



## A voluntary nutrition labeling program in restaurants: Consumer awareness, use of nutrition information, and food selection

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### ABSTRACT

Health Check (HC) was a voluntary nutrition labeling program developed by the Heart and Stroke Foundation of Canada as a guide to help consumers choose healthy foods. Items meeting nutrient criteria were identified with a HC symbol. This study examined the impact of the program on differences in consumer awareness and use of nutritional information in restaurants. Exit surveys were conducted with 1126 patrons outside four HC and four comparison restaurants in Ontario, Canada (2013). Surveys assessed participant noticing of nutrition information, influence of nutrition information on menu selection, and nutrient intake. Significantly more patrons at HC restaurants noticed nutrition information than at comparison restaurants (34.2% vs. 28.1%; OR = 1.39;  $p = 0.019$ ); however, only 5% of HC restaurant patrons recalled seeing the HC symbol. HC restaurant patrons were more likely to say that their order was influenced by nutrition information (10.9% vs. 4.5%; OR = 2.96,  $p < 0.001$ ); and consumed less saturated fat and carbohydrates, and more protein and fibre ( $p < 0.05$ ). Approximately 15% of HC restaurant patrons ordered HC approved items; however, only 1% ordered a HC item and mentioned seeing the symbol in the restaurant in an unprompted recall task, and only 4% ordered a HC item and reported seeing the symbol on the item when asked directly. The HC program was associated with greater levels of noticing and influence of nutrition information, and more favourable nutrient intake; however, awareness of the HC program was very low and differences most likely reflect the type of restaurants that "self-selected" into the program.

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### 1. Introduction

Diet is a primary risk factor for a range of chronic diseases, including heart disease, diabetes and some forms of cancer (Mensah, 2004; Vineis and Wild, 2014; World Health Organization, 2003). Currently, few Canadians meet recommended dietary guidelines, and less than 1% have 'good quality diets', defined as adherence to Canada's Food Guide (Garriguet, 2009). For example, three-quarters of Canadians exceed the upper limit for sodium consumption and fewer than half consume the recommended amounts of fruit and vegetables (Garriguet, 2004; Health Canada, 2010). As a consequence, the prevalence of nutrition-related conditions is increasing: two-thirds of adult Canadians are overweight or obese, and 7% have been diagnosed with diabetes, an increase of 70% since 1998 (Public Health Agency of Canada, 2011;

Public Health Agency of Canada and Canadian Institute for Health Information, 2011).

Food consumed 'away from home' accounts for an increasing proportion of the North American diet (Dietary Guidelines Advisory Committee, 2010; Powell et al., 2012; Powell and Nguyen, 2013; Slater et al., 2009). In Canada, around one quarter of adults eat food prepared in a fast food restaurant each day (Garriguet, 2004). Food eaten outside the home is associated with higher calorie and fat intake, and excess weight gain (Brownell, 2004; Dietary Guidelines Advisory Committee, 2010; Mancino et al., 2009; Nguyen and Powell, 2014; Pereira et al., 2005). A primary challenge to healthy eating in restaurant settings is that consumers have very little idea about the nutritional quality of menu items, which varies widely even for similar items across different establishments (Block et al., 2013; Burton et al., 2006; Scourboutakos and L'Abbé, 2012).

Mandatory labeling of nutrient information has been proposed as a measure to enhance consumer awareness of restaurant foods (Block and Roberto, 2014; Kasapila and Shaarani, 2016), and has been implemented in some US states and municipalities. Federal legislation requiring large chain restaurants ( $\geq 20$  outlets) to post calories on menus is under development in the US (USFDA, 2016). Beginning January 2017, all large chain restaurants in Ontario, Canada will be required to post

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calories on menus ([Government of Ontario, 2016](#)). In the absence of mandatory policies, many restaurants have adopted voluntary measures communicating nutrition information on menus, which include programs developed by individual restaurants or third-parties. The Heart and Stroke Foundation of Canada developed the Health Check restaurant program, a 'summary indicator' system designed to help consumers choose healthy foods. Menu items meeting specific nutrient criteria were identified on restaurant menus or menu boards with the Health Check symbol (see [Fig. 1](#)). The Health Check restaurant program was adapted from a similar program for pre-packaged foods, which was the most widely recognized front-of-pack symbol implemented in Canada ([Sae Yang, 2012](#)) and was similar to systems common in other jurisdictions ([European Food Information Council, 2013](#); [Institute of Medicine, 2011](#); [Roodenburg et al., 2011](#); [Schermel et al., 2013](#)). The Health Check program was discontinued in June 2014; the symbol no longer appears on food packaging or restaurant menus.

Summary indicator symbols, such as the Health Check symbol, are perceived by many consumers as credible indicators of nutrition quality and may support 'faster' at-a-glance food selection choices, compared to more detailed presentations of nutrient content ([Andrews et al., 2011](#); [Berner et al., 2008](#); [Emrich et al., 2014](#); [Feunekes et al., 2008](#); [Steenhuis et al., 2010](#)). However, previous research indicates that voluntary summary indicator systems displayed on pre-packaged food items may not always align with a product's nutritional quality ([Emrich et al., 2015](#); [Roberto et al., 2012](#)).

