

Estimating the impact of various menu labeling formats on parents' demand for fast-food kids' meals for their children: An experimental auction



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ABSTRACT

This study experimentally tested whether parents' demand for fast-food kids' meals for their children is influenced by various menu labeling formats disclosing calorie and sodium information. The study also examined the effect of various menu labeling formats on parents' ability to identify fast-food kids' meals with higher calorie and sodium content.

Online surveys were conducted among parents of children aged 3–12. Parents were randomized to view 1 of 5 menu conditions: 1) No Nutrition Information; 2) Calories-Only; 3) Calories + Contextual Statement (CS); 4) Calories, Sodium, + CS; and, 5) Calorie and Sodium in Traffic Lights + CS. Using an established experimental auction study design, parents viewed replicated McDonald's menus according to their assigned condition and were asked to bid on 4 Happy Meals. A randomly selected price was chosen; bids equal to or above this price “won” the auction, and bids less than this price “lost” the auction. After the auction, participants were asked to identify the Happy Meal with the highest calories and sodium content.

Adjusting for multiple comparisons and covariates, the Calories, Sodium, + CS menu had a mean attributed value across all 4 Happy Meals which was 8% lower (−\$0.31) than the Calories + CS menu ($p < 0.05$). Significantly more parents in the 4 menu conditions providing calories were able to correctly identify the Happy Meal with the highest calories ($p < 0.0001$) and significantly more parents in the 2 conditions providing sodium information were able to correctly identify the Happy Meal with the highest sodium content ($p < 0.0001$).

Menus disclosing both calories and sodium information may reduce demand for fast-food kids' meals and better support parents in making more informed and healthier food choices for their children.

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1. Introduction

The prevalence of overweight and obesity among children is increasing in most countries worldwide (Ng et al., 2014). Prior to 1981, childhood obesity rates in Canada were generally below 10% (Tremblay et al., 2010). Since then, rates have almost tripled, with

approximately 26% of Canadians aged 6–19 years currently overweight or obese (Tremblay et al., 2010). Although the prevalence of childhood obesity has increased more rapidly in some segments of the population, childhood obesity has increased in all age groups, socioeconomic strata, and geographic regions of Canada (Shields & Tjepkema, 2006). The rapid increase in the prevalence of obesity highlights the importance of changing environmental influences and behavioral determinants including unhealthy eating as primary causes of the obesity epidemic (Ebbeling, Pawlak, & Ludwig, 2002; Jeffery & Harnack, 2007).

Unhealthy diet puts children at risk for a number of nutrition-related diseases, including obesity, type 2 diabetes, and

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hypertension (Freedman, Dietz, Srinivasan, & Berenson, 1999; Funtikova, Navarro, Bawaked, Fito, & Schroder, 2015). Children's eating behaviours are influenced by a wide range of factors, including access to and the availability of foods, and socioeconomic and sociocultural factors, such as parental education, time constraints, and ethnicity (Couch, Glanz, Zhou, Sallis, & Saelens, 2014; Larson, Wall, Story, & Neumark-Sztainer, 2013; Loth, Fulkerson, & Neumark-Sztainer, 2014; Mazarello Paes, Ong, & Lakshman, 2015; Patrick & Nicklas, 2005). The frequency of eating “outside the home” at restaurants and fast-food outlets is associated with increased energy intake and poor diet (An, 2016; Berman & Lavizzo-Mourey, 2008; Powell & Nguyen, 2013), including higher intake of calories, sodium, and fat and saturated fat, as well as lower intake of fibre, calcium, and fruit and vegetables. For example, several prospective studies among both adults and youth have demonstrated that frequently eating at restaurants—particularly fast-food restaurants—is associated with excess weight gain over time (Pereira et al., 2005; Thompson et al., 2004). Eating out has become increasingly common in Canada. More than half of Canadians eat at least one meal prepared outside of the home each day; young Canadians are most likely to eat out or order “take-out” (Canadian Foundation for Dietetic Research, 2008; Statistics Canada, 2015a). Overall, the average Canadian household now spends approximately one quarter of its food dollars on the food service industry and the average child under the age of 14 consumes up to 8.4% of daily calories from fast food (Black & Billette, 2015; Statistics Canada, 2015a; Statistics Canada, 2015b). Evidence comparing the nutritional content of kids' meals offered by leading multinational fast food chains also indicates that Canada offers foods with the highest calorie and sodium content (Hobin et al., 2013).

With the goal of reducing childhood obesity in Ontario by 20% over the next 5-years, one recommendation made in the Ontario Healthy Kids Strategy (2013) is mandatory menu labeling in chain restaurants (Ontario Healthy Kids Panel, 2013). In May 2015, menu labeling legislation, mandating calories and a contextual statement on menus in restaurants with 20 or more locations starting January 2017, was passed in the Ontario government for the first time in Canada (Legislative Assembly of Ontario, 2015). These new regulations follow the introduction of similar US federal menu labeling legislation (US Food and Drug Administration 2011; US Food and Drug Administration 2014).

