

Nutrition labelling, marketing techniques, nutrition claims and health claims on chip and biscuit packages from sixteen countries

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Abstract

Objective: Food packages were objectively assessed to explore differences in nutrition labelling, selected promotional marketing techniques and health and nutrition claims between countries, in comparison to national regulations.

Design: Cross-sectional.

Setting: Chip and sweet biscuit packages were collected from sixteen countries at different levels of economic development in the EPOCH (Environmental Profile of a Community's Health) study between 2008 and 2010.

Subjects: Seven hundred and thirty-seven food packages were systematically evaluated for nutrition labelling, selected promotional marketing techniques relevant to nutrition and health, and health and nutrition claims. We compared pack labelling in countries with labelling regulations, with voluntary regulations and no regulations.

Results: Overall 86% of the packages had nutrition labels, 30% had health or nutrition claims and 87% displayed selected marketing techniques. On average, each package displayed two marketing techniques and one health or nutrition claim. In countries with mandatory nutrition labelling a greater proportion of packages displayed nutrition labels, had more of the seven required nutrients present, more total nutrients listed and higher readability compared with those with voluntary or no regulations. Countries with no health or nutrition claim regulations had fewer claims per package compared with countries with regulations.

Conclusions: Nutrition label regulations were associated with increased prevalence and quality of nutrition labels. Health and nutrition claim regulations were unexpectedly associated with increased use of claims, suggesting that current regulations may not have the desired effect of protecting consumers. Of concern, lack of regulation was associated with increased promotional marketing techniques directed at children and misleadingly promoting broad concepts of health.

Keywords
Health claim
Nutrition claim
Nutrition labelling
Food marketing

The rise of obesity in the past three decades has reached worldwide epidemic proportions⁽¹⁾. Obesity causes numerous health complications^(2,3), decreases life expectancy by 5 to 20 years⁽⁴⁾ and is associated with increasing health-care expenditure⁽⁵⁾. There is an urgent need to understand the determinants of obesity, particularly in children^(6–8). High energy intake and low physical activity levels are encouraged by 'obesogenic' environments in which less nutritious, energy-dense, processed food is inexpensive,

readily available, served in large portions and heavily marketed^(9,10). In Canada, it is estimated that 14 305 kJ (3419 kcal)/d were available per capita in the food supply in 2011⁽¹¹⁾, a significantly greater amount than the guidelines of 8368 to 12 552 kJ (2000 to 3000 kcal)/d for men and 6485 to 9832 kJ (1550 to 2350 kcal)/d for women⁽¹²⁾.

The overabundance of energy-dense food has created a competitive retail environment where marketing is essential to food company success⁽¹³⁾. Marketing literature

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describes techniques relating to the four 'Ps': product, price, placement (distribution) and promotion. In the present paper we focus on selected promotional marketing techniques that have relevance for nutrition and health. Food package labelling is a powerful marketing tool that food manufacturers can utilize to help increase sales. Health and nutrition claims are another method used by manufacturers of delivering information on 'healthier food' options⁽¹⁴⁾. Nutrition claims explicitly state or imply that the food has particular nutritional properties and health claims state that there is a relationship between the food and beneficial health outcomes⁽¹⁵⁾. Food companies are motivated to use health and nutrition claims because there is evidence indicating that having these claims increases sales, in particular when health claims stating a link between consuming the product and decreasing the risk of a certain disease are used⁽¹³⁾. Surveys have found more than 30% of people use labels to help select food products on a regular basis, with up to 80% using them when purchasing a new product^(16–19). However, while consumers report reading labels, many misinterpret the information displayed^(18,20,21). Food companies also target specific products at children using strategies such as free toys or giveaways, contests and promotional imaging appealing to younger age groups to increase sales⁽²²⁾.

The use of promotional marketing techniques is of particular concern when used on snack foods. For the purposes of the present study, 'snack foods' are defined as processed foods that are eaten between meals in small to moderate quantities. Products considered snack foods can range from minimally processed foods such as dried fruit and nuts to highly processed energy-dense items like potato chips and sweet biscuits. The association between snack food consumption and obesity is inconclusive⁽²³⁾ and the variation in findings may be partly explained by varying definitions⁽²⁴⁾. Children are the most at risk of being exposed to environments that encourage snacking⁽²⁵⁾ and many unhealthy snack foods are specifically marketed to children⁽²²⁾. There is international consensus that such marketing of foods to children impacts negatively on nutrition knowledge, food preferences and consumption patterns, leading to adverse health outcomes including obesity^(26,27).