To our knowledge, there are no published quasi-experimental studies evaluating voluntary nutrient labeling systems in restaurants. This evidence is directly relevant to jurisdictions where voluntary menu labeling programs are becoming more common and proposed by the industry as a viable alternative to mandatory menu labeling regulations, such as those to be implemented in the US and Ontario, Canada. The current study examined the impact of the Health Check restaurant program on consumer awareness of nutritional information in restaurants, including the Health Check symbol; use of this information in guiding menu selection; and nutrient intake.

## 2. Methods

### 2.1. Study design

The study compared two types of restaurants: those participating in the Health Check program, and comparison restaurants not participating in the program, but with similar menu offerings. Surveys were



**Fig. 1.** Heart and Stroke Foundation Health Check symbol.

conducted with restaurant patrons outside of four Health Check restaurant chains, and 4 comparison chains, with a burger, pizza, pita, and grill restaurant in each group (specific restaurant names not disclosed). Surveys were conducted at 12 outlets total: two outlets per restaurant chain, where feasible (only one for each grill chain, the comparison burger chain, and comparison pita chain). Locations were selected based on feasibility, including restaurant cooperation, reasonable proximity to the research institution, and where possible, neighbourhood diversity (geographically and socio-economically).

#### 2.1.1. Health Check program

The Health Check nutrient criteria were developed by the Heart and Stroke Foundation of Canada's registered dietitians and were based on recommendations in Canada's Food Guide. The criteria included nutrients Canadians should limit, such as total fat, saturated fat, trans fats, and sodium, and those they are encouraged to consume more of, such as fibre, calcium, vitamins and minerals. Calories were not part of the Health Check nutrient criteria. Different menu categories (e.g., soups, side salads, large entrées) each had unique criteria. Generally, Health Check approved items were required to come in standard portion sizes and provide adequate amounts of protein and limited amounts of fat and sodium. Large entrees were required to include a serving of vegetables or fruit.

Restaurants participating in the Health Check program identified menu items that met the nutrient criteria by displaying the Health Check symbol (see [Fig. 1](#)) beside the item on the menu or menu board. Across the participating restaurants, the symbol was present on 5–20% of entrée items. Additional nutrition information, including posters and brochures was sometimes available in these restaurants, but was not required to participate in the Health Check program. In the pita Health Check restaurant, calorie information was also displayed on the menu board for approximately half of the pita entrée items, and in the pizza Health Check restaurant, calories, sodium, fat and protein were listed on Health Check approved items. The chains selected as comparison restaurants did not display the Health Check symbol anywhere in their outlets, but still may have displayed some nutrition information (e.g., on pamphlets or brochures); three comparison restaurants (pita, grill and pizza) used other symbols on their menus to indicate "healthy" or "lighter" menu options.

### 2.2. Participants and recruitment

A total of 1146 adults completed the survey. Ten individuals were excluded from the analytic sample due to incomplete food order information; 10 further individuals were excluded due to serious concerns about data quality (e.g., highly intoxicated; visually impaired; severe language barrier), for a final sample size of 1126 (n = 589 at Health Check sites and n = 537 at comparison sites). The study response rate was 34.8% according to the American Association for Public Opinion Research's 4th definition for calculating response rates ([American Association for Public Opinion Research, 2011](#)).

At each site, restaurant patrons were approached upon exiting the restaurant using an intercept method and invited to participate. Individuals were eligible to participate if they were 18 years or older; had purchased food or drinks at the restaurant; and had dined in the restaurant, except at pita and pizza restaurants where takeout customers were also eligible due to low dine-in customer traffic.

### 2.3. Study protocol

Data were collected over an 8-week period (May-June, 2013) during lunch and dinner hours (with approximately equal spread between meals). Computer-assisted personal interviews were administered using iPads, and took approximately 10 min to complete. All restaurants were located within Southern Ontario. Participants received a \$5 gift card for the restaurant where the survey was completed as

remuneration for their time. The study received ethics clearance from the Office of Research Ethics at the University of Waterloo. Verbal informed consent was obtained from all participants before completing the survey.

## 2.4. Measures

### 2.4.1. Demographics

Demographic information included gender, age, education level (high school or less; college or some university; university degree or higher; not stated), race (White; other/not stated) and income (less than \$50,000; \$50,000 to \$90,000; more than \$90,000; not stated).

### 2.4.2. General health

Participants were asked to report their height and weight, which was then used to calculate BMI and classify respondents as underweight; normal weight; overweight; or obese, using WHO guidelines (World Health Organization, 2013). The survey also assessed perceived diet healthiness ("In general, how healthy is your overall diet... poor, fair, good, very good or excellent"), and weight aspirations ("Which of the following are you trying to do about your weight... lose weight, gain weight, stay the same weight, or are you not trying to do anything about your weight?"). A series of measures from the Canadian Community Health Survey was used to assess usual fruit and vegetable consumption (Statistics Canada, 2013).

### 2.4.3. Awareness and use of nutrition information

Participants were asked, "Did you notice any nutrition information anywhere in the restaurant?" Follow-up questions assessed where the participants saw the nutrition information (e.g., on the menu, next to food items) and what type of information they saw (e.g., calories, fat). Responses to the type of nutrition information seen, and the location of the information, were open-ended with no prompting to participants.

Participants were also asked whether the nutrition information influenced their choices, and if yes, how the information influenced their choices (open-ended). Responses were coded by the interviewer into relevant pre-defined categories (e.g., ordered a smaller size, ordered 'healthier' items, chose items with fewer calories), or as an 'other'.

