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A quasi-experimental study of a mandatory calorie-labelling policy in restaurants: Impact on use of nutrition information among youth and young adults in Canada

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ABSTRACT

In 2017, Ontario became the first Canadian province to require calorie amounts on menus/menu boards of chain restaurants. The province of British Columbia (BC) implemented a voluntary nutrition information initiative in which calorie and sodium information were available upon request. A quasi-experimental design was used to examine the use of nutrition information in Ontario (mandatory calorie labelling), compared to BC (voluntary policy) and three other provinces with no formal menu labelling policy ('control'). Data were collected from youth and young adults (16–30 years) in all provinces pre- (fall 2016; $n = 2929$) and post- (fall 2017; $n = 968$) implementation of Ontario's calorie-labelling policy in January 2017. Generalized estimating equations tested differences between provinces over time in noticing and impact of nutrition information and support of mandatory calorie labelling. Noticing of nutrition information in restaurants increased in Ontario significantly more than in BC (+25.1% vs. +1.6%; AOR = 4.26, 95% CI = 2.39–7.61) and control provinces (+6.5%; AOR = 3.00, 95% CI = 1.91–4.73). Ontario respondents were significantly more likely to report that the nutrition information influenced their order than those in BC (+12.9% vs. +2.2%; AOR = 3.53, 95%CI = 1.61–7.76) and control provinces (+2.0%; AOR = 3.71, 95%CI = 1.87–7.36). Policy support increased in all groups at follow-up, with a significantly greater increase in Ontario than control provinces (+12.9% vs. +5.7%; AOR = 1.57, 95%CI = 1.06–2.34). Socio-demographic differences were also observed. Findings suggest that the mandatory menu labelling policy implemented in Ontario has increased noticing and use of nutrition information, with no evidence to support the effectiveness of voluntary policies that require consumers to request nutrition information.

1. Introduction

Eating outside the home has become a routine part of the North American diet. In Canada, 83% of Canadian youth and young adults eat at least one meal per week outside the home (Wiggers et al., 2018), which is associated with higher intakes of calories, fats, added sugars, and sodium (Todd et al., 2010). Although many chain restaurants voluntarily provide some in-store nutrition information, it is usually presented only upon request or for a subset of items (Hobin et al., 2015).

In the U.S., federal regulations have required mandatory calorie amounts on menus/menu boards at chain restaurants since May 2018 (U.S. Food and Drug Administration, 2018). In Canada, Ontario became the first province to implement mandatory calorie-labelling regulations in January 2017. Sit-down and quick-service restaurants with > 20 locations in Ontario are required to post calorie amounts next to items on menus/menu boards (Government of Ontario, 2015). In British Columbia (BC),[1] the Informed Dining program (IDP) was launched in 2012 (Healthy Families BC, 2012) as a voluntary nutrition information program for private food services. Participating establishments must display the program logo and directional statement (e.g., 'See our nutrition brochure') on menus/menu boards, and make information on calorie and sodium content available upon request (Healthy Families BC, 2012). This information is typically provided in the form of a pamphlet; posting nutrient information on menus is not required. Preliminary evaluation of the IDP revealed a lack of public awareness and

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[1] Abbreviations: AOR: adjusted odds ratio; BC: British Columbia; BMI: body mass index; CCHS: Canadian Community Health Survey; IDP: Informed Dining program

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barriers such as having to ask for the nutrition information (Government of British Columbia, 2016).

To date, few high-quality randomized controlled trials have examined calorie labelling on menus, and laboratory studies have shown mixed results. In contrast, well-powered quasi-experimental or naturalistic studies have tended to show significant reductions in calories purchased (Bleich et al., 2017). In Canada, several experimental (Hammond et al., 2013) and quasi-experimental or 'naturalistic' studies (Hammond et al., 2015; Olstad et al., 2015; Vanderlee, 2016; Lillico et al., 2015) have been conducted, generally indicating that menu labelling is associated with greater noticing and use of nutrition information in restaurants, as well as reduced calories purchased and/or consumed (Hammond et al., 2013; Hammond et al., 2015; Olstad et al., 2015). There is a lack of research examining population-level changes in response to menu labelling policies.

