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RESEARCH ARTICLE

Consumers' attitudes before and after the introduction of the Chilean regulation on food labelling

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ABSTRACT

The aim of the present study is to understand how the attitudes towards food labelling in the Chilean population have changed after the introduction of the Chilean law on food labelling and advertising. A computer-assisted telephone interview was conducted in 2012 and 2016, employing the same procedures. The difference in outcomes between 2012 and 2016 was assessed using a logistic regression model. One hundred and sixty-seven subjects responded to both the 2012 and 2016 survey editions (respondents). For both the unadjusted and adjusted analyses, the respondents in 2016 were more likely to be involved in a programme to lose weight and to consider food labelling the most effective intervention introduced to date to promote healthy nutrition. However, no significant differences were reported in both self-reported and objectively assessed understandings of front-of-pack-labelling. Evidence suggests a positive perception among Chileans regarding the effectiveness of the new law.

Introduction

Dietary habits are undergoing continuous development because of socioeconomic changes that influence lifestyles and consequently eating patterns. In recent years, especially in newly industrialised countries, an increased per-capita daily caloric intake has been reported, which is estimated to grow further over the next several decades (World Health Organization 2015). Such increased caloric intake has been hypothesised to be related to the increasing availability of calorically dense, nutrient-poor and pre-packaged food (Monteiro et al. 2013).

Governments worldwide are trying to develop and implement interventions aimed at reducing the purchase and consumption of calorically dense food (Zhang et al. 2014). Several initiatives have been put forward, such as the adoption of restraints to food advertising (especially those aimed at children) (Raine et al. 2013); the taxation of junk food (soft drinks, fast food and snacks) (Kim and Kawachi 2006; Franck et al. 2013), which has been recently adopted by the Mexican government and shown encouraging preliminary results (Cochero et al. 2017); and the front-of-pack-labelling (FoPL) of pre-packaged food. Undoubtedly, FoPL is the intervention most widely employed by governments worldwide (including countries in North and South America, Europe, Australia and Oceania, White and Signal 2012) to try to discourage consumers from buying calorically dense food.

The wide adoption of FoPL interventions is prompted by the assumption that providing consumers with more detailed nutritional information might discourage the purchase of calorically dense, nutrient-poor, pre-packaged food in favour of the purchase of healthier food products. In recent years, research has focused on several aspects of food labelling, including consumers' understanding and attitudes towards FoPL and its actual effectiveness in reducing the purchase of unhealthy food. Generally, consumers declare that they are interested in FoPL and think that it might be a promising initiative to promote the adoption of a healthy diet (Cowburn and Stockley 2005; Campos et al. 2011). In addition, consumers of both Western and non-Western countries declare themselves to be

interested in receiving more nutritional information (Mandle et al. 2015). Interestingly, a recent survey conducted among European citizens demonstrated that they may be willing to pay an additional small amount of money for their yearly food expenditure for labelled food packs (Gregori et al. 2015). Despite their positive attitude towards FoPL, consumers do not seem to truly understand FoPL (Cowburn and Stockley 2005). Such findings are relevant, especially among subjects with low socioeconomic status (Malam et al. 2009). Looking at the effectiveness of FoPL, a recent meta-analysis (Cecchini and Warin 2016) demonstrated that FoPL tends to promote the purchase of healthy foods and that tends to be inversely associated, even if not significantly, with caloric intake. However, such a meta-analysis summarises evidence from randomised clinical trials, whereas real-world data are lacking.

The aim of the present study is to understand how attitudes towards and understanding of food labelling in the Chilean population have changed after the introduction of the Chilean law (20606/2012) on food labelling and advertising. The Chilean law (20606/2012) was approved in 2012 and implemented in 2016 given that a staggered implementation across 3 years was planned. The law established a mandatory FoPL for solids high in energy ($\geq$350 kcal/100 g), sodium ($\geq$800 mg/100 g), total sugar ($\geq$22.5 g/100 g), statured fat ($\geq$6 g/100 g), and liquids high in energy ($\geq$100 kcal/100 ml), sodium ($\geq$100 mg/100 ml), total sugar ($\geq$6 g/100 ml) and statured fat ($\geq$3 g/100 ml). For such solids and liquids, a FoPL black octagonal symbol reporting the message "Alto en -" ("High in -") must be reported, one for each excess of nutrient. The cut offs have been planned to be further reduced in 2018 and 2019. Some food products (specified in the text of the law) are excluded from the regulation on food labelling (e.g. infant food). The Chilean law has also prohibited the use of encouragement in the advertising of "high in energy, sodium, fat and sugar" foods aimed at children under the age of 14 years.