### 2.4.4. Health Check symbol

Interviewers showed participants a picture of the Health Check symbol on the iPad and inquired whether they recognized the symbol. Only participants who answered "yes" were considered to meet the threshold for "recognition" of the logo (yes, no/don't know). Participants were then asked what it might mean if the symbol appeared next to a food item on a menu, if any of the items they ordered displayed this symbol, and if so, whether or not it influenced their choice.

### 2.4.5. Food order and consumption

The respondent's food order was obtained through a series of open-ended questions: (i) "Did you order a main food item or entrée at this meal?", (ii) "Did you modify or add anything to this main food item or entrée, for example adding cheese or asking for no sauce?", and (iii) "Did you order any other main food items or entrees at this meal?". This series of questions was repeated for 'sides', 'drinks', and 'appetizers, desserts or other food items'. At sit-down restaurants that offered complimentary items, participants were also asked "Did you eat any complimentary or free items, such as bread?"

To examine the amount of food consumed, participants who had dine-in meals were asked "Did you eat all of your meal?" If the respondent had not finished the entire meal, he/she was asked how much of the food or drink item was consumed (one quarter, one half, three quarters, the entire item, or other). Participants who ordered take-out at pita restaurants were assumed to have consumed the entire item. Participants who ordered takeout at pizza restaurants were excluded from food consumption analyses because the majority of menu items were

'family size' and could have been shared by multiple people in unequal serving sizes ( $n = 29$ ).

The nutritional content of each food item, including caloric content, total fat, saturated fat, carbohydrates, sodium, fibre and protein, was obtained from publicly available information on each restaurant's company website, and used to determine nutrient intake for each participant, adjusting for whether the person finished their meal. Nutritional values missing from company websites were obtained from the Canadian Nutrient File, food manufacturer's websites (e.g., [www.fritolay.ca](http://www.fritolay.ca)), or if needed, from other general online nutrition databases.

Individuals who did not report details on portion or serving size were assumed to have selected a medium size, a conservative standard amount (e.g., 1 packet of sugar) or the most common option reported by other study participants (e.g., 9-inch whole wheat pita) ( $n = 18$ ). For entries that did not contain sufficient detail to illicit the specific item sold (e.g., pizza), a standard item type was assigned (e.g., pepperoni on a traditional crust) ( $n = 27$ ). Individuals who did not identify a specific type of a modification were assigned that category's lowest caloric value (e.g., if the type of salad dressing was not specified, one serving of "vinaigrette" dressing was assigned because it has the fewest calories of all dressing options) ( $n = 11$ ). It was assumed that meals came with standard sides and toppings, unless detail was otherwise provided in the participant's description. Participants whose food order descriptions were not sufficiently detailed to identify foods purchased were excluded from the analysis of food consumption ( $n = 5$ ). Participants were also excluded from some of the nutrient intake analyses if it was not possible to access certain nutrient values about the items from the restaurant website or an alternative source ( $n = 48$  for calories, total fat, protein;  $n = 49$  for carbohydrates and fibre;  $n = 52$  for sodium;  $n = 217$  for saturated fat). Each participant's food order was compared to a listing of Health Check approved items to identify if the items ordered carried a Health Check logo.

## 2.5. Analysis

All analyses were conducted using IBM SPSS version 22. Chi-square and t-tests were used to examine statistically significant differences in the sample profile between the Health Check and comparison sites. Differences in outcomes were tested for statistical significance using logistic regression models for binary outcomes (e.g., noticing and influence of nutrition information) and linear regression for continuous outcomes (e.g., calories consumed). All regression models included an indicator variable of "restaurant condition" (Health Check = 1, comparison = 0) to assess differences between Health Check and comparison sites. Odds ratios were adjusted for age, gender, education, income, race, BMI, fruit and vegetable consumption, weight aspiration, and perceived overall diet quality. Unstandardized regression coefficients are reported. 'Not stated' responses are shown for education, weight aspiration and perceived overall diet quality in Table 1, but were excluded from the regression models.

## 3. Results

### 3.1. Sample characteristics

Characteristics of the sample are described in Table 1. No significant differences were observed between respondents at the Health Check and comparison restaurants, except for age ( $F = 9.9$ ,  $p = 0.002$ ).

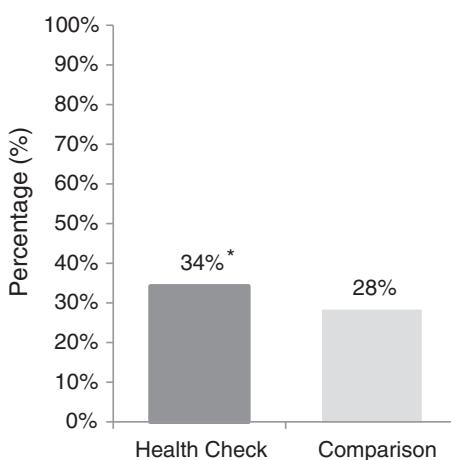
### 3.2. Noticing nutrition information

Significantly more respondents at the Health Check restaurants reported noticing nutrition information than at the comparison restaurants (34.2% vs. 28.1%, respectively; OR = 1.39,  $p = 0.019$ , see Fig. 2).