The current study used secondary cohort data to examine the impact of mandatory and voluntary policies on the use of nutrition information at restaurants among youth/young adults in Ontario (mandatory calorie labelling policy) compared to BC (voluntary IDP) and other provinces (Alberta, Nova Scotia, Québec). The latter provinces, which may have had some minor exposure to the IDP, were considered a naturalistic 'control' group. Young adulthood is an important demographic given young people's high rates of eating outside the home (Wiggers et al., 2018); it is also an important period for the development of long-term dietary behaviours (Nelson et al., 2008).

2. Methods

2.1. Participants and recruitment

Data were collected as part of the Canada Food Study, a cohort of 3000 16–30-year-old respondents from five Canadian cities/provinces (Toronto, Ontario; Montreal, Québec; Halifax, Nova Scotia; Edmonton, Alberta; and Vancouver, BC). Participants were recruited in October—December 2016. Eligibility criteria consisted of age 16–30 years, fluency in English or French, residence in one of the five cities and internet access. Participants were asked to complete the survey again in fall 2017.

2.2. Procedure

Participants provided informed consent, received $2 CDN in cash at initial recruitment and $20 CDN upon completion of the surveys. Response rates in waves 1 and 2 were 48.1% and 37.3%, respectively. Detailed methods (including survey weighting and detailed measures) are available in the study's Technical Reports (Hammond et al., 2016; Hammond et al., 2017). The project was reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (#21631).

2.3. Measures

2.3.1. Socio-demographic variables and other covariates

Respondents provided their province of residence and postal code (both waves) and current city (wave 2). The remaining variables were assessed at wave 1: age, biological sex, race, student status, maternal education, income adequacy, perceived diet quality, past-year weight loss attempts, health literacy (measured with the Newest Vital Sign (Weiss et al., 2005)) and household food security (using the adapted CCHS Module (Government of Canada, 2012)). BMI classification was calculated using self-reported height and weight.

2.3.2. Condition assignment

Respondents were assigned a study 'condition' corresponding to their place of residence [0 = Control (Other provinces), 1 = Mandatory policy (Ontario), 2 = Voluntary policy (BC)]. Respondents with discrepant locations between the two waves or those who had moved in/out of Ontario/BC were excluded.

2.3.3. Outcome variables

(1) Noticing any nutrition information was assessed using: "The last time you visited a restaurant, did you notice any nutrition information?" (1 = Yes, 0 = No/Don't know). If respondents answered "Yes", the following two questions were asked: **(2) noticing nutrition information on menus:** "Where was this information located?" (1 = Menu/menu board, 0 = Other location/Don't know/Not applicable) and **(3) influence of nutrition information**: "Did the nutrition information influence what you ordered?" (1 = Yes, 0 = No/Don't know/Not applicable). **(4) Impact of nutrition information** was assessed using, "In the past 6 months, have you done any of the following because of nutrition information in restaurants?" (Ordered something different, Ate less of the food you ordered, Changed which restaurants you visit, Ate at restaurants less often, None of the above, Don't know, Refuse) and recoded (1 = Yes, at least one of these, 0 = No/Don't know). **(5) Support for mandatory calorie labelling** was assessed using, "Would you support or oppose a government policy that would require calorie amounts on menus of chain restaurants?" (1 = Support, 0 = Oppose/Neutral/Don't know). 'Not applicable' codes applied to respondents who did not see questions due to skip logic.

2.4. Statistical analysis

ANOVA (continuous variables) and Chi-square analysis (categorical variables) indicated significant differences in demographic variables across conditions (data not shown); these covariates were entered into generalized estimating equations (GEEs, described below).

Repeated-measures logistic GEEs were fitted to assess differences over time between the three conditions on each of the five outcomes (listed above). In each model, indicator variables for study condition (mandatory, voluntary, or no policy) and survey wave (1 or 2) were entered along with the following covariates: sex, age, race, BMI classification and survey completion mode (smartphone vs. other device) (block 1), and adjusted for student status, maternal education level, income adequacy, household food security status, perceived diet quality, past-year weight loss attempt and health literacy (block 2). A two-way interaction variable between condition and wave was used to test differences between conditions over time (block 3). Main effects of wave and condition are reported for block 2; interaction effects and main effects of covariates are reported for the final adjusted model (block 3). Weighted results and adjusted odds ratios (AORs) with 95% confidence intervals (95%CI) are reported unless otherwise indicated. Statistical analysis was conducted using SPSS version 25.0 (IBM, Armonk, NY). Values of $p < 0.05$ were considered significant.