The existing evidence examining the efficacy and effectiveness of posting numeric calorie information on restaurant menus is mixed. While there are some positive results from experimental studies, the majority of real-world quasi-experimental studies show that calorie labels do not reduce total calories ordered (Harnack, French, & French, 2008; Kiszko, Martinez, Abrams, & Elbel, 2014; Long, Tobias, Craddock, Batchelder, & Gortmaker, 2015; Sinclair, Cooper, & Mansfield, 2014; Swartz, Zank, Smith, & Williams, 2011). However, although limited, available evidence suggests the presence of interpretational (displaying a symbol to convey nutritional quality) or contextual (displaying a statement about daily caloric needs) information may further assist consumers in selecting and consuming fewer calories (Sinclair et al., 2014). Nevertheless, it is unclear which format for displaying calorie information on menus has the greatest impact or if disclosing nutrient information, such as sodium, in addition to calories, may better support consumers in making more informed and healthier food purchases.

Among the evidence examining the impact of menu labeling, few studies have been conducted among children ordering for themselves (Conklin, Cranage, & Lambert, 2005; Elbel, Gyamfi, & Kersh, 2011; Holmes, Serrano, Machin, Duetsch, & Davis, 2013; Hunsberger, McGinnis, Smith, Beamer, & O'Malley, 2015;

Rainville, Choi, Ragg, King, & Carr, 2010; Stutts, Zank, Smith, & Williams, 2011; Yamamoto, Yamamoto, Yamamoto, & Yamamoto, 2005), or among parents ordering on behalf of their children (Dodds et al., 2014; Elbel et al., 2011; Tandon, Wright, Zhou, Rogers, & Christakis, 2010, 2011; Viera & Antonelli, 2015). Experimental evidence suggests that menu labeling can influence the food choices of children; however, it is unclear whether contextual or interpretive menu labeling formats are more effective compared to numeric calorie information alone (Sacco, Lilloco, Chen, & Hobin, *in press*). Given that fast food outlets play a notable role in feeding children, the type and format of information that best supports choices from fast food kids' menus requires more consideration. The current study aimed to use an experimental auction to test the effect of various formats of calorie and sodium information on parents' demand for fast-food kids' meals for their children. Parents' knowledge of the calorie and sodium content of menu items was also assessed.

2. Methods

2.1. Participants and recruitment

An online survey was conducted in April and May 2015 among 1000 participants age 18+, residing in Ontario, Canada. Participants were eligible if they understood English, had eaten food purchased at a fast-food outlet in the past year, and had at least one child between the ages of 3–12. To recruit participants, a stratified random sample was selected from an online consumer panel consisting of over 400,000 consumers maintained by Leger (<http://leger360.com/en-ca/legerwebpanel.asp>). Panelists were sent an email to complete a 20-min survey, but the nature of the study was not disclosed. Quotas were set to include 50% female parents and an equal distribution of parents with children across ages 3 to 12. Participants were remunerated with approximately CDN\$3. Ethical approval for the study was received from Public Health Ontario's Research Ethics Board.

2.2. Research design and experimental conditions

A between-groups experimental design was used in this study. Participants were randomly assigned to view images of 4 McDonald's Happy Meals displayed on a replicated McDonald's menu board altered according to 1 of 5 menu labeling conditions:

- (1) **No Nutrition Information:** The no nutrition information menu did not provide any calorie or sodium information.
- (2) **Calories-Only:** The calories-only menu provided numeric calorie information below each of the 4 Happy Meals.
- (3) **Calories + Contextual Statement (CS):** The calories + CS menu included numeric calorie information, as well as the following statement, adapted from the wording in the US FDA regulations: “2000 calories a day is used for general nutrition advice, but calorie needs vary by age, gender, and activity level.”
- (4) **Calories, Sodium, + CS:** The calorie, sodium, + CS menu included numeric calorie and sodium information underneath each Happy Meal, as well as the statement, “2000 calories a day is used for general nutrition advice, but calorie needs vary by age, gender, and activity level. Healthy adults should aim for 1500 to 2300 mg of sodium per day. Children and seniors need less.”
- (5) **Calories and Sodium in Traffic Lights + CS:** The calories and sodium in traffic lights + CS menu included numeric calorie and sodium information highlighted in green, amber, and red lights, as well as the statement, “2000 calories a day is used

for general nutrition advice, but calorie needs vary by age, gender, and activity level. Healthy adults should aim for 1500 to 2300 mg of sodium per day. Children and seniors need less.” The colors applied in the traffic light menu condition were determined based on criteria from the UK Food Standards Agency guidelines for traffic light labeling on pre-packaged foods (UK Food Standards Agency, 2007). The criteria defines cut-offs for low, medium, and high levels of calories and sodium per 100 g or 100 ml of foods. These cut-offs have been used in other menu labeling research (Hammond, Goodman, Hanning, & Daniel, 2013).