In both types of restaurants, the most common location patrons recalled noticing nutrition information was the menu or menu board;

**Table 1**  
Sample characteristics by restaurant type, Canada, 2013 (n = 1126)

	Health Check (n = 589)	Comparison (n = 537)	Statistical difference
Age mean (SD)	43.3 (16.4)	40.2 (16.4)	F = 9.903 p = 0.002
Gender %			
Male	50.4%	50.5%	X <sup>2</sup> = 0.000 p = 0.989
Education %			
High school or less	28.9%	27.7%	X <sup>2</sup> = 4.375 p = 0.224
College/some university	35.0%	39.1%	
University degree or higher	35.5%	31.7%	
Not stated	0.7%	1.5%	
Income %			
Less than \$50,000	16.0%	18.2%	X <sup>2</sup> = 1.673 p = 0.643
\$50,000–\$90,000	22.9%	20.5%	
More than \$90,000	36.5%	37.1%	
Not stated	24.6%	24.2%	
Race %			
White	84.7%	84.9%	X <sup>2</sup> = 0.008 p = 0.927
Non-White/not stated	15.3%	15.1%	
BMI %			
Underweight	0.5%	1.1%	X <sup>2</sup> = 3.499 p = 0.478
Normal weight	34.0%	31.5%	
Overweight	34.8%	35.8%	
Obese	19.9%	18.4%	
Not stated	10.9%	13.2%	
Weight aspirations %			
Lose weight	49.9%	45.1%	X <sup>2</sup> = 3.291 p = 0.510
Gain weight	4.8%	6.0%	
Stay same weight	25.6%	27.2%	
Not trying to do anything	18.7%	20.3%	
Not stated	1.0%	1.5%	
Overall diet %			
Poor	7.8%	6.9%	X <sup>2</sup> = 3.583 p = 0.611
Fair	26.3%	29.2%	
Good	37.4%	38.9%	
Very good	24.8%	20.9%	
Excellent	3.2%	3.7%	
Not stated	1.0%	0.4%	
Fruit and vegetable mean (SD)	5.0 (2.6)	5.0 (2.7)	F = 0.020 p = 0.887



**Fig. 2.** Proportion of respondents who noticed any nutrition information anywhere in the restaurant, in Health Check restaurants and comparison restaurants, Canada, 2013 (n = 1126).

although significantly more patrons at Health Check restaurants recalled noticing nutrition information on the menu than at comparison restaurants (21.6% vs. 9.3%, respectively; OR = 2.81, p < 0.001).

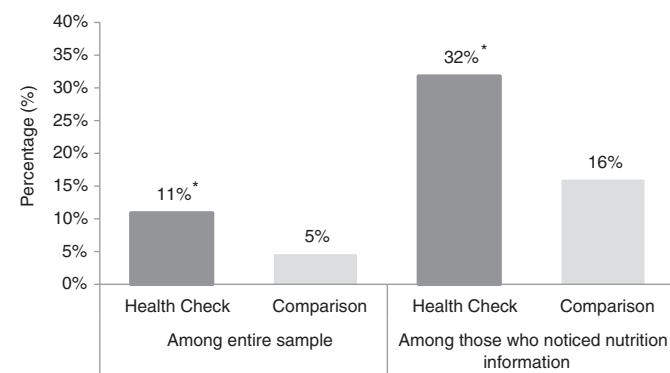
Calories were the most commonly reported type of nutrition information recalled in both types of restaurants (23.8% of Health Check respondents; 15.3% of comparison respondents), followed by fat (9.2% of Health Check respondents; 7.1% of comparison respondents). Recall of nutrient information varied within Health Check restaurants; for example, more than 80% of the respondents at the pita Health Check restaurant recalled seeing calories. Unprompted recall of the Health Check symbol was relatively low: 5.3% of respondents at the Health Check restaurants recalled noticing the symbol. Additionally, 1.3% of respondents at the comparison restaurants reported noticing a Health Check symbol, even though the symbol was not present, indicating a small amount of false reporting.

### 3.3. Influence of nutrition information

Fig. 3 shows the proportion of respondents who reported that the nutrition information influenced their meal choice. When examining the entire sample, as well as the subsample who reported noticing nutrition information, participants at Health Check restaurants were significantly more likely to say that their order was influenced by nutrition information than participants at comparison restaurants (10.9% vs. 4.5%, respectively; OR = 2.96, p < 0.001 and 31.8% vs. 15.9%, respectively; OR = 2.79, p = 0.001). Of those who reported being influenced by the nutrition information, the vast majority claimed that it influenced them to select either a 'healthier' item (51.1%) or an item with fewer calories (37.5%). Significantly more participants at the Health Check restaurants claimed that they chose items with fewer calories, compared to participants at the comparison restaurants (43.8% vs. 20.8%; OR = 5.54, p = 0.037).

### 3.4. Recognition of the Health Check symbol

Participants were shown an image of the Health Check symbol and were asked if they recognized the symbol. Overall, 90.4% of participants reported recognizing the symbol, with no significant difference in recognition between the Health Check and comparison restaurants (91.0% vs. 89.8%; OR = 1.35, p = 0.179). The participants were also asked what they thought the symbol would mean if it was displayed on a menu next to a food item. More than 80% of participants thought the symbol would indicate that the food was a healthy or nutritious option. Other responses included that the symbol would indicate the product was low fat, low calorie, good for your heart, certified, or low sodium.



**Fig. 3.** Proportion of respondents who reported nutrition information influenced their food and drink order in Health Check restaurants and comparison restaurants, Canada, 2013.

