*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

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## 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.



## 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.

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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.

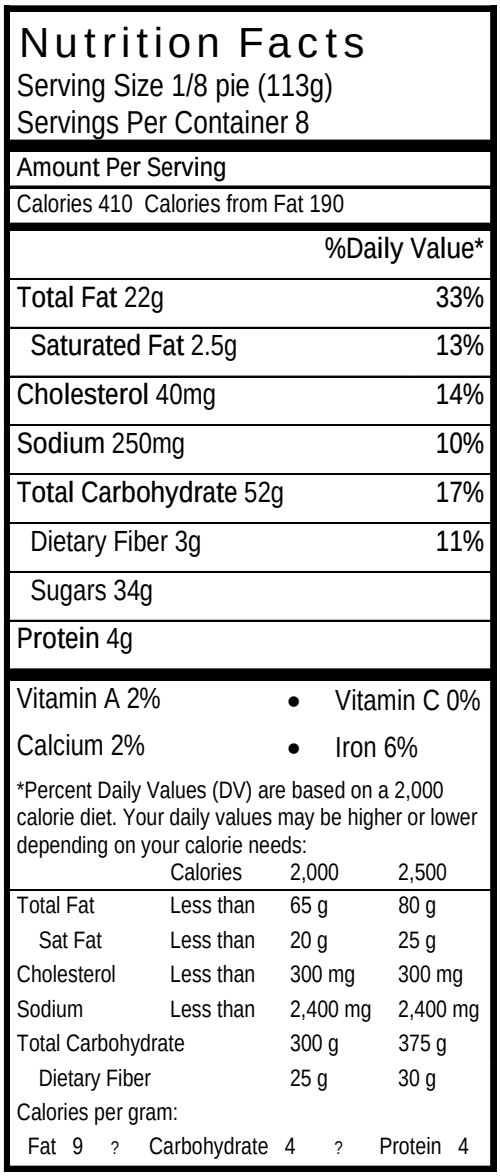
Now NLEA is recognized as a model for others to follow in efforts to improve health and welfare through labeling (CSPI 1998, Телегин). Canada was the first country to institute nutritional labeling standards similar to NLEA. Although geographic proximity and incentives to standardize food labeling to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

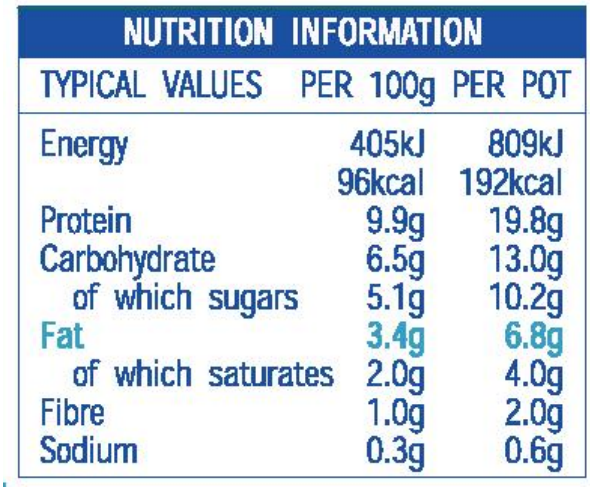
## Labels in Other Countries

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<br>96kcal | 809kJ<br>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.

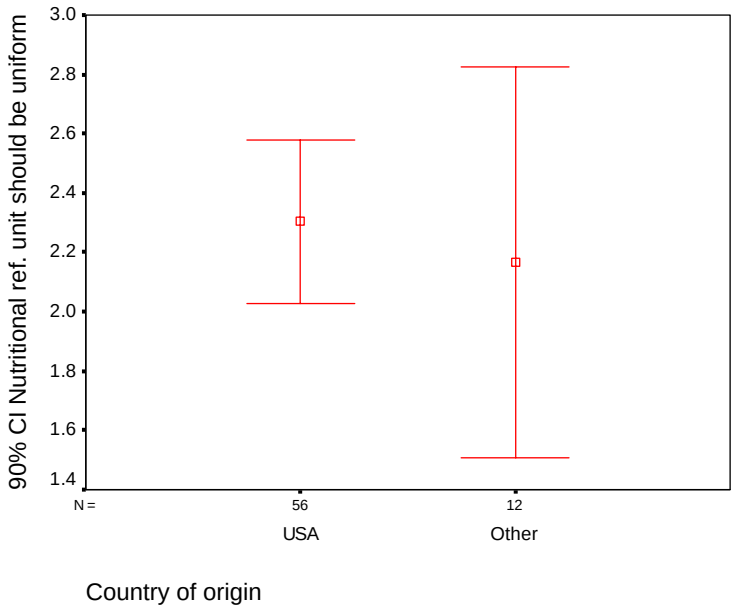
Nations using 100g as a reference unit should consider providing percent of daily value for micronutrients, sodium, and cholesterol, or develop alternative magnitude estimation aides for these nutrients. For countries, such as the U. S., where sugar is a nutrient of concern, reference amounts for recommended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