3. Results

After excluding respondents with incomplete data, data quality concerns and those who had not visited a restaurant in the past 6 months, the final analytic sample consisted of 3897 participants (wave 1: $n = 2929$; wave 2: $n = 968$). Table 1 displays characteristics of the analytic sample at wave 1.

3.1. Noticing of nutrition information

With regards to noticing nutrition information in restaurants, there were significant main effects of survey wave ($X^2 = 54.22$, $p < 0.001$), condition ($X^2 = 12.66$, $p < 0.01$), and the interaction between condition and survey wave ($X^2 = 12.66$, $p < 0.01$) (Fig. 1A). Ontario respondents were significantly more likely to report noticing nutrition information at wave 2 vs. 1 than were control (+25.1% vs. +6.5%; AOR = 3.00, 95%CI = 1.91–4.73) or BC respondents (+1.6%; AOR = 4.26, 2.39–7.61). BC and control respondents did not significantly differ.

Table 1
Baseline characteristics of analytic sample from Canada Food Study cohort, 2016 (n = 2929).

Variable	Unweighted (%, n)	Weighted (%)
Age (years)		
M (SD)	21.7 (3.8)	23.3 (4.2)
Sex		
Male	39.7% (1162)	51.0%
Female	60.3% (1767)	49.0%
Race		
White	44.0% (1290)	45.0%
Chinese	8.3% (242)	8.1%
South Asian	6.4% (186)	6.5%
Black	5.6% (165)	5.4%
Aboriginal	4.1% (119)	3.9%
Mixed/other/unstated	31.6% (927)	31.1%
Student status		
Yes (full- or part-time)	70.3% (2059)	59.9%
No	29.5% (863)	39.9%
Unstated	0.3% (7)	0.1%
Maternal education level		
High school or less	28.6% (770)	29.2%
At least some college	25.7% (695)	26.2%
At least some university	42.6% (1149)	41.7%
Unstated	3.0% (80)	3.0%
Income adequacy (difficulty making ends meet)		
Very difficult	5.5% (149)	5.7%
Difficult	17.5% (471)	18.1%
Neither easy nor difficult	39.5% (1064)	39.9%
Easy	17.8% (478)	18.2%
Very easy	10.3% (277)	10.4%
Unstated	9.4% (252)	7.7%
Household food security status		
Food secure	65.7% (2561)	66.2%
Moderately food insecure	17.7% (690)	17.6%
Severely food insecure	8.4% (329)	8.7%
Unstated/missing	8.1% (317)	7.5%
BMI classification		
Underweight	6.9% (201)	5.8%
Normal weight	50.0% (1465)	50.0%
Overweight	15.7% (460)	17.3%
Obese	7.8% (228)	8.0%
Unstated/missing	19.6% (575)	18.9%
Perceived diet quality		
Poor	9.5% (262)	8.7%
Fair	32.4% (891)	31.0%
Good	37.7% (1037)	38.1%
Very good	16.7% (460)	18.3%
Excellent	2.9% (79)	3.1%
Unstated	0.7% (20)	0.8%
Attempted weight loss in past year		
Yes	53.6% (1525)	50.6%
No/unstated	46.4% (1321)	49.4%
Health literacy		
High likelihood of limited literacy	14.4% (389)	14.5%
Possibility of limited literacy	21.3% (578)	19.9%
High likelihood of adequate literacy	64.3% (1742)	65.6%
Recruitment location[a]		
Toronto	25.8% (757)	24.9%
Montréal	18.8% (552)	20.0%
Halifax area	18.8% (552)	17.0%
Edmonton	17.4% (510)	16.6%
Vancouver area	19.1% (558)	21.4%
Study condition[b]		
Mandatory calorie labelling (Ontario)	25.8% (757)	24.9%
Voluntary nutrition information (BC)	19.1% (558)	21.4%
Control (other provinces)	55.1% (1614)	53.7%

BMI: body mass index; CEGEP: pre-university college in the province of Québec; SD: standard deviation.

[a] For recruitment purposes, Halifax area included Halifax and Dartmouth. Vancouver area included Vancouver, Burnaby, Richmond, North Vancouver and West Vancouver.

