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Comparison of Reported Serving Sizes of Packaged Foods in Costa Rica with National Guidelines

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Abstract

Introduction: Overweight and obesity is growing drastically worldwide, with increasing portion sizes of processed food identified as one of the contributing factors. To date there has been no research looking at the reported serving sizes of Costa Rican processed foods. The aim of this study was to compare the reported serving sizes on nutritional labels of packaged food products available in Costa Rica with the recommendations established in the Central American Regulation.

Materials and methods: Information on reported serving sizes (g) was obtained from the nutrition label of "processed food" packages using established methodology. Fifteen food categories were included. Means (g) and medians (g) were calculated. Homogeneity of variances (Levine's test $p<0.05$) and Welch ANOVA test were used for comparison of means and Brown-Forsythe's test for medians of unequal variances. Comparisons between groups were made by the coefficient of variation value. A p value of <0.05 was deemed statistically significant.

Results: Data were collected for 2600 products, of which 17% didn't provide nutritional information. A huge variability ($p<0.05$) in reported serving sizes was seen in most food categories. Also, in 11 out of 15 categories, products reported smaller serving sizes than the national recommendation.

Conclusions: The variability in reported serving sizes in processed food may lead to consumer confusion in understanding nutritional labeling. Furthermore, serving size recommendations in Costa Rica should be reviewed and monitored on an ongoing basis. These results serve as a baseline for government to establish the recommendations for nutritional labeling more appropriate to the reality of the shopping environment and less confusing to consumers.

Keywords: Serving size, Processed food, Central American Regulation, Obesity, Codex Alimentarius

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Introduction

The prevalence of overweight and obesity is increasing drastically worldwide, including in the Americas [1]. Globally, diets are changing significantly with a marked reduction in consumption of unprocessed and home prepared foods that are sources of essential fatty acids, antioxidants, vitamins, minerals and proteins and increases in intakes of processed foods that are high in refined carbohydrates, saturated fat and salt [2, 3]. This "obesogenic" environment that includes among other things increasing portion sizes, cheap prices and advertising of low nutritional quality food, is one of the main factors contributing to the current obesity pandemic [4-6].

Nutrition labeling is one of the main strategies used in public health policies to promote healthy eating and consumer awareness of what is in the foods that they are eating [7]. Previous research indicates that 67.8% of Costa Ricans adults report reading food labels [8], and that this practice is correlated with improved dietary patterns [9]. However, despite consumers indicating that nutritional information is very important for making healthier decisions when shopping for food, several studies reveal that most consumers find it difficult to understand and interpret food labels, particularly in estimating portion size [10-12]. As rates of obesity and diet-related chronic disease have continued to rise, some researchers propose that portion sizes should be standardized to make it easier for consumers to make healthy food choices [13].

Codex Alimentarius, led by Food Agriculture Organization and World Health Organization (FAO/WHO), is the global reference point for consumers, food producers and processors, national food control agencies and the international food trade in relation to food labeling standards,. While Codex recommendations are for voluntary application by its members, their standards serve as a basis for legislation in many countries, including those in The Americas. In 1997 the government of Costa Rica published the regulation RTCR 100: 1997 "Prepackaged food labeling" which was the homologated version of the Codex standards for prepackaged food labeling [14]. This document was updated in 2010 with the help of experts from Guatemala, El Salvador, Nicaragua and Honduras in order to apply the regulation in all Central American countries. As a result the document RTCA 67.04.60:10 "Nutritional labeling for prepackaged food for human consumption" was published [15, 16]. However, the regulation is still in its transition period until January 2015, allowing time for the beverage industry to adjust their policies and processes to the new labeling standards.

In Central America, the regulation established a non-mandatory "portion size guide" based on the United States recommendations, due to the lack of regional information available. However, to date there has been no research in this region examining whether packaged foods adhere to these guidelines. The aim of this study was to compare the reported serving sizes on nutritional labels of packaged food products available in Costa Rica with the recommendations established in the Central American Regulation for Nutritional Labeling of pre-packed foods.

Materials and Methods

This study comprised a systematic survey of Costa Rican processed foods, with the exception of minimally processed food (as they are not main sources of sugar, sodium or saturated fat) and alcoholic beverages. Data collection was done over a four month period (May - August 2013) in one of the most visited supermarket chain in Costa Rica.