The aim of the present study was to objectively evaluate and compare snack food package labelling and selected promotional marketing techniques that have relevance to nutrition and health in order to explore differences in countries with and without regulations regarding food package labelling.

Methods

Setting

As part of the Prospective Urban Rural Epidemiology (PURE) study, the Environmental Profile of a Community's

Health sub-study (EPOCH)⁽²⁸⁾ asked investigators from sixteen countries (India, China, South Africa, Colombia, United Arab Emirates (UAE), Zimbabwe, Brazil, Sweden, Chile, Iran, Canada, Argentina, Poland, Malaysia, Turkey and Pakistan) to collect one chip packet and one sweet biscuit packet from each participating community. In the PURE study, communities were selected to participate purposively from urban and rural locations and diverse socio-economic settings across countries at all levels of national economic development. Most countries in PURE had a minimum of twenty participating communities. For the countries that had fewer than twenty communities participating in the study, the investigators were asked to collect additional packages to ensure a minimum sample size of forty snack food packages per country. The UAE sent an additional seventeen packages (seven sweet biscuits, ten chips), Zimbabwe an additional seventeen packages (eight sweet biscuits, nine chips), Chile an additional sixteen packages (ten sweet biscuits, six chips), Poland an additional twenty-eight packages (fifteen sweet biscuits, thirteen chips) and an additional eighteen packages came from Pakistan (nine sweet biscuits, nine chips).

Data collection

A food labelling assessment instrument was developed by the authors using a combination of a literature review of nutrition and health labelling on food products and expert opinion from investigators included in the study. This instrument was applied by a single assessor to all eligible food packages collected for EPOCH. Questions from the instrument related to nutrition labelling, health and nutrition claims and selected promotional marketing techniques were used in the analysis.

Nutrition labels

Nutrition labels were assessed for: (i) the total number of nutrients listed on the label; (ii) the number of seven required nutrients recommended by CODEX Alimentarius on the label⁽²⁹⁾ (international food standards coordinated by the FAO and WHO); and (iii) the readability of the label assessed by a single Likert scale from 1 to 7. A score of 1 indicates that the label was very difficult to read with small font, low colour contrast and/or crowded by other writing; and a score of 7 indicates that the label was very easy to read with large font, high colour contrast and/or in an area separate from other writing.

Health and nutrition claims

Health and nutrition claims were categorized using CODEX Alimentarius guidelines⁽¹⁵⁾. 'Nutrition claims' refer to 'any representation that states, suggests or implies that a food has particular nutritional properties including but not limited to the energy value and to the content of protein, fat and carbohydrates, as well as the content of vitamins and minerals'. These claims can be subdivided into

'nutrient content claims' that describe the nutrition properties of the food and 'nutrient comparative claims' which compare the nutrient levels and/or energy value of two or more foods (e.g. 'lower in fat'). 'Health claims' are described as 'any representation that states, suggests or implies that a relationship exists between a food or a constituent of that food and health'. Health claims include the subcategories of 'other function claims', which refer to specific beneficial effects of the consumption of foods or their constituents and relate to a positive contribution to health, the improvement of a bodily function or to modifying or preserving health, and 'reduction of disease risk claims', which link the consumption of a food or food constituent to the reduced risk of developing a disease or health-related condition⁽¹⁵⁾. For each package, the numbers of claims in each of the above categories were counted. CODEX Alimentarius also defines 'nutrient function claims' referring to the physiological role of the nutrient in growth, development or normal functions of the body. This category was combined with other function claims in the instrument because of strong similarities between the categories.

