1=Not at all; 10=Extremely</p>
<b>Effectiveness</b>	<p>To what extent, if at all, do you think this type of information would help consumer chose healthier foods?"</p> <p>1=Not at all; 10=Extremely</p>
<b>Comprehension</b>	<p>How easy was it for you to <b>understand</b> the information provided by this label?</p> <p>1=Not at all; 10=Extremely</p>
<b>Credibility</b>	<p>How <b>credible</b> is this label, in your opinion?</p> <p>1=Not at all; 10=Extremely</p>

<b>Liking; Open-Ended</b>	What do you like, if anything, about this warning? _____																																			
<b>Improvement; Open-Ended</b>	How would you improve this warning? _____																																			
<b>Effectiveness Ranking</b>	<p><i>Some nutrition labels may be more effective than others at helping consumers make healthy choices when grocery shopping.</i></p> <p>Following the ranking system below, please rank the labels below on their <b>effectiveness at helping consumers make healthy choices</b>.</p> <p>So, 1 would be the label that you find the <b>most</b> effective, and 10 would be the label that you find <b>least</b> effective.</p> <table border="1" data-bbox="431 884 1503 1119"> <tr> <td>1</td> <td>2</td> <td>3</td> <td>4</td> <td>5</td> <td>6</td> <td>7</td> <td>8</td> <td>9</td> <td>10</td> </tr> <tr> <td>Most effective</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>Least effective</td> </tr> </table> <p><b>Note:</b> For each type of label, we have shown one label for a <b>low</b> sodium product and one label for a <b>high</b> sodium product, so that you can see how the labels would be used. <b>Please place your ranking in the column on the left.</b></p> <table border="1" data-bbox="431 1220 1503 1465"> <thead> <tr> <th>Ranking</th> <th>Low Sodium Label</th> <th>High Sodium Label</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	1	2	3	4	5	6	7	8	9	10	Most effective									Least effective	Ranking	Low Sodium Label	High Sodium Label												
1	2	3	4	5	6	7	8	9	10																											
Most effective									Least effective																											
Ranking	Low Sodium Label	High Sodium Label																																		
<b>Feedback</b>	Do you have any other comments regarding any of the labels we have shown you today? <i>(open-ended)</i> _____																																			

## Appendix H: Questionnaire Measures

### Survey #1: Lifestyle Questionnaire

*For each question below, please circle the most applicable response.*

1.	What is your gender?  1) Male 2) Female 3) Prefer not to say
2.	Please indicate your age:  _____ years
3.	What is the highest level of education you have completed?  1) Some elementary school or less 2) Some high school 3) Completed high school 4) Some college or university 5) Completed college or university 6) Graduate or professional school (e.g. MSc, MBA, PhD) 7) Prefer not to say
4.	What is your current employment status?  1) Working full-time (35 or more hours per week) 2) Working part-time (less than 35 hours per week) 3) Self-employed 4) Currently unemployed, but looking for work 5) Student 6) Retired 7) Not in workforce (Homemaker/Unemployed, not looking for work) 8) Other/prefer not to say
5.	What is your current household income, <b>before</b> taxes?  1) Below \$10,000 2) \$10,000 to \$19,999 3) \$20,000 to \$29,999 4) \$30,000 to \$39,999 5) \$40,000 to \$49,999 6) \$50,000 to \$59,999 7) \$60,000 to \$69,999 8) \$70,000 to \$79,999 9) \$80,000 to \$99,999 10) \$100,000 and above 11) Prefer not to say

6.	<p>What is your current marital status?</p> <ol style="list-style-type: none"> <li>1) Single/Never married</li> <li>2) Married/Common-law</li> <li>3) Divorced/Separated</li> <li>4) Widowed</li> <li>5) Prefer not to say</li> </ol>
7.	<p>Do you have any children under the age of 18 who currently live at home with you?</p> <ol style="list-style-type: none"> <li>1) No</li> <li>2) Yes</li> <li>3) Prefer not to say</li> </ol>
8.	<p>Which of the following best describes your racial or ethnic background?</p> <ol style="list-style-type: none"> <li>1) White/Caucasian</li> <li>2) Black</li> <li>3) Asian</li> <li>4) European</li> <li>5) Middle-Eastern</li> <li>6) Mixed</li> <li>7) Other</li> <li>8) Prefer not to say</li> </ol>