[b] Study condition based on respondents' city, province and/or postal code at survey waves 1 and 2. Control provinces were Québec, Nova Scotia and Alberta. Sample sizes (unweighted) at wave 2 (N = 968) were n = 282 in Ontario, n = 189 in BC, and n = 497 in control provinces.

There were significant main effects of age ($X^2 = 12.52$, $p < 0.001$), race ($X^2 = 13.31$, $p = 0.02$), survey mode ($X^2 = 9.48$, $p < 0.01$) and health literacy ($X^2 = 8.05$, p = 0.02). A higher likelihood of noticing nutrition information in restaurants was observed among younger individuals (AOR = 1.05; 1.02–1.08) and respondents completing the survey on a smartphone (AOR = 1.53, 1.17–2.01). Chinese (AOR = 0.66, 0.45–0.96) and South Asian respondents (AOR = 0.51, 0.31–0.84) were significantly less likely than White individuals to notice nutrition information, as were those with limited compared to adequate health literacy (AOR = 0.60, 0.42–0.87).

3.2. Location of nutrition information

With regards to noticing nutrition information specifically on the menu/menu board, there were significant main effects of wave ($X^2 = 98.54$, $p < 0.001$), condition ($X^2 = 22.90$, $p < 0.001$), and the interaction between condition and survey wave ($X^2 = 30.06$, $p < 0.001$) (Fig. 1b). Ontario respondents were significantly more likely to report noticing nutrition information on the menu/menu board at wave 2 vs. 1 than were control (+24.4% vs. +7.2%; AOR = 3.77, 2.15–6.63) or BC respondents (+4.2%; AOR = 5.32, 2.72–10.41). BC and control respondents did not significantly differ.

There were significant main effects of age ($X^2 = 11.49$, $p = 0.001$), sex ($X^2 = 5.03$, $p = 0.03$) and BMI ($X^2 = 13.05$, $p = 0.01$). Specifically, a higher likelihood of noticing nutrition information on the menu/menu board was observed among younger individuals (AOR = 1.06, 1.03–1.10); females (AOR = 1.34, 1.04–1.73) and those with obesity compared to normal weight (AOR = 2.06, 1.34–3.17).

3.3. Influence of nutrition information

Regarding self-reported influence of noticed nutrition information, there were significant main effects of wave ($X^2 = 35.90$, $p < 0.001$), condition ($X^2 = 11.83$, $p < 0.01$), and the interaction between condition and survey wave ($X^2 = 16.79$, $p < 0.001$) (Fig. 2). Ontario respondents were significantly more likely to report that nutrition information influenced their order at wave 2 vs. 1 than were control (+12.9% vs. +2.0%; AOR = 3.71, 1.87–7.36) and BC respondents (+2.2%; AOR = 3.53, 1.61–7.76). BC and control respondents did not significantly differ.

There were significant main effects of sex ($X^2 = 9.44$, $p < 0.01$), student status ($X^2 = 6.26$, $p = 0.01$), past-year weight loss attempts ($X^2 = 12.88$, $p < 0.001$) and perceived diet quality ($X^2 = 19.53$, $p < 0.001$). Specifically, a higher likelihood of reporting an influence of nutrition information was observed among females (AOR = 1.64, 1.20–2.25); students (AOR = 1.62, 1.11–2.37); and those with past-year weight loss attempts (AOR = 1.84, 1.32–2.56) or healthier self-reported diet (AOR = 1.51, 1.26–1.81).

3.4. Impact of nutrition information

Regarding the impact of nutrition information, there were significant main effects of wave ($X^2 = 6.65$, $p = 0.01$) and condition ($X^2 = 12.99$, $p < 0.01$) whereby Ontario ($X^2 = 1.39$, 1.15–1.67) and BC respondents ($X^2 = 1.23$, 1.02–1.50) were significantly more likely than control respondents to report a behavioural impact of nutrition information (Fig. 3a). Fig. 3b–d show different reported behavioural responses. As Fig. 3b indicates, +12.8% of Ontario respondents reported 'ordering something different'; the interaction between condition and survey wave was non-significant.