Promotional marketing techniques

Four categories were chosen to assess selected written and graphic promotional marketing techniques on the food packages that were considered relevant to nutrition, health behaviours or health outcomes. 'Promotion to children' includes evidence of promotional material targeted at children such as the presence of cartoon images, celebrity endorsements, images of children in photographic or cartoon formats, free giveaways (toys/prizes) or contests. 'Promotion of health and well-being' refers to material on packages that suggests or promotes aspects of the product that may be perceived as benefiting general health or well-being through both written and graphic images. Domains include: (i) emphasis on the naturalness of ingredients using statements such as 'real', 'natural' or 'whole'; (ii) images of ingredients in their raw format such as stalks of corn on a bag of corn chips; (iii) statements highlighting the nutrient content of the product, e.g. 'lower in fat'; (iv) information on the front of the package highlighting the nutrient content of only one or two nutrients, e.g. '50 g of whole wheat'; (v) the product belonging to a 'healthy' product line from a brand; or (vi) declarations of being free from artificial colours, flavours or preservatives. 'Promotion of special characteristics' is defined as messages that convey the product is unique or superior in some way relevant to nutrition or health. Packages were evaluated for the presence of claims referring to a premium nature, e.g. the product being organic, vegetarian, 'improved' or halal. 'Promotion of value' are characteristics involved in promoting the value of the product, including receiving increased package size for the same price (such as 25% extra or value packs), buy one get one free or half price offers, samples of a different product free with purchase, and coupons or rebates with purchase.

Analysis

We described the proportion of packs with nutrition labels, selected promotional marketing techniques and nutrition or health claims, and the mean number of each. Means are reported with standard deviations. We then compared results in countries with legislation on labelling *v.* those with voluntary regulations or no regulations. For nutrition labelling we compared: (i) the number of seven required nutrients according to CODEX Alimentarius (total energy, protein, carbohydrates, fibre, sugar, total fat, saturated fat and sodium); (ii) the total number of nutrients listed on the package; (iii) the percentage of packages in each category with nutrition labels; and (iv) the mean readability score on a scale of 1–7. For health and nutrition claims we compared: (i) nutrient content claims; (ii) nutrient comparative claims; (iii) nutrient and other function claims; and (iv) reduction of disease claims. For promotional marketing techniques we investigated four selected categories: (i) targeting children; (ii) emphasizing characteristics suggesting broad health and well-being benefits; (iii) emphasizing special characteristics; and (iv) emphasizing value. There are no standardized methods classifying marketing techniques and few countries have regulations for food marketing, so we did not make between-country comparisons of legislation and presence of packet marketing techniques. Health and nutrition claim legislation is more complex than nutrition labelling and more varied across countries. For this analysis we dichotomized health and nutrition claim legislation into either having some national legislation (categories 1 to 4 from online supplementary material: Health and nutrition claim requirements by country) or having no legislation (category 5).

We used the statistical software package IBM SPSS Statistics version 20 (2011) to conduct group comparisons using ANOVA for comparison of means when three or more categories were present and *t* tests when there were two categories. Tukey's *post hoc* test was applied to the ANOVA analysis to determine which groups were different. $P \leq 0.05$ was considered significant.

Results

General characteristics

We obtained 921 food packages from sixteen countries, 448 chip packets and 473 sweet biscuit packets. We discarded 184 duplicate packages leaving 737 packets (372 chip packets and 365 sweet biscuit packets) for analysis.

Nutrition labelling requirements

Overall nutrition labels were present on 86% of the packages. For packs with nutrition labels there was a mean of 10.1 (SD 4.4) nutrients listed including those with a value of zero. Of the seven mandatory nutrients, there was a mean of 5.2 (SD 2.4) reported. Food packets from Canada

and Brazil were found on average to have a higher number of the seven mandatory nutrients reported and packets from Iran and Pakistan had the lowest number reported. The mean readability score was 5.6 (SD 1.3) out of 7 and the readability of food labels was highest for Canada, Brazil and Sweden (Table 1).

Health and nutrition claims

Nutrition claims were far more common than health claims, with 29% of packages having at least one nutrient content claim and 1% of packages having a nutrient comparative claim. Only 2% of packages had one or more health claims. Health claims were found most frequently on packs from Brazil, Canada and Argentina and least frequently on packs from UAE and Pakistan (Table 2).

Promotional marketing techniques

Eighty-seven per cent of all packages had some form of the selected marketing techniques displayed. Promotional marketing emphasizing general health, well-being or naturalness was the most frequent type of technique used. Forty per cent of packages had marketing techniques clearly targeted at children. This was lowest in Sweden with less than 5% of packs (Table 3).