This study represents an investigation of the early reaction of the Chilean population to the introduction of the regulation of food labelling and advertising. Clearly, the analysis of Chileans' understanding of FoPL represents a surrogate marker of the effectiveness of the Chilean law. However, such an investigation represents an intermediate but necessary step to pursuing the long-term effects of the regulation, i.e. the purchase and consumption of calorically dense food, and the consequent analysis of obesity trends.

Methods

Survey conduction

A computer-assisted telephone interview (CATI) was conducted in September–October 2012 and November–December 2016 (after the approval of the Chilean regulation of food labelling and advertising), employing the exact same procedures. The CATI survey was conducted at ZETA Research Ltd.'s facility (www.zetaresearch.eu).

The survey was conducted using the same sample of the Chilean population enrolled in 2012 using a stratified random sampling procedure from Santiago del Chile's telephone book.

Participants were Spanish speakers and expressed explicit agreement for participation in the study.

A detailed description of the study methods applied in 2012 is provided elsewhere (Gregori et al. 2013).

Questionnaire

The phone interview was based on a questionnaire (the same tool was employed in both the 2012 and the 2016 survey editions). The questionnaire included four sections (Gregori et al. 2013). The first section aimed at assessing subjects' demographic and socioeconomic characteristics (family size, number of children, monthly income and educational level). The second section consisted of questions about attitudes towards obesity/nutrition and the subjects' own initiatives for a healthy lifestyle (named "Attitudes towards obesity/nutrition and subjects' own initiatives for a healthy lifestyle"). The third section investigated subjects' attitudes towards and understanding (both self-reported and objectively assessed through ad hoc items) of the nutritional information reported in prepackaged food (named "Subjects' attitudes towards and understanding of nutritional information reported in prepackaged food"). The last section presented subjects with a hypothetical scenario: an increase in food prices due to the introduction of a new FoPL. This scenario was intended to assess consumers' willingness to pay (named "Willingness to pay").

Outcomes

Responses to items belonging to three out of four sections of the survey (nine items from "Attitudes towards obesity/nutrition and subjects' own initiatives for a healthy lifestyle", 17 items from "Subjects' attitudes towards and understanding of nutritional information reported in prepackaged food", and 1 item

from "Willingness to pay") were considered outcomes of interest.

Propensity scores estimation

To account for the heterogeneity between subjects who did not respond in 2016 (nonrespondents) and those who responded in both 2012 and 2016 (respondents), a propensity score was computed to estimate the subjective inclination to answer the second survey in 2016 (four years after the first survey) given that such method has been widely used in the literature to adjust potential biases in surveys estimates (Wun et al. 2014). It was estimated via a logistic regression model for respondents vs. nonrespondents, including main sociodemographic characteristics (gender, ethnicity, age, marital status, number of children (if any), monthly income and educational level) as covariates in the model.

Once the propensity score was estimated, differences in outcomes between 2012 and 2016 were assessed by performing the computations only on subjects who responded to both survey editions (respondents).

Sample size

A sample size estimation was performed for the ratios of odds of favourable responses vs. odds of unfavourable responses to the 27 items considered outcomes of interest of the survey. The alpha level was 0.05, and the statistical power was 0.8. The estimation was performed for different combinations of ORs (ranging from 1.5 to 4.9) and proportions of responders (ranging from 0.1 to 0.1) across the 2012 and 2016 surveys (Table S1). To correct for the sample size in a multiple logistic regression model, including explanatory variables and estimated propensity scores (Hsieh 1989), a penalisation term (ρ^2, equal to 0.1) was used, where ρ is the correlation coefficient between covariates included in the model.

The final sample size was of 333 subjects, assuming an OR of favourable responses equal to 1.5 and a proportion of responders of 0.2 across the 2012 and 2016 surveys.

Statistical analysis

Data were reported as medians (I and III quartiles) for continuous variables and as percentages (absolute numbers) for categorical variables. The Wilcoxon test was used for continuous variables, and Pearson's chi-square tests were used for categorical variables. p

Values for differences among the answers to survey items between the two editions (2012 and 2016) were adjusted by multiple tests using the Benjamini and Hochberg procedure to control for the false discovery rate (Hochberg and Benjamini 1990).