Within this model, there were significant main effects of age ($X^2 = 18.02$, $p < 0.001$), sex ($X^2 = 32.30$, $p < 0.001$), BMI ($X^2 = 14.82$, $p < 0.01$), income adequacy ($X^2 = 16.63$, $p < 0.01$), food security ($X^2 = 15.76$, $p = 0.001$), past-year weight loss attempts ($X^2 = 44.07$, $p < 0.001$), and perceived diet quality ($X^2 = 40.20$, $p < 0.001$). Specifically, a higher likelihood of reporting a change due to nutrition information was observed among younger individuals

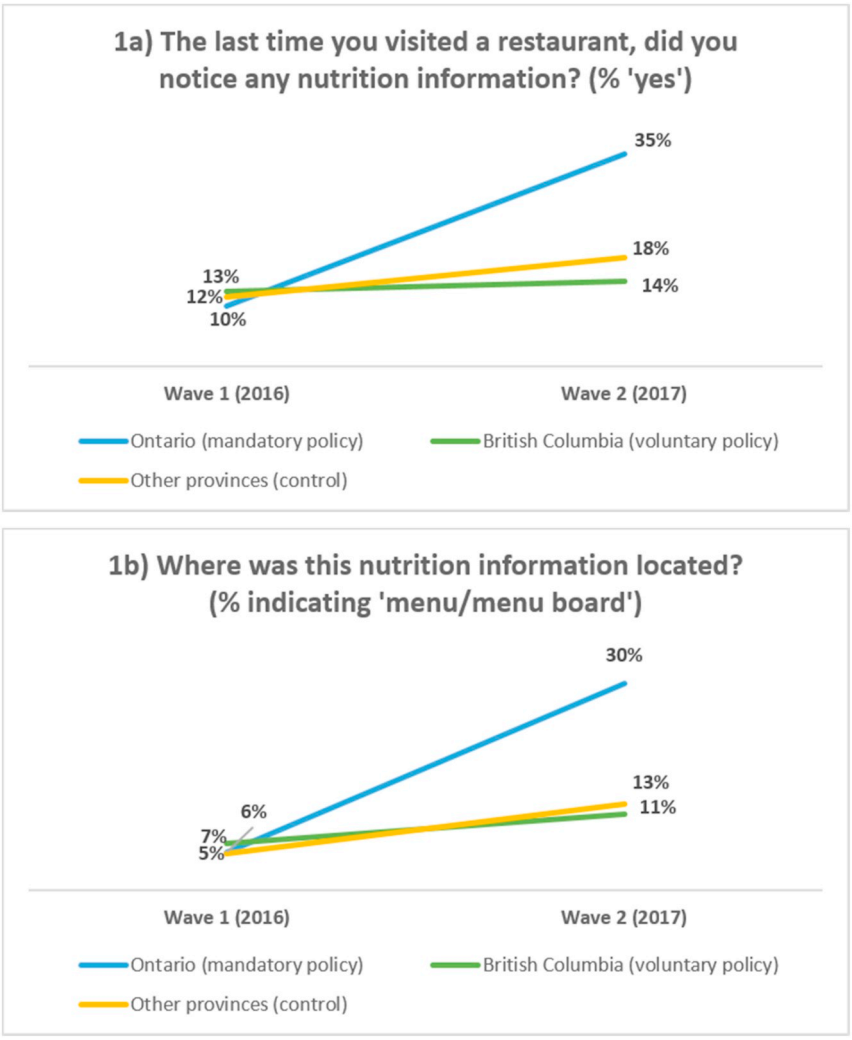


Fig. 1. Self-reported noticing of nutrition information (n = 3836). (a) % respondents indicating they had noticed any nutrition information at restaurants; (b) % respondents indicating they had noticed nutrition information on the menu/menu board.

(AOR = 1.05, 1.02–1.07); females (AOR = 1.57, 1.34–1.83); those with obesity vs. normal weight (AOR = 1.52, 1.15–2.01); those who reported that it was 'neither easy nor difficult' (AOR = 1.32, 1.02–1.71) or 'easy' (AOR = 1.35, 1.02–1.80) compared to 'very easy' to make ends meet; those with moderate (AOR = 1.46, 1.19–1.79) or severe food insecurity (AOR = 1.43, 1.08–1.89) compared to food security; and those with past-year weight loss attempts (AOR = 1.71, 1.46–2.00) or healthier reported diet (AOR = 1.31, 1.21–1.42).