### 3.5. Ordering of Health Check items

After being shown the Health Check symbol, the respondents were asked whether any of the items they ordered had the symbol. Overall, 7.5% ( $n = 44$ ) of the Health Check patrons indicated that they believed they had ordered an item with the Health Check symbol. Among those individuals, 52.3% ( $n = 23$ ) claimed that the presence of the symbol influenced their meal choice.

When actual ordering data was verified, nearly 15% ( $n = 87$ ) of the Health Check restaurant patrons had ordered at least one Health Check approved item; however, only 1% ( $n = 8$ ) of the Health Check restaurant patrons ordered a Health Check approved item and mentioned seeing the Health Check symbol in the restaurant during the unprompted nutrition information recall task. Approximately 4% ( $n = 25$ ) ordered a Health Check approved item and reported seeing the Health Check symbol on the item when asked directly whether any of the items that they ordered displayed the symbol. Just over 2% ( $n = 13$ ) ordered a Health Check approved item, reported seeing the Health Check symbol on the item, and said the symbol influenced their meal choice.

### 3.6. Nutrient consumption

**Fig. 4** shows the mean calories, total fat, saturated fat, carbohydrate, sodium, fibre and protein consumed in respondent meals (including beverages) at Health Check and comparison restaurants.

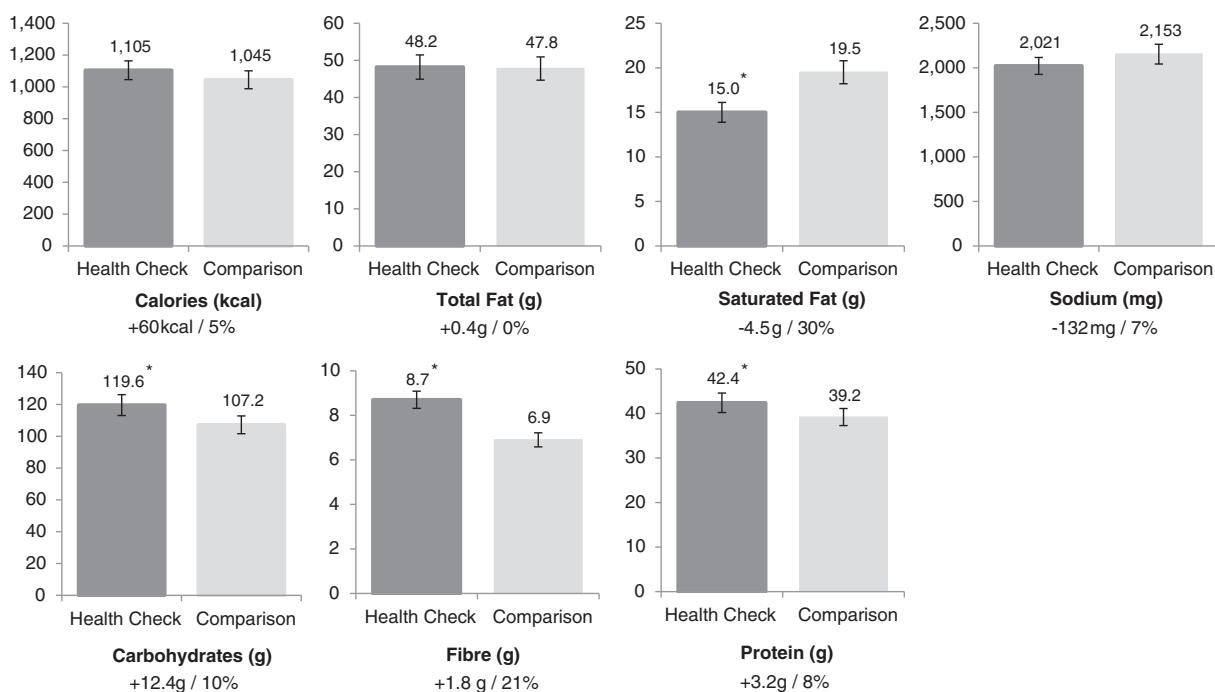
Meals consumed at Health Check restaurants were significantly lower in saturated fat than at comparison restaurants (15.0 g vs. 19.5 g;  $\beta = -4.0$ ,  $p < 0.001$ ); but higher in carbohydrate (119.6 g vs. 107.2 g;  $\beta = 13.0$ ,  $p = 0.003$ ), fibre (8.7 g vs. 6.9 g;  $\beta = 1.7$ ,  $p < 0.001$ ) and protein (42.4 g vs. 39.2 g;  $\beta = 3.6$ ,  $p = 0.014$ ) content. There was no significant difference in the amount of calories, total fat, or sodium consumed between the two types of restaurants.

## 4. Discussion

Overall, the findings indicate that the Health Check program—a voluntary nutrition labeling program—was associated with greater levels of noticing and using nutrition information during meal selection

relative to the comparison restaurants. Previous research has also indicated that the introduction of calorie labeling on menus, and other labeling systems, such as 'Traffic Light' systems, increase noticing and use of nutrition information (Hammond et al., 2015; Hammond et al., 2013). Although noticing and use of nutrition information was higher in Health Check restaurants, the extent to which the observed differences were due to the Health Check program is unclear. Indeed, the Health Check symbol was present on a relatively small subset of entrée items (5–20%), and very few participants noticed the Health Check symbol on menu items, including participants who had ordered meals with the Health Check symbol. Participants were more likely to notice other nutrition information not included as part of the program. For example, calories were the most common type of nutrition information recalled, despite calories not being listed as part of the Health Check program. There was also substantial variation in information recalled among the four Health Check restaurants. One of the Health Check chains displayed calories for some items directly on their menu board: more than 80% of the respondents at that restaurant recalled seeing calories, which likely drove the higher calorie recall levels observed among the Health Check respondents.