A logistic regression model was estimated for binary variables, and the Huber–White method was used to adjust the variance–covariance matrix accounting for person- and time-related correlations in the data. For multinomial variables, a GEE (generalized estimation equation) model was computed. The method involved a modification of the original GEE method by Liang and Zeger (1986) to account for multinomial responses.

For each model, odds ratios (ORs) were reported, including both unadjusted and adjusted (by including the propensity scores in the final model to account for selection bias). Analyses were performed using the R system (R Development Core Team 2015) with the rms (Harrell 2013), non-random (Stampf 2014) and multgee (Touloumis 2014) libraries.

Results

In the 2012 edition of the survey, 1282 people were included in the analysis (Gregori et al. 2013). In the 2016 edition, 167 out of the 1282 people in the previous edition agreed to be interviewed.

Table 1 reports the sociodemographic characteristics of the 167 subjects interviewed in both 2012 and 2016 (respondents). Consistent with 2012, most of the subjects interviewed were women of Chilean nationality over the age of 45. Most of these respondents were married (or cohabiting), had at least one child, and lived in families of a medium-low socioeconomic status.

Table 2 presents the distribution of the main outcomes between the respondents to the two editions. In 2016, an increased proportion of subjects said that they were involved in a weight management programmed (47% in 2012 vs. 79% in 2016, p value .011) and considered food labelling the most effective intervention introduced thus far in Chile to promote healthy nutrition (10% in 2012 vs. 35% in 2016, p value .0086). A high proportion of subjects reported that they regularly read and understand FoPL in both 2012 and 2016 (no significant difference). However, only a small proportion of subjects (6% in 2012 and 10% in 2016) declared knowing what guideline daily amount (GDA) is, and the proportion of subjects who provided a correct definition of nutrients "per 100 g", "per portion," and "per 100 kcal" did not significantly

Table 1. Sociodemographic characteristics of subjects who participated in the survey in both the 2012 and 2016 editions ($N = 167$).

	2012 (n = 167)	2016 (n = 167)	p Value
Gender: Male	28% (47)	28% (47)	1
Nationality: Chilean	99% (163)	99% (163)	.565
European	0% (0)	0% (0)	
North American	0% (0)	0% (0)	
South American (other than Chilean)	1% (2)	1% (1)	
Ethnicity: White	69% (106)	69% (106)	1
Mapuche	6% (10)	6% (10)	
Mestizo	24% (37)	24% (37)	
Quechua	1% (1)	1% (1)	
Age: 18–24	9% (14)	7% (12)	.901
25–34	9% (14)	10% (16)	
35–44	15% (25)	10% (17)	
45–54	19% (31)	21% (34)	
55–64	28% (46)	27% (44)	
65–74	12% (20)	16% (26)	
75–84	7% (11)	7% (12)	
85+	2% (3)	2% (3)	
Married/cohabitant: Yes	66% (107)	62% (101)	.536
Children: Yes	80% (133)	80% (134)	.891
Number of family members	3/4/5	3/4/5	.078
Income: high (>2,000,000 pesos per month)	2% (2)	8% (8)	.073
Educational level: primary school	24% (38)	24% (38)	1
Secondary school	54% (85)	54% (85)	
Higher education (Bachelor/Master's degree/PhD)	22% (35)	22% (35)	
Job: manager-professional	19% (19)	25% (23)	.217
Office-worker	29% (29)	31% (28)	
Workman-artisan	48% (48)	36% (33)	
Odd jobs	3% (3)	8% (7)	

Data are percentages (absolute numbers) for categorical variables and I quartile/median/III quartile for continuous variables. p Values refer to the difference between the two editions.

improve. Moreover, the proportion of respondents who were willing to pay an additional fee for more detailed FoPL decreased (p value .0538).

Results were confirmed when differences in answers between the two editions were estimated by adjusting for selection bias in completing the survey. The propensity score-based analysis is presented in Table 3, confirming that respondents in 2016 were more likely involved in a programmed to lose weight (OR 4.02, 95% CI 1.72–9.38) and were more likely to consider food labelling the most effective intervention introduced thus far to promote healthy nutrition (OR 10.87, 95% CI 2.49–47.32). Nonsignificant differences between 2012 and 2016 were observed in participants' practices of regularly reading FoPL and in their self-reported understanding of FoPL. In addition, no significant differences emerged in the self-reported understanding of GDA, the objectively assessed understanding of FoPL and the willingness to pay an additional fee for more detailed FoPL.