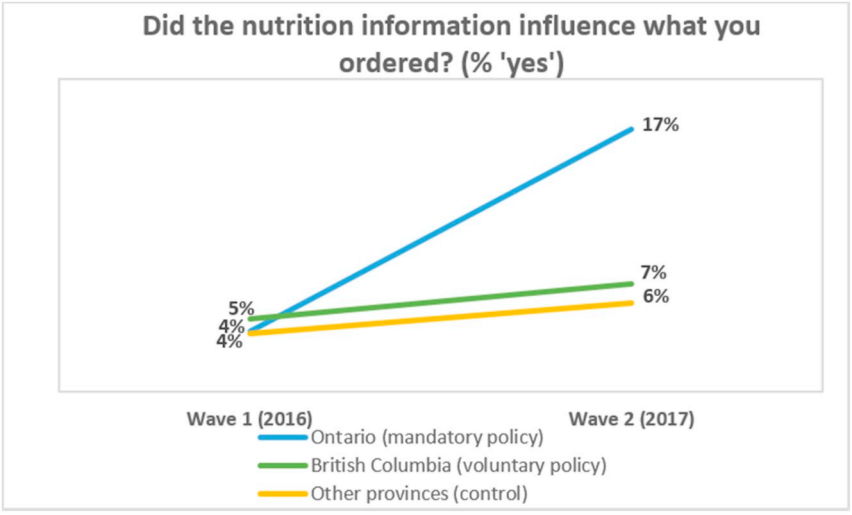
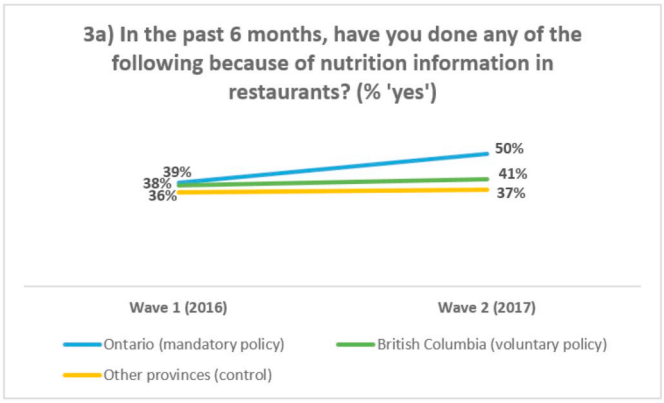
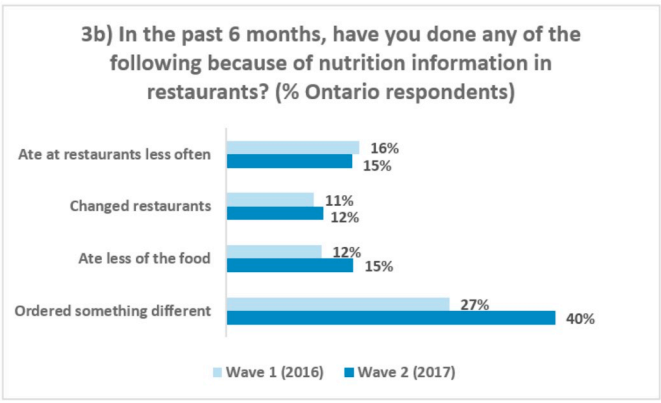
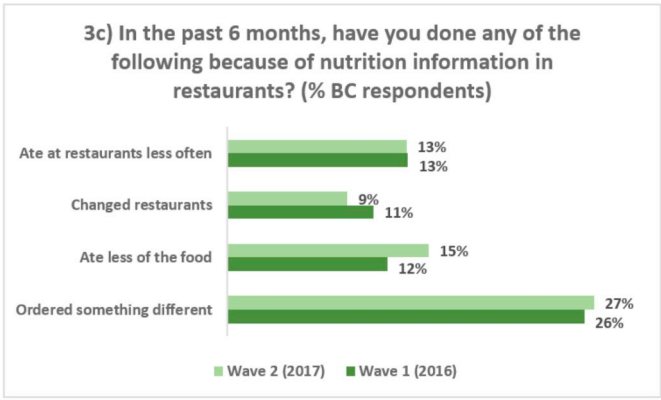


Fig. 2. Self-reported influence of nutrition information (n = 3836).