9)	<p>In general, would you say your <b>HEALTH</b> is...?</p> <ol style="list-style-type: none"> <li>1) Poor</li> <li>2) Fair</li> <li>3) Good</li> <li>4) Very Good</li> <li>5) Excellent</li> <li>6) Don't know / Prefer not to say</li> </ol>
10)	<p>In the past 7 days, how many hours of <b>moderate</b> physical activity (such as walking, biking or recreational swimming) did you engage in?</p> <ol style="list-style-type: none"> <li>1) None; I did not engage in any moderate physical activity</li> <li>2) Less than 1 hour per week</li> <li>3) 1-2 hrs per week</li> <li>4) 3-5 hrs per week</li> <li>5) 6-7 hrs per week</li> <li>6) 8 or more hrs per week</li> <li>7) Don't know / Prefer not to say</li> </ol>
11)	<p>In the past 7 days, how many hours of <b>intense</b> physical activity (running, aerobic exercise, team sports, or any other activities that <b>increase your heart rate and make you breathe hard and sweat</b>) did you engage in?</p> <p>(Do not include moderate physical activity)</p> <ol style="list-style-type: none"> <li>1) None; I did not engage in any hard physical activity</li> </ol>

	<ul style="list-style-type: none"> <li>2) Less than 1 hour per week</li> <li>3) 1-2 hrs per week</li> <li>4) 3-5 hrs per week</li> <li>5) 6-7 hrs per week</li> <li>6) 8 or more hrs per week</li> <li>8) Don't know / Prefer not to say</li> </ul>
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12)	<p>Which, if any medical conditions do you suffer from?</p> <p><b>(Circle any that apply)</b></p> <ul style="list-style-type: none"> <li>1) Diabetes</li> <li>2) Hypertension or high blood pressure</li> <li>3) Crohn's Disease</li> <li>4) Ulcerative Colitis</li> <li>5) Irritable Bowel Syndrome</li> <li>6) Osteoporosis</li> <li>7) Arthritis</li> <li>8) Cardiovascular disease or heart disease</li> <li>9) Cancer</li> <li>10) Gastro esophageal reflux disease (GERD)</li> <li>11) Back problems</li> <li>12) Migraine Headaches</li> <li>13) Chronic bronchitis or emphysema</li> <li>14) Stomach ulcers</li> <li>15) Stroke</li> <li>16) Urinary incontinence</li> <li>17) Alzheimer's Disease</li> <li>18) Hyperglycemia or diagnosed high blood sugar</li> <li>19) Hypoglycemia or diagnosed low blood sugar</li> <li>20) Anemia or Iron Deficiency</li> <li>21) Other: _____</li> <li>22) None of these</li> </ul>
13)	<p>How would you describe your <b>OVERALL DIET</b>?</p> <ul style="list-style-type: none"> <li>1) Poor</li> <li>2) Fair</li> <li>3) Average</li> <li>4) Good</li> <li>5) Excellent</li> <li>6) Don't know / Prefer not to say</li> </ul>
14)	<p>In a typical week, how often do you eat <b>outside the home</b> at a sit-down or fast-food restaurant?</p> <ul style="list-style-type: none"> <li>1) Never</li> <li>2) Less than once per week</li> <li>3) Once per week</li> <li>4) Two or three times per week</li> <li>5) Four or more times per week</li> <li>6) Don't know/prefer not to say</li> </ul>



15)	<p>During the past year, have you been on a <b>diet</b> (such as Weight Watchers, Atkins Diet, South Beach Diet, etc.) or <b>actively tried to lose weight</b>?</p> <p>1) No 2) Yes 3) Don't know / Prefer not to say</p>
16)	<p>Do you have any food allergies?</p> <p>1) No 2) Yes – I am allergic to the following food(s): _____ 3) Don't know / Prefer not to say</p>
17)	<p>Thinking specifically about <u>nutrition labels</u> on the various food products you buy (other than brand name or flavour), how often do you read the labels?</p> <p>1) Never 2) Sometimes 3) Usually 4) Always 5) Only the first time I buy a product 6) Don't know / Prefer not to say</p>