In examining the nonrespondents, the characteristics of the subjects who responded to the survey in 2016 vs. those who did not respond are reported in Table S2. When the attitudes of respondents to the 2016 edition were compared with those of subjects who responded only to the 2012 edition (nonrespondents) of the survey, the results showed (Table S3) that respondents were more likely to exhibit a positive attitude towards FoPL. Such findings propose a plausible explanation for their decision to complete the survey in 2016.

Discussion

The aim of the present study was to compare the Chilean population's attitudes towards and understanding of FoPL before and after the introduction of the Chilean regulation on food labelling and advertising.

The analysis of attitudes towards FoPL showed that both before and after the introduction of the law, people stated their interest in FoPL and self-reported a good understanding of FoPL.

The results of differences in respondents' outcomes between 2016 and 2012 suggested that even though individuals exhibited interest in adopting healthier lifestyles and had a positive attitude towards FoPL, FoPL understanding was unsatisfactory when assessed objectively. The present findings are consistent with those of other studies in the field. Such studies have widely demonstrated that consumers are generally interested in FoPL, but they often have a poor understanding of information reported in FoPL (Campos et al. 2011).

Given that FoPL often represents the main source of nutritional information for consumers, the present results should imply that public health nutrition interventions based on FoPL might not be limited to the introduction of new types of FoPL. Rather, these interventions should be accompanied by educational interventions aimed at improving the population's understanding of nutritional information.

Study limitations

This study is based on a self-selected sample of respondents in both 2012 and 2016 and resulted in a limited sample size. Regarding the first issue, the availability of detailed information for all 1282 subjects made possible an estimation of the selection bias and the development of a propensity score model aimed at limiting its influence on the evaluation of outcomes. Although limited, the sample size is still sufficient to provide meaningful information for a

Table 2. Answers to the main domains of the survey of subjects who participated in the survey in both the 2012 and 2016 editions (respondents, $n = 167$).

	2012 edition ($n = 167$)	2016 edition ($n = 167$)	p Value
Attitudes towards obesity/nutrition and subjects' own initiatives for a healthy lifestyle			
Obesity perceived as a severe public health burden	99% (166)	98% (164)	.5538
Reporting to be obese/overweight	36% (60)	45% (75)	.2526
Reporting that at least one family member is obese/overweight	37% (61)	34% (57)	.7635
Reporting to do something to lose weight	47% (79)	79% (59)	.0011
Strategies employed to build an opinion on healthy nutrition. Physician	29% (23)	55% (92)	.0011
Mass media	50% (40)	35% (58)	.0860
Family/school	42% (34)	32% (54)	.2693
Personal experience	38% (30)	37% (61)	.9184
Most effective action introduced thus far to promote healthy nutrition. School	21% (15)	15% (23)	.0086
Food labelling	10% (7)	35% (53)	
General practitioner	31% (22)	24% (37)	
Advertising	39% (28)	26% (40)	
Physical activity perceived as an important strategy for obesity prevention	97% (162)	94% (156)	.3577
Reporting to regularly do physical activity	59% (98)	65% (108)	.4861
Reporting to regularly do aerobic exercise	33% (44)	65% (70)	.0011
Subjects' attitudes towards and understanding of nutritional information reported in pre-packaged food			
Reporting to regularly read FoPL	70% (117)	68% (100)	.7635
Reasons for not reading FoPL. Self-reported poor understanding	38% (9)	31% (15)	.6954
Never noticed FoPL	38% (9)	29% (14)	
Poor interest in FoPL	25% (6)	40% (19)	
Self-reported understanding of nutritional facts	76% (42)	73% (73)	.7635
Previously, heard of GDA (guideline daily amount)	22% (18)	18% (27)	.6954
Self-reported understanding of GDA	6% (5)	10% (15)	.5538
Nutritional facts available in FoPL are considered exhaustive	32% (24)	32% (48)	.9184
Words most frequently associated with FoPL. Sugar	36% (60)	57% (84)	.0011
Fat	50% (83)	45% (66)	.6037
Calories	29% (48)	39% (58)	.1433
Servings	2% (3)	0% (0)	.2555
Carbohydrates	11% (18)	14% (20)	.6954
Cholesterol	19% (31)	9% (14)	.0860
Calcium	7% (12)	5% (8)	.7425
Sodium	36% (60)	35% (52)	.9184
Iron	3% (5)	3% (5)	.9184
Correct definition of "per 100 g"	25% (41)	15% (19)	.1254
Correct definition of "per 100 kcal"	9% (15)	1% (1)	.0123
Correct definition of "per portion"	16% (27)	16% (20)	.9184
Simplest way to present nutritional facts. "per 100 kcal"	7% (11)	3% (4)	.1433
"Per 100 g"	28% (43)	20% (28)	
"Per serving"	65% (100)	77% (108)	
Best/most effective FoPL. Total Kcal (expressed as percentage of GDA)	11% (9)	12% (16)	.2693
Total kcal together with sugar, fat, sodium (expressed as percentages of GDA)	10% (8)	11% (15)	
Battery-shaped front-of-pack labelling	14% (11)	11% (15)	
Traffic light	46% (37)	32% (45)	
Symbol of healthy product	19% (15)	35% (48)	
The introduction of traffic light FoPL would not change consumption patterns	34% (27)	47% (66)	.1433
The introduction of battery-shaped FoPL would not change consumption patterns	42% (31)	45% (63)	.7635
Information employed to estimate the amount of food to eat at mealtimes. Fat per serving	11% (9)	9% (13)	.7635
Suggested serving	15% (12)	9% (13)	.3577
Calories per serving	12% (10)	15% (21)	.7635
FoPL	9% (7)	15% (22)	.3397
None of this information	34% (27)	50% (71)	.0860
Hunger	15% (12)	3% (5)	.0123
Problem solving 1: correct identification of the most energy dense food item	21% (15)	24% (28)	.7635
Problem solving 2: correct identification of the most energy dense food item	36% (26)	37% (42)	.9550
Willingness to pay			
Willing to pay an additional fee for more detailed FoPL	22% (22)	9% (11)	.0538