The menu labeling formats chosen were guided by Ontario policy documents, recommendations by Canadian health organizations, existing labeling systems in other jurisdictions internationally, as well as peer-reviewed literature (City of Toronto, 2016; Conklin et al., 2005; Dietitians of Canada, 2015; Dodds et al., 2014; Elbel et al., 2011; Harnack et al., 2008; Holmes et al., 2013; Hunsberger et al., 2015; Kiszko et al., 2014; Legislative Assembly of Ontario, 2012; Legislative Assembly of Ontario, 2015; Long et al., 2015; Rainville et al., 2010; Sinclair et al., 2014; Stutts et al., 2011; Swartz et al., 2011; Tandon et al., 2010, 2011; US Food and Drug Administration 2014; Viera & Antonelli, 2015; Yamamoto et al., 2005). The menu boards were created using images of McDonald’s menu boards from local restaurants supplemented with images of combination meals taken from their website. Images of full menu boards used in each condition are available at: <http://davidhammond.ca/supplemental-materials/>.

2.3. Food and nutritional composition of the 4 happy meals

Consistent with actual McDonald’s Happy Meals in Canada, the 4 meal options offered in the auction included a main, side, drink, and yogurt as well as a toy (Table 1) (McDonalds Canada. Happy meals). Calorie and sodium content for each Happy Meal were similar to actual values obtained from the nutritional information provided on the company’s publicly accessible web site as of March 2015 (McDonald’s Canada. Nutrition Facts). The nutritional composition of the meals was strategically selected so that one Happy Meal was relatively high and one low in both calories and sodium content. McDonald’s Happy Meals were used in this experimental auction because they are the most popular kids’ meal among children 12 years and under in North America, are familiar to and recognizable among participants, and were presumed to be widely accessible to all study participants given the large number of McDonald’s outlets across Ontario (Technomics, 2009; McDonald’s. Media centre).

2.4. Auction method

Data in this study were collected using the Becker-deGroot-Marschak (BDM) auction mechanism (Becker, DeGroot, & Marschak, 1964). The BDM auction is designed such that it is in a participant’s best interest to bid the true value (demand) they place on the product; this approach is considered “demand revealing” (Lusk, Feldkamp, & Schroeder, 2004). Participants in a BDM auction

have no incentive to understate their demand because the “binding price” that auction winners pay is determined by a random draw, not their bid. A participant who bids higher than their true value for the product could end up paying more than that true value, while a participant who bids lower than their true value may miss out on a profitable purchase if the randomly selected binding price is less than their true value but higher than the bid they submitted. Unlike studies using hypothetical purchase situations, participants in an experimental auction make decisions that have true financial impact (Blumenschein, Johannesson, Blomquist, Liljas, & O’Connor, 1997; Grebitus, Lusk, & Nayga, 2013; Little & Berrens, 2004; Lusk et al., 2004). Put another way, auction winners pay for and receive the product, just as they would in the marketplace. Therefore, this methodology captures a behavioral outcome (i.e., purchasing the product) that may be considered more proximal to desired behavioral impact than self-reported psychosocial indicators.

2.5. Auction protocol

Before the study began, all participants provided consent. Consistent with the BDM method, participants were initially given \$7, which is enough money to compensate for their time and to provide them with more than enough money to pay the market value (i.e., store-price) for a McDonald’s Happy Meal in Canada. Participants were briefed on the auction method and invited to participate in a “practice” auction. For the practice auction, participants viewed a menu board altered according to their assigned condition that displayed 4 specialty drinks. Participants were then shown 4 separate images of the specialty drinks one at a time and asked to place a bid ranging from \$0 to \$7 on each of the drinks. Economic theory predicts an individual may reduce their bid if they think they may win multiple products (Grebitus et al., 2013), therefore it was emphasized that bids for only 1 of the 4 drinks would be randomly selected to be binding in the auction, and that it is in the participants’ best interest to bid equal to the full price they are willing to pay. Finally, a fixed price ranging from \$0.10 to \$7 was selected randomly from a uniform distribution of prices. For the binding round, if a participant bid more than or equal to the randomly selected price, they won the auction and purchased the drink at the selected price; a participant who bid less than the selected price, “lost” the auction and did not purchase the drink.

The above protocol was then replicated for the actual auction, except participants bid on 4 McDonald’s Happy Meals, and were told if they won the auction they would receive a gift certificate for the Happy Meal that could be redeemed at any McDonald’s restaurant. To control for ordering effects, the order in which the 4 Happy Meals were displayed on the menu board and presented to participants in the auction varied across participants.

In the end, participants did not receive a gift certificate for a McDonald’s Happy Meal. Instead, all participants received the equivalent of CDN\$3, the typical compensation for participating in an online survey, plus an additional CDN\$7, regardless of whether they won the auction. Participants were debriefed on the need for deception to make the auction more realistic and to capture a true or unbiased opinion on the value of fast-food kids’ meals.