18)	<p>When shopping for food for you and your family, what types of nutrition information provided on the food package do you usually look for? (<b>Circle all that apply</b>)</p> <p>1) None 2) Nutrition Facts table 3) Number of calories 4) Fat content (total) 5) Saturated fat content 6) Trans fat content 7) Sodium/salt content 8) Carbohydrate content 9) Sugar content 10) Fibre content 11) Protein content 12) Vitamin A content 13) Vitamin C content 14) Calcium content 15) Iron content 16) Health logo or symbol 17) Nutrition claims (e.g. high in fibre, low in fat) 18) Other: _____ 19) Don't know/prefer not to say</p>
19)	<p>I am knowledgeable about health and nutrition issues.</p> <p>1) Strongly disagree 2) Disagree somewhat 3) Neutral/no opinion 4) Agree somewhat 5) Strongly agree 6) Don't know / Prefer not to say</p>

**FOLLOW-UP SURVEY: PART A**

*For each question below, please circle the most applicable response.*

The following questions refer to the Subway meal you ordered for dinner earlier.	
1.	<p>How hungry were you before you ate the Subway meal we provided tonight?</p> <p>1) Not at all hungry                  2) A little hungry                  3) Very hungry                  4) Don't know /can't remember</p>
2.	<p>Was there any nutritional information provided on the Subway menu you were given?</p> <p>1) No                  2) Don't know/can't remember                  3) Yes</p> <p align="right">→ <b>If yes:</b> what information did you notice: _____                  _____                  _____</p>
3.	<p>How much, if at all, did the nutritional information shown on your menu influence what you ordered for your meal?</p> <p>1) I did not notice any nutrition information on the menu                  2) Not at all                  3) A little                  4) A lot                  5) Don't know/ Can't remember</p>
4.	<p>Approximately how many calories were in your Subway <u>sandwich</u>? <i>If you are not sure, please provide your best guess.</i></p> <p>1) _____ calories                  2) Don't know /can't remember                  3) I did not order a Subway sandwich</p>
5.	<p>If you ordered a <u>snack</u> (chips), approximately how many calories were in that snack? <i>If you are not sure, please provide your best guess.</i></p> <p>1) _____ calories                  2) Don't know /can't remember                  3) I did not order chips</p>

The following questions refer to the <u>box of crackers</u> you selected after your meal.	
6.	<p>Did you notice any nutritional information <u>on the box of crackers</u>?</p> <p>1) No  2) Don't know/can't remember  3) Yes → <b>If yes:</b> what information did you notice: _____  _____</p>
7.	<p><u>Where</u> was the nutrition information located on the box of crackers?</p> <p>_____</p>
8.	<p>How much, if at all, was your choice of crackers influenced by the nutritional information?</p> <p>1) I did not notice any nutrition information  2) Not at all  3) A little  4) A lot  5) Don't know/ Can't remember</p>
9.	<p>Thinking about the box of crackers you selected, would you say the crackers were low, medium or high in sodium?</p> <p>1) Low sodium  2) Medium sodium  3) High sodium  4) Don't know / Can't remember</p>
10.	<p>In your opinion, how healthy are the crackers you chose?</p> <p>1) Not at all healthy  2) Somewhat unhealthy  3) Neutral/no opinion  4) Somewhat healthy  5) Very healthy</p>