p Values refer to the difference between the two editions and are adjusted for multiplicity. Data are percentages (absolute numbers).

sensitive range of effects as demonstrated by a what-if scenario analysis.

Conclusions

Overall, this preliminary study on the Chilean population's attitudes towards and understanding of FoPL suggests that Chilean people seem to be positive about the adoption of the current FoPL labels and that the awareness of the need to adopt healthier lifestyles seems to be increasing. However, the limited understanding of FoPL with all the related implications suggests that education campaigns should be implemented to accompany FoPL measures to avoid eroding the high and rising expectations of such regulatory interventions.

Table 3. Unadjusted and propensity score – adjusted odds ratios for a favourable response (in 2016 vs. 2012 edition of the survey) for all variables of interest.

	Unadjusted			Adjusted		
	OR	CI (lower)	CI (upper)	OR	CI (lower)	CI (upper)
Attitudes towards obesity/nutrition and subjects' own initiatives for a healthy lifestyle						
Obesity perceived as a severe public health burden	0.3293	0.0336	3.232	0.4943	0.0432	5.6521
Reporting to be obese/overweight	1.4538	0.9373	2.2549	1.1968	0.6675	2.1458
Reporting that at least one family member is obese/overweight	0.9004	0.5754	1.4092	1.3475	0.7178	2.5296
Reporting to do something to lose weight	4.1076	2.1894	7.7065	4.0207	1.7217	9.3896
Strategies employed to build an opinion on healthy nutrition. Physician	3.04	1.707	5.414	3.6167	1.6787	7.7923
Mass media	0.5321	0.3218	0.8799	0.7000	0.3492	1.4032
Family/school	0.6465	0.3768	1.1093	0.6355	0.3161	1.2776
Personal experience	0.9591	0.5621	1.6367	0.8577	0.4125	1.7836
Most effective action introduced so far to promote healthy nutrition. School vs. advertising	1.075	0.4598	2.5135	0.6004	0.1778	2.0276
Food labelling vs. advertising	5.2217	2.1133	12.9021	10.8703	2.497	47.3218
General practitioner vs. advertising	1.1836	0.5847	2.3962	0.9464	0.3898	2.2976
Physical activity perceived as an important strategy for obesity prevention	0.4815	0.1573	1.4738	0.6593	0.1051	4.136
Reporting to regularly do physical activity	1.2888	0.8219	2.0211	1.0473	0.5632	1.9475
Reporting to regularly do aerobic exercise	3.6842	2.2049	6.1561	3.8526	1.8343	8.0915
Subjects' attitudes towards and understanding of nutritional information reported in pre-packaged food						
Reporting to regularly read FoPL	0.8725	0.5452	1.3963	0.6912	0.3875	1.2331
Reasons for not reading FoPL. Self-reported poor understanding vs. poor interest in FoPL	0.4268	0.17	1.072	0.3052	0.0905	1.0294
Never noticed FoPL vs. poor interest in FoPL	0.4634	0.1446	1.4851	0.4532	0.0778	2.6402
Self-reported understanding of nutritional facts	0.8369	0.4064	1.7231	1.3638	0.5283	3.5206