In terms of consumption patterns, patrons at Health Check restaurants were reported consuming food with less saturated fat, and more carbohydrates, protein and fibre; however, no differences were observed with respect to calorie, total fat, or sodium intake. Given the fact that the Health Check logo was associated with low levels of recall and use, the differences observed in saturated fat, protein and fibre consumption may be due to factors other than the Health Check campaign. It is possible that restaurants that participated in the Health Check program may have offered meals with a more favourable nutrition profile, which may reflect the type of restaurants that "self-selected" into the program, or may have been a direct result of participating in the program. There is some evidence that restaurants reformulate their menu offerings when introducing calorie labeling (Bleich et al., 2015); however, there may be less incentive to do so in the case of menu labeling programs where specific calorie amounts are not displayed, such as the Health Check program, or are displayed only for some items in a selective manner. Due to the complexity of menu options, especially at restaurants serving customizable items (e.g., pitas, pizza), it is difficult to



**Fig. 4.** Comparison of mean calories, total fat, saturated fat, carbohydrates, sodium, fibre and protein consumption in respondent meals (including beverages) at Health Check restaurants and comparison restaurants, Canada, 2013.

objectively assess whether the Health Check restaurants in the current study had a more favourable nutrition profile.

#### 4.1. Strengths and limitations

While the Health Check and comparison restaurants were matched as closely as possible on menu offerings, the restaurant environments varied on factors other than just the presence of the Health Check program, such as the use of other symbols to indicate healthier options, and the availability and visibility of other nutrition information (e.g., information on posters, pamphlets, or tray liners). This makes it challenging to attribute differences in consumption patterns directly to the presence of the Health Check program. However, the study design captures the realistic manner in which voluntary programs are implemented, which increases the external validity of the research. The nutrient consumption analyses in this study required making some assumptions and estimations, which may have led to some measurement error at the individual level including overestimations of energy consumption; however, the same method was used in both Health Check and comparison restaurants, and should provide sufficient estimates to calculate differences across restaurant type.

Finally, the study relied on self-reported data and accurate recall of food items purchased and consumed; as such, may have been subject to some recall bias. Although some calorie labeling studies have utilized receipts to verify self-reported data, this technique requires approaching patrons before they enter the restaurant to ask them to keep the receipt (Elbel et al., 2013), and has greater potential to influence meal choices and cue participants to notice nutrition-related information. In this study, patrons were only approached as they exited; and the survey was conducted immediately after the participants consumed their meal so the degree of error in recall should have been minimized. Furthermore, previous research has shown high correspondence between self-reported measures of noticing, use and consumption verified through objective measures and sales data (Hammond et al., 2013; Sonnenberg et al., 2013). While alternative measures—such as the amount of food ordered—do not require assumptions about unfinished amounts, they may include items intended to be shared with others.

#### 4.2. Policy implications

The findings suggest a very modest impact of this voluntary nutrition labeling program: the Health Check program was noticed and used by few consumers, and differences with the comparison restaurants appear to be driven by factors unrelated to the program. The variability in the amount of nutrition information available within different Health Check restaurants—both in terms of the number of menu items labeled and the extent of other information provided—highlights a common limitation of voluntary nutrition labeling programs: to be effective, nutrition information must be provided in a salient, systematic manner to adequately inform consumers. Although the Health Check program has now been removed from menus of participating restaurants, the results have implications for ongoing discussions of menu labeling policy in Canada and other jurisdictions. Whereas the province of Ontario has passed mandatory calorie labeling for restaurant chains beginning in 2017, voluntary industry programs remain the norm in the rest of Canada. A better understanding of the impact of these voluntary programs—if any—can help to inform policy development in other jurisdictions. Indeed, one of the reasons cited by the Heart and Stroke Foundation for discontinuing the Health Check program was an increase in similar nutrition labeling programs, which made it difficult to have their message heard. The organization indicated that more is needed to be done to encourage governments and industry to adopt broader policies, such as requiring restaurants to post nutrition information at the point of sale (Macdonald and Weeks, 2014).

To date, most menu labeling policies currently provide calorie information, which has been criticized for requiring mathematical

manipulation, and thus higher levels of nutrition knowledge and literacy (Emrich et al., 2014; Roberto and Khandpur, 2014). The Health Check symbol summarized the nutritional quality of food items to help consumers identify ‘healthy’ items, but did not allow for comparison between items that might have been ‘less healthy’, unlike Traffic Light systems which incorporate colours and symbols, to help consumers identify items that have ‘low’, ‘medium’ or ‘high’ nutritional quality. Future research should examine differences in diet and health outcomes that result from different types of menu labeling policies, including the difference between voluntary and mandatory regulations, and the use of non-numeric labeling information that may meaningfully impact consumer behaviours.