Data collection

Information on reported serving sizes was obtained from the nutrition label of all "processed food" packages (refers to foods that have been altered from their natural state either for safety reasons or for convenience) [17], sold in the most visited supermarket in Costa Rica. Smartphone technology developed by The George Institute for Global Health was used to collect data, in line with the established methodology of the Global Food Monitoring Group [17]. This methodology includes: 1) Taking photographs of products labels; 2) Entering into The Food Monitoring Group's online content management system;

3) Checking the data entry process by selecting a random sample of entries and comparing the database information against the original source (product photographs); 4) Food categorization.

Food categorization

The food categories used in this study were based on the review of the applicable scientific literature [18 - 21] and on the categorization system developed by the Global Food Monitoring Group [22, 23]. Out of 17 food categories defined by the Global protocol, 15 were included in this study that were known to provide high levels of saturated fat, sugar, salt and energy intakes in Costa Rica (Table 1) [24 - 27].

Table.1 Reported serving sizes (g) of processed food by food category

Food category	N	Mean (g)	Variance	SD	Coefficient of variation (CV)	Minimum (g)	Maximum (g)	Median (g)
Biscuits	214	27.5	129.5	11.4	0.4	3.0	100.0	27.0
Breads	58	42.8	598.0	24.5	0.6	7.0	125.0	40.9
Breakfast cereals	104	35.4	258.9	16.1	0.5	22.0	100.0	30.0
Cheese	114	37.5	1424.8	37.7	1.0	5.0	320.0	30.0
Cream and sour cream	20	30.5	325.7	18.0	0.6	4.0	100.0	30.0
Edible fats	42	14.6	16.2	4.0	0.3	12.0	32.0	14.0
Meat and meat products	106	72.3	1301.2	36.1	0.5	15.0	300.0	75.0
Milks	57	167.9	9565.6	97.8	0.6	23.0	263.0	257.5
Pasta and noodles	27	111.6	7703.6	87.8	0.8	30.0	340.0	100.0
Pastries	98	53.6	3355.8	57.9	1.1	1.0	550.0	43.0
Snacks	189	29.1	271.5	16.5	0.6	10.0	100.0	28.0
Sodas	64	277.9	5097.8	71.399	0.3	237.0	624.0	255.0
Soups	93	104.6	7352.2	85.7	1.2	6.0	270.0	65.0
Sugary drinks	586	194.1	21204.3	145.6	0.8	1.0	1000.0	247.2
Yogurts	122	173.2	8899.4	94.3	0.5	50.0	773.0	150.0