Table 1
Food and nutritional composition of McDonald’s Happy Meals.^a

Meal 1: Cheeseburger, Small Fries, 1% Chocolate Milk, Yogurt (Calories: 715, Sodium: 1115 mg)
Meal 2: Grilled Cheese, Small Fries, Apple Juice, Yogurt (Calories: 585, Sodium: 950 mg)
Meal 3: Hamburger, Small Fries, Small Coke, Yogurt (Calories: 605, Sodium: 699 mg)
Meal 4: Chicken Nuggets, Apples, Bottle of Water, Yogurt (Calories: 255, Sodium: 400 mg)

^a Consistent with actual McDonald’s Happy Meals in Canada, the 4 meals in the auction included a main, side, drink, and yogurt as well as a toy.

2.6. Measures

2.6.1. Sociodemographic factors and eating behaviors

Before the auction was explained and conducted, participants responded to survey items assessing sociodemographic factors related to the parent and the child as well as eating behaviors (e.g., frequency of parent eating food prepared outside the home, frequency of child eating food prepared outside the home). For instance, parents were asked to report their age, ethnicity, income and education level, self-rated health, relation to child, perception of child's weight, usual role in food purchasing decisions with child at restaurants, as well as their child's age and gender. Parents' self-reported measures of their height and weight were used to calculate BMI and categorize their weight status (healthy/unhealthy).

2.6.2. Calorie and sodium knowledge

Participants viewed on-screen a menu board altered according to their assigned condition that displayed all 4 Happy Meals and asked: Which meal do you think has the highest amount of calories? Subsequently, participants were asked: Which meal do you think has the highest amount of sodium? Responses to both items were coded as "correct" if the Happy Meal containing the cheeseburger, fries, chocolate milk, and yogurt was selected (Food and nutritional composition of McDonald's Happy Meals provided in Table 1). "Don't Know" responses were coded as incorrect.

2.6.3. Data analysis

A total of 1000 participants started the study. Two participants were excluded from the analysis because they failed to complete the auction. Chi-square tests were used to test for differences in the sample profile between menu conditions, as well as to test for differences in nutrition knowledge between conditions. A linear mixed effects model was used to assess main effects for association between experimental conditions and parents' bid amounts for each of the 4 meal types, adjusting for sociodemographic factors and eating-related behavior covariates. To build this model, bivariate associations between each of the covariates of interest (parent's age, BMI, education, role in food purchase, and the frequency of the parent eating food prepared outside the home, as well as child's gender and the frequency of the child eating food prepared outside the home) and the primary outcome were first examined at $p < 0.10$. The final multivariate adjusted model included the main effect (condition) and was adjusted for the type of meal, parent's gender, ethnicity, income, self-rated health, relation to child, and perception of child's weight. Based on the findings, we then evaluated pair-wise adjusted differences in bid amounts between all five menu conditions using Tukey's posthoc adjustment. Analyses were conducted using SAS 9.3 (Cary, NC).

3. Results

3.1. Sample characteristics

Sample characteristics are shown in Table 2. Overall, 49.6% of the participants were male, the majority identified as White, and had a mean age of 39.9 (SD = 7.6). More than 20% of participants reported a household income before taxes of less than \$50,000 per annum and about 50% reported less than a university education or above. On average, parents reported eating food prepared outside the home 2.5 (SD = 2.3) times per week and their child eating 2.1 (SD = 1.8) times per week. There were no significant differences in sociodemographic factors and eating behaviors across experimental conditions (Table 2).

3.2. Auction and parents' demand for fast-food kids' meals

Overall, less than 1% ($n = 9$) of participants bid either CDN\$0 (the minimum) or CDN\$7 (the maximum) on the Happy Meals, or declined to bid on any of the meals. Moreover, participants' average bid amount was within $\pm \$0.03$ of the store-price for the McDonald's Happy Meals, indicating the auction successfully replicated market transactions. Fig. 1 illustrates participants' average bid amounts by menu condition and meal type. Overall, the results of the linear mixed effects model examining differences by menu condition in parents' bid amounts indicate parents in the menu condition with Calories, Sodium + CS compared to No Nutrition Information bid significantly lower ($\beta = -0.23$, SE = 0.1, $p < 0.05$), adjusting for covariates (Table 3). No significant differences were detected among the other menu labeling formats or by meal type. None of the covariates assessed in the final model were significantly associated with parents' bids, with the exception of ethnicity. Participants who identified as non-white made, on average, higher bids compared to parents who were white ($\beta = 0.22$, SE = 0.1, $p < 0.05$; Table 3).

Pair-wise comparisons of parents' bid amounts between menu conditions were also tested. Inspection of adjusted differences in bid amounts by condition show the menu with Calories, Sodium + CS prompted significantly lower bids compared to Calories + CS ($t = 2.8$, SE = 0.1, $p = 0.04$), in which parents assigned to the Calories, Sodium, + CS condition bid an average of \$0.31 lower on the Happy Meals than those assigned to the Calories + CS condition. However, the average bid amounts among parents assigned to the Calories, Sodium, + CS condition were no longer significantly lower compared to the No Nutrition Information condition.