Food package regulations

Regulations on the requirement for nutrition labelling

At the time of data collection (2008–2010) placement of a nutrition label on all food packages was mandatory in Argentina, Brazil, Canada, Colombia and Malaysia. In Chile, South Africa and Sweden, nutrition labels were voluntary unless a health or nutrition claim was made on the package and in China, India, Poland, Turkey and UAE nutrition labels were voluntary except on foods with

special dietary uses, such as baby food. In Iran, Pakistan and Zimbabwe there were no regulations requiring nutrition labels on any food packages^(30–46). In Malaysia, nutrition labels were mandatory but only for specific foods⁽³⁶⁾. Analysis was conducted with and without Malaysia included in the mandatory regulation category and the results were found to not differ significantly. Countries from the two voluntary legislation groups were combined for analysis. Countries with mandatory nutrition labelling were more likely to have labels with the seven required nutrients and had a greater number of nutrients listed on labels compared with countries with voluntary and with no regulations. Unsurprisingly, countries with mandatory labelling also had a higher percentage of packages with a nutrition label compared with countries without regulations and a higher mean readability score of those labels than countries with voluntary regulations (Table 4).

Regulations on use of health claims

The types of health claim regulations are summarized for various countries in Table 5. In countries with any type of health claim regulations, food packs displayed significantly more health claims ($P=0.006$) compared with those without legislation (Table 6).

Discussion

Legislation on food labelling is known to vary worldwide. In the present study of snack food packages from sixteen low-, middle- and high-income countries, only five countries had mandatory nutrition labelling with three more requiring a nutrition label if a health or nutrition claim was present. In countries with nutrition labelling regulations

Table 1 Quality of nutrition labelling characteristics on chip and sweet biscuit packages ($n=737$), by country; EPOCH (Environmental Profile of a Community's Health) study, 2008–2010

Country	No. of seven required nutrients		Total no. of nutrients		Packages with nutrition labels	Readability score (1–7)	
	Mean	SD	Mean	SD	%	Mean	SD
India ($n=92$)	4.03	2.50	8.88	3.47	73.9	5.07	1.24
China ($n=79$)	3.99	2.47	9.32	7.73	76.0	5.37	0.94
South Africa ($n=19$)	6.05	1.35	9.00	4.54	100.0	5.26	1.10
Colombia ($n=92$)	4.61	3.12	12.91	3.23	70.7	5.84	1.04
UAE ($n=23$)	5.09	2.31	7.60	2.93	87.0	5.65	1.27
Zimbabwe ($n=23$)	5.52	2.04	9.71	3.90	91.3	5.67	1.07
Brazil ($n=20$)	6.35	0.49	9.79	2.35	100.0	6.15	0.67
Sweden ($n=44$)	5.36	2.19	7.26	2.05	90.9	6.13	0.76
Chile ($n=23$)	6.04	0.21	10.17	0.39	100.0	5.65	1.15
Iran ($n=24$)	3.42	2.28	10.39	6.93	75.0	5.22	1.40
Canada ($n=90$)	6.91	0.74	14.45	1.25	98.9	6.91	0.29
Argentina ($n=28$)	6.18	0.39	10.18	1.59	100.0	5.07	1.22
Poland ($n=49$)	6.06	1.18	7.88	2.71	100.0	5.73	1.17
Malaysia ($n=52$)	5.63	1.39	9.42	5.13	100.0	5.21	1.24
Turkey ($n=57$)	5.61	2.40	8.18	2.34	87.7	4.24	1.90
Pakistan ($n=22$)	3.64	3.14	10.33	3.31	59.9	5.23	0.60
All ($n=737$)	5.21	2.35	10.10	4.44	86.2	5.61	1.30

UAE, United Arab Emirates.

Table 2 Health and nutrition claims on chip and sweet biscuit packages (*n* 737), by country; EPOCH (Environmental Profile of a Community's Health) study, 2008–2010