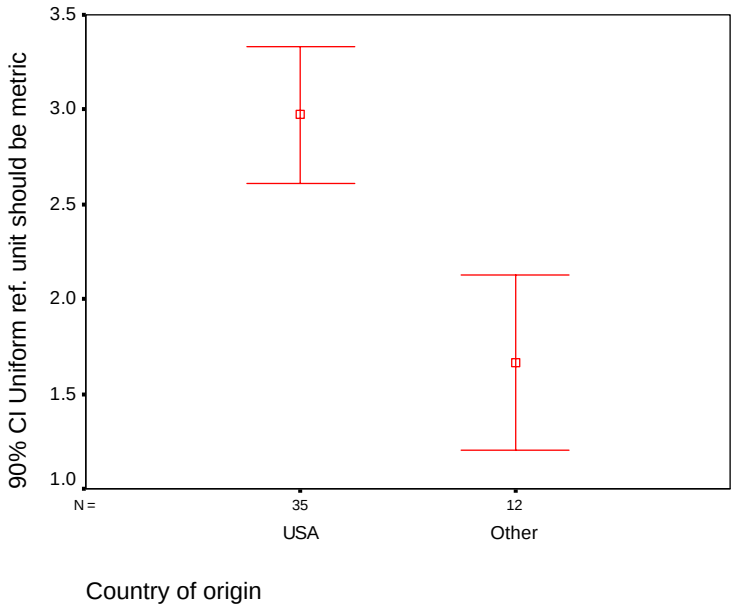
## APPENDICES

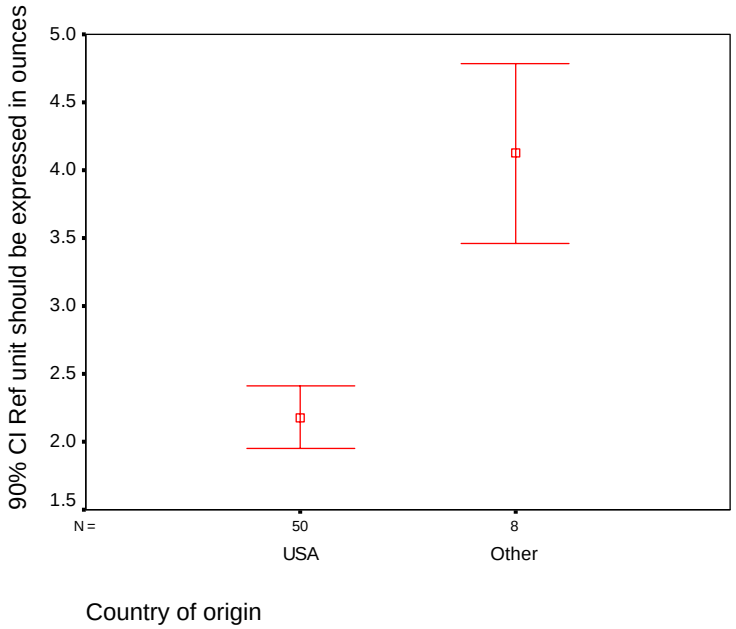
*COMPARISON OF GROUPS USING CONFIDENCE INTERVALS*[1]

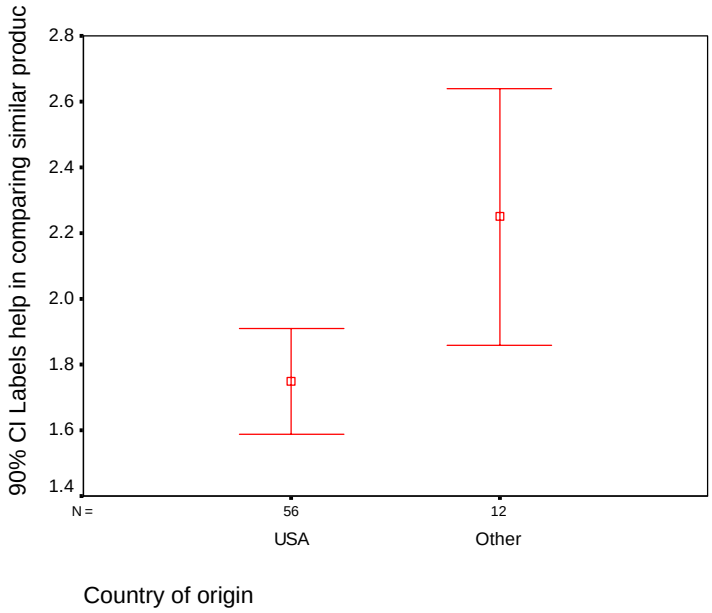



Both U.S. and foreign respondents expressed agreement that a nutritional reference unit should be uniform for all foods. Foreign respondents expressed a preference for using metric units in presenting nutritional information, while U.S. respondents preferred ounces. The U.S. label was found helpful in 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