3.3. Calorie and sodium knowledge

3.3.1. Calories

In total, 66.1% of participants were able to correctly identify the Happy Meal with the highest calorie content. As shown in Fig. 2, significant differences were observed between conditions ($\chi^2 = 106.3$, $p < 0.0001$): a greater proportion of participants in the Calories-Only (75.1%), Calories + CS (70.2%), Calories, Sodium + CS (77.6%), and Calories and Sodium in Traffic Lights + CS (73.7%) menu conditions, were able to correctly identify the Happy Meal with the highest calorie content as compared to the No Nutrition Information menu condition (36.9%). No more than 2% of participants reported "Don't Know" across the conditions.

3.3.2. Sodium

Similarly, 50.5% of participants were able to identify the Happy Meal with the highest sodium content. Significant differences were observed between conditions ($\chi^2 = 131.0$, $p < 0.0001$): a greater proportion of participants in the Calories, Sodium + CS (75.5%), and Calories and Sodium in Traffic Lights + CS (70.2%) menu conditions, were able to correctly identify the Happy Meal with the highest sodium content as compared to the No Nutrition Information menu condition (32.2%) (Fig. 2). No significant differences were observed with the Calories-Only (37.0%) or Calories + CS conditions (39.5%). No more than 3% of participants reported "Don't Know" across the conditions.

4. Discussion

To our knowledge, the current study is the first empirical research conducted in Canada and internationally to examine the efficacy of various formats of menu labeling on parents' demand for fast-food kids' meals for their children. The findings indicate that

Table 2
Characteristics of study participants by menu labeling conditions.

	Menu Labeling condition					Total sample (n = 998)	P Value
	No nutrition information (n = 214)	Calories only (n = 189)	Calories + CS (n = 205)	Calories, sodium + CS (n = 192)	Traffic lights + CS (n = 198)		
	% (n)						
Parent eat-out frequency per week^a (mean, standard deviation)	2.86 [5.5]	3.40 [8.6]	3.38 [7.6]	3.07 [7.8]	2.96 [5.8]	3.13 [7.1]	0.5815 ^d
Child eat-out frequency per week^a (mean, standard deviation)	2.79 [7.5]	3.28 [10.0]	2.55 [5.6]	2.72 [7.8]	2.14 [1.9]	2.69 [7.1]	0.7344 ^d
Parent age							
20 to 40 Years	57.0 (122)	51.9 (98)	53.7 (110)	55.2 (106)	54.6 (108)	54.5 (544)	0.8821 ^c
41 to 70 Years	43.0 (92)	48.2 (91)	46.3 (95)	44.8 (86)	45.5 (90)	45.5 (454)	
Parent gender							
Female	50.9 (109)	49.2 (93)	52.2 (107)	50.0 (96)	49.5 (98)	50.4 (503)	0.9760 ^c
Male	49.1 (105)	50.8 (96)	47.8 (98)	50.0 (96)	50.5 (100)	49.6 (495)	
Parent BMI							
Healthy weight (18.5–24.9)	29.4 (63)	34.9 (66)	35.6 (73)	34.9 (67)	29.8 (59)	32.9 (328)	0.6006 ^c
Unhealthy weight (<18.5,>24.9)	54.7 (117)	48.7 (92)	46.3 (95)	51.6 (99)	50.5 (100)	50.4 (503)	
Missing	15.9 (34)	16.4 (31)	18.1 (37)	13.5 (26)	19.7 (39)	16.7 (167)	
Ethnicity^a							
White	68.8 (143)	71.4 (135)	71.2 (146)	76.3 (145)	70.3 (137)	70.7 (706)	0.5425 ^c
Other	31.3 (65)	28.6 (54)	28.8 (59)	23.7 (45)	29.7 (58)	28.2 (281)	
Income^a							
\$100,000 to >\$150,000	31.6 (65)	29.5 (54)	25.4 (51)	30.3 (56)	31.6 (61)	28.8 (287)	0.6805 ^c
\$50,000 to \$100,000	43.2 (89)	47.5 (87)	53.7 (108)	44.9 (83)	45.1 (87)	45.5 (454)	
<\$50,000	25.2 (52)	23.0 (42)	20.9 (42)	24.9 (46)	23.3 (45)	22.7 (227)	
Parent education^a							
No Post-Secondary	12.4 (26)	14.8 (28)	14.6 (30)	12.3 (23)	15.7 (31)	13.8 (138)	0.9863 ^c
Some Certificate/Diploma	36.7 (77)	36.0 (68)	34.6 (71)	35.8 (67)	36.0 (71)	35.5 (354)	
University or above	51.0 (107)	49.2 (93)	50.7 (104)	51.9 (97)	48.2 (95)	49.7 (496)	
Parent Health^a							
Poor, fair, or good	66.4 (142)	63.5 (120)	59.6 (121)	62.8 (120)	72.7 (144)	64.8 (647)	0.0733 ^c
Very good, or excellent	33.6 (72)	36.5 (69)	40.4 (82)	37.2 (71)	27.3 (54)	34.9 (348)	
Parent relation to child							
Parent	95.8 (205)	92.1 (174)	94.6 (194)	95.8 (184)	96.5 (191)	95.0 (948)	0.2937 ^c
Other ^b	4.2 (9)	7.9 (15)	5.4 (11)	3.2 (8)	3.5 (7)	5.0 (50)	
Parent perception of child's weight^a							
Healthy weight	86.5 (185)	83.9 (156)	85.9 (176)	87.0 (167)	80.3 (159)	84.5 (843)	0.3375 ^c
Unhealthy weight	13.6 (29)	16.1 (30)	14.2 (29)	13.0 (25)	19.7 (39)	15.2 (152)	
Parent's role in food purchase^a							
Let Child Select	38.3 (82)	47.1 (88)	34.2 (70)	36.1 (69)	36.9 (73)	38.3 (382)	0.1399 ^c
Negotiate for Child	38.8 (83)	27.3 (51)	40.0 (82)	41.4 (79)	38.4 (76)	37.2 (371)	
Select for Child	22.9 (49)	25.7 (48)	25.9 (53)	22.5 (43)	24.8 (49)	24.2 (242)	
Child's age							
3 to 4 years	22.0 (47)	25.9 (49)	24.4 (50)	29.2 (56)	23.2 (46)	24.8 (248)	0.9216 ^c
5 to 6 years	27.1 (58)	24.3 (46)	25.9 (53)	21.9 (42)	25.8 (51)	25.1 (250)	
7 to 9 years	24.3 (52)	25.9 (49)	27.8 (57)	23.4 (45)	24.8 (49)	25.3 (252)	
10 to 12 Years	26.6 (57)	23.8 (45)	22.0 (45)	25.5 (49)	26.3 (52)	24.8 (248)	
Child's gender							
Female	43.9 (94)	47.6 (90)	44.4 (91)	51.6 (99)	42.4 (84)	45.9 (458)	0.3807 ^c
Male	56.1 (120)	52.4 (99)	55.6 (114)	48.4 (93)	57.6 (114)	54.1 (540)	