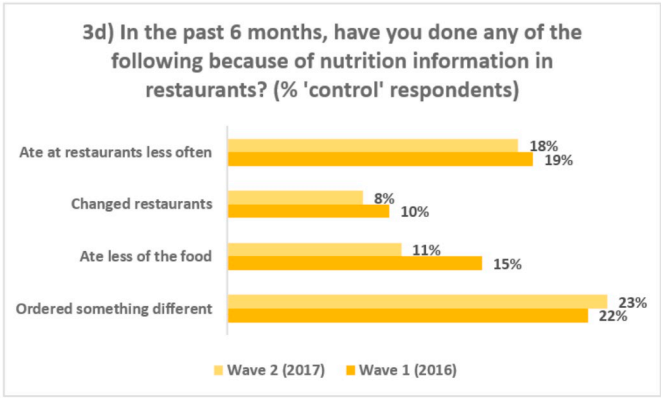


Fig. 3. Self-reported impact of nutrition information (n = 3836). (a) % respondents indicating a behaviour change due to nutrition information in restaurants. (b–d) % Ontario, BC, and Other ('control') respondents indicating each of four specific behaviours.

3.5. Support for calorie-labelling policy

Support for mandatory calorie labelling in restaurants increased overall ($X^2 = 19.49$, $p < 0.001$) (Fig. 4), with 66.4% of respondents indicating support at wave 1 (23.8% 'neutral,' 4.4% 'opposed,' 3.1% 'don't know') and 74.8% at wave 2 (19.6% 'neutral,' 3.0% 'opposed,' 2.6% 'don't know'). The main effect of condition approached significance ($p = 0.05$), and the interaction between condition and survey wave was non-significant. Ontario respondents were significantly more likely to report supporting the policy at wave 2 vs. 1 than were control respondents (+12.9% vs. +5.7%; AOR = 1.57, 1.06–2.34). BC respondents (+9.5%) did not differ significantly from Ontario or control respondents.

There were significant main effects of age ($X^2 = 13.82$, $p < 0.001$), sex ($X^2 = 4.68$, $p = 0.03$), BMI ($X^2 = 9.83$, $p = 0.04$), health literacy ($X^2 = 55.31$, $p < 0.001$), maternal education ($X^2 = 36.60$, $p < 0.001$), and past-year weight loss attempts ($X^2 = 36.83$, $p < 0.001$). Specifically, a higher likelihood of supporting the policy was observed among older individuals (AOR = 1.04, 1.02–1.07); females (AOR = 1.20, 1.02–2.41); and those with past-year weight loss attempts (AOR = 1.70, 1.43–2.02). A lower likelihood of support was observed among those with unstated BMI compared to normal weight (AOR = 0.69, 0.53–0.90); those with limited vs. adequate health literacy (AOR = 0.40, 0.32–0.51); and those whose mothers had attended college (AOR = 0.54, 0.40–0.74) or with unstated maternal education level (AOR = 0.36, 0.23–0.56) compared to those whose mothers had attended university.

4. Discussion

4.1. Effect of mandatory calorie-labelling policy

The implementation of mandatory calorie labelling on menus in chain restaurants in Ontario was associated with substantial increases in self-reported noticing and use of nutrition information, consistent with previous research (Vanderlee, 2016; Chen et al., 2015). In contrast, there was little to no observable effect of a voluntary nutrition intervention in which nutrition information was only available upon request. These findings align with previous research reporting low awareness of voluntary menu labelling programs (White et al., 2016) and highlight the importance of accessible calorie information that is available without consumer effort.

Several sub-group differences were also observed. Females were significantly more likely to notice nutrition information on the menu and to report that it influenced their order, consistent with several reviews (Kiszko et al., 2014; Krieger and Saelens, 2013; Sinclair et al., 2014). 'White' respondents were more likely than certain minorities (South Asian and Chinese respondents) to report noticing nutrition information. This may reflect differences in the types of restaurants frequented or in reporting. Previous evidence on the effect of race has been mixed (Harnack et al., 2008; Elbel et al., 2009).