**YOU HAVE FINISHED PART A.**

**PLEASE PUT UP YOUR HAND TO RECEIVE PART B.**

**FOLLOW-UP SURVEY: PART B**

	<p>The following questions refer to the <u>Image Sheet</u> you were given with your survey. The two images shown are examples of a nutritional label for a <b>low</b> and a <b>high</b> sodium product.</p> <p>Please refer to the <u>Image Sheet</u> when answering the following questions.</p>
11.	<p>How much do you <b>like</b> these nutrition labels?</p> <p>1      2      3      4      5      6      7      8      9      10 <b>Not at all</b>      <b>Extremely</b></p>
12.	<p>To what extent, if at all, do you think the type of information provided on these labels would <b>help you choose healthier foods</b>?</p> <p>1      2      3      4      5      6      7      8      9      10 <b>Not at all</b>      <b>Extremely</b></p>
13.	<p>How easy is it for you to <b>understand</b> the information provided by these labels?</p> <p>1      2      3      4      5      6      7      8      9      10 <b>Not at all</b>      <b>Extremely</b></p>
14.	<p>How <b>believable</b> are these labels, in your opinion?</p> <p>1      2      3      4      5      6      7      8      9      10 <b>Not at all</b>      <b>Extremely</b></p>

**Ranking Task**

15.

Four different formats for **nutrition labels** are shown below.





Each format shows an example of a nutritional label for a low and a high sodium product.

Please rank the formats from **Most Effective** to **Least Effective**.

Put the **letter** for each format in the table below.

**Which format would be most effective at helping you choose low sodium products?**

<b>1<sup>st</sup> place</b> (Most effective)	<b>2<sup>nd</sup> place</b>	<b>3<sup>rd</sup> place</b>	<b>4<sup>th</sup> place</b> (Least effective)

FORMAT	Low Sodium	High Sodium
<b>A</b>	<p><b>SODIUM</b> 20 mg per serving 1% Daily Value</p>	<p><b>SODIUM</b> 375 mg per serving 25% Daily Value</p>
<b>B</b>	<p><b>LOW SODIUM</b> 20 mg per serving 1% Daily Value</p>	<p><b>HIGH SODIUM</b> 375 mg per serving 25% Daily Value</p>
<b>C</b>		
<b>D</b>	 <p>20 mg per serving 1% Daily Value</p>	 <p>375 mg per serving 25% Daily Value</p>

Final Questions	
16.	<p>In your opinion, should the government require food companies to put nutrition information on <b>MENUS AT RESTAURANTS?</b></p> <ol style="list-style-type: none"> <li>1) No</li> <li>2) Yes</li> <li>3) Maybe</li> <li>4) Don't know/prefer not to say</li> </ol>
17.	<p>In your opinion, should the government require food companies to put nutrition information on the <b>FRONT OF FOOD PACKAGES?</b></p> <ol style="list-style-type: none"> <li>1) No</li> <li>2) Yes</li> <li>3) Maybe</li> <li>4) Don't know/prefer not to say</li> </ol>
18.	<p>Are you red-green colorblind?</p> <ol style="list-style-type: none"> <li>1) No</li> <li>2) Yes</li> <li>3) Don't know/prefer not to say</li> </ol>

*Please go to next page...*

19. The picture below shows nutrition information on the back of a container of ice cream. Please look at the picture and answer the questions below.

**500 ml (2 cups) per container.**

<b>Nutrition Facts</b>	
Per 125 mL (1/2 cup)	
Amount	% Daily Value
<b>Calories</b> 250	
<b>Fat</b> 13g	20%
Saturated 9g + Trans 0g	40%
<b>Cholesterol</b> 28mg	
<b>Sodium</b> 55mg	2%
<b>Carbohydrate</b> 30g	12%
Fibre 2g	8%
Sugars 23g	
<b>Protein</b> 4g	
Vitamin A 0 %	Vitamin C 0 %
Calcium 4 %	Iron 8 %

\*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

Ingredients: Cream, Skim Milk, Liquid Sugar, Water, Egg Yolks, Brown Sugar, Milkfat, Peanut Oil, Sugar, Butter, Salt, Carrageenan, Vanilla Extract.

20. If you eat half the container of ice cream, how many calories will you eat? *If you are unsure, please try to provide your best guess.*

- 1) \_\_\_\_\_ calories
- 2) Don't know

21. If you usually eat 2500 calories in a day, what percentage of your daily value of calories will you be eating if you eat one serving (125 ml) of ice cream? *If you are unsure, please try to provide your best guess.*

- 1) \_\_\_\_\_ % daily value
- 2) Don't know