

REVIEW AND COMPARISON OF INDIVIDUAL NUTRIENT VALUES IN SELECTED PROCESSED FOODS

Bethany Showell and Pamela Pehrsson

U.S. Department of Agriculture, ARS, Beltsville Human Nutrition Research Center, Beltsville, MD 20705



Abstract

Objective: Increased intake of prepared foods can have public health implications as intake of nutrients such as sodium also increases. The USDA Nutrient Data Laboratory is focused on tracking nutrient intake for some of these foods. Mean nutrient values are reported in the Nutrient Database for Standard Reference (SR) but for many frequently consumed foods, it is useful to know the individual values that determine the mean i.e., the nutrient variability/range. This is particularly true in recent analyses conducted to track sodium in processed foods. **Methods:** Highly-consumed, high-sodium baked products and mixed dishes were studied to examine differences in various nutrients in different brands of processed food products. Several of these foods, including prepared corn muffin mix, frozen garlic bread, frozen burritos, and canned meat ravioli with sauce, were analyzed by AOAC methods. The nutrients included total fat, total sugar, calcium, and sodium. **Results:** Two popular brands of corn muffin mix were prepared and analyzed. The mean analytical calcium value was 52mg/100g (range of 40-95mg/100g) in one brand and 140mg/100g (135-147mg/100g) in the other brand. The weighted (by market share) mean value across brands was 135mg/100g. Two brands of cheese crackers were analyzed; brand A sodium was 819mg/100g (688-928mg/100g) and brand B sodium was 1126mg/100g (963-1280mg/100g). The mean sodium value across brands was 973mg/100g. Preliminary statistical analyses reveal significant differences between brands of some foods (e.g., cheese crackers (p=0.0021) and corn muffin mix (p=0.0014)). **Conclusion:** Examination of individual values does highlight some variability in several nutrients of public health concern within various food items. Analysis of individual values is critical in determining whether the nutrient value differences are a result of outliers, brand differences, or formulation differences due to a change in ingredients. Nutrient variability information is an important component of nutrition research and for nutrition policy makers.

Introduction

As the number of people consuming commercially processed foods has increased, the USDA Nutrient Data Laboratory (NDL) has increased analysis of these foods. Through NDL's National Food and Nutrient Analysis Program (NFNAP), up to 12 nationwide samples of each food type may be analyzed. These individual samples can show range and variability between brands and across brands used in the sampling composite. Examination of these samples can allow further insight as to the effect of one value, several values, or a range of values in the final product.

While it can be expected that an item can vary from brand to brand, the same item can also vary within brand. There can be two different versions of the same branded product on the shelf due to manufacturing differences. These differences are reflected in the variability of nutrient values.

Objective

To demonstrate the nutrient variability and range of individual nutrient values in select baked products and mixed dishes

Methods

Sampling

- Sampling done through the National Food and Nutrient Analysis Program (NFNAP) in 12 locations nationwide¹
- 2-3 brand name and/or store brand foods were sampled for each food item based on 80% of the market share
- High-consumption, high-sodium baked products and mixed dishes were sampled: cheese crackers, prepared corn muffin mix, frozen garlic bread, frozen bean and cheese burrito, canned meat

Analytical Methodology

- Sodium and calcium - ICP (AOAC 985.01 + 984.27)
- Total fat - modified acid hydrolysis (AOAC 989.5)/acid hydrolysis (AOAC 954.02)
- Total sugar - liquid chromatography (AOAC 982.14)

Quality control

- Analytical quality control performed through the use of duplicate sampling with in-house control and certified reference materials

Statistics

- Statistics were done using a Mann-Whitney U-test with Exact Probabilities in SAS

Acknowledgments

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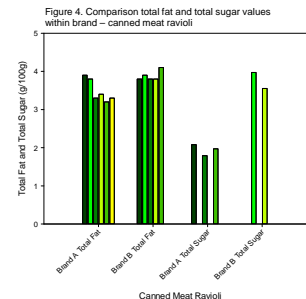
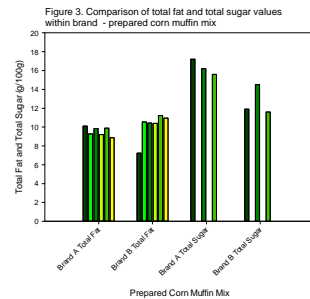
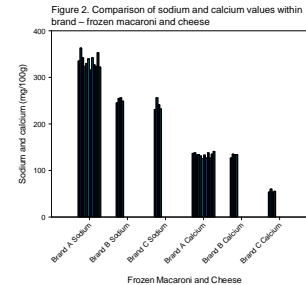
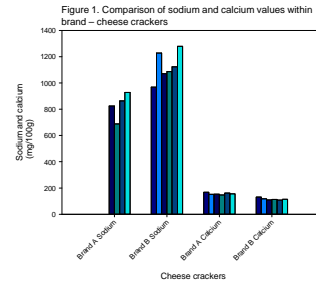


