Scalzo Food Industries
Division of Scalzo Trading Co Pty Ltd
ABN 52 005 318 810

RESPONSE TO CONSULTATION PAPER (25-14) - Labelling Review
Recommendation17: Per serving declarations in the nutrition information panel.

Submission Paper

Scalzo Food Industries – Response to Consultation paper (25-14)

February 27, 2015

Contact Details:
Name: [redacted]
Position: National Quality Manager
Address: 156-174 Kensington Road West Melbourne, Vic 3003
Telephone: [redacted]
Fax: ([redacted]
Email: c[redacted]

Submission Authorised by: [redacted] – National Quality Manager

Consultation Paper *(25-14) – Labelling Review Recommendation17: Per serving declarations in the nutrition information panel.*

Prepared by:
[redacted] (Senior Retail Technologist);
[redacted] (National Quality Manager);
[redacted] (Innovation and Development Manager).

Introduction:

Scalzo Food Industries is an Australian family owned company dedicated to delivering food solutions to delight our customers while creating value for all stakeholders.

Our head office is situated in Melbourne, our manufacturing facilities are located in Campbellfield and at our head office (Kensington), we also have sites at Bayles which is south-east of Melbourne and operations in Auckland. Our flagship distribution centre is located in Altona, Melbourne where most of our products are stored and distributed from. On average we send out approximately 1,000,000 cases of product per month and receive approximately 200 - 20 foot equivalent containers per month. Further sales offices and warehouses are located in Sydney, Brisbane, Perth and Auckland, allowing us close proximity to all major food companies throughout Australia and New Zealand.

Our ingredients are sourced both locally and from around the globe. Included in our ingredient portfolio are nuts, vegetables, fruit, seeds, grains, snacks, starches and dehydrated meats. Through our manufacturing facilities we value add and customise these ingredients by roasting, blending and packing; suitable for further processing or retail ready products. Our own retail brands, Freshlife and Nutters are manufactured and packed in these facilities; we also supply Private Label brands to the major retailers.

Given our extensive range of products that we supply into retail packs and the standards that we are required to comply with we believe that our knowledge and expertise will assist Food Standards Australia in the decision making process for this consultation paper.

Please refer to our answers and comments below.

Questions for Submitters:

Question 1: How do you or your organisation use per serving information in the nutrition information panel on food labels?

Scalzo Food Industries uses the per serving information in the nutrition information panel on food labels to ensure the following:

1. Compliance to the Food Standards Code when making nutrient or health claims.
2. Calculating the percentage whole grain daily target per serve.
3. Calculating the percentage dietary intake (DI) and recommended dietary intake (RDI) per serve.
4. VITAL - the per serve information is used to set the action levels for on pack allergen labelling.
5. To facilitate easy comparison between like products.
6. Allows us to compare portion size against the Industry.

Question 2: Are there any particular food categories or types of food packages (e.g. single serve packages) for which per serving information is particularly useful? If so, what are they? Explain why the information is useful.

Food categories: Scalzo Food Industries supplies products from all food categories, this includes but is not limited to nuts, dried fruits, snacking products, cereals and functional ingredients.

Food packages: Multi packs, single serve items, portion control, shared packs and value packs.

The per serving information is useful for the following reasons:

1. It allows consumers to make informed decisions regarding portion control for management for nutrient, vitamins and minerals intake (weight management and dietary requirements).
2. The per serve reflects the actual nutrients consumed, for example if the serving size is less than or more than 100 grams.
3. Information is readily available for the consumer in reference to the amount of servings per pack and serving size.
4. To facilitate easy comparison between like products.
5. Allows us to compare portion size against the Industry.
6. Compliance to the Food Standards Code when making nutrient or health claims.
7. Calculating the percentage whole grain daily target per serve.
8. Calculating the percentage dietary intake (DI) and recommended dietary intake (RDI) per serve.
9. VITAL - the per serve information is used to set the action levels for on pack allergen labelling.

Question 3: The Labelling Review recommendation suggests that per serving information be voluntary *unless a daily intake claim is made*.

Do you support this approach? That is, do you think declaration of per serving information in the nutrition information panel should be mandatory if a daily intake claim is made (e.g. %DI or %RDI)? Give reasons for your answer.

Scalzo Food Industries does not support this approach. We firmly believe that the approach should be that the per serve information should form part of the nutritional panel regardless of whether there is a claim being made in relation to %DI or %RDI.

It is important to ensure conformity and uniformity across all labels and food categories. Should the approach be adopted we believe that this level of flexibility will be reduced and add confusion and complexity for the consumer. As stated previously the per serving information is used widely for weight management, allergen management and conformance to the Food Standards Code in relation to the vitamins and minerals claims (Reference 1.2.7) to name a few.

Further to the above, it is well known fact that obesity is a growing public health problem, with rates continuously increasing. Excess energy intake is the main driver behind this epidemic. Stating the serving size on the label aims to address the issue of potential "portion distortion" (Vanderlee *et al*, 2012).

Question 4: As noted in Section 4, there is currently variation in the format of NIPs on food labels because of voluntary permissions for the use of %DI labelling and the option to include a third column for foods intended to be prepared or consumed with at least one other food. If per serving information in the NIP was voluntary this would result in more variability in the format of NIPs across the food supply. Do you think this would be a problem? Why/why not?

Scalzo Food Industries believes that this would be an issue for the following reasons:

1. Consumers are unable to make informed decisions.
2. Lack of information for the consumer.
3. Unable to compare between like products.
4. This variability will undoubtedly lead to confusion and complexity for the consumer.
5. Without a mandatory approach to food labelling it allows the Food Industry to be scrutinised for the lack of uniformity and familiarity across the food supply.

Question 5: If per serving information in the nutrition information panel was voluntary, do you think the inclusion of per serving information in the nutrition information panel should be mandatory when a nutrition content claim about vitamins, minerals, protein, omega-3-fatty acids or dietary fibre is made? Give reasons for your answer.

Scalzo Food Industries believes that per serving information should be mandatory when a nutrient claim is made for the following reasons:

1. Need to include the %RDI in the nutritional panel which is based on per serve for vitamins and minerals.
2. Provides the quantity of vitamins and minerals per serve.
3. Provides the quantity of nutrients per serve.

Question 6: If per serving information in the nutrition information panel was voluntary, do you think the inclusion of per serving information in the NIP should be mandatory in any other specific regulatory situations? Explain your answer

Scalzo Food Industries believes that information in the NIP should be mandatory in other specific regulatory situations as it is a requirement of the Food Standards Code example below.

Special Foods (Formulated Supplementary Foods and Supplementary Foods) – requirements are based on a per serving (Standard 2.9.3).

Question 7: What additional studies examine consumer use and understanding of per serving information in the nutrition information panel on food labels? Please provide a copy of studies where possible.

The below studies examine consumer use and understanding of per serving information in the nutritional information panel on food labels. Please refer to the 3 attachments.

Spanos S, Kenda S.A, Vartanian R.L (2015) Can serving size labels reduce the portion size effect? Eating Behaviours16 (2015) 40 – 42. **Attachment 1**

Usmanova N, Thor E (2003) Communicating Nutritional Information to the Global Consumer: Adapting to Shifting Consumer Attitudes Toward Nutrition, International Food and Agribusiness Management Review Vol 6 Issue 2. **Attachment 2**

Vanderlee L, Goodman S, Sae Yang W, Hammond D (2012) Consumer Understanding of Calories Amounts and Serving Size: Implications for Nutritional Labelling, Canadian Journal of Public Health 103(5):e327-e331. **Attachment 3**

Question 8: From your perspective, what are the advantages and disadvantages of per serving information in the nutrition information panel being voluntary? Please provide evidence where possible.

Disadvantages of removing per serving information on the NIP:

1. Consumers are familiar with the current labelling format and studies have shown that there is a high awareness of the NIP on food packaging.
2. It does nit allow consumers to make informed decisions regarding portion control for management for nutrient, vitamins and minerals intake (weight management and dietary requirements).
3. Information will not be readily available for the consumer in reference to the amount of servings per pack and serving size.
4. Will not facilitate easy comparison between like products with regards to per serving.
5. The consumer will need to be re educated in how to manage portion control.
6. Cost to industry for consumer education and packaging changes.

Advantages of removing per serving information on the NIP:

1. Simple and easy to read due to minimal information required.
2. With the Health Star Rating System stated in 100 grams on front of pack it allows for uniformity.
3. Easy and quick comparison between like products (100 grams).
4. Removes the inconsistency of serving size declarations by manufacturers.

Question 9: Do you think the declaration of the amount of energy and nutrients per serving in the NIP should be voluntary? YES/NO/UNCERTAIN

Please give reasons and evidence to support your view.
If you are UNCERTAIN, please indicate what information you would need in order to form a view.

We do not believe that this should be voluntary, however given that this question has been asked several times throughout this submission we request more information as to what you actually mean by this question as we believe this has already been answered.

Further information required:

1. Will the servings per pack remain if the per serving in the NIP is removed?
2. Will there be a reference guide for the consumer in relation to per serving size?

Conclusion

The nutritional panel aims to assist consumers in making the right food choice. The per serving information stated on the nutritional panel, allows the consumer to understand the intake of macro nutrients, vitamins and minerals for an individual serve, by removing this from the nutritional panel it removes the consumers ability to assess the appropriate portion size.

Further to this, the Food Industry needs to ensure that our labels remain consistent across all categories; allowances to this will undoubtedly result in confusion for the consumer and complexity for the manufacturer.

Based on the above Scalzo Food Industries does not support the approach to remove the per serve information in the nutritional panel.

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Australia New Zealand Food Standards Code Standard 1.2.7 - Nutrition, Health and Related Claims - F2014C01191, http://www.comlaw.gov.au/Details/F2014C01191. Accessed 18 February 2014.

Australia New Zealand Food Standards Code Standard 2.9.3 - Formulated Meal Replacements and Formulated Supplementary Foods - F2013C00623, http://www.comlaw.gov.au/Details/F2013C00623. Accessed 18 February 2014.

Spanos S, Kenda S.A, Vartanian R.L (2015) Can serving size labels reduce the portion size effect? Eating Behaviours16 (2015) 40 – 42.

Usmanova N, Thor E (2003) Communicating Nutritional Information to the Global Consumer: Adapting to Shifting Consumer Attitudes Toward Nutrition, International Food and Agribusiness Management Review Vol 6 Issue 2.