Data analysis

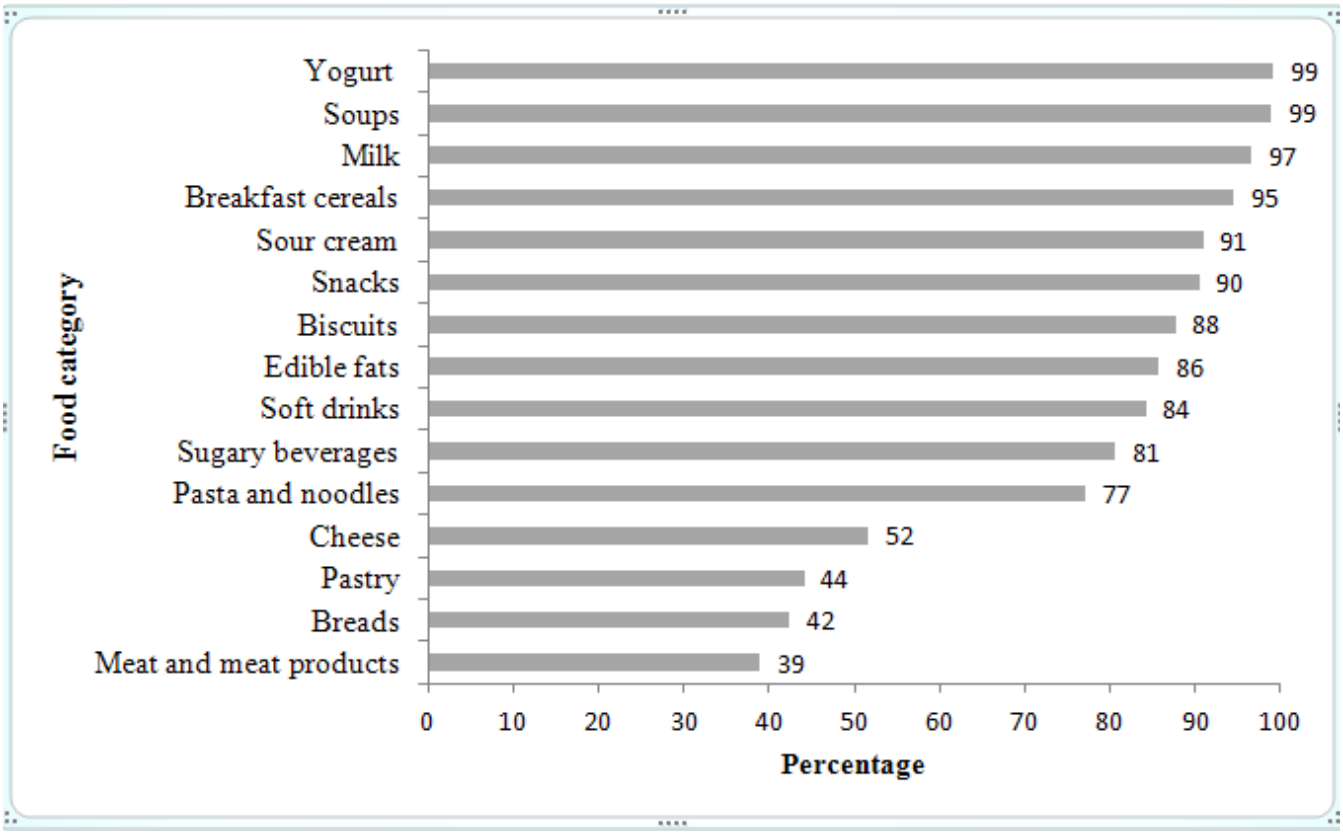
The reported serving size of all products in grams was used for analysis. For food categories like yogurt, milk, sodas and sugary drinks, a density factor was applied to convert values in milliliters to grams [28]. The mean (g) and median (g) serving size were calculated for each food category and presented alongside the minimum, the maximum and the Central American recommendations for nutritional labeling [29]. We tested homogeneity of variances by using Levine's test to obtain a single p-value that indicated the presence ($p<0.05$) or absence ($p>0.05$) of variability in portion sizes across food categories. Due to the variance observed, we used the Welch ANOVA test for comparison for means and Brown-Forsythe's test for medians. Additional, comparisons between groups were made

by the coefficient of variation value. All statistical analyses were performed using SPSS version 20. A p value of <0.05 was deemed statistically significant.

Results

Data were collected for 2600 products, with 442 (17%) not providing nutritional information. This left 1894 (73%) products to be used for analysis. Figure 1 shows the portion of products displaying nutritional information by food category.