4.2. Socio-economic status

Respondents with moderate or severe food insecurity were more likely to report making a change due to noticed nutrition information compared to those with greater food security. This finding contrasts previous research indicating greater noticing and/or use of nutrition information among higher-income individuals (Vanderlee, 2016; Chen et al., 2015), and suggests that posted nutrition information is being used by vulnerable populations. Indeed, posting simple nutrition information (such as calorie amounts) at the point of sale may reduce

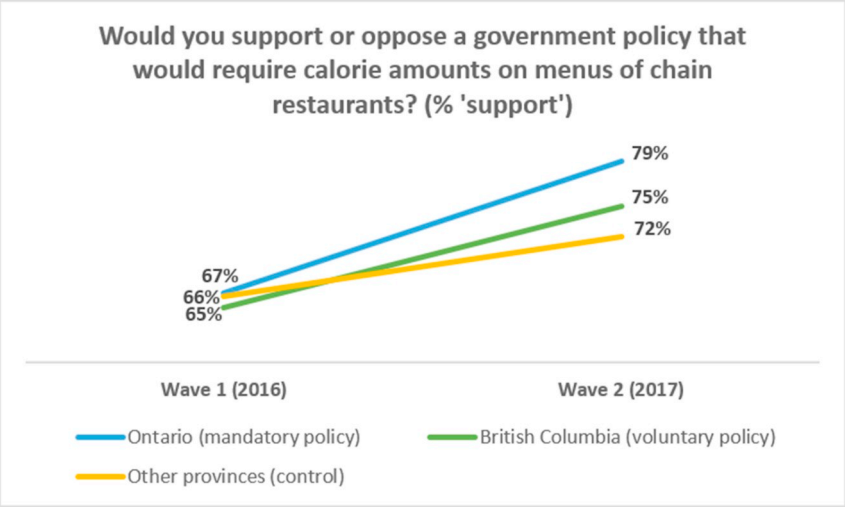


Fig. 4. Support for mandatory calorie labelling policy (n = 3640).

socio-economic disparities by increasing its accessibility, perhaps explaining why those with lower health literacy were no less likely to use the nutrition information than those with higher levels of understanding.

4.3. Weight and weight-related behaviours

Those with obesity were more likely notice nutrition information on the menu—consistent with previous research (Chen et al., 2015)—and to report an impact of that information. U.S. calorie-labelling laws have positively affected BMI among overweight adults and men with obesity (Deb and Vargas, 2015). Likewise, respondents who had tried to lose weight or who perceived their diet to be healthier were more likely to report an influence and impact of nutrition information; in previous research, Canadians who had dieted in the past year were more likely to use nutrition labels (Goodman et al., 2011). Collectively, these findings suggest that providing nutrition information in restaurants may be especially helpful for individuals interested in nutrition and those with obesity or weight loss goals.

4.4. Support for calorie-labelling policy

Mandatory calorie labelling received very high levels of support, with negligible levels of opposition. Previous research affirms that consumers wish to see nutrition information in restaurant settings (Vanderlee, 2016; Center for Science in the Public Interest, 2009; Martinez et al., 2013) and support menu labelling as a policy measure (Vanderlee, 2016; Center for Science in the Public Interest, 2009); support for government health policies also tends to improve after policy implementation (Diepeveen et al., 2013). Overall levels of support increased from baseline to follow-up, particularly in Ontario, suggesting positive perceptions of the calorie-labelling policy by those exposed to it.

4.5. Limitations

This study was not without limitations. Since 2014, the IDP has been introduced in some national chains with locations outside of BC (Government of British Columbia, 2016); thus, some exposure to the IDP in 'control' provinces was possible. Participants were recruited from urban cities using non-probability-based methods; therefore, the study cannot provide nationally representative estimates. Compared to national estimates, participants are somewhat more likely to report food insecurity and to be students, but have similar levels of overweight and obesity (Hammond et al., 2016). Finally, this study did not examine the effect of calorie labelling on objective measures of consumer behaviour (such as sales data or dietary intake) and responses may therefore have been subject to self-report or social desirability bias. Nevertheless, the extent of this bias would be constant across conditions and would not account for differences between provinces over time.

5. Conclusions

Study findings suggest that the first mandatory menu labelling policy in Canada has been effective at increasing consumer awareness and use of nutrition information in restaurants. This underscores the importance of menus as the most salient location for communicating nutrition information in restaurants: voluntary measures that stop short of displaying information on menus and require consumers to request nutrition information appear to have little or no impact. The results also indicate public support of mandatory menu labelling, and suggest that it may be subject to fewer socio-economic disparities than other health communication channels.

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Conflicts of interest

None.

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