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Eating Behaviors 16 (2015) 40–42

Contents lists available at ScienceDirect

Eating Behaviors

Can serving-size labels reduce the portion-size effect? A pilot study

Samantha Spanos *, Andree S. Kenda, Lenny R. Vartanian *

School of Psychology, UNSW Australia, Sydney, NSW 2052, Australia

ARTICLE INFO

Article history:
Received 26 June 2014
Received in revised form 23 September 2014
Accepted 24 October 2014
Available online 1 November 2014

Keywords:
Portion size
Labeling
Food intake
Serving size
College women

ABSTRACT

Research has shown that the bigger the portion that people are served, the more food they eat; this phenomenon is referred to as the portion size effect. Providing objective serving size information on food products has been shown to reduce the influence of external food cues on people's eating behavior. The current study examined whether providing objective serving size information would also reduce the portion size effect. 100 female participants were served either a small or large portion of pizza in the context of a taste test. The large portion was either unlabeled, labeled as "Contains 2 servings," or labeled as "Contains 4 servings." Food intake was lower when the large portion was labeled "Contains 4 servings" compared to when it was labeled "Contains 2 servings." Moreover, participants' intake in the large portion/4 servings condition was statistically similar to the intake of participants in the small portion condition. Thus, the standard portion size effect was observed when the large portion was unlabeled or was labeled as "Contains 2 servings," but not when the large portion was labeled as "Contains 4 servings". These findings suggest that providing serving size information can reduce the portion size effect, but that the specific content (and not just the presence) of serving size information is important in determining food intake.

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1. Introduction

Portion size effects on food intake have received a great deal of attention from both the scientific community and the popular media. Portion sizes have increased dramatically since the 1970s (Nielsen & Popkin, 2003), and this increase in portion size has been identified as one of the main contributors to weight gain and obesity (Young & Nestle, 2002). Research has demonstrated that food intake tends to be governed by how much food people have available to them (e.g., Levitsky & Youn, 2004), and that the bigger the portion people are served, the more food they eat (e.g., Rolls, Morris, & Roe, 2002). A recent meta analysis found that doubling the size of a portion results in a 35% increase in consumption (Zlatevska, Dubelaar, & Holden, 2014). Furthermore, the impact of portion size appears to be unaffected by other factors that would be expected to moderate the effect, such as hunger (Rolls et al., 2002) and palatability of the food (Wansink & Kim, 2005). Finding ways to reduce the portion size effect has important implications for individuals' health and wellbeing.

One recent study tested whether psychological interventions could reduce the portion size effect on food intake. Cavanagh, Vartanian, Herman, and Polivy (2014) assigned participants to an educational exercise that increased awareness of external factors that can influence food intake, or to a mindfulness exercise intended to increase participants' reliance on their internal sensations rather than on external food cues. Participants were then served either a small portion or a large portion of pasta for lunch. Neither of these manipulations reduced the portion size effect; overall, participants ate 34% more pasta from the large portion than from the small portion.

An alternative approach to tackling the problem of larger portion sizes is to modify the food environment (Wansink, 2004). Specifically, Wansink and Chandon (2006) proposed that providing objective serving size information could reduce the impact of external cues on people's food intake. They argued that, in many cases, the serving size of a portion of food is ambiguous, and consumers are thus left to draw their own inferences about how much they should eat. Others have also suggested that portion size can provide an anchor that strongly influences decisions about how much to eat (Marchiori, Papies, & Klein, 2014). Providing objective serving size information, then, should eliminate the need for people infer the appropriate amount to eat and should reduce the reliance on external cues (i.e., portion size). In support of this hypothesis, Wansink and Chandon (2006, Study 3) showed that participants who were given a bag of granola that was labeled "contains 2 servings" ate approximately 30% less than did participants who were given a bag of granola labeled "contains 1 serving."

Building on the findings of Wansink and Chandon (2006), we conducted a pilot study to examine whether providing objective serving size information would reduce the effect of portion size on the amount of food consumed. Participants were provided with either a

* Corresponding authors.
E-mail addresses: Samantha_spanos@hotmail.com (S. Spanos), lvartanian@psy.unsw.edu.au (L.R. Vartanian).

http://dx.doi.org/10.1016/j.eatbeh.2014.10.007
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small portion of pizza or a large portion of pizza. Furthermore, the large portion either contained no serving size information, was labeled as containing 2 servings, or was labeled as containing 4 servings. First, we predicted that the standard portion size effect would be observed, with participants eating more in the unlabeled large portion condition than in the unlabeled small portion condition. Second, we predicted that providing objective serving size information would reduce the portion size effect on participants' food intake. That is, following from Wansink and Chandon (2006), we predicted that participants given the large portion labeled "Contains 4 servings" would eat less than would participants given the large portion labeled "Contains 2 servings."

2. Method

2.1. Participants

Participants were 104 female undergraduate students at an Australian university who received either $10 or course credit for their participation. Four participants were excluded from the study (two because their food intake was more than 3 SD above the mean, and two because they did not pay attention to the task). Thus, data from 100 participants were included in the analyses below. Their mean age was 20.85 (SD = 2.25; range = 18 28) and their mean body mass index (BMI; kg/m^2) was 21.53 (SD = 2.95; range = 16.1 34.7). Of those who reported their ethnicity, 29% were Caucasian, 56% were Asian, and 14% identified as "other."

2.2. Portion size manipulation

Participants were randomly assigned to either a small portion condition or large portion condition. Those allocated to the small portion condition were served a plate containing 200 g of cheese pizza presented as 12 bite sized pieces, and those allocated to the large portion condition were served a plate containing 400 g of cheese pizza presented as 24 bite sized pieces. The same plate size was used in all conditions.

2.3. Labeling manipulation

Before being served the pizza, all participants were given a laminated pizza packaging to evaluate on various dimensions (e.g., color, font style, esthetic appeal), and were told that this was the packaging from the pizza that they would be tasting during the experimental session. For the small portion condition and one of the large portion conditions, the packaging included no information about the number of servings. For the other two large portion conditions, the packaging either included the statement "Contains 2 servings" or included the statement "Contains 4 servings." (According to the manufacturer, 1 serving = 100 g of pizza).

2.4. Procedure

Participants signed up for a study on "product advertising and taste perceptions" and were asked not to eat for 3 h prior to their experimental session. Experimental sessions took place between 11 am and 3 pm. Participants were randomly assigned to one of four conditions: small portion/no label (S; n = 26), large portion/no label (L; n = 26), large portion/2 servings label (L2; n = 23), or large portion/4 servings label (L4; n = 25). (The two unlabeled conditions represent the standard portion size manipulation.) After participants provided written consent, they rated their initial hunger on a 10 cm visual analogue scale anchored *Not at all hungry* and *Extremely hungry*. Next, they were given the pizza packaging, which they were asked to evaluate on different aspects of its design. Participants were then served either a small or large portion of pizza, which they were told was the pizza from the package that they had just evaluated, and were asked to taste and rate the pizza on a variety of dimensions (e.g., how salty, how crunchy). Participants were told that they should feel free to eat as much as they want in order to make accurate taste ratings. Participants were then left alone for 12 min to make their taste ratings. After the 12 min had elapsed, the experimenter entered the room to remove the plate of pizza. Plates were re weighed to determine the total amount of pizza consumed (in grams).

Participants were then given a questionnaire packet to complete. Among several filler items, they were asked to indicate how many standard servings they thought they were given (which served as a manipulation check for participants in the L2 and L4 conditions), and to provide some basic demographic information including their age, height and weight (used to calculate their BMI), and ethnicity. Finally, participants were probed for suspicion using a funnel debriefing procedure (Bargh & Chartrand, 2000); none guessed the hypotheses.

3. Results

To test the effectiveness of the random assignment, a set of one way ANOVAs was conducted with pizza condition as the independent variable and with participants' age, BMI, and initial hunger ratings as the dependent variables; there were no group differences for any of those variables ($ps > .20$). Initial hunger was significantly correlated with total food intake ($r = .27$, $p = .01$), and was therefore included as a covariate in the food intake analysis; age ($r = -.10$, $p = .34$) and BMI ($r = .17$, $p = .10$) were not related to the amount of food eaten.

3.1. Manipulation check

A one way ANOVA on participants' estimates of how many standard servings of pizza they were given (L2 and L4 conditions only) confirmed the effectiveness of the manipulation, $F_{(1,46)} = 11.83$, $p = .001$, $\eta_p^2 = .21$. Participants in the L2 condition provided lower estimates of how many servings they were given (M = 2.52, SD = 0.73) than did participants in the L4 condition (M = 3.28, SD = 0.79).

3.2. Food intake

Mean pizza consumption for each of the four groups is displayed in Fig. 1. As predicted, a one way ANCOVA revealed that pizza consumption varied by condition, $F_{(3,95)} = 3.45$, $p = .02$, $\eta_p^2 = .10$. Planned contrasts indicated that participants in the S condition ate significantly less than did participants in the L condition ($p = .04$) and participants in the L2 condition ($p = .004$), but did not differ from participants in

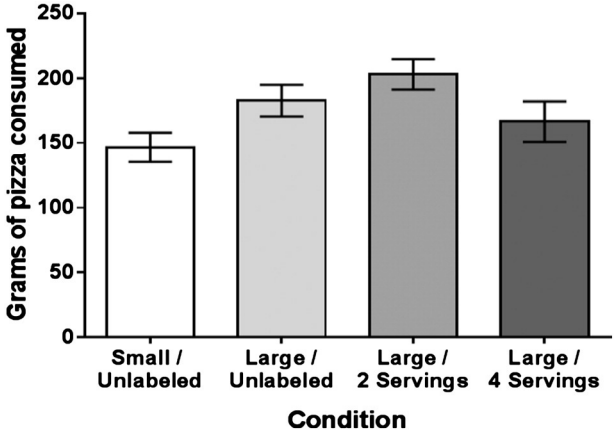

Fig. 1. Grams of pizza consumed per condition. Error bars represented standard error of the mean.

the L4 condition ($p = .40$). Furthermore, participants in the L4 condition ate significantly less than did participants in the L2 condition ($p = .04$), and ate slightly (but non significantly) less than did participants in the L condition ($p = .25$). (The overall pattern was the same when the outliers were included in the analyses.)