CS – Contextual Statement.

^a Less than 5% of sample reported missing values and were omitted in this table.

^b Other includes legal guardian, step-parents, grandparents, and other relatives.

^c Chi-square test was conducted to compare across experimental conditions.

^d One-way ANOVA was conducted to compare across experimental conditions.

posting calories, sodium information, plus a CS on menus decreases the value parents' place on McDonald's Happy Meals for their children by an average of CDN\$0.31 compared to only posting calories plus a CS on menus, representing an 8% reduction in perceived value. This lower perceived value was consistent across groups defined by sociodemographics and eating behaviors. Moreover, we also found that providing both calorie and sodium information increases understanding of the nutritional composition of fast-food kids' meals, similar to previous studies among adults (Scourboutakos, Corey, Mendoza, Henson, & L'abbe, 2014).

We found mean bid amounts were significantly lower when parents were exposed to menus including calories, sodium information, plus a CS. These findings indicate that the inclusion of both

calorie and sodium information may be most effective to produce a decline in the demand for less healthy foods for children. A previous study also indicates the benefit of adding sodium information on restaurant menus on the nutritional quality of adults' food choices for themselves (Scourboutakos et al., 2014). One explanation for the decrease in the demand for Happy Meals when calories and sodium information were disclosed on menus is that the actual calorie content of Happy Meals was perceived as more favourable than expected (Fig. 1), and parents were not alarmed when exposed to this information. Whereas, given that the sodium in Happy Meals provides up to 90% of a child's daily safe upper limit of sodium (Health Canada, 2016), posting sodium amounts may have provided consumers with information that was more influential. Indeed,