Country	Nutrient content claims		Nutrient comparative claim		Nutrient/other function claims		Reduction of disease risk claims		Total claims	
	Mean or %	SD	Mean or %	SD	Mean or %	SD	Mean or %	SD	Mean or %	SD
India (<i>n</i> 92)										
No. of health claims	0.68	0.901	0.00	0.000	0.16	0.700	0.04	0.417	0.89	1.418
% of packages with claims	45.7	–	0	–	7.6	–	1.1	–	45.7	–
China (<i>n</i> 79)										
No. of health claims	0.23	0.598	0.00	0.000	0.05	0.354	0.00	0.000	0.28	0.783
% of packages with claims	13.9	–	0	–	2.5	–	0	–	15.2	–
South Africa (<i>n</i> 19)										
No. of health claims	0.16	0.501	0.00	0.000	0.00	0.000	0.00	0.000	0.16	0.501
% of packages with claims	10.5	–	0	–	0	–	0	–	10.5	–
Colombia (<i>n</i> 92)										
No. of health claims	0.27	0.786	0.02	0.147	0.02	0.209	0.00	0.000	0.32	0.838
% of packages with claims	13.0	–	2.2	–	1.1	–	0	–	15.2	–
UAE (<i>n</i> 23)										
No. of health claims	0.04	0.209	0.00	0.000	0.00	0.000	0.00	0.000	0.04	0.209
% of packages with claims	4.4	–	0	–	0	–	0	–	4.4	–
Zimbabwe (<i>n</i> 23)										
No. of health claims	0.22	0.422	0.00	0.000	0.00	0.000	0.00	0.000	0.22	0.422
% of packages with claims	21.7	–	0	–	0	–	0	–	21.7	–
Brazil (<i>n</i> 20)										
No. of health claims	0.70	0.979	0.10	0.447	0.00	0.000	0.00	0.000	0.80	1.101
% of packages with claims	50.0	–	5.0	–	0	–	0	–	50.0	–
Sweden (<i>n</i> 44)										
No. of health claims	0.11	0.321	0.07	0.452	0.00	0.000	0.00	0.000	0.18	0.540
% of packages with claims	11.4	–	2.3	–	0	–	0	–	13.6	–
Chile (<i>n</i> 23)										
No. of health claims	0.48	0.593	0.00	0.000	0.00	0.000	0.00	0.000	0.48	0.593
% of packages with claims	43.5	–	0	–	0	–	0	–	43.5	–
Iran (<i>n</i> 24)										
No. of health claims	0.38	0.770	0.00	0.000	0.00	0.000	0.00	0.000	0.38	0.770
% of packages with claims	20.8	–	0	–	0	–	0	–	20.8	–
Canada (<i>n</i> 90)										
No. of health claims	0.92	1.183	0.03	0.181	0.00	0.000	0.00	0.000	0.96	1.208
% of packages with claims	50.0	–	3.3	–	0	–	0	–	50.0	–
Argentina (<i>n</i> 28)										
No. of health claims	0.75	0.518	0.00	0.000	0.00	0.000	0.00	0.000	0.75	0.518
% of packages with claims	71.4	–	0	–	0	–	0	–	71.4	–
Poland (<i>n</i> 49)										
No. of health claims	0.35	1.110	0.00	0.000	0.08	0.571	0.00	0.000	0.429	1.225
% of packages with claims	18.4	–	0	–	2.0	–	0	–	20.4	–
Malaysia (<i>n</i> 52)										
No. of health claims	0.42	1.091	0.00	0.000	0.37	1.138	0.00	0.000	0.79	1.563
% of packages with claims	19.2	–	0	–	9.6	–	0	–	25.0	–
Turkey (<i>n</i> 57)										
No. of health claims	0.49	0.504	0.00	0.000	0.00	0.000	0.00	0.000	0.49	0.504
% of packages with claims	49.1	–	0	–	0	–	0	–	49.1	–
Pakistan (<i>n</i> 22)										
No. of health claims	0.14	0.640	0.00	0.000	0.00	0.000	0.00	0.000	0.14	0.640
% of packages with claims	4.6	–	0	–	0	–	0	–	4.6	–
All (<i>n</i> 737)										
No. of health claims	0.45	0.853	0.01	0.156	0.06	0.447	0.01	0.147	0.524	1.031
% of packages with claims	29.3	–	1.0	–	2.2	–	0.1	–	30.4	–

UAE, United Arab Emirates.

we found that there was a higher percentage of packages with a nutrition label present, a greater number of the seven required nutrients on the label and labels were designed so that they are easier to read. The presence of these characteristics is an indicator of overall quality of labelling as derived from the recommendations of CODEX Alimentarius. In our comparative study it appears that the existence of nutrition labelling regulations is associated

with improved quality of snack food package labelling. In countries with voluntary nutrition labelling legislation the total number of nutrients listed on food labels was higher compared with countries with no regulations. The presence of more nutrients displayed on a food label may not be a positive attribute as studies show that consumers often find detailed food labels confusing and prefer more simplified formats to aid comprehension⁽⁴⁷⁾.