Table 1. Sodium and calcium values in selected baked product and mixed dish food items

Food Item	n	Sodium (mg/100g)		Calcium (mg/100g)	
		Median	P-value	Median	P-value
Prepared Corn Muffin Mix					
Brand A	6	606	0.0024	140.3	0.0022
Brand B	6	534		59.33	
Frozen Garlic Bread					
Brand A	5	544	0.0708	19.4	0.00036
Brand B	5	544		31.6	
Brand C	2	411.5		61.2	
Frozen Bean & Cheese Burrito					
Brand A	5	375	0.0066	53.3	<0.0001
Brand B	4	285.5		40.85	
Brand C	6	385		14.25	
Canned Meat Ravioli with Sauce					
Brand A	6	259	0.0041	11.45	0.0043
Brand B	5	411		14.5	

References

1 Perry, C.R., Pehrsson, P.R., Holden, J.M. 2003. A Revised Sampling Plan for Obtaining Food Products for Nutrient Analysis for the USDA National Nutrient Database. Proceedings of the American Statistical Association, Section on Survey Research Methods, Alexandria, VA: American Statistical Association, San Francisco, CA.

Table 2. Total fat and total sugar values in selected baked product and mixed dish food items

Food Item	n	Total Fat (g/100g)		Total Sugar (g/100g)	
		Median	P-value	Median	P-value
Cheese Crackers					
Brand A	6	26.93	0.0021	N/A	N/A
Brand B	6	18.46		N/A	N/A
Frozen Garlic Bread					
Brand A	5	16.5	0.0084	3	3.69
Brand B	5	17		2	3.845
Brand C	2	7.1		2	2.632
Frozen Bean & Cheese Burrito					
Brand A	5	5.9	0.00074	3	2.598
Brand B	4	5.95		4	4.628
Brand C	6	2.95		3	2.01
Frozen Macaroni & Cheese					
Brand A	12	7.495	<0.0001	6	1.5
Brand B	4	6.8		4	2.2
Brand C	4	3.86		4	0.75

Results and Discussion

- Significant differences were shown in several baked product and mixed dish items
 - Cheese crackers (p=0.0022) and canned meat ravioli with sauce (p=0.0041) showed significant differences in sodium values (Table 1)
 - Cheese crackers (p=0.0021) were also significantly different with total fat, as was frozen macaroni and cheese (p=<0.0001) (Table 2)
 - Total sugar values were significantly different in the frozen bean and cheese burritos (p=0.00014) and frozen macaroni and cheese (p=<0.0001), as well (Table 2)
 - Calcium was significantly different in all foods - cheese crackers, prepared corn muffin mix (p=0.0022), frozen garlic bread (p=0.00036), frozen bean and cheese burrito (p=<0.0001), canned meat ravioli with sauce (p=0.0043), and frozen macaroni and cheese (p=0.0032) (Table 1)
- Ranges for selected food items varied by nutrient within brand
 - Brand A cheese crackers ranged from 699 to 928mg/100 g of sodium with a median value of 837.5mg/100g, while Brand B cheese crackers ranged from 969 to 1280mg/100 g of sodium with a median value of 1106mg/100g (Figure 1)
 - For ranges of total fat in frozen garlic bread (Table 2), Brand A ranged from 15.1 to 18.4g/100g with a median of 16.5g/100g; Brand B ranged from 14.2 to 18g/100g with a median of 17g/100g; and Brand C ranged from 6.5 to 7.7g/100g with a median of 7.1g/100g
 - Some total sugar ranges were more narrow - frozen bean and cheese burrito (Table 2) Brand A values ranged from 2.527 to 2.607g/100g (median 2.598g/100g); Brand B values ranged from 4.447 to 4.867g/100g (median 4.628g/100g); Brand C ranged from 1.85 to 2.02g/100g (median 2.01g/100g)
 - Calcium values in frozen macaroni and cheese (Figure 2) ranged widely - Brand A 126 to 141mg/100g (median 133.5mg/100g); Brand B 127 to 135mg/100g (median 134mg/100g); Brand C 53.5 to 60.1mg/100g (median 54.55mg/100g)

Conclusion

- Variability of nutrients across brands was demonstrated in several selected food products
- Ranges across brands give insight into median and mean values reported in SR
- The number of samples may have some affect on range and variability
- It would be advantageous to conduct periodic review of individual nutrient values of certain products to determine effect on mean values
- Variability is as important as mean values for use in dietary assessment