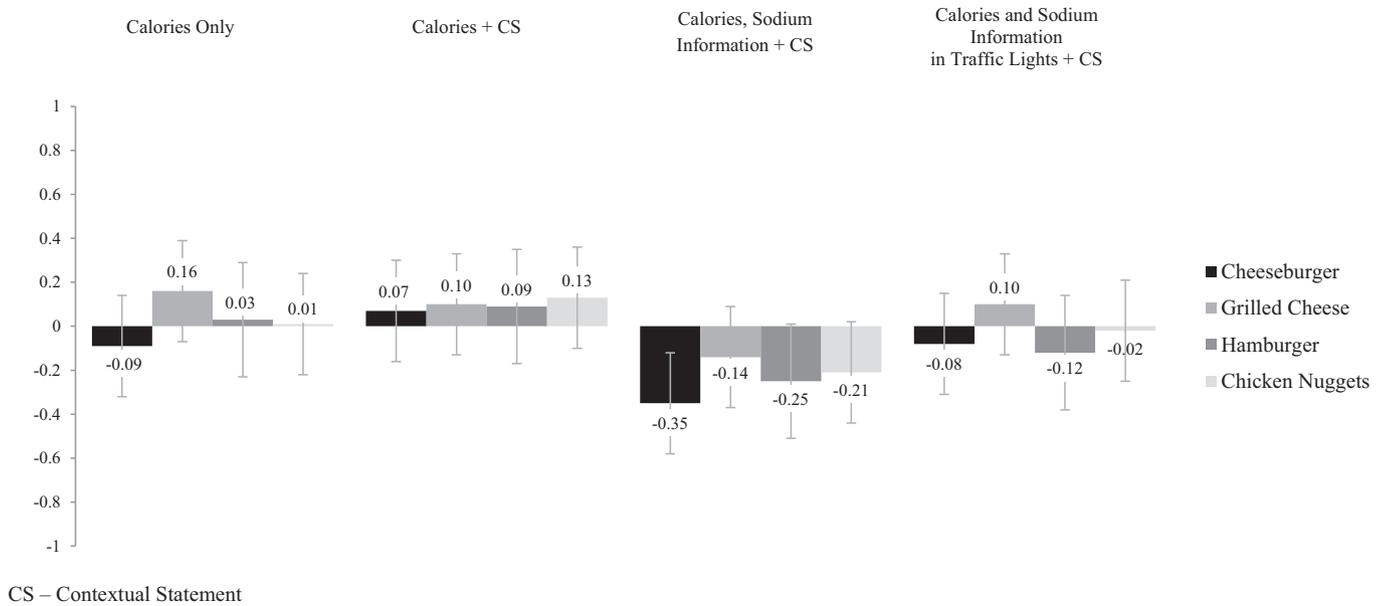


Fig. 1. Differences in mean bid amounts (\$0.00) between experimental menu conditions and no nutrition information.

Table 3

Multivariate adjusted linear mixed effects regression model and correlates of parents' bids on McDonald's Happy Meals by menu labeling condition (n = 998).

	Characteristics	Multivariate B (SE)
Menu labeling conditions	No Nutrition Information – Control	Referent
	Calories Only	0.01 (0.1)
	Calories + CS	0.08 (0.1) ^b
	Calories, Sodium Information, + CS	-0.23 (0.1) ^{a,c}
	Calories and Sodium Information in Traffic Lights + CS	-0.06 (0.1)
Meal types	Chicken Nuggest	Referent
	Grilled Cheese	0.01 (0.03)
	Hamburger	-0.03 (0.03)
	Cheeseburger	-0.01 (0.03)
	Parent's gender	Male (Referent) vs Female
Parent's ethnicity	White (Referent) vs Non-white	0.22 (0.1) ^a
Household Income	<\$50,000	Referent
	\$50,000 to \$100,000	0.04 (0.1)
	\$100,000 to >\$150,000	-0.13 (0.1)
Parent's self-rated health	Very good, Excellent (Referent) vs. Poor, Fair, Good	0.05 (0.1)
Parent's relation to child	Parent (Referent) vs. Other e.g., grandparent, guardian	-0.004 (0.2)
Parent's perception of child's weight	Healthy Weight	Referent
	Overweight	-0.24 (0.2)
	Underweight	-0.05 (0.1)

CS – Contextual Statement.

^a Indicates statistical significance at $p < 0.05$ in the multivariate adjusted linear mixed effects model.

^b indicates statistical significance at $p < 0.05$ after Tukey adjustment for multiple comparisons and covariates.

^c indicates statistical significance at $p < 0.05$ after Tukey adjustment for multiple comparisons and covariates.

Burton et al. found that menu labeling is only likely to influence consumers' food choices when the nutrition information is less favourable than expected (Burton, Howlett, & Tangari, 2009). Early local and provincial efforts in Ontario attempted to include sodium labels in menu labelling legislation, but were unsuccessful^{46,47}. More research is needed to inform policy decisions about the impact of adding sodium labels to restaurant menus.

It is also critically important to note that providing calories plus a CS promoted parents to place higher bids for McDonald's Happy Meals. One might speculate that the CS provided a benchmark against which parents judged the calorie content of the Happy Meals to be less harmful than expected. Although the evidence on

CSs is inconsistent (Sinclair et al., 2014), the results of this study do not support the introduction of a statement with daily calorie recommendations as a means to enhance the impact of disclosing calorie information on restaurant menus.

It should also be acknowledged that the effect of the various formats for disclosing nutrition information on menus was not associated with meal type. In this study, the Happy Meals included in the auction were selected to capture variations in calories and sodium content; however, the influence of the menu labeling formats on parents' bids appears to have held across all 4 Happy Meals, regardless of their healthfulness. Previous studies that have assessed the impact of labelling on consumer demand have found