Table 3 Marketing techniques used on chip and sweet biscuit packages (*n* 737), by country; EPOCH (Environmental Profile of a Community's Health) study, 2008–2010

Country	Children		Healthfulness		Special characteristics		Value		All categories	
	Mean or %	SD	Mean or %	SD	Mean or %	SD	Mean or %	SD	Mean or %	SD
India (<i>n</i> 92)										
No. of advertising techniques	0.61	0.679	1.28	1.261	1.14	0.639	0.23	0.422	2.11	1.444
% of packages with advertising	50.0	–	59.8	–	88.0	–	22.8	–	91.3	–
China (<i>n</i> 79)										
No. of advertising techniques	0.48	0.574	1.27	0.916	0.19	0.395	0.03	0.158	1.77	1.120
% of packages with advertising	44.3	–	78.5	–	19.0	–	2.5	–	93.7	–
South Africa (<i>n</i> 19)										
No. of advertising techniques	0.26	0.452	1.11	0.809	0.95	0.524	0.05	0.229	1.42	1.071
% of packages with advertising	26.3	–	79.0	–	84.2	–	5.3	–	94.7	–
Colombia (<i>n</i> 92)										
No. of advertising techniques	0.73	0.697	0.58	0.867	0.05	0.227	0.02	0.147	1.33	1.070
% of packages with advertising	63.0	–	38.0	–	5.4	–	2.2	–	78.3	–
UAE (<i>n</i> 23)										
No. of advertising techniques	0.22	0.423	0.74	0.915	0.65	0.885	0.00	0.000	0.96	0.976
% of packages with advertising	21.7	–	56.5	–	39.1	–	0	–	78.3	–
Zimbabwe (<i>n</i> 23)										
No. of advertising techniques	0.39	0.499	0.87	0.815	0.57	0.728	0.04	0.209	1.3	0.974
% of packages with advertising	39.1	–	65.2	–	43.5	–	4.4	–	73.9	–
Brazil (<i>n</i> 20)										
No. of advertising techniques	0.70	0.657	1.95	1.276	0.35	0.489	0.00	0.000	2.65	1.461
% of packages with advertising	60.0	–	90.0	–	35.0	–	0	–	100.0	–
Sweden (<i>n</i> 44)										
No. of advertising techniques	0.05	0.211	1.61	1.351	0.20	0.408	0.07	0.255	1.73	1.387
% of packages with advertising	4.6	–	72.7	–	20.5	–	6.8	–	77.3	–
Chile (<i>n</i> 23)										
No. of advertising techniques	0.39	0.656	1.52	1.038	0.04	0.209	0.00	0.000	1.91	1.083
% of packages with advertising	30.4	–	82.6	–	4.4	–	0	–	91.3	–
Iran (<i>n</i> 24)										
No. of advertising techniques	0.29	0.464	1.00	0.659	0.17	0.381	0.00	0.000	1.29	0.999
% of packages with advertising	29.2	–	79.2	–	16.7	–	0	–	79.2	–
Canada (<i>n</i> 90)										
No. of advertising techniques	0.19	0.447	1.77	1.551	0.31	0.630	0.01	0.105	1.97	1.525
% of packages with advertising	16.7	–	75.6	–	22.2	–	1.1	–	83.3	–
Argentina (<i>n</i> 28)										
No. of advertising techniques	1.18	1.249	1.11	0.832	0.04	0.190	0.00	0.000	2.29	1.718
% of packages with advertising	57.1	–	78.6	–	3.6	–	0	–	82.1	–
Poland (<i>n</i> 49)										
No. of advertising techniques	0.51	1.003	1.88	1.536	0.41	0.643	0.08	0.277	2.47	1.582
% of packages with advertising	28.6	–	77.6	–	32.7	–	8.2	–	93.9	–
Malaysia (<i>n</i> 52)										
No. of advertising techniques	0.65	0.738	1.29	1.160	1.17	0.474	0.04	0.194	1.98	1.393
% of packages with advertising	53.9	–	78.9	–	96.2	–	3.9	–	100	–
Turkey (<i>n</i> 57)										
No. of advertising techniques	0.96	1.210	1.46	1.324	0.70	0.499	0.4	0.186	2.46	2.196
% of packages with advertising	43.9	–	68.4	–	68.4	–	3.5	–	82.5	–
Pakistan (<i>n</i> 22)										
No. of advertising techniques	0.64	0.790	0.68	1.086	1.55	0.912	0.00	0.000	1.32	1.171
% of packages with advertising	50.0	–	40.9	–	86.4	–	0	–	95.5	–
All (<i>n</i> 737)										
No. of advertising techniques	0.53	0.769	1.28	1.238	0.51	0.682	0.05	0.224	1.86	1.459
% of packages with advertising	40.0	–	67.8	–	41.0	–	5.3	–	87.0	–

UAE, United Arab Emirates.