4. Discussion

Consistent with past research, we found a standard portion size effect: Participants ate 27% more when they were served a large (unlabeled) portion of pizza than when they were served a small (unlabeled) portion of pizza. The primary aim of the current study, however, was to determine whether providing objective information about the number of servings contained in a portion of food would reduce the effect of portion size on the amount of food consumed. When the large portion of pizza was labeled as "Contains 4 servings," intake was lower than when the pizza was as labeled "Contains 2 servings." Thus, the nature of the information provided influenced how much participants ate; labeling the pizza with a higher number of servings decreased food intake relative to labeling the pizza with a lower number of servings. This finding parallels the findings of Wansink and Chandon (2006) who found that labeling a package of granola as containing 2 servings resulted in lower intake than when the package was labeled as containing 1 serving. Importantly, we also extend these findings by demonstrating that intake in the L4 condition did not differ from intake in the small portion condition. This is the first evidence indicating that labeling can reduce the portion size effect. Note, however, that the difference between the unlabeled large portion condition and the two labeled large portion conditions was not statistically significant, and this may have been due to low power (the differences were in the small to moderate range).

The findings of the present study, along with those of Wansink and Chandon (2006), are consistent with accumulating evidence indicating that the way food is presented can influence how much people eat. For example, research suggests that packaging a quantity of food as three separate units decreases food intake compared to packaging the same quantity of food as a single unit (Kerameas, Vartanian, Herman, & Polivy, in press), and that segmenting a tube of potato chips using visual dividers (different colored chips) reduces consumption and improves intake estimation (Geier, Wansink, & Rozin, 2012).

For consumers, making judgments about serving size, the number of servings contained within food products, or the appropriate amount to eat can be a challenging task, and providing objective serving size information can aide consumers in those decisions. The potential for food labels to influence people's eating behavior, however, relies on people noticing, recognizing, and understanding the labels. Unfortunately, consumers can face considerable difficulty in interpreting the information presented on labels, which can interfere with their ability to identify appropriate food portions (Bryant & Dundes, 2005). People's ability to interpret this information is improved by presenting clear and simplified front of pack labeling on food products, as was done in the present study. Furthermore, research suggests that there is a disparity between people's typical portion size and recommended serving sizes on food products (Bryant & Dundes, 2005). Providing labels that more closely mirror consumers' actual food beliefs and behaviors could help consumers better regulate their food intake and control their body weight. Moreover, addressing this disparity is important to ensure that future studies on consumer intake produce meaningful results and are not misleading.

This pilot study represents an initial demonstration that providing serving size labeling on a food product can reduce the portion size effect on people's food intake. Although the findings are promising, some limitations should be noted. First, the sample was relatively small (limiting our power to detect some potentially meaningful differences) and was limited to undergraduate females who were either Asian or Caucasian (limiting the generalizability of the results). Second, participants were not perfectly accurate in their reports of how many servings of pizza they were provided. It may be that some participants did not believe that the pizza they were served came from the package they evaluated. Future research should replicate these effects with a food that participants consume directly from the package to strengthen the connection between the serving size information and the food itself. Future research is also needed to extend the present findings to more ecologically valid eating contexts, as well as other food types and labeling formats, and to determine what type of label information influences consumption for which type of people. Finally, future research is needed to identify the mechanisms underlying the effect of labeling on food intake. Research suggests that portion size and other external food cues can provide a norm of appropriate food intake, which in turn influences how much people eat (Kerameas et al., in press; Vartanian, Sokol, Herman, & Polivy, 2013; Wansink, 2004). Future research should test whether serving size labels also influence norms of appropriate intake and, in turn, how much people eat.

Role of funding sources

This research was supported under Australian Research Council's *Discovery Projects* funding scheme (project number DP110101124). The Australian Research Council had no role in the study design, collection, analysis or interpretation of the data, writing the manuscript, or the decision to submit the paper for publication.

Contributors

All authors contributed to the design of the study. SS and LRV conducted the analyses and wrote the first draft of the manuscript. All authors contributed to and have approved the final manuscript.

Conflict of interest

All authors declare that they have no conflicts of interest.

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Consumer Understanding of Calorie Amounts and Serving Size: Implications for Nutritional Labelling

Lana Vanderlee, BSc,[1] Samantha Goodman, MSc,[2] Wiworn Sae Yang, MSc[1], David Hammond, PhD[1]

ABSTRACT

Objective: Increased consumption of sugar-sweetened beverages has contributed to rising obesity levels. Under Canadian law, calories for pre-packaged foods and beverages are presented by serving size; however, serving sizes differ across products and even for the same product in different containers. This study examined consumer understanding of calorie amounts for government nutrition labels and industry labelling schemes.

Methods: A national sample of 687 Canadian adults completed an online survey. Participants were randomized to view images of Coke® bottles that displayed different serving sizes and calorie amounts. Participants viewed either the regulated nutrition information on the "back" of containers, or the voluntary calorie symbols displayed on the "front" of Coke® products. Participants were asked to determine how many calories the bottle contained.

Results: Across all conditions, 54.2% of participants correctly identified the number of calories in the beverage. Participants who viewed government-mandated nutrition information were more likely to answer correctly (59.0%) than those who saw industry labelling (49.1%) (OR=5.3, 95% CI: 2.6-10.6). Only 11.8% who viewed the Coke® bottle with calorie amounts per serving correctly identified the calorie amount, compared to 91.8% who saw calorie amounts per container, regardless of whether information was presented in the Nutrition Facts Table or the front-of-pack symbol (OR=242.9, 95% CI: 112.1-526.2).

Conclusions: Few individuals can use nutrition labels to correctly identify calorie content when presented per serving or using industry labelling schemes. The findings highlight the importance of revising labelling standards and indicate that industry labelling initiatives warrant greater scrutiny.

Key words: Nutrition labelling; food labelling; nutrition policy; comprehension; front-of-package labelling

La traduction du résumé se trouve à la fin de l'article.

Can J Public Health 2012;103(5):327-31.

Obesity is a growing public health problem. In Canada, more than two thirds of adults are overweight or obese.[1] Excess energy intake is a main driver behind the obesity epidemic.[2] Increased consumption of sugar-sweetened beverages, including soft drinks, is a potentially important contributor to increased energy intake.[3] Sugar-sweetened beverages are characterized by high caloric content with little to no nutritional value.[1] In North America, beverages are often sold in large containers holding several times the recommended serving. An American study suggested that actual soft drink portion sizes exceeded the federally recommended standard portion sizes by 35-103%.[4]

Nutrition information on pre-packaged foods is mandatory in most high-income countries.[5] In Canada, the Nutrition Facts Table must appear on the back or side of all pre-packaged food items and is the primary source of nutrition information for Canadian consumers.[6,7] The Nutrition Facts Table uses serving size labelling, which displays the nutrition information for a single serving of the product. Serving size labelling aims to address "portion distortion", a phenomenon whereby individuals perceive large portion sizes as appropriate amounts to eat at a single eating occasion.[8] Current Canadian labelling regulations allow a range of serving sizes to be displayed for different items. For example, servings of non-carbonated and carbonated beverages can range from 250 mL to 375 mL, and are selected at the discretion of the manufacturer.[9] Several studies have shown that consumers have difficulty interpreting serving size information.[10,11] A cross-sectional study examining health label literacy found that difficulty with serving sizes and incorrect calculations were the primary reason for errors in interpreting nutrition content.[12] A recent study found that only 37% of individuals could correctly identify the amount of carbohydrates in a 20-oz multiple-serving beverage container.[13] Qualitative research commissioned by Health Canada also indicates that inconsistent serving sizes for similar products are a point of confusion for Canadians in trying to understand the Nutrition Facts Table.[14] Across studies, lower levels of comprehension have been associated with lower income, education, literacy and numeracy skills.[5,12,13]

Front-of-package labelling has been introduced as a simplified method of informing consumers about the calorie and nutrient content of packaged foods. Several large food and beverage companies have recently launched large front-of-package campaigns. One such initiative is the *Clear of Calories* campaign, launched by the American and Canadian Beverage Associations and implemented by leading companies, including *The Coca-Cola Company*

Author Affiliations

1. School of Public Health and Health Systems, University of Waterloo, Waterloo, ON
2. Family Relations and Applied Nutrition, University of Guelph, Guelph, ON

Correspondence: David Hammond, School of Public Health and Health Systems, University of Waterloo, Waterloo, ON N2L 3G1, Tel: 519-888-4567, ext. 36462, Fax: 519-886-6424, E-mail: dhammond@uwaterloo.ca

Acknowledgements: The authors thank Samantha Daniel for technical assistance with the manuscript. This research was supported by a grant from Canadian Cancer Society Research Institute, as well as CIHR Master's Award (Vanderlee, Goodman, Sae Yang), the Heart and Stroke Foundation of Canada and the CIHR/Training Grant in Population Intervention for Chronic Disease Prevention: A Pan-Canadian Program (Grant #: 53893) (Vanderlee, Goodman, Sae Yang), Ontario Graduate Scholarships (Vanderlee, Goodman), Vanier Canada Graduate Scholarship (Vanderlee), the Propel Centre for Population Health Impact, a Canadian Institutes of Health Research New Investigator Award (Hammond), and a Canadian Cancer Society Research Institute Junior Investigator Research Award (Hammond).

Conflict of Interest: None to declare.