Previously heard of GDA (guideline daily amount)	0.7686	0.3811	1.55	0.8357	0.3384	2.0638
Self-reported understanding of GDA	1.6917	0.5732	4.9933	1.4982	0.4283	5.2413
Nutritional facts available in FoPL are considered exhaustive	1.04	0.5633	1.9202	1.3542	0.6084	3.0142
Words most frequently associated with FoPL. Sugar	2.3406	1.4627	3.7454	2.072	1.1338	3.7864
Fat:	0.8146	0.5317	1.2479	0.8983	0.5075	1.59
Calories	1.5977	1.0174	2.5089	2.041	1.0857	3.8368
Servings	0.0005	0.0001	0.0015	0.0008	0.0001	0.0067
Carbohydrates	1.2934	0.6284	2.6622	1.5977	0.5794	4.4057
Cholesterol	0.4584	0.2446	0.8588	0.7955	0.3795	1.6676
Calcium	0.7381	0.2992	1.8211	0.7517	0.2375	2.3797
Sodium	0.966	0.6046	1.5434	0.6314	0.3401	1.1722
Iron	1.1329	0.3158	4.0636	1.0524	0.1525	7.2622
Correct definition of "per 100 g"	0.5272	0.2865	0.9701	0.6679	0.3071	1.4525
Correct definition of "per 100 kcal"	0.082	0.0105	0.6387	0.0005	0.0002	0.0012
Correct definition of "per portion"	0.9465	0.5136	1.7444	0.568	0.2271	1.4209
Simplest way to present nutritional facts. "per 100 kcal" vs. "per serving"	0.3163	0.1156	0.8655	0.1172	0.0136	1.0127
"per 100 g" vs. "per serving"	0.603	0.3465	1.0492	0.8981	0.4438	1.8174
Best/most effective FoPL. Total Kcal (expressed as percentage of GDA) vs. symbol of healthy product	0.5714	0.2259	1.4451	0.8488	0.2058	3.5011
Total kcal together with sugar, fat, sodium (expressed as percentages of GDA) vs. symbol of healthy product	0.5998	0.2123	1.6949	0.4928	0.1279	1.8985
Battery-shaped front-of-pack labelling vs. symbol of healthy product	0.4196	0.149	1.1819	0.3076	0.0828	1.1423
Traffic light vs. symbol of healthy product	0.39	0.1876	0.8106	0.366	0.135	0.9919
The introduction of traffic light FoPL would not change consumption patterns	1.7747	0.9854	3.1965	1.31	0.6379	2.6901
The introduction of battery-shaped FoPL would not change consumption patterns	1.1498	0.6424	2.0582	1.0539	0.498	2.2305
Information employed to estimate the amount of food to eat at mealtimes. Fat per serving	0.7889	0.3293	1.8897	1.1825	0.3595	3.8895
Suggested serving	0.5667	0.2526	1.2712	0.8522	0.3347	2.1698
Calories per serving	1.2049	0.5642	2.5734	0.8541	0.296	2.4639
FoPL	1.8961	0.8321	4.3206	1.7664	0.6482	4.8137
None of these information	1.9357	1.1171	3.3542	2.0125	0.9945	4.0725
Hunger	0.2053	0.0673	0.6266	0.0584	0.0069	0.4964
Problem solving 1: correct identification of the most energy dense food item	1.1745	0.5794	2.3811	1.7781	0.7011	4.5099
Problem solving 2: correct identification of the most energy dense food item	1.0179	0.5651	1.8335	0.7919	0.3784	1.6569
Willingness to pay						
Willing to pay an additional fee for more detailed FoPL	0.3679	0.165	0.8205	0.4935	0.1854	1.3134

Respondents only ($n = 167$). OR: odds ratio; CI (lower): 95% confidence interval, lower limit; CI (upper): 95% confidence interval, upper limit.