Some research has shown that consumers find it difficult to directly compare nutrition labels, especially when formats differ⁽⁴⁸⁾. It has been suggested that health claims for food products may help consumers make more informed decisions about packaged foods without needing to directly compare nutrient values across multiple product labels⁽⁴⁹⁾. There is also the risk that health claims may be an oversimplification or incomplete presentation of information and be misinterpreted and misguide consumers⁽⁵⁰⁾.

Research on nutrition claims and health claims similarly finds that consumers perceive overall healthiness of products with these labels⁽⁵¹⁾. A major concern for both types of claims is that they are currently only present on processed, pre-packaged products and not on whole foods⁽⁵⁰⁾.

The present study investigated chip and biscuit packages because both product types are widely available internationally and are examples of food items that should be eaten in limited quantities due to their high energy density

Table 4 Quality of nutrition labels on chip and sweet biscuit packages (*n* 737), by nutrition labelling requirement categories; EPOCH (Environmental Profile of a Community's Health) study, 2008–2010

Indicator of nutrition label quality	Mandatory (<i>n</i> 282)†		Voluntary (<i>n</i> 386)‡		No regulations (<i>n</i> 69)§		<i>P</i> value
	Mean or %	SD	Mean or %	SD	Mean or %	SD	
No. of seven required nutrients	5.81*	2.147	4.95*	2.328	4.19*	2.658	<0.001
Total no. of nutrients on package	12.16*	3.706	8.53*	4.225	10.10*	4.993	<0.001
% of packages with nutrition label	90.0*	—	85.2	—	75.4*	—	0.005
Mean readability	6.03*	1.153	5.31*	1.355	5.40*	1.107	<0.001

*Indicates a statistically significant difference between groups.

†Countries with mandatory nutrition labelling are Argentina, Brazil, Canada, Colombia and Malaysia.

‡Countries with voluntary nutrition labelling are Chile, China, India, Poland, South Africa, Sweden, Turkey and the United Arab Emirates.

§Countries with no regulations for nutrition labelling are Iran, Pakistan and Zimbabwe.

||Statistically significant difference between mandatory and voluntary and voluntary and no regulations only.

Table 5 Health claim requirements by country

1. Claims making reference to disease are specifically prohibited	2. Specified disease risk-reduction claims are permitted	3. Nutrient function and/or other function claims are permitted	4. Specific framework to permit product-specific health claims	5. No regulations specific to health claims
Colombia Malaysia Turkey	Brazil Canada China Poland Sweden	Brazil Canada China Colombia India Malaysia Poland Sweden Turkey	Sweden	Argentina Chile Iran Pakistan South Africa UAE Zimbabwe

UAE, United Arab Emirates.

Table 6 Prevalence of health and nutrition claims on chip and sweet biscuit packages (*n* 737), by health and nutrition claim requirement categories; EPOCH (Environmental Profile of a Community's Health) study, 2008–2010

Type of health or nutrition claim	No regulations (<i>n</i> 162)†		Regulations (<i>n</i> 575)‡		<i>P</i> value
	Mean or %	SD	Mean or %	SD	
Nutrient content claims					
No. of claims	0.33	0.588	0.48	0.912	0.046
% of packages with claims	27.2	—	29.9	—	
Nutrient comparative claims					
No. of claims	0.00	0.000	0.02	0.176	0.210
% of packages with claims	0.0	—	1.2	—	
Total of all nutrient claims					
No. of claims	0.33	0.588	0.50	0.935	0.347
% of packages with claims	27.2	—	31.1	—	
Nutrient and other function claims					
No. of claims	0.00	0.000	0.08	0.505	0.054
% of packages with claims	0.0	—	2.8	—	
Reduction of disease risk claims					
No. of claims	0.00	0.000	0.01	0.167	0.596
% of packages with claims	0.0	—	0.2	—	
Total of all health claims					
No. of claims	0.00	0.000	0.08	0.569	0.596
% of packages with claims	0.0	—	2.82	—	
Total of nutrient and health claims					
No. of claims	0.33	0.588	0.58	1.119	0.006
% of packages with claims	27.2	—	31.3	—	

†Countries without regulations for health claims are Argentina, Chile, Iran, Pakistan, South Africa, United Arab Emirates and Zimbabwe.