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Table 1. Sample Characteristics (N=687)

	Experimental Conditions				
	FOP/serving	**FOP/ container**	**Nutrition Facts/serving**	**Nutrition Facts/container**	**Overall**
	n=153	n=183	n=171	n=180	N=687
	% (n)	**% (n)**	**% (n)**	**% (n)**	**% (n)**
Sex					
Female	77.1% (118)	73.8% (135)	77.2% (132)	77.2% (141)	76.6% (526)
Male	22.9% (35)	26.2% (48)	22.8% (39)	22.8% (39)	23.4% (161)
Age (years)					
18-34	32.0% (49)	32.8% (60)	34.4% (59)	29.4% (53)	32.2% (221)
35-44	49.7% (76)	51.4% (94)	52.6% (90)	55.0% (99)	52.3% (359)
≥45	18.3% (28)	15.8% (29)	12.9% (22)	15.6% (28)	15.6% (107)
BMI*					
Underweight	2.6% (4)	1.6% (3)	4.7% (8)	2.8% (5)	2.9% (20)
Normal	49.7% (76)	41.0% (75)	47.4% (81)	51.4% (93)	47.3% (325)
Overweight	23.5% (36)	33.9% (62)	26.9% (46)	22.8% (41)	26.9% (185)
Obese	23.5% (36)	21.3% (39)	19.9% (34)	20.6% (37)	21.3% (146)
Not reported	0.7% (1)	2.2% (4)	1.2% (2)	2.2% (4)	1.6% (11)
Education					
High school or less	30.1% (46)	24.6% (45)	15.2% (26)	25.6% (46)	23.7% (163)
Certificate or diploma	42.5% (65)	39.3% (72)	48.0% (82)	36.7% (66)	41.5% (285)
Bachelor's Degree	17.6% (27)	27.3% (50)	23.4% (40)	22.8% (41)	23.0% (158)
University degree greater than bachelor's degree	9.2% (14)	7.7% (14)	13.5% (23)	14.4% (26)	11.2% (77)
Not reported	0.7% (1)	1.1% (2)	0% (0)	0.6% (1)	0.6% (4)
Income					
<$40,000	22.9% (35)	23.5% (43)	19.9% (34)	23.9% (43)	22.6% (155)
$40,000 - $80,000	36.6% (56)	34.4% (63)	34.5% (59)	29.4% (53)	33.6% (231)
>$80,000	32.0% (49)	32.2% (59)	39.8% (68)	34.5% (62)	34.6% (238)
Not reported	8.5% (13)	9.8% (18)	5.8% (10)	12.2% (22)	9.2% (63)
Ethnicity					
White	73.9% (113)	71.6% (131)	77.2% (132)	77.2% (139)	75.0% (515)
Other	24.8% (38)	26.8% (49)	22.2% (38)	21.7% (39)	23.9% (164)
Not reported	1.3% (2)	1.6% (3)	0.6% (1)	1.1% (2)	1.2% (8)

FOP = Front-of-package, industry-led voluntary labelling; Nutrition Facts = government-mandated labelling.
* BMI categories: Underweight = BMI <18.5; Normal weight = BMI 18.5-24.99; Overweight = BMI 25-29.99; Obese = BMI ≥30.

Table 2. Estimation of Calorie Content by Experimental Condition (N=687)

	% Underestimated % (n)	**% Overestimated % (n)**	**% Correct % (n)**
Labelling Condition			
Front of Package per serving	71.9% (110)	21.6% (33)	6.5% (10)
FOP *per container*	5.5% (10)	9.8% (18)	84.7% (155)
Nutrition Facts *per serving*	73.7% (126)	9.9% (17)	16.4% (28)
Nutrition Facts *per container*	0% (0)	0.6% (1)	99.4% (179)
Overall	35.8% (246)	10.0% (69)	54.2% (372)

and *PepsiCo*.[15] The voluntary program prominently displays calorie and serving size information on the front label of beverage containers. In Canada, some beverages are labelled with the calorie content of the entire bottle, while others are labelled per 250 mL or 355 mL serving, similar to the information presented in the Nutrition Facts Table.

To date, there is no published evidence examining consumer understanding of these industry labelling schemes in Canada. The current study sought to examine calorie estimation of beverage products with various serving sizes. The study examined consumers' ability to correctly identify calorie content in beverages when presented with calories per serving or per container of actual Coke products. The study also examined potential differences in consumer understanding when the consumer is shown the government-mandated Nutrition Facts Table on the back of containers, versus the front-of-pack labelling scheme currently appearing on Coke® products. Finally, the study examined individual differences in consumer understanding by socio-demographic factors.

METHODS

Sample description

A total of 687 participants from a national sample of Canadians were recruited using an online commercial panel consisting of over 400,000 consumers through Global Market Insite, Inc. (GMI, Bellevue, Washington).[16] Invitations to participate in the web-survey were emailed to panel members over the age of 18; the invitation did not indicate the nature or purpose of the study.[16] The current study was part of a larger study on the marketing of children's food products, and was completed online. Participants were eligible for the study if they were over the age of 18, a parent of at least one child between 4-10 years of age, and the primary shopper for their household. This study received ethics clearance from the University of Waterloo Office of Research Ethics.

Study protocol

Participants were randomized to view a Coke® beverage in one of four labelling conditions: 1) a 591 mL bottle with front-of-package calorie information *per serving*, 2) a 591 mL bottle with front-of-package calorie information *per container*, 3) a 591 mL bottle with the Nutrition Facts Table *per serving*, and 4) a 591 mL bottle with the Nutrition Facts Table *per container.*

Measures

Demographics

Demographic information of participants included sex, age (18-34, 35-44, and ≥45), education (high school or less, certificate or diploma, bachelor's degree, or university degree or certificate greater

Figure 1. Experimental labelling conditions

Condition 1: FOP *per serving.*

Condition 2: FOP *per container.*

Condition 3: Nutrition Facts *per serving.*

Condition 4: Nutrition facts *per container*

than a bachelor's degree), ethnicity (White or other) and income (<$40,000, $40,000-$80,000, or >$80,000 annually). Self-reported height and weight were collected to calculate body mass index (BMI) using categories defined by the World Health Organization.[17]

Nutritional Knowledge, Understanding of Nutrition Labels and General Health

Nutrition label use was assessed by the question, "When shopping for food, do you usually look at the nutrition information provided on the package?", with a 5-point Likert scale (1=never; 5=always). *Perceived nutritional knowledge* was examined using the statement, "I am knowledgeable about health and nutrition issues", using a 5-point Likert scale (1=strongly agree; 5=strongly disagree). A measure of *perceived general health* was assessed by asking, "In general, how would you rate your overall health?", with a 5-point Likert scale (1=poor; 5=excellent).

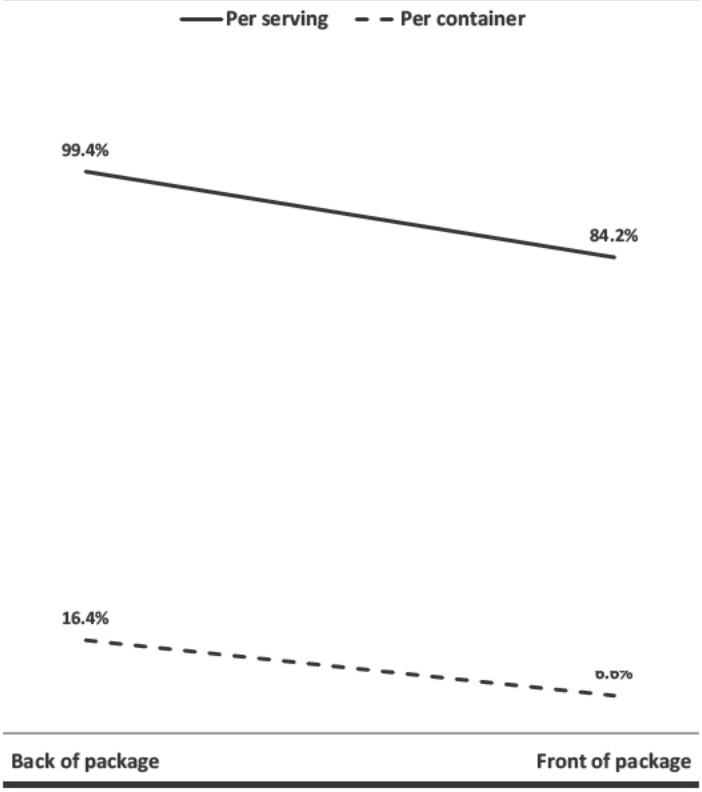
Calorie Content

Participants were asked "How many calories are in this bottle of Coke®?", with an open response field in which participants could fill in a number of calories. This question was asked while the image of the Coke® bottle and calorie information were displayed on the screen.

Analysis

Chi-square tests were used to test for demographic differences between experimental conditions. Logistic regression modelling was used to test for differences in the proportion of individuals who responded correctly. Two outcomes were used: an exact response (260 calories) and a more lenient "range" measure, where a correct response was defined as a response within a 10-calorie range above or below the correct answer (1=correct response; 0=incorrect response). Patterns of significance were the same for both outcome measures; therefore results are reported only for exact correct responses. Odds ratios (OR) and 95% confidence intervals (95% CI) are reported. Labelling location (front-of-package=0, Nutrition Facts Table=1), serving size portion (entire container=0, single serving=1), socio-demographic variables (age, sex, education, BMI, ethnicity, income), perceived nutrition knowledge, label use and perceived general health were included in the regression model. All analyses were conducted using SPSS v.20 (IBM Corp., Somers, NY).

Figure 2. Estimation of calorie content: Serving size vs. location on package (% correct)



RESULTS

Sample characteristics are shown in Table 1. There were no significant differences between conditions for any demographic measures.

Across all four conditions, 54.2% (n=372) of participants correctly identified the exact number of calories in the entire beverage container and 61.0% (n=419) were able to identify the number of calories within a 10-calorie range of the correct answer. Of the entire sample, 35.8% underestimated and 10% overestimated the calorie content.

Table 2 shows the proportion of correct responses, underestimation and overestimation for each experimental condition. Figure 2 also illustrates the overall effect of labelling conditions on correct estimation of calorie content of the container. Participants were able to correctly identify the exact calorie content of the entire beverage container 59.0% of the time when presented with the back-of-package Nutrition Facts Table, and 49.1% of the time when viewing the front-of-package industry labelling. In conditions with *per container* labelling, 91.8% of participants correctly identified the calorie content of the bottle, compared to 11.8% of participants who saw *per serving* labelling.

A logistic regression model was conducted to test for differences in the proportion of participants who could correctly identify the calorie amount between experimental conditions (where 0=incorrect calorie amount and 1=correct calorie amount), adjusting for age group, sex, BMI, education level, income, ethnicity, perceived nutritional knowledge, frequency of label use, and perceived general health. Both portion labelled (serving vs. container) and type of label (Nutrition Facts Table vs. industry label) were significant. Participants who viewed calories per container were significantly more likely to correctly estimate the calories per container compared to those who viewed the calories per serving (OR=242.9, 95% CI: 112.1-526.2, p<0.001). Those who viewed the government-mandated Nutrition Facts Table were significantly more likely to answer correctly than those who saw voluntary front-of-package labelling (OR=5.3, 95% CI: 2.6-10.6, p<0.001). There were no significant overall differences in correctly estimating calorie content for the demographic measures age, sex, education, BMI, ethnicity, income, nutrition label use and perceived nutritional knowledge or health.