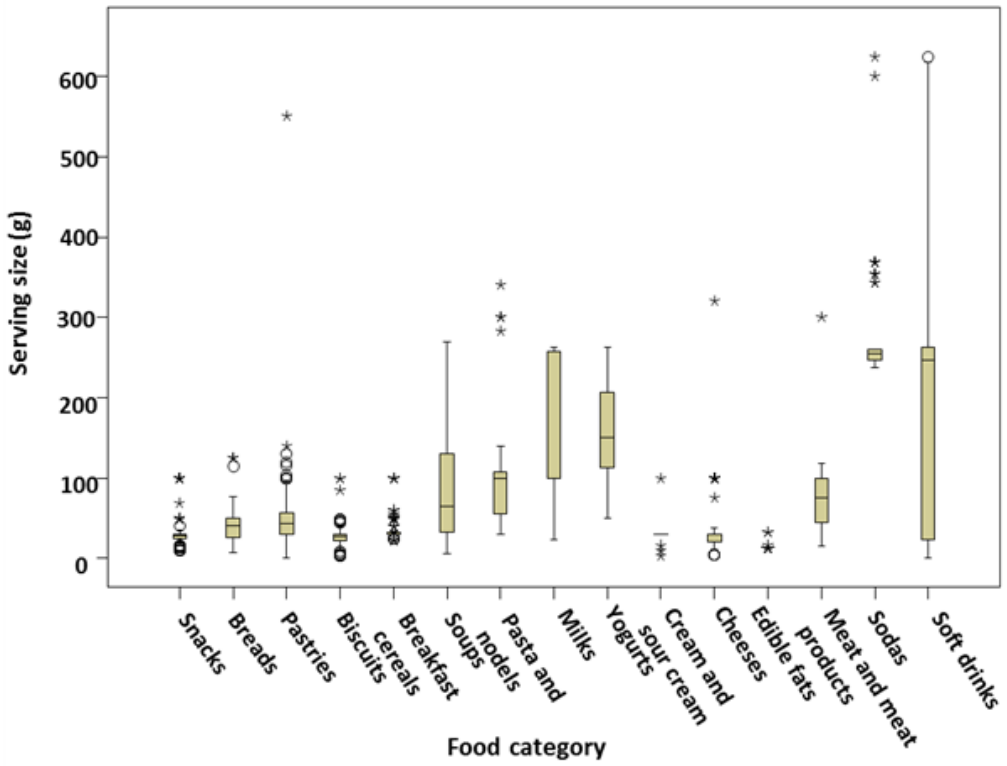
Figure 1: Proportion of products displaying nutritional information by food category



Sugary drinks was the category with the largest number of products (Table 1) followed by biscuits, snacks, yogurt, cheese, and meats and meat products. Mean and median serving size values were similar in nine of the 15 categories, however larger differences were seen in milks, soups, pasta and noodles, sodas, yogurts and pastries.

Levine's test in means ($p<0.05$) and Brown-Forsythe's test in medians ($p<0.05$) revealed a large variability in serving sizes within food groups. There were also some food categories in which serving sizes did not vary greatly (e.g. edible fats and sodas CV = 0.3) and categories in which reported serving sizes varied significally from one product to another (e.g. soups CV = 1.2; pastries CV = 1.1 and cheeses CV = 1.0). Results also showed a wide range of reported serving sizes within specific food categories (Figure 2), especially in sugary dinks, yogurts, pastries, and sodas.

Figure 2: Variability of reported serving sizes by food category



Footnote: Crosses and circles represent outliers

Table 2: Comparison of reported serving sizes with Costa Rican recommendations by food category

Food category	N	Mean (g)	SD	Recommended portion size (g)	Products meeting recommendations (%)	Products above recommendations (%)	Products below recommendations (%)
Biscuits	214	27	11.4	30	13	23	64
Breads	58	43	24.5	50	20	20	60
Breakfast cereals	104	35	16.1	55	1	7	92
Cheeses	114	37	37.7	30	33	18	49
Cream and sour cream	20	30	18.0	30	80	5	15
Edible fats	42	15	4.0	14	67	7	26
Meat and meat products	106	72	36.1	55	5	65	30
Milks	57	168	97.8	258	0	4	96
Pasta and noodles	27	112	87.8	146.3	0	15	85
Pastries	98	54	57.9	55	5	26	69
Snacks	189	29	16.5	30	15	15	70
Sodas	64	278	71.4	287.7	0	17	83
Soups	93	105	85.7	250	4	0	96
Sugary drinks	586	194	145.6	260.7	0	66	34
Yogurts	122	173	94.3	232	0	18	82

Table 2 shows the recommended serving sizes in the Central American regulation (26) and the percentage of products per category that were below, above or met the recommendations. Sour cream and edible fats were the categories with the most products meeting the recommendations. In most categories (11 out of 15), products reported smaller serving sizes than the recommendation, with the exception of meat and meat products and soft drinks.