‡Countries with regulations for health claims are Brazil, Canada, China, Colombia, India, Malaysia, Poland, Sweden and Turkey.

and low nutrient content. Given the focus on unhealthy snack foods it was surprising to find that so many of the packages examined had health and nutrition claims.

We found the highest occurrence of health and nutrition claims to be on packages from countries with health claim regulations, mostly high- and middle-income countries.

There could be many explanations including higher-income countries in the present study also having higher literacy and health literacy rates (as found by cross-referencing World Bank country data on income levels and literacy^(52–56)) which food companies respond to with more product labelling and health claims.

More research on the accuracy of health claims is necessary to enable greater comparison of health claim regulations between countries. This would require an in-depth audit and analysis of the nutrient content of foods with claims, concurrent examination of the relevant health literature that the claim draws on and identification of the use of deceptive and non-scientifically justified terms (e.g. 'lower in fat'). This later issue echoes previous debates in the tobacco labelling literature on use of deceptive terms such as 'low tar'⁽⁵⁶⁾. In addition, the effects of national policy on health claims needs to be more clearly investigated. In a study of food labelling in the USA after the Nutrition Labeling and Education Act (NLEA) was enforced, there was an initial decrease in the overall number of claims but a subsequent increase and a redistribution of claims across different food categories, as well as alterations in the wording of claims to make them more factual⁽⁵⁷⁾. Policies may also need to consider standardization of health claims. With the exception of countries in which all health and nutrition claims are banned, the voluntary use or unstandardized regulation of health claims may allow two products that are equivalent in terms of nutrients and health benefits to have different health claims. Larger companies are also more likely to be able to afford the process of having a health claim approved while smaller companies with similar products may not.

In contrast to nutrition labelling, most countries have little or no regulation of food marketing techniques and most policies involve voluntary codes⁽⁵⁸⁾. It is concerning for public health professionals that the present study found the use of 'on-package' promotional marketing techniques was prevalent on chip and biscuit packages from all sixteen countries (on 87% of all packages), with the most frequent techniques misleadingly promoting broad concepts of health and well-being or attempting to make the product appealing to children. It was not possible to analyse the effect of legislation on marketing and it is not possible to extrapolate the potential impact that more effective mandatory or voluntary restrictions may have on marketing claims or consumption of snack foods. However, it is probably not coincidental that the lack of regulations results in study findings such as these.

The nature of the research question inevitably meant that the present study had a number of methodological limitations. We set out to compare food packets from multiple rural and urban communities in sixteen countries at all levels of economic development (including diverse countries such as India and China). Given the scope we were unable to devise a sampling technique for food packets that could provide either a comprehensive

national sample or a truly random selection of all chip and biscuit packages available in each country. However, we obtained a large sample of 737 packages from sixteen countries that we assumed would reduce specific biases in the sample collection. The worldwide range of study countries from all levels of economic development also precluded us from directly comparing similar or 'standard' food types as varieties of chips and biscuits vary by country even if produced by the same food multinational. A limiting factor was the lack of standard regulations for either food labelling or nutrition and health claims. This meant we could only conduct high-level comparative analyses between countries. We could have improved the analysis of health and nutrition claims by assessing the accuracy of the health claims made (as discussed earlier) but this was beyond the scope of this initial study. Another limitation was that only one investigator assessed the packages and therefore inter-rater reliability has not been assessed. We also did not study consumer behaviour in relation to buying the snack food items studied and the study does not allow for conclusions regarding effects of regulations. While our assessment of the selected marketing features of probable influence on health is based on a review of the literature, reverse causation that greater use of claims actually leads to more regulations is also possible.

Despite the methodological challenges the present study is the first worldwide one to compare the effect of regulations on food labelling and marketing techniques on snack packets between countries at all levels of economic development. It clearly shows that mandatory nutrition labelling is associated with the quality of food product labelling, both in terms of label content and readability. In contrast, the study found a worryingly high prevalence in all countries of marketing techniques directed at children and promoting misleading perceptions of health and well-being on processed snack foods that are generally considered unhealthy. Food marketing is largely 'self-regulated' by the industry, highlighting a need for further research into the effects of such 'on-package' marketing techniques on consumer perception and food consumption. Such continued research is important to influence future development of policies on food marketing and health claims, including introduction of statutory regulatory approaches and more effective voluntary approaches such as disincentives for non-participation and sanctions for non-compliance⁽⁵⁹⁾.

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Supplementary material

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