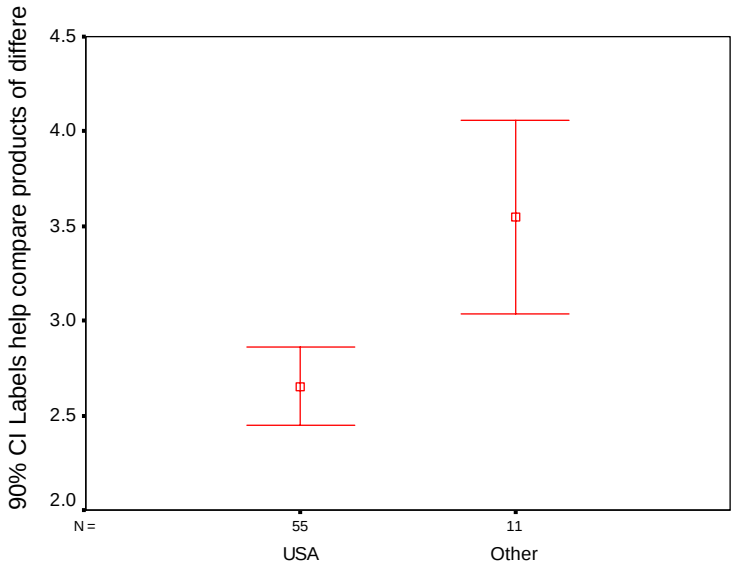
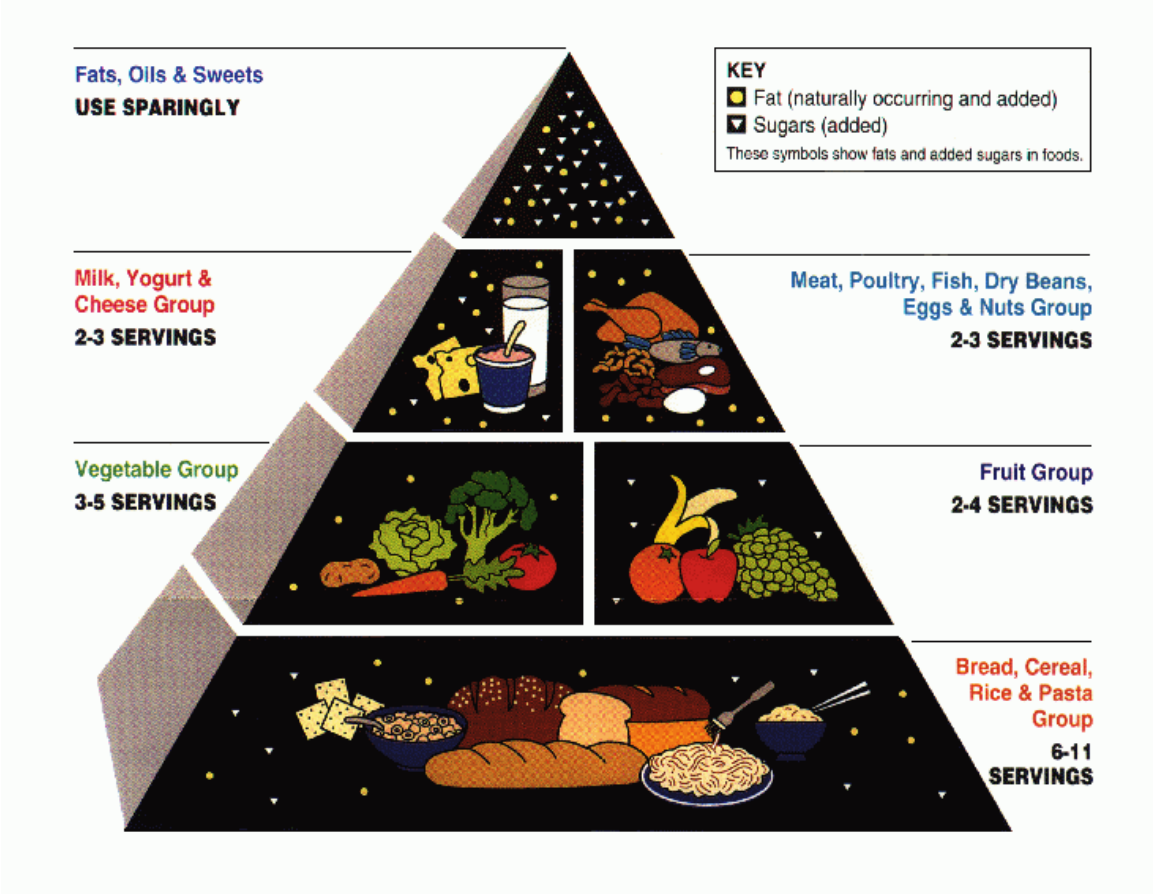

90% CI Labels help compare products of differe
4.5
4.0
3.5
3.0
2.5
2.0
N =
55
11
USA
Other
Country of origin

**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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