Discussion

The key finding from this study is the large range of reported serving sizes available for consumers to purchase in Costa Rica, even within specific food categories. Although in some food categories this difference was likely due to the different product types included (e.g. powdered and liquid forms of milk or sugary drinks), in others, this highlights the potential for the current food environment in Costa Rica to cause confusion or even mislead consumers as to the amount of energy (and other nutrients) they are actually consuming. In the absence of standardized serving size information being displayed on all food products, consumers are left to decide on an appropriate amount of food to consume using existing information on the product label [7] but it is well known that many consumers cannot correctly calculate nutrient amounts in food products by multiplying this amounts by the number of servings per container [30]. Additionally, national research has shown that few consumers in Costa Rica use nutritional labeling because they find it complicated, [31] and a review of research on nutrition labels in the United States, Canada, and Northern Europe found that although consumers could understand some of the nutrient information, they reported finding nutrition labeling confusing, especially the use of numerical information [32]. With the wide variability of serving sizes available, consumers are often confused about what constitutes a “normal” portion size [33].

We found that although a small number of categories such as “edible fats” and “sour cream” had relatively standard reported serving sizes that were similar to the Costa Rican recommendations, most categories reported serving sizes below the recommendations. In addition, we found that even though all products had labels, 17% of products did not display nutrition information on-pack (nutritional information panel or “NIP”), which in itself is a concerning finding, and shows the problem with Costa Rica’s lack of mandatory NIP or nutritional labeling (unless producers make some nutritional claim such as: light, low fat, high fiber, etc.), despite Codex Alimentarius (on which Central American’s regulation is based) establishing it as a mandatory requirement [34]. Nevertheless, the presence of nutritional information in processed food has been improving in Costa Rica over the past 10 years. In 2002, just 58% of products reported nutritional information in their labels [35], showing an approximately 25%increase in the proportion of products displaying nutrition information by 2013. The proportion improved in all food categories, with the “meat and meat product” category still having the lowest proportion of products with nutritional information reported [35].

Another complexity in the standardization of serving sizes is that even within the Americas there exists variation in recommendations at a national level. For example, for “yogurts” Canada recommends a serving size of 175g [29], US 170g [36] and Costa Rican’s national standards recommend 232g [29]. Our results show that in eleven of 15 food categories most products reported smaller serving sizes than the national recommendations, especially in “milk”, “soups”, “breakfast cereals” and “yogurt”, possibly reflecting smaller reported consumption patterns in Costa Rica, which have been seen in national dietary surveys [24, 25]. Of concern, however, is that “sodas” and “meats and meats products” had larger reported serving sizes than the national recommendations. Although again this is consistent with findings from national dietary surveys that the population tends to eat larger portions of these foods [13]. Interestingly, we observed that “sugary drinks” was the category with the highest number of products available for consumers to purchase, supporting previous research that has shown that Costa Ricans regularly consume sugar-sweetened beverages with their meals [37]. This also is an important finding as the rate of increase in consumption of sugary drinks and sodas is faster in low-middle income countries such as

Costa Rica, and is increasing at a much higher rate than in high-income countries [38].

Limitations

Nutrition information provided by industry was used, so there is no guarantee that the information was accurate; some companies undertake laboratory analysis and some estimate the nutritional composition of their products using food composition tables. A key limitation of this research was that in Costa Rica the nutrient declaration (nutrition label) is not mandatory for all processed food, only for products that display health claims; and it can also be declared per 100 grams or/and per serve, which limited our sample used in the analysis. However, this is the most comprehensive and up to date available information on packaged foods in Costa Rica and provides a snapshot of the current reporting of serving sizes in the country.

Conclusions

Nutrition labels are only one of many approaches that will be required to address overweight and obesity at a population level in Costa Rica. However, for the effectiveness of this approach, consumers must be able to easily identify and understand information presented on the package. This study provides a situational analysis of serving sizes reported by manufacturers on pre-packaged foods available in Costa Rica. Serving size recommendations in Costa Rica should be reviewed and monitored on an ongoing basis. These data can serve as a baseline for government to establish the recommendations for nutritional labeling more appropriate to the shopping environment in the region and less confusing to consumers.