DISCUSSION

Overall, almost half of participants were not able to correctly identify the calories in commonly consumed beverage containers when viewing nutrition labels. In addition, approximately one in ten Canadian parents of children ages 4-10 could correctly identify calorie content when the serving size was less than the entire container. This was true regardless of whether they viewed the government-mandated Nutrition Facts Table on the back of containers or the front-of-pack calorie labels voluntarily provided by manufacturers. There was slightly improved performance with the use of the Nutrition Facts Table compared to the front-of-package labelling in both *per serving* and *per container* conditions. This likely reflects consumer familiarity with the Nutrition Facts Table, as it has been mandatory in Canada since 2003.

Several factors could account for the high proportion of incorrect responses. First, the "per serving" information on the Coke® containers was written in very small and often blurry text. Prior to the study, we visited several stores and were unable to find bottles with more legible calorie labels, suggesting that this is likely representative of challenges consumers face. Second, respondents who attempted to use the serving size information may have had difficulty calculating the total number of calories due to poor numeracy skills, as higher numeracy rates have previously been associated with higher label comprehension.[14] This is unlikely in this study, as the education level of the sample was higher than that of the general Canadian public. Finally, the serving size used on the many beverage containers may be counter-intuitive to consumers. The existing regulations in Canada allow the same product to display different serving sizes when sold in different containers. For example, at the time of the study, Coke® products were labelled as *per serving* for 591 mL bottles, and *per container* for 355 mL cans. As a result, a higher calorie number was posted on cans (160 calories) than on the larger bottle container (110 calories per serving). At the time of the study, the 591 mL container included 2.4 servings; however, many respondents may have assumed that the labelled amount was for the entire container. Previous research has found that less than 40% of individuals correctly acknowledged multiple servings in multi-serving food and beverage products.[11,18] This is consistent with the current findings: more than 40% of participants who viewed the "110 calories per serving" label estimated the content of the bottle to be 110 calories. This suggests that labelling per serving may systematically lead consumers to underestimate the calorie content of products, and this may contribute to higher levels of consumption.

Strengths and limitations

The sample was limited to parents of children aged 4-10 years. In addition, the online survey did not allow participants to pick up and examine the container. This may have reduced the accuracy of calorie estimates; however, the study also served to focus attention on the calorie information and likely resulted in increased attention and scrutiny than would be typical in a naturalistic setting. Finally, the online sample had somewhat higher-than-average levels of education and income compared to the general population.[19] Previous research has noted that those with higher levels of income and education generally perform better on nutritional labelling tasks.[13] Poor performance on this task among a more educated sample suggests that the accuracy of calorie estimates could be even lower in the general population. Strengths of the study include the use of a large national sample and the use of actual product labels currently available on the Canadian market. The between-conditions experimental design is also a considerable strength in terms of drawing inferences about the impact of different labelling formats.

CONCLUSION

Nutrition labels are only one of many approaches that will be required to address obesity at a population level. However, for this approach to be effective, consumers must be able to easily identify and understand information on product labels. The current study suggests that government-mandated nutrition labelling practices are confusing to Canadians. Very few individuals were able to use the information in the Nutrition Facts Table to calculate calorie content when there was more than one serving per container. Voluntary industry measures appear to be even less effective and can lead to dramatic underestimates of calorie intake.

Given steadily increasing rates of obesity, these findings highlight the need for substantive changes to the nutrition labelling of pre-packaged food and beverages in Canada. The findings suggest that providing calorie amounts for the entire container can dramatically increase the accuracy of calorie estimates. For products that clearly include multiple servings and for which serving sizes equivalent to the entire container are not appropriate, more intuitive labelling should be considered. An alternative is dual-column labels, which display nutritional information for one serving of a product in addition to information for the entire package.[20] At the very least, serving sizes should be standardized within product categories. Finally, voluntary industry labelling should be subjected to greater scrutiny to ensure that the labels enhance rather than reduce consumer understanding of nutrition information.

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Received: January 4, 2012
Accepted: June 10, 2012

RÉSUMÉ

Objectif : La hausse de la consommation des boissons édulcorées au sucre contribue à l'augmentation des niveaux d'obésité. En vertu de la loi canadienne, le nombre de calories dans les aliments et les boissons préemballés est indiqué par portion, mais les portions diffèrent d'un produit à l'autre, et même pour des produits identiques conditionnés dans des emballages différents. Nous avons examiné la compréhension par les consommateurs du nombre de calories sur les étiquettes nutritionnelles du gouvernement et sur celles de l'industrie.

Méthode : Un échantillon national de 687 Canadiennes et Canadiens adultes a répondu à un sondage en ligne. Des participants sélectionnés au hasard ont visionné des images de bouteilles de Coke® affichant des portions et un nombre de calories différents. Les participants ont vu soit l'information nutritionnelle réglementée au « dos » du contenant, soit les symboles de calories affichés sur le « devant » du produit Coke®. Nous avons demandé aux participants de calculer combien de calories contenait la bouteille.

Résultats : Globalement, 54,2 % des participants ont correctement calculé le nombre de calories dans la boisson. Ceux qui ont visionné l'information nutritionnelle exigée par le gouvernement étaient plus susceptibles de répondre correctement (59 %) que ceux qui ont vu l'étiquetage de l'industrie (49,1 %) (RC=5,3, IC de 95 % : 2,6-10,6). Seulement 11,8 % des participants ayant vu la bouteille de Coke® indiquant le nombre de calories par portion ont correctement calculé les calories, contre 91,8 % des participants ayant vu la bouteille indiquant le nombre de calories par contenant, peu importe si l'information était présentée dans le tableau « Valeur nutritive » ou dans le symbole sur le devant de l'emballage (RC=242,9, IC de 95 % : 112,1-526,2).

Conclusion : Peu de gens savent se servir des étiquettes nutritionnelles pour calculer correctement le nombre de calories lorsque l'information leur est présentée par portion ou sur les étiquettes créées par l'industrie. Il est donc important de réviser les normes d'étiquetage, et les initiatives d'étiquetage de l'industrie mériteraient un examen approfondi.

Mots clés : étiquetage nutritionnel; étiquetage aliments; politique nutritionnelle; compréhension; étiquetage sur le devant de l'emballage

International Food and Agribusiness Management Review
Vol 6 Iss 2 2003

Communicating Nutritional Information to the Global Consumer: Adapting to Shifting Consumer Attitudes Toward Nutrition

Natalia Usmanova [a] and Eric Thor [b] ⓘ

[a] *Survey Research and Methodology at the University of Nebraska-Lincoln, USA*
[b] *Morrison School of Agribusiness and Resource Management, Arizona State University, USA*

Abstract

This paper analyzes factors affecting the choice of a reference amount in nutrition labeling. Two most common reference units are compared: a serving and 100 grams; advantages and shortcomings are discussed; implications for policymakers are drawn.

Choice of a reference unit is often dictated by existing labeling traditions and the prevailing system of measurements. The authors recommend that international harmonization of food labeling be based on general principles that allow flexibility rather than provide specific recommendations on the label components and format. This way countries can preserve and further the labeling traditions to which consumers have become accustomed.

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Overview of Food and Nutrition Labeling

Food labeling expresses efforts by governments and the scientific community to ensure that consumers can make informed decisions about safety and healthfulness of foods. Labeling standards also reflect current and historic health and nutrition concerns.
The original purpose of labeling was to protect consumers from unsafe foods. Although still important, there is a major shift toward nutrition on food labels.

ⓘ Corresponding author: Email: ethor@asu.edu

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Now, the labeling requirements usually include the food's name, ingredients, quantity, and the manufacturer's name and location. Some countries require quantitative listing of ingredients, nutrient content; expiration, production, or freshness date (CSPI 1998).

Harmonization of food labeling facilitates trade and ensures that consumers have adequate information on which to base their choice. Codex is the international body established by the Food and Agriculture Organization and the World Health Organization to develop such standards.

There are several approaches to presenting nutritional information: per serving size, per package, and per 100 grams/100 milliliters or another standard unit. This paper will compare the advantages and disadvantages of using the most common reference amounts – a serving and 100 grams – and discuss factors to be considered by policymakers in selecting a reference amount.

The choice of a reference unit, to a large extent, is a matter of tradition rather than science. For instance, countries using British measurements tend toward the serving size (e.g., United States), while those that adopted the metric system use the 100g/100ml reference (e.g., Former Soviet Union countries). Some countries provide nutrient information per 100g and per serving (e.g., United Kingdom).
In developed countries, many consumers now understand the relation between diet and health and choose products based on this. The reason is the growing amount of data that links diet with health and diseases that plague Western societies, such as cancer, heart disease, diabetes, and obesity. These trends increase the importance of nutritional labeling to help consumers better manage their diets.

Food and Nutrition Labeling in the United States

Food labeling development reflects the evolution of public health concerns. Over a short time, public concerns and goals of food labeling in the U.S. changed from issues of undernutrition to those of overnutrition. If in the 1930-60s, the goal was to help consumers choose a nutritionally adequate diet, in the 1980-90s preventing over-consumption of fats, cholesterol, and sodium became the priority (FDA 1999a; The Institute of Medicine 1990).

The 1990 Nutrition Labeling and Education Act (NLEA) addressed Americans' concerns about diet- and nutrition-related diseases and industry's questionable practices of providing unsubstantiated and misleading claims about products' nutritional qualities or benefits.