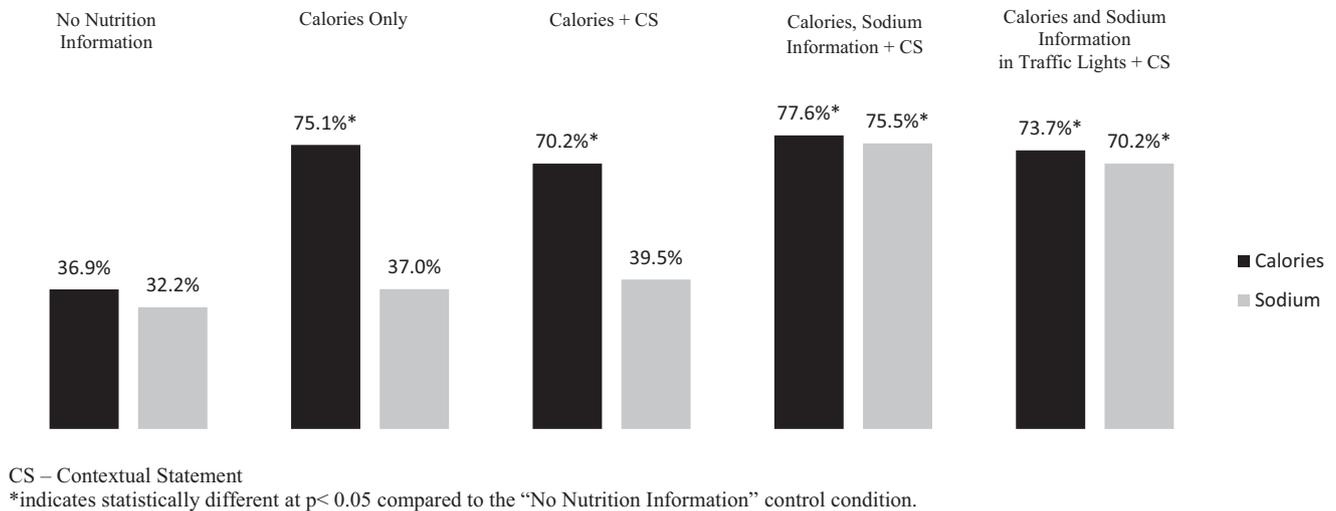


Fig. 2. Percentage of parents correctly identifying the fast-food kids' meal with highest amount of calories and sodium, by 10 experimental condition.

some consumers shift purchases towards healthier options whereas others forgo or reduce purchases (Bollinger, Leslie, & Sorensen, 2011; Olstad, Vermeer, McCargar, Prowse, & Raine, 2015). We also found that parents who are non-white placed a significantly higher perceived value on the 4 Happy Meals than parents who are white. This finding was surprising given that previous evidence suggests adults who identify as non-white are more likely to use menu labels (Lee-Kwan, Pan, Maynard, McGuire, & Park, 2016). More research is needed to better understand if providing nutrition information on menus reduces demand for fast food overall, regardless of the nutritional content of foods, and thereby reduces restaurants' sales and profits.

In addition to testing the disclosure of calories plus sodium information, the current study also compared different formats for presenting nutrition information on restaurant menus. Results indicate that displaying numeric calorie and sodium information better supports parents in making more informed food choices compared to the provision of less nutrition information. However, presenting calories and sodium information using “traffic lights” did not further influence parents' food choices. This is consistent with a previous experimental study conducted in Canada testing the influence of various menu labelling formats on adults' food choices for themselves (Hammond et al., 2013). Nevertheless, the current experiment was conducted in a controlled environment that directed consumers' attention to the menu labeling information. In a real world scenario, traffic lights or other interpretative formats may help to attract consumers' attention to high calorie and sodium values in manner that is not testable in an artificial study. Further research testing both numeric and interpretative formats for presenting nutrition information on menus in actual restaurant settings is required.

4.1. Limitations

The study participants were selected from an online panel of parents with young children, therefore the results may not be generalizable to the Ontario population. However, we used quota sampling by key socio-demographic characteristics and eating behaviors, and as a result, study participants represented a wide range of population segments. Another limitation is that, although the auction study design is meant to measure differences in actual consumer demand, the experimental conditions are not ‘real world’

market transactions, and participants may have ascribed lesser value to the Happy Meals with nutrition information to comply with their perceptions of study goals. Moreover, an experimental setting is not well suited to testing the differential effects of noticing and reading menu labeling formats, given that the study setting results in greater levels of “forced exposure” than naturalistic settings. Nevertheless, the auction method better simulates market transactions than hypothetical scenarios (Corrigan & Rousu, 2008). It should also be noted that although this study applies a unique auction methodology that contributes to the evidence base, the results are unable to provide the measurable nutritional benefit of the various labelling formats. Lastly, given that the current study tested 4 McDonald's Happy Meals, generalizing results to all restaurant food items, chains, and types should be done with caution.

5. Conclusions

The province of Ontario is the first jurisdiction in Canada to require mandatory disclosure of calories on menus among large restaurant chains. The current research suggests that posting calories plus sodium, and a CS on restaurant menu boards may reduce parents' demand for fast-food kids' meals for their children. As jurisdictions contemplate implementation of various menu labeling formats, as well as which nutrient information to disclose on restaurant menus, the auction method may be useful in predicting how nutrition labeling affects the demand for restaurant foods.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <http://dx.doi.org/10.1016/j.appet.2016.06.017>

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