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References

1. Alwan A (2011) Global status report on noncommunicable diseases 2010.Switzerland: World Health Organization.
2. Prentice A (2014). Nutrition and chronic disease: lessons from the developing and developed world. *Nestle Nutritional Institute Workshop Series* 78: 155-60.
3. Singh R, Takahashi T, Nakaoka T, Otsuka K, Toda E et al (2013). Nutrition in Transition from Homo sapiens to Homo economicus. *The Open Nutraceuticals Journal* 6: 6-17.
4. Wansink B (2004). Environmental factors that increase the food intake and consumption volume of unknowing consumers. *Annual Revew of Nutrition* 24: 455-79.
5. French S, Story M andJeffery R (2001). Environmental influences on eating and physical activity. *Annual Review of Public Health* 22 :309-35.
6. Osei-Assibey G, Dick S, Macdiarmid J, Semple S, Reilly J et al (2012). The influence of the food environment on overweight and obesity in young children: a systematic review. *British Medical Journal Open* 2(6): 1-12.
7. McCann M, Wallace J, Robson P, Rennie K, McCaffrey T et al (2013). Influence of nutrition labelling on food portion size consumption. *Appetite* 65:153-8.
8. Barrantes J and Jiménez A (2005). Conocimientos y prácticas de compra de los consumidores adultos del Área Metropolitana de San José, sobre el etiquetado nutricional de alimentos modificados en grasa, colesterol, energía y sodio. Unpublish bachelor's degree dissertation, Costa Rica: University of Costa Rica.
9. Ollberding N, Wolf R and Contento I (2010). Food label use and its relation to dietary intake among US adults. *Journal of the American Dietetic Association* 110(8): 1233-7.
10. Grunert K, Wills J and Fernández L (2010). Nutrition knowledge, and use and understanding of nutrition information on food labels among consumers in the UK. *Appetite* 55(2): 177-89.

11. Vermeer W, Steenhuis I, Leeuwis F, Bos A, Boer M et al (2010). Portion size labeling and intended soft drink consumption: the impact of labeling format and size portfolio. *Journal of Nutrition Education and Behavior* 42(6): 422-6.
12. Pelletier A, Chang W, Delzell J and McCall J (2004). Patients' understanding and use of snack food package nutrition labels. *The Journal of the American Board of Family Practice* 17(5): 319-23.
13. Nielsen S and Jopkin B (2003). Patterns and Trends in Food Portion Sizes, 1977-1998. *Journal of the Amercian Medical Association* 289(4): 450-3.
14. Ministry of Economy and Trade (1997). *Etiquetado de alimentos preenvasados*. [Online] Costa Rica. Available at: http://costarica.eregulations.org/media/ley%2026012%20etiquetas%20procesados.pdf [Accessed 4 July 2014].
15. Ministry of Economy and Trade (2011). *Reglamento Técnico Centroamericano: Etiquetado General de los alimentos previamente envasados (preenvasados).* [Online] Costa Rica. Available at: http://meic.go.cr/reglatec/consulta/etiquetadopreenvasados2011-670102.pdf. [Accessed 4 July 2014].
16. Ministry of Economy and Trade (2012) *Reglamento Técnico Centroamericano: Etiquetado Nutricional de productos alimenticios preenvasados para consumo humano para la población a partir de 3 años de edad.* [Online] Costa Rica. Available at: http://usam.salud.gob.sv/archivos/pdf/reglamentos/ANEXO_RES_281_RTCA_Etiquetado_Nutricional.pdf. [Accessed 4 July 2014]
17. Dunford E, Webster J, Blanco A, Czernichow S, Ni Mhurchu C et al. (2012). International collaborative project to compare and monitor the nutritional composition of processed foods. *European Journal of Preventive Cardiology* 19(6):1326-32.
18. Nilson E, Jaime P and Resende O (2012). Initiatives developed in Brazil to reduce sodium content of processed foods. *Pan Amenrican Journa of Public Health* 32(4): 287-92.
19. Combris P, Goglia R, Henini M, Soler LG and Spiteri M (2011). Improvement of the nutritional quality of foods as a public health tool. *Public Health* 125(10): 717-24.
20. Hendriksen M, Hoogenveen R, Hoekstra J, Geleijnse J, Boshuizen H et al (2014). Potential effect of salt reduction in processed foods on health. *The American Journal of Clinical Nutrition* 99(3): 446-53.
21. Monteiro C, Levy R, Claro R, Castro I and Cannon G (2010). A new classification of foods based on the extent and purpose of their processing. *Cadernos de Saúde Pública* 26(11): 2039-49.
22. Food Monitoring Group (2013). Progress with a global branded food composition database. *Food Chementry* 140(3): 451-7.
23. Dunford E, Webster J and Neal B (2001). *Tools and templates for the Global Food Monitoring Group*. [Online] The George Institute for Global Health. Available at: http://www.georgeinstitute.org/sites/default/files/documents/instructions-for-manual-data-collection-for-global-branded-food-composition-database-fmg-2030108.doc. [Accessed 3 July 2014].
24. National Institute of Statistics and census (2001a). *Encuesta de Hogares de propósitos múltiples.* [Online] Ministry of Health. Available at: http://www.inec.go.cr/anda4/index.php/catalog/104 [Accessed 3 July 2014].
25. National Institute of Statistics and census (2001b). *Encuesta Nacional de Consumo de Alimentos.* [Online] Ministry of Health Available at: http://www.binasss.sa.cr/enconali.pdf [Accessed 3 July 2014].
26. National Institute of Statistics and census (2010). *Encuesta de Hogares de propósitos múltiples.* [Online] Ministry of Health. Available at:

http://www.inec.go.cr/enaho/result/ingHogares.aspx [Accessed 3 July 2014].

27. National Institute of Statistics and census (2011). Resultados Generales de la Población y Vivienda de la Población. [Online]. INEC. Available from: http://www.inec.go.cr/Web/Home/GeneradorPagina.aspx. [Accessed 4 July 2014].
28. Agricultural Research Service (2013) *National Nutrient Database for Standard Reference* [Online]. United States Department of Agriculture. Available at: ndb.nal.usda.gov/ndb/search/list. [Accessed 4 July 2014].
29. Ministry of Health (2012) *Regulations Amending the Food and Drug Regulations: Nutrition Labelling, Nutrient Content Claims and Health Claims.* [Online] Canada Gazette II part, vol 37 n° 1. Available at: http://publications.gc.ca/gazette/archives/p2/2003/2003-01-01/pdf/g2-13701.pdf. [Accessed 1 July 2014].
30. Vanderlee L, Goodman S, Sae Yang W and Hammond D (2012). Consumer understanding of calorie amounts and serving size: implications for nutritional labelling. *Canadian Journal of Public Health* 103(5): e327-31.
31. Pacheco M and Primus D (2013).*Conocimientos en etiquetado nutricional de alimentos procesados, con énfasis en sodio, en adultos de clase media residentes de San José.* Unpublised Bachelor´s degree dissertation, Costa Rica: Universidad Autónoma de Ciencias Médicas.
32. Cowburn G and Stockley L (2005). Consumer understanding and use of nutrition labelling: a systematic review. *Public Health Nutrition* 8(1): 21-8.
33. Vermeer W, Steenhuis I and Seidell J (2010). Portion size: a qualitative study of consumers' attitudes toward point-of-purchase interventions aimed at portion size. *Health Education Research* 25(1): 109-20.
34. Codex Alimentarius (2013). *Guidelines on nutrition labelling*. [Online] World Health Organization. Available at: file:///C:/Users/kheredia/Downloads/CXG_002e%20(1).pdf. [Accessed 1 July 2014].
35. Blanco A, Roselló M and Núñez H (2011) Situación basal de la información nutricional declarada en las etiquetas de los alimentos comercializados en Costa Rica. *Archivos Latinoamericanos de Nutrición* 61(1): 87-95.
36. Food and Drugs Administration (2014). Food Labeling: Serving Sizes of Foods That Can Reasonably Be Consumed at One-Eating Occasion; Dual-Column Labeling; Updating, Modifying, and Establishing Certain Reference Amounts Customarily Consumed; Serving Size for Breath Mints; and Technical Amendments. [Online] United States, Federal Register. Available at: https://www.federalregister.gov/articles/2014/03/03/2014-04385/food-labeling-serving-sizes-of-foods-that-can-reasonably-be-consumed-at-one-eating-occasion. [Accessed 1 July 2014].
37. Rhee J, Mattei J and Campos H (2012). Association between commercial and traditional sugar-sweetened beverages and measures of adiposity in Costa Rica. *Public Health Nutrition*. 15(8): 1347-54.
38. Stuckler D, McKee M, Ebrahim S and Basu S (2012). Manufacturing epidemics: the role of global producers in increased consumption of unhealthy commodities including processed foods, alcohol, and tobacco. *PLOS Medicine* 9(6): e1001235.