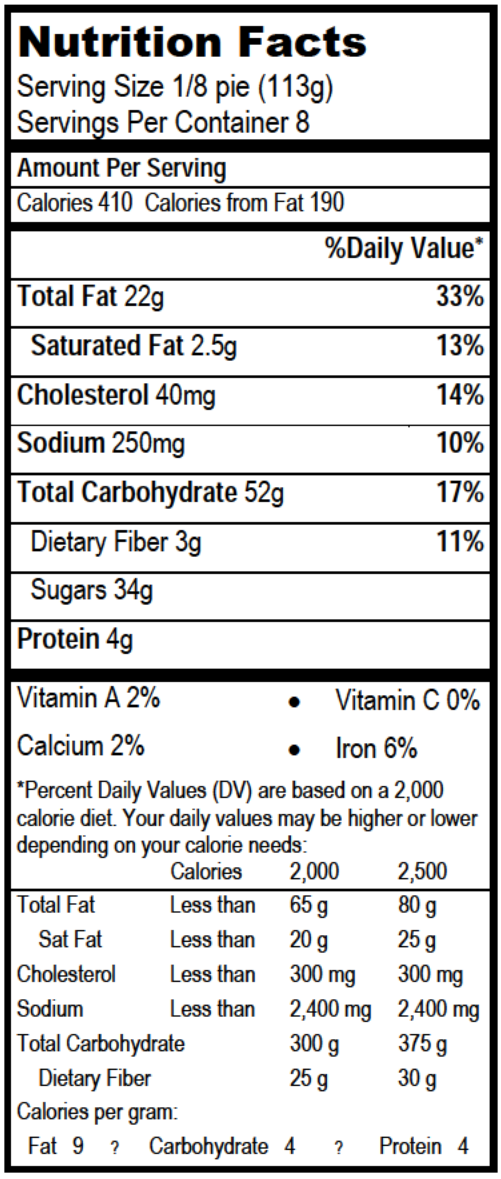
Now NLEA is recognized as a model for others to follow in efforts to improve health and welfare through labeling (CSPI 1998, Телегин). Canada was the first country to institute nutritional labeling standards similar to NLEA. Although geographic proximity and incentives to standardize food labeling to facilitate trade under

NAFTA may have played a role, public health was the main driver of the legislation (Health Canada 1999).

A laudable feature of the U.S. label is that it must disclose how much a food serving contributes to the total daily nutrient needs of an average American by providing the percent of daily value (%DV) for all nutrients that appear on the label and for which such values are established. Percent of DV appears in a column next to the amount of nutrients per serving. Daily values are based on a 2000-calorie diet that is close to average daily calorie needs in the U.S.

Under NLEA, nutrients must be expressed in terms of amount per serving. This is consistent with traditions of the food industry, however serving sizes are now defined by law and are calculated "for persons 4 years of age or older to reflect the amount of food customarily consumed per eating occasion by persons in this population group" (Code of Federal Regulations 2001).

There is some confusion among Americans about the term "serving" as its everyday usage differs from that in the dietary literature. The press tries to clear up this confusion by explaining the differences between the terms "serving" and "portion" and by providing advice from dieticians and government officials on diet management and label use (Holmstrom 2000; Margen 1999; Pratt 1996; Sullivan 2000; Swoboda 2000; Townsel 1998). A serving size is a unit defined by the government and tied to dietary recommendations, including a graphic illustration of dietary advice – the Food Guide Pyramid (Figure 5). Serving sizes on labels are equal or close to those on the Pyramid. Consumers should be reminded that suggestions on labels are often much smaller than amounts people eat and they should account for that in managing their intake (Clarke; Walker).



Nutrition Facts

Serving Size 1/8 pie (113g)
Servings Per Container 8

Amount Per Serving	
Calories 410 Calories from Fat 190	
	%Daily Value*
Total Fat 22g	33%
Saturated Fat 2.5g	13%
Cholesterol 40mg	14%
Sodium 250mg	10%
Total Carbohydrate 52g	17%
Dietary Fiber 3g	11%
Sugars 34g	
Protein 4g	

Vitamin A 2% • Vitamin C 0%

Calcium 2% • Iron 6%

*Percent Daily Values (DV) are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65 g	80 g
Sat Fat	Less than	20 g	25 g
Cholesterol	Less than	300 mg	300 mg
Sodium	Less than	2,400 mg	2,400 mg
Total Carbohydrate		300 g	375 g
Dietary Fiber		25 g	30 g

Calories per gram:

Fat 9 ? Carbohydrate 4 ? Protein 4

Figure 1. Current Label in the U.S.
(Reproduced from a food package; ingredient panel is omitted.)

The Institute of Medicine (1990) recommends that serving sizes be based on dietary recommendations rather than on amounts consumed – this way servings can be used more readily in educational programs and will be consistent with guidance materials. However, the Code of Federal Regulations (CFR 2001) suggests that servings represent amounts usually consumed. NLEA allows some flexibility for food companies to determine serving sizes, especially through use of different package sizes (CFR 2001; FDA 1994; FDA 1999a; Institute of Medicine 1990). The most common alternative to a serving size used by other countries is a standard amount, such as 100g. The Institute of Medicine (1990) and Center for Science in the Public Interest (CSPI 1998) support providing nutrient declaration per serving

rather than per 100g or another standard unit, which is preferred by U.S. consumers, health professionals and the food industry.

Research on Label Formats

The FDA 1978 Consumer Food Labeling Survey revealed that attention paid to food labels was motivated by fear, as consumers used label information to identify and avoid hazards rather than to seek benefits. Sources of confusion on labels included quantitative terms – primarily metric units, percentages, U.S. Recommended Daily Amounts, technical terms, and complaints that the information was not usable in evaluation. Other literature also shows confusion over the differences between fat and cholesterol and between saturated and unsaturated fats (Institute of Medicine 1990, p. 9).

In the 1990 survey for the National Food Processors Association, consumers were equally divided in their preferences between a food-specific serving size and a standard one-ounce serving, routinely used by the industry prior to NLEA. The authors concluded this was personal preference rather than any specific concern. The study supports earlier findings that consumers want more, rather than less, information and look for additional information on amounts and/or recommended daily quantities of nutrients (Opinion Research Corporation 1990).

Levy et al. (1992) observed an apparent conflict, consistent with previous research, that some consumers wanted simplified information whereas others preferred more detail, and nutrition labels must attempt to accommodate both of these needs. Levy & Fein (1998) analyzed consumers' ability to perform tasks commonly reported as purposes of label use, such as (1) comparing products within and across product categories, (2) evaluating product claims, (3) determining levels of a nutrient, (4) deciding how to adjust the diet when adding a specific food, and (5) tracking the food's contribution to the overall diet. Tasks one and three are the most frequent purposes of label use for U.S. consumers. The study found that consumers can use quantitative nutrition information to compare products and accurately judge high-low nutrient levels but cannot draw appropriate dietary implications from this kind of information. This was attributed to the difficulty in moving between product level and total diet level of analysis. The post-NLEA label was expected to ease the "transition between product levels and diet level analysis by enabling accurate high-low judgments without math" through the use of %DV display. Levy & Fein (1998) conclude that consumers do not perform well with math calculations and their performance does not improve with practice, as it does on other tasks. Dietary guidelines should instruct consumers how to balance their diets without calculations. On tasks that consumers find easy (product comparison, high-low judgments) performance improves in time and it is recommended that nutrition education rely more on these (Levy & Fein 1998).

Codex Standards

To facilitate international trade and ensure consumer protection, Codex has developed a number of standards, including Codex Guidelines on Nutrition Labeling. The purpose of the Guidelines is to ensure that nutrition labeling provide information about a food so that a wise choice can be made, describe the nutrient content, and encourage the use of sound principles in formulating foods to benefit public health. If nutrient declaration is provided, information must include the energy value, amounts of protein, carbohydrates, fat, the amount of the nutrients for which the claim is made, and the amount of any other nutrient considered relevant for maintaining good nutrition. Vitamins and minerals can be declared for which recommended intakes have been established and/or those important in the country. This information should be provided per 100g or 100ml or per package if a single portion. Countries routinely using servings in labeling can provide this information per serving if the number of servings per package is stated (Codex 1985).

Global accord in food labeling is difficult due to different languages, dietary and cultural practices and health concerns. Food standards developed by Codex are sometimes seen as minimal requirements to ensure fair trade practices and consumer protection. In developed countries many standards exceed such minimal requirements, while for other countries Codex recommendations can serve as a benchmark for establishing national food standards (CSPI 1997). This explains why Codex Guidelines on Nutrition Labeling provide a general approach to labeling and allow flexibility.

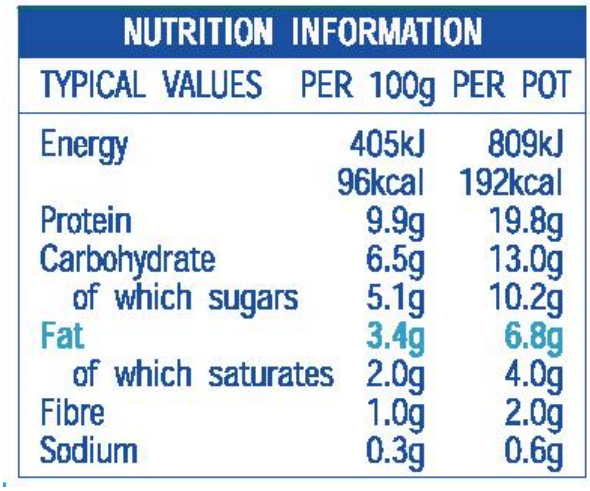
Labels in Other Countries

In the European Union, consistent with Codex Guidelines, nutrition labeling is required only if a claim is made or the food is intended for particular nutritional use. When labeling is provided, the list must be of either Group One, known as "Big 4", (energy value, protein, carbohydrate, and fat) or Group Two, known as "Big 4 + little 4" (energy value, protein, carbohydrate, sugars, fat, saturated fat, fiber, and sodium).

When a claim is made for sugars, saturated fat, fiber or sodium, the Group Two nutrients must be listed. The amount of nutrients must be expressed per 100 grams or 100 milliliters, but also per serving/portion, provided the number of servings in the package is stated (CSPI 1998; U.K. MAFF 1999).

The United Kingdom, recognizing the importance of health-related information provided by labels, recommends that Group Two information be given on all foods voluntarily (U. K. MAFF 1999).

Figure 3. Nutritional Panel on a U.K. Food Label



NUTRITION INFORMATION		
TYPICAL VALUES	PER 100g	PER POT
Energy	405kJ 96kcal	809kJ 192kcal
Protein	9.9g	19.8g
Carbohydrate	6.5g	13.0g
of which sugars	5.1g	10.2g
Fat	3.4g	6.8g
of which saturates	2.0g	4.0g
Fibre	1.0g	2.0g
Sodium	0.3g	0.6g

Reproduced from Food Labels – A Guide to the UK Regulations available at http://www.fst.rdg.ac.uk/foodlaw/label/index2.htm *(The University of Reading)*

In many post-Soviet countries, based on standards inherited from the Soviet Union, requirements on nutrition labeling are limited: food manufacturers must provide information on calories, fat, carbohydrates, and protein per 100 grams/100 milliliters. Fats and carbohydrates are not broken down by type; no information is given on vitamins or minerals (Figure 4.) Although obesity is not common and diet-related diseases resulting from over-consumption are not a priority, nutritionists and dietitians recommend that consumers pay more attention to labels, ensure adequate consumption of proteins, and switch to low fat and reduced calorie diets (Гарматина 2001). Given the inadequacy of current labeling requirements, alternative standards (e.g., NLEA) are viewed as superior (Телегин).