#### Conflict of interest

This research was funded by the Heart and Stroke Foundation of Canada (HSFC). The HSFC had no influence over the design, data collection, analyses, or writing of the manuscript. The results and views expressed in this paper are those of the authors and not the HSFC.

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#### References

- American Association for Public Opinion Research, 2011. Standard Definitions: Final Dispositions of Case Codes and Outcomes for Surveys. 7th ed. Accessed 10 July 2015 [https://www.esomar.org/uploads/public/knowledge-and-standards/codes-and-guidelines/ESOMAR\\_Standard-Definitions-Final-Dispositions-of-Case-Codes-and-Outcome-Rates-for-Surveys.pdf](https://www.esomar.org/uploads/public/knowledge-and-standards/codes-and-guidelines/ESOMAR_Standard-Definitions-Final-Dispositions-of-Case-Codes-and-Outcome-Rates-for-Surveys.pdf).
- Andrews, J.C., Burton, S., Kees, J., 2011. Is simpler always better? Consumer evaluations of front-of-package nutrition symbols. *J. Public Policy Mark.* 30 (2), 175–190.
- Berning, J.P., Chouinard, H.H., McCluskey, J.J., 2008. Consumer preferences for detailed versus summary formats of nutrition information on grocery store shelf labels. *J. Agric. Food Ind. Organ.* 6 (1), 1–22.
- Bleich, S.N., Wolfson, J.A., Jarlenski, M.P., Block, J.P., 2015. Restaurants with calories displayed on menus had lower calorie counts compared to restaurants without such labels. *Health Aff.* 34 (11), 1877–1884.
- Block, J.P., Roberto, C.A., 2014. Potential benefits of calorie labeling in restaurants. *JAMA* 312 (9), 887–888.
- Block, J.P., Condon, S.K., Kleinman, K., et al., 2013. Consumers' estimation of calorie content at fast food restaurants: cross sectional observational study. *BMJ* 346. <http://dx.doi.org/10.1136/bmj.f2907>.
- Brownell, K.D., 2004. Fast food and obesity in children. *Pediatrics* 113, 132.
- Burton, S., Creyer, E.H., Kees, J., Huggins, K., 2006. Attacking the obesity epidemic: the potential health benefits of providing nutrition information in restaurants. *Am. J. Public Health* 96, 1669–1675.
- Dietary Guidelines Advisory Committee (DGAC), 2010. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010. U.S. Department of Health and Human Services, U.S. Department of Agriculture, Washington (DC).
- Elbel, B., Mijanovich, T., Dixon, B., et al., 2013. Calorie labelling, fast food purchasing and restaurant visits. *Obesity* 21 (11), 2172–2179.
- Emrich, T.E., Qi, Y., Mendoza, J.E., Lou, W., Cohen, J.E., L'Abbé, M.R., 2014. Consumer perceptions of the nutrition facts table and front-of-pack nutrition rating systems. *Appl. Physiol. Nutr. Metab.* 39 (4), 417–424.
- Emrich, T.E., Qi, Y., Cohen, J.E., Lou, W.Y., 2015. Front-of-pack symbols are not a reliable indicator of products with healthier nutrient profiles. *Appetite* 84, 148–153.
- European Food Information Council (EUFIC), 2013. Global Update on Nutrition Labeling. EUFIC, Brussels, Belgium.
- Feunekes, G.I., Gortemaker, I.A., Willems, A.A., Lion, R., van den Kommer, M., 2008. Front-of-pack nutrition labeling: testing effectiveness of different nutrition labeling formats front-of-pack in four European countries. *Appetite* 50 (1), 57–70.
- Garriguet, D., 2004. Overview of Canadians' Eating Habits. Statistics Canada. No. Catalogue No. 82-620-MIE — No. 2. Accessed 10 July 2015 <http://www.statcan.gc.ca/pub/82-620-m/82-620-m2006002-eng.pdf>.
- Garriguet, D., 2009. Diet quality in Canada. *Health Rep.* 20 (3), 41–52.