Disclosure statement

No potential conflict of interest was reported by the authors.

References

Campos S, Doxey J, Hammond D. 2011. Nutrition labels on pre-packaged foods: a systematic review. Public Health Nutr. 14:1496–1506.

Cecchini M, Warin L. 2016. Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies. Obes Rev. 17:201–210.

Cochero MA, Rivera-Dommarco J, Popkin BM, Ng SW. 2017. Mexico, evidence of sustained consumer response two years after implementing a sugar-sweetened beverage tax. Millwood: Health Aff.

Cowburn G, Stockley L. 2005. Consumer understanding and use of nutrition labelling: a systematic review. Public Health Nutr. 8:21–28.

Franck C, Grandi SM, Eisenberg MJ. 2013. Taxing junk food to counter obesity. Am J Public Health. 103: 1949–1953.

Gregori D, Ballali S, Vögele C, Galasso F, Widhalm K, Berchialla P, Baldi I. 2015. What is the value given by consumers to nutritional label information? Results from a large investigation in Europe. J Am Coll Nutr. 34: 120–125.

Gregori D, Contreras LV, Pérez CB. 2013. Survey on understanding, use and willingness to pay on front of pack labeling in Chile. FASEB J. 27:110.5.

Harrell FE Jr. 2013. rms: regression modeling strategies. R package version 4.0-0.

Hochberg Y, Benjamini Y. 1990. More powerful procedures for multiple significance testing. Stat Med. 9:811–818.

Hsieh FY. 1989. Sample size tables for logistic regression. Stat Med. 8:795–802.

Kim D, Kawachi I. 2006. Food taxation and pricing strategies to "thin out" the obesity epidemic. Am J Prev Med. 30:430–437.

Liang K-Y, Zeger SL. 1986. Longitudinal data analysis using generalized linear models. Biometrika. 73:13–22.

Malam S, Clegg S, Kirwan S, McGinigal S, Raats M, Shepherd R, Barnett J, Senior V, Hodgkins C, Dean M. 2009. Comprehension and use of UK nutrition signpost labelling schemes. London: Food Standards Agency.

Mandle J, Tugendhaft A, Michalow J, Hofman K. 2015. Nutrition labelling: a review of research on consumer and industry response in the global South. Glob Health Action. 8.

Monteiro CA, Moubarac JC, Cannon G, Ng SW, Popkin B. 2013. Ultra-processed products are becoming dominant in the global food system. Obes Rev. 14:21–28.

R Development Core Team. 2015. R: a language and environment for statistical computing. Vienna, Austria: R Foundation for Statistical Computing.

Raine KD, Lobstein T, Landon J, Kent MP, Pellerin S, Caulfield T, Finegood D, Mongeau L, Neary N, Spence JC. 2013. Restricting marketing to children: consensus on policy interventions to address obesity. J Public Health Policy. 34:239–253.

Stampf S. 2014. Nonrandom: stratification and matching by the propensity score. R package version 1.42. 2014.

Touloumis A. 2014. R package multgee: a generalized estimating equations solver for multinomial responses. ArXiv Prepr ArXiv14105232.

White J, Signal L. 2012. Submissions to the Australian and New Zealand Review of Food Labelling Law and Policy support traffic light nutrition labelling. Aust N Z J Public Health. 36:446–451.

World Health Organization. 2015. Global and regional food consumption patterns and trends; [accessed 2017 Feb 14]. http://www.who.int/nutrition/topics/3_foodconsumption/en/.

Wun L, Ezzati-Rice TM, Baskin R, Greenblatt J, Zodet M, Potter F, Diaz-Tena N, Touzani M. 2014. Using propensity scores to adjust weights to compensate for dwelling unit level nonresponse in the Medical Expenditure Panel Survey. Washington (DC): Agency for Healthcare Research and Quality.

Zhang Q, Liu S, Liu R, Xue H, Wang Y. 2014. Food policy approaches to obesity revention: an international perspective. Curr Obes Rep. 3:171–182.