Figure 4. Nutritional Information on Russian Labels

A milk package is likely to contain this or similar information in addition to the name, address and phone number of the manufacturer:

Content: made from homogenized milk.
Nutritional value per 100g of the product:
Fat – 1.5 g
Protein – 2.85 g
Carbohydrates – 4.78
Energy value per 100 g of the product 44 kcal/ 184 kJ

The following information would be listed on a candy wrapper:

> Content: chocolate icing, cocoa powder, cocoa butter, cashew nut, milk powder, cinnamon, artificial flavoring. 100g of the product contain: Protein – 7.1g, Fat – 29g, Carbohydrates – 55.7g. Energy value of the product 513 kcal

Methodology

Expert Opinions. Recognizing that there has been little research specifically addressing the differences between presenting nutrition information per 100g versus serving, expert opinions were used as an exploratory research tool. Dr. Julie Caswell , University of Massachusetts; Dr. Brian Roe , Ohio State University; and Dr. Alan Levy , Food and Drug Administration, were interviewed over the phone. The primary purpose of the interviews was to glean their opinions on the merits and shortcomings of either approach (100 g vs. serving size), as well as their perspective on the future labeling standards in the U.S. and internationally.

Survey. A survey was developed and distributed to Arizona State University East faculty and students at frequently attended locations (bookstore, learning center, and swimming pool) and on-campus social events. It included questions on label understanding and use, opinions on a uniform reference unit, inclusion of percent daily value, understanding of the terms "serving and portion," demographic questions, and comparisons of three labels. Most questions were structured, requiring either a dichotomous response or opinions on a Likert scale.
Sixty-nine surveys were completed. Correlation tests were used to identify patterns or similarities among responses; and confidence intervals were used to compare groups – these tests were chosen over ANOVA and t-tests due to highly unequal sample sizes; the results are reported in the Appendix. Open-ended questions were categorized by common themes.

Gender * Country of origin Crosstabulation
Count

		Country of origin		Total
		USA	Other	
Gender	Female	36	4	40
	Male	20	8	28
Total		56	12	68

Shopping responsibilities * Gender Crosstabulation
Count

		Gender		Total
		Female	Male	
Shopping responsibilities	I do grocery shopping for myself	18	14	32
	I do most family/ household food shopping	20	9	29
	Somebody else does most of the shopping	3	4	7
Total		41	27	68

Focus Groups. Two focus groups were conducted to obtain more in-depth responses than surveys afford. Three female university employees participated in the first focus group and four students (3 females, 1 male) in the second. Participants' responses were summarized to support and/or clarify response patterns revealed by the survey.

Findings and Discussion

Consumers appear to understand that servings on labels are smaller than amounts typically consumed by adults, although there is some confusion about the meaning of the term "serving." Labels in the U. S. are helpful in most label use tasks, such as judging general healthiness of a product and product comparison. The NLEA label is helpful in within-category comparison of products, but is less so in cross-category comparison.

Serving sizes are preferred by the U.S. consumer, although both the survey and the focus groups revealed support for a standard unit that is uniform across all foods, and for servings to reflect typical consumption levels.
Percent of daily value may not be well understood, but most respondents agreed that it should be provided on the label. The experts feel that labels are used to make magnitude estimations and provide a general reference for this task. The NLEA label seems to be geared to those who already know how to use it, but continued education efforts make the information more accessible to the less-informed. More efforts are needed to help clarify the confusion about servings vs. portions and use of %DV.

Some focus group participants feel that product claims can be deceptive, but nutrition facts help and should be used for verification. Data revealed consumer distrust of the food industry regarding nutritional information with a preference for information that is straightforward, unambiguous and not subject to misinterpretation.

Sugar is a concern in the U. S. Other "negative" nutrients show %DV for magnitude estimation, yet there is no such value for sugar. In accordance with U.S. nutritional guidelines, fats and sweets should be used sparingly – unlike fats, no benchmark amounts for sugars are provided (Nestle, p. 83-84, 108-110; CSPI 2000). Sugars

appear in large quantities in foods that are considered or featured as healthy (e.g. yogurts, cereals, flavored milks, juices, and fruit desserts). A quote from Pratt's article (1996) provides an illustration of this inconsistency: "… for potato chips, French fries, cookies, salad dressings and foods that are primarily fats or sweets, there's, well, no comparison. The pyramid, ever optimistic about influencing American eating habits, recommends that you eat these things "sparingly"; the Nutrition Facts labels are more pragmatic, assuming that you will eat an entire candy bar once you unwrap it." The difficulty with calculating a recommended daily amount for sugars lies in the differentiation between added sugars and those that naturally occur in the food.
Consumers have difficulty understanding information that is presented in a multi-column format. Some U.S. companies choose to add a second column, which, according to Alan Levy, unnecessarily complicates the display (e.g., columns for nutritional value of dry cereal and cereal with milk).

Use of Reference Amounts

Neither an amount of 100g nor serving is ideal as a reference unit for labeling. Servings are well suited for comparison among products of the same kind. A 100-gram basis provides a measure of relative content useful in comparing nutrition characteristics of different products, even across product categories. Additionally, a relative content measure allows estimation of high-low content of desirable and undesirable nutrients. However, the ability to judge high-low content depends on experience and/or education. In order to know that 28% fat mayonnaise is fairly low in fat for this product, the consumer should know that normally mayonnaise contains 60-70% fat. A similar condition applies to judging calorie content. For instance, products containing 0-150 cal. per 100g can be classified as low calorie density, 150-300 as medium, 300-450 as high, and over 450 as very high.

Serving sizes cannot be identical even for foods of the same category, and the use of strict universal servings is neither desirable nor practical. As currently determined by the FDA, a serving size is a reference amount calculated "for persons 4 years of age or older to reflect the amount of food customarily consumed per eating occasion by persons in this population group" (CFR 2001). In actuality, it does not reflect individual consumption patterns. In some instances, the manufacturers can determine these "reference amounts" for their products that are different from FDA's reference amounts (e.g. when one unit weighs more than 50% but less than 200% of the FDA's reference amount, the serving size is still one unit).

While it is easier to derive relative nutrient content from a standard 100-gram reference for macronutrients, percent of daily value may be a more convenient measure for micronutrients, cholesterol, and sodium. Usage of DV is more appropriate with the serving size as a reference unit where %DV serves as a magnitude estimation aide. Servings appear a better reference device in comparing products of different densities (puffed cereal vs. heavy cereal) or in judging

nutritional value of products that are normally consumed in very small amounts (e.g., butter).

Both with servings and 100g reference units, consumers often need to do calculations if they want to find the nutritional value of the food they consume, as these amounts usually differ from 100g or a serving.

Conclusions and Recommendations

Consumers tend to develop a good understanding of the existing labeling standards in their country and adjust to changes in regulations. A choice of a reference amount should depend on the traditions in a particular country. As there are no proven or well-researched benefits of servings vs. 100g, countries that use 100g in their labeling standards should continue to do so. Although some researchers suggest that all countries should provide nutritional information in terms of amount of nutrients per serving rather than per 100g or another standard unit (CSPI 1998), this recommendation appears unsubstantiated as it is primarily based on consumer studies conducted in the U. S.

International accord is desirable; however harmonizing details can be complicated (Food and Agriculture Organization 1994). International standardization of food labeling should be based on principles that allow flexibility rather than provide specific recommendations on the components and format of the label. This way, countries can adhere to and further the traditions to which consumers are accustomed. The reference unit for labeling is one of these specific details that need not be standardized.

Countries trying to improve their labeling standards should develop the format with use of extensive consumer research in order to determine common purposes of use, accommodate traditions and prioritize nutrients of importance for each country. Attempts to satisfy all information needs in a particular label are likely to result in label overload; compromises have to be made about the content and format of the standard food label. Multi-column formats should be avoided or thoroughly tested, as research of U.S. consumers showed that such formats are difficult to interpret. Label formats should be designed in ways that do not require calculations or conversions of measurement units.

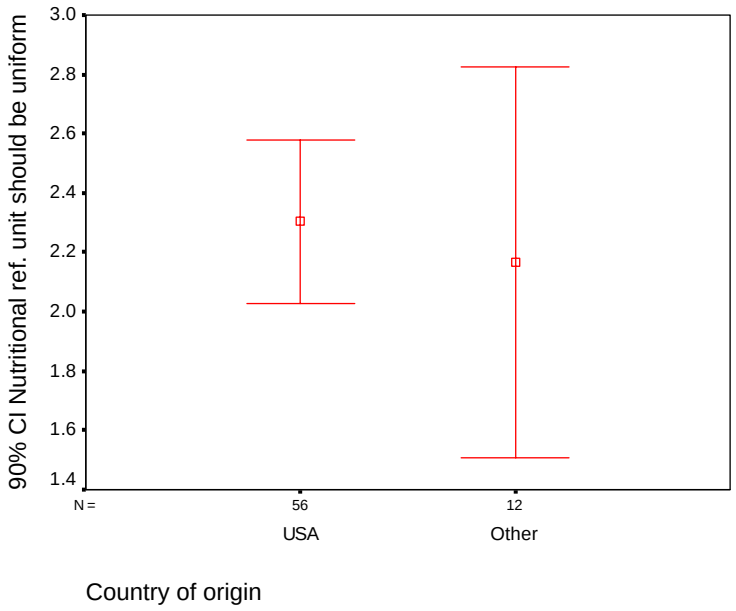
Nations using 100g as a reference unit should consider providing percent of daily value for micronutrients, sodium, and cholesterol, or develop alternative magnitude estimation aides for these nutrients. For countries, such as the U. S., where sugar is a nutrient of concern, reference amounts for recommended daily intake of sugar should be determined and appear on the nutrition label.

Limitations

Due to resource and time constraints, the survey and focus groups were conducted on Arizona State University East campus. This has resulted in oversampling of people with advanced education and possibly with specialized knowledge in nutrition. International students were not adequately represented in the survey (17.6% of the sample). In order to better support conclusions for policy-makers in other countries, it would be desirable that consumer studies be conducted in those countries.