- Government of Ontario, 2016. Ontario Regulation 50/16 Made Under the Healthy Menu Choices Act, 2015. Accessed 25 April 2016 <https://www.ontario.ca/laws/regulation/r16050>.
- Hammond, D., Goodman, S., Hanning, R., Daniel, S., 2013. A randomized trial of calorie labelling on menus. *Prev. Med.* 57, 860–866.
- Hammond, D., Lillico, H.G., Vanderlee, L., White, C.M., Reid, J.L., 2015. The impact of nutrition labelling on menus: a naturalistic cohort study. *Am. J. Health Behav.* 39 (4), 540–548.
- Health Canada, 2010. Sodium Reduction Strategy for Canada: Recommendations of the Sodium Working Group. Accessed 10 July 2015 [http://www.hc-sc.gc.ca/fn-an/alt\\_formats/pdf/nutrition/sodium/strateg/reduct-strat-eng.pdf](http://www.hc-sc.gc.ca/fn-an/alt_formats/pdf/nutrition/sodium/strateg/reduct-strat-eng.pdf).
- Institute of Medicine, 2011. Front-of-package Nutrition Rating Systems and Symbols: Promoting Healthier Choices.
- Kasapila, W., Shaarani, S.M., 2016. Legislation-impact and trends in nutrition labeling: a global overview. *Crit. Rev. Food Sci. Nutr.* 56 (1), 56–64.
- Macdonald, G., Weeks, C., 2014. Heart and Stroke Foundation Ends Health Check Program. The Globe and Mail. Accessed 25 April 2016 <http://www.theglobeandmail.com/news/national/heart-and-stroke-foundation-ends-health-check-program/article19222121/>.
- Mancino, L., Tood, J., Lin, B.H., 2009. Separating what we eat from where: measuring the effect of food away from home on diet. *Food Policy* 34, 557–562.
- Mensah, G.A., 2004. The Atlas of Heart Disease and Stroke. World Health Organization Accessed 10 July 2015 [http://www.who.int/cardiovascular\\_diseases/resources/atlas/en/](http://www.who.int/cardiovascular_diseases/resources/atlas/en/).
- Nguyen, B.T., Powell, L.M., 2014. The impact of restaurant consumption among US adults: effects on energy and nutrient intakes. *Public Health Nutr.* 17 (11), 2445–2452.
- Pereira, M.A., Kartashov, A.I., Ebbeling, C.B., et al., 2005. Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet* 365, 36–42.
- Powell, L.M., Nguyen, B.T., 2013. Fast-food and full-service restaurant consumption among children and adolescents: effect on energy, beverage, and nutrient intake. *JAMA Pediatr.* 167, 14–20.
- Powell, L.M., Nguyen, B.T., Han, E., 2012. Energy intake from restaurants: demographics and socioeconomics, 2003–2008. *Am. J. Prev. Med.* 43, 498–504.
- Public Health Agency of Canada, 2011. Diabetes in Canada: Facts and Figures From a Public Health Perspective. Accessed 10 July 2015 <http://www.phac-aspc.gc.ca/cd-mc/publications/diabetes-diabète/facts-figures-faits-chiffres-2011/index-eng.php>.
- Public Health Agency of Canada and Canadian Institute for Health Information, 2011H. Obesity in Canada: A Joint Report From the Public Health Agency of Canada and the Canadian Institute for Health Information. Accessed 10 July 2015 [https://secure.cihi.ca/free\\_products/Obesity\\_in\\_canada\\_2011\\_en.pdf](https://secure.cihi.ca/free_products/Obesity_in_canada_2011_en.pdf).
- Roberto, C.A., Khandpur, N., 2014. Improving the design of nutrition labels to promote healthier food choices and reasonable portion sizes. *Int. J. Obes.* 38 (Suppl. 1), S25–S33.
- Roberto, C.A., Bragg, M.A., Livingston, K.A., et al., 2012. Choosing front-of-package food labeling nutritional criteria: how smart were 'Smart Choices'? *Public Health Nutr.* 15 (2), 262–267.
- Roodenburg, A.J., Popkin, B.M., Seidell, J.C., 2011. Development of international criteria for a front of package food labeling system: the international choices programme. *Eur. J. Clin. Nutr.* 65, 1190–1200.
- Sae Yang, W., 2012. The Impact of Cartoon Characters and Front-of-package (FOP) Nutrition Information on Parental Perceptions of Children's Food Products Master's thesis University of Waterloo Accessed 10 July 2015. Available from: <https://uwspace.uwaterloo.ca/handle/10012/6532>.
- Schermel, A., Emrich, T., Arcand, J., Wong, C., L'Abbé, M., 2013. Nutrition marketing on processed food packages in Canada: 2010 food label information program. *Appl. Physiol. Nutr. Metab.* 38, 666–672.
- Scourboutakos, M.J., L'Abbé, M.R., 2012. Restaurant menus: calories, caloric density, and serving size. *Am. J. Prev. Med.* 43 (3), 249–255.
- Slater, J., Green, C.G., Sevenhuijsen, G., Edginton, B., O'Neil, J., Heasman, M., 2009. The growing Canadian energy gap: more the can than the couch? *Public Health Nutr.* 12 (11), 2216–2224.
- Sonnenberg, L., Gelsomin, E., Levy, D.E., Riis, J., Baraclough, S., Thorndike, A.N., 2013. A traffic light food labelling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. *Prev. Med.* 57 (4), 253–257.
- Statistics Canada, 2013. Canadian Community Health Survey, 34–40. Accessed 10 July 2015 [http://www23.statcan.gc.ca/imdb-bmdi/instrument/3226\\_Q4\\_V2-eng.pdf](http://www23.statcan.gc.ca/imdb-bmdi/instrument/3226_Q4_V2-eng.pdf).
- Steenhuis, I.H.M., Kroese, W., Vyth, E.L., Valk, S., Verbaeten, R., Seidell, J.C., 2010. The effects of using a nutrition logo on consumption and product evaluation of a sweet pastry. *Appetite* 55 (3), 707–709.
- U.S. Food and Drug Administration (FDA), 2016. Menu and Vending Machines Labeling Requirements. Accessed 25 April 2016 <http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm217762.htm>.
- Vineis, P., Wild, C.P., 2014. Global cancer patterns: causes and prevention. *Lancet* 383 (9916), 549–557.
- World Health Organization, 2003. Food Based Dietary Guidelines for the WHO European Region. World Health Organization, Regional Office for Europe Accessed 10 July 2015 [http://www.euro.who.int/\\_data/assets/pdf\\_file/0017/150083/E79832.pdf](http://www.euro.who.int/_data/assets/pdf_file/0017/150083/E79832.pdf).
- World Health Organization, 2013. Global Database on Body Mass Index: BMI Classification. Accessed 10 July 2015 [http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html).