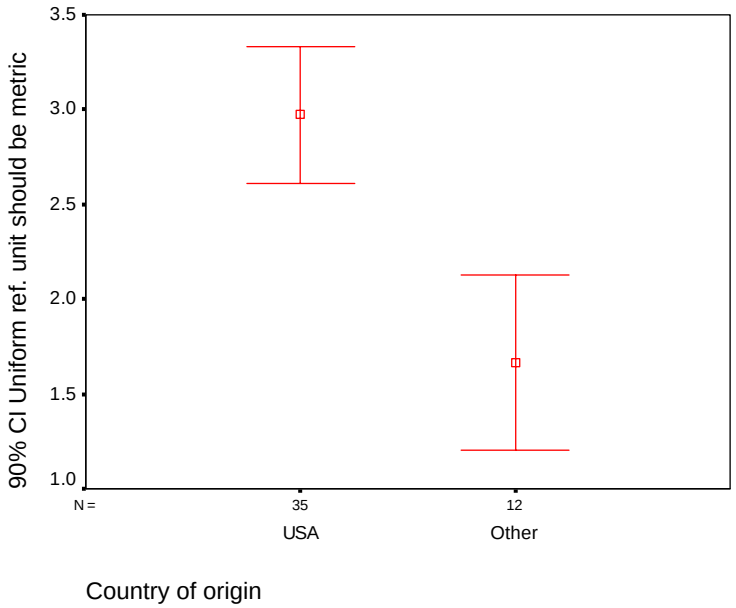
APPENDICES

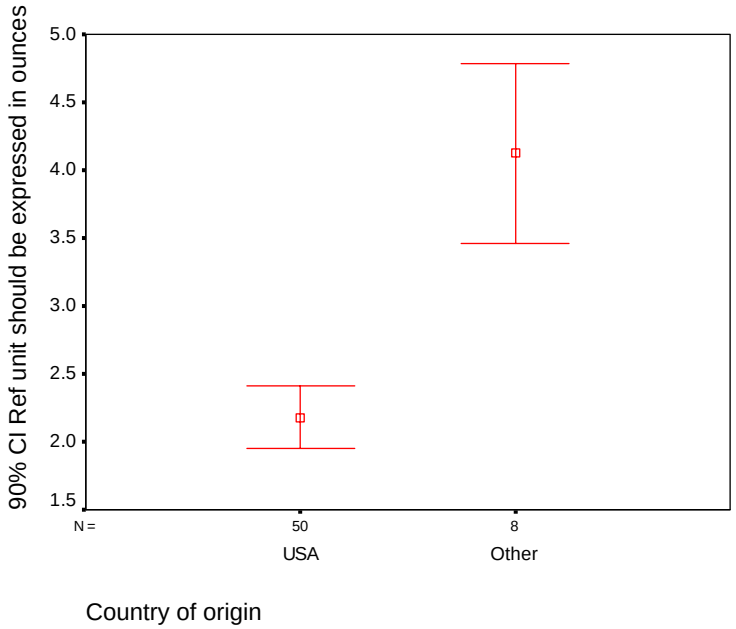
COMPARISON OF GROUPS USING CONFIDENCE INTERVALS[1]

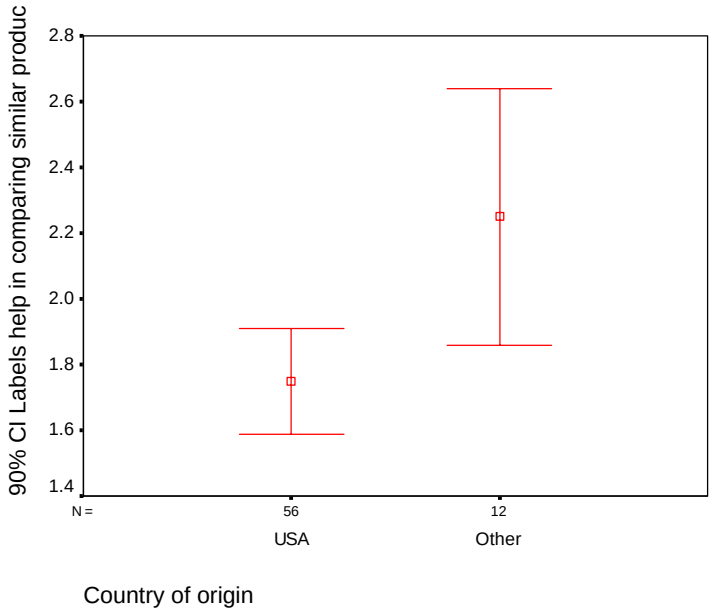


Both U.S. and foreign respondents expressed agreement that a nutritional reference unit should be uniform for all foods. Foreign respondents expressed a preference for using metric units in presenting nutritional information, while U.S. respondents preferred ounces. The U.S. label was found helpful in comparing similar products, especially by U.S. respondents; labels are considered less helpful in comparing products of different kind.

[1] Recognizing the possibility of underpowered statistical tests, comparisons were conducted at the 90% confidence level.


90% CI Uniform ref. unit should be metric
3.5
3.0
2.5
2.0
1.5
1.0
N =
35
12
USA
Other
Country of origin


90% CI Ref unit should be expressed in ounces
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
N =
50
8
USA
Other
Country of origin


90% CI Labels help in comparing similar produc
2.8
2.6
2.4
2.2
2.0
1.8
1.6
1.4
N =
56
12
USA
Other
Country of origin

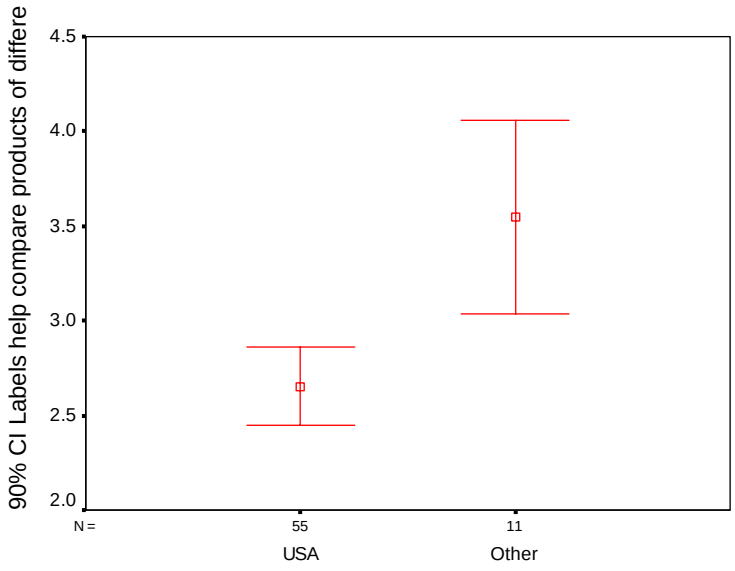
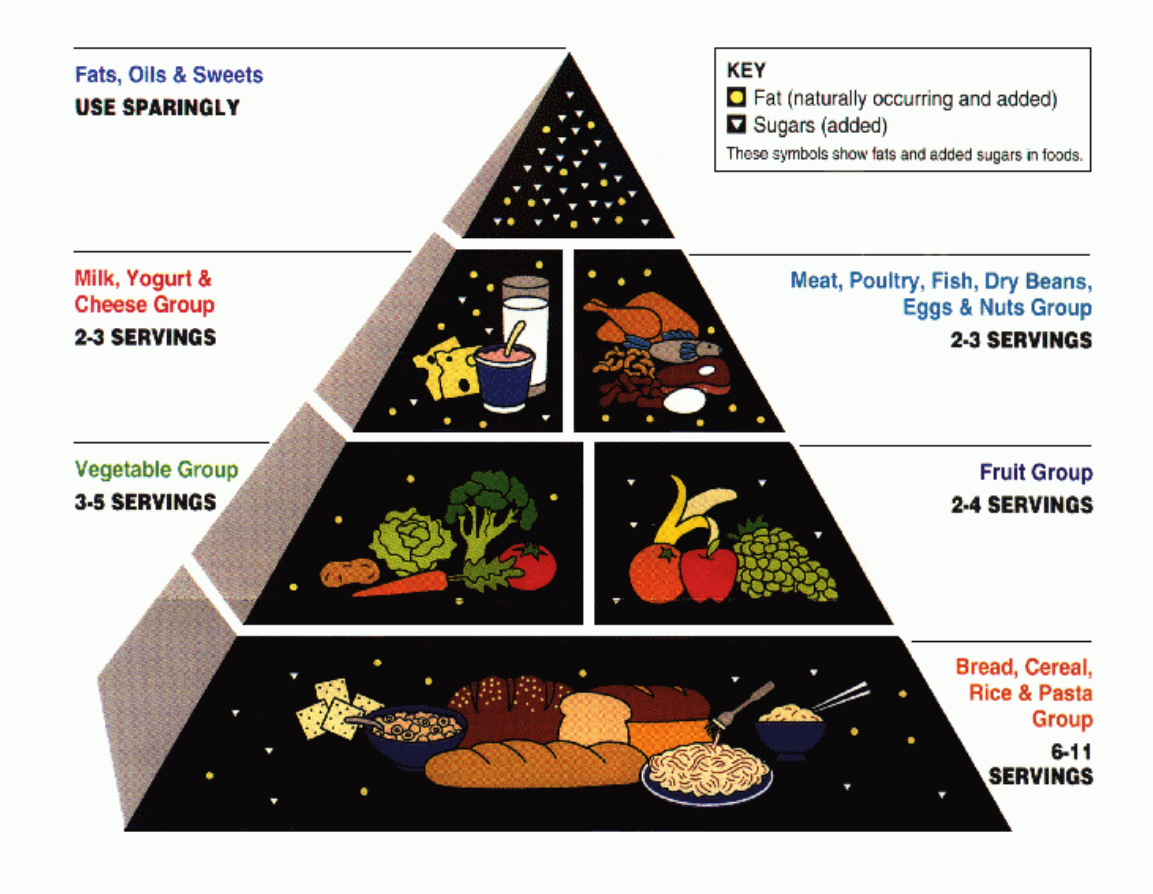

90% CI Labels help compare products of differe
4.5
4.0
3.5
3.0
2.5
2.0
N =
55
11
USA
Other
Country of origin

Figure 5. Food Guide Pyramid



Source: the U.S. Department of Agriculture and the U.S. Department of Health and Human Services

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