20121029 - BNI of kinds of corn chips (inferential statistics) - 2012

[Data] [<Normal page] [**PEREZGONZALEZ Jose D (2012).** *BNI of kinds of corn chips (inferential statistics).* Journal of Knowledge Advancement & Integration (ISSN 1177-4576), 2012, pages 305-309.]

BNI of generic brands (inferences)

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Table of Contents

Some corn chips[6] are sold under generic brands (eg, a supermarket brand) while others are sold under proprietary brands. Thus, it is of interest to test whether such characteristic informs about overall nutritional balance (BNI) and, thus, whether it may help choose more balanced products. As part of a research on the nutritional balance of corn chips *(2012b)*[3], Perezgonzalez also assessed whether generic and proprietary brands differed in regards to overall nutritional balance. This article provides inferential information both about the population of products under research (foodBNI) as well as about hypothetical diets based on those products (dietBNI).

foodBNI

Proprietary brands tend to be more abundant than generic brands, overall providing more flavors and package sizes. Furthermore, the distribution of nutritional balance of both kinds of products also differs. Named brands tend to be extremely unbalanced[7], having a mean located somewhere between BNI 48 and BNI 59 (95% confidence). Meanwhile, generic brands tend to have a somewhat higher unbalance, with their means located somewhere between BNI 63 and BNI 74 (illustration 1).

Illustration 1: Food's nutritional balance		
Non-parametric	**Generic brand**	
	No	**Yes**
Median CI_{95} lower	50.78	64.37
Median CI_{95} upper	64.98	78.11
SPR lower	8.73	4.27
SPR upper	22.93	18.00
Mann-Whitney U	65.00 (p=0.01)	
Parametric	**Generic brand**	
	No	**Yes**
Mean CI_{95} lower	48.13	62.79
Mean CI_{95} upper	59.49	73.79

SD CI_{95} lower	10.74	5.40
SD CI_{95} upper	18.80	13.20
t-test (df 29)	-3.59 (p=0.001)	
Mean diff CI_{95} lower	22.72	
Mean diff CI_{95} upper	6.23	
(95% confidence interval's lower and upper bounds)		

Even when both kinds of corn chips are extremely unbalanced, the difference between groups is still perceptible. Indeed, statistic tests are significant both under non-parametric assumptions (Mann-Whitney U) as well as under parametric assumptions (t-test), suggesting that corn chips by named brands are, overall, less unbalanced than those by generic brands. Such difference can be as much as between 6 and 23 units on the BNI scale (95% confidence), equivalent to a slight to moderate difference in nutritional balance between both kinds of products (illustration1).

The type of branding also relates moderately with the BNI in a positive manner, reinforcing the suggestion that avoiding generic brands may help in choosing between 13% to 72% of more nutritionally balanced products (Adj.R) (illustration 2).

Illustration 2: Correlations with the BNI			
		rho	**r**
Generic brand	**CI_{95} lower**	0.13	0.16
	CI_{95} upper	0.73	0.75
Adj.R	**CI_{95} lower**		0.13
	CI_{95} upper		0.72

dietBNI

As part of two hypothetical diets where the corresponding generic and named products contributed the same weight of chips, the resulting nutritional balance would still be extremely unbalanced, with 95% confidence of it ranging somewhere between BNI 42.72 and BNI 52.40 for the diet based on proprietary brands, and between BNI 47.46 and BNI 62.97 for the diet based on generic brands (illustration 3).

Illustration 3: Diet's nutritional balance corn chips								
Named brands	**Protein**	**Carbs**	**Sugar**	**Fat**	**Sat.fat**	**Fiber**	**Sodium**	**BNI**
CI_{95} lower	6.7	60.1	1.7	24.6	6.3	3.7*	466.2	**42.72**
CI_{95} upper	8.8	57.8	3.2	25.8	9.7	3.7*	631.8	**52.40**
Generic brands	**Protein**	**Carbs**	**Sugar**	**Fat**	**Sat.fat**	**Fiber**	**Sodium**	**BNI**
CI_{95} lower	5.8	61.7	1.4	24.8	9.7	3.7*	585.6	**47.46**
CI_{95} upper	6.6	56.0	3.9	25.6	11.0	3.7*	789.2	**62.97**
*(Nutrients per 100g; *fiber content estimated from 'Doritos Burn'; **carbs' upper and lower bounds are reversed[8])*								

Methods

Research approach

Exploratory study for comparing the nutritional balance of corn chip products[6] sold under generic and proprietary brands in New Zealand.

Design

Quantitative (fixed) in nature, including a descriptive component and a between-group component.

Sample

Stratified sample of 37 corn chip products *(Perezgonzalez, 2012a[2])*, including diverse flavors and other relevant categories. Of these products, 11 were from generic brands and 26 were from proprietary brands. Notwithstanding this, the actual products were collected in a convenient manner from four major national supermarket chains. The final sample covered a large proportion of the population of corn chip products available at such supermarkets. Thus, given the scope of the sample and the national coverage of the retail chains behind the sampled supermarkets, the actual sample is fairly representative of the population of corn chips available to New Zealanders nationwide. It may also partially inform about the population of corn chips available to Australians, as one of the retail chains is Australian-owned and several of the products are imported from (and probably exported to) Australia.

Variables

Variables of interest for this research were the following:

- Weight contribution of seven nutrients (protein, carbohydrate, sugar, fat, saturated fat, fiber and sodium) to 100g of a food product.
- The Balanced Nutrition Index (BNI) of each food product, as calculated from above variables.
- Aggregated information for the sample of products (foodBNI).
- Aggregated information about the individual nutrients for the simulation of hypothetical diets (dietBNI).

Materials and procedure

Relevant data were collated after purchasing the food products or by capturing such information from the producers' websites if this information was available and was deemed reliable. The data were then assessed using the Balanced Nutrition Index™ (BNI™) technology *(see Perezgonzalez, 2011[1])*. Missing data for fiber was estimated from 'Doritos Burn', the product with the lowest fiber content.

Data analysis

The sample's data was assessed as per normality and linearity, for the whole sample *(Perezgonzalez, 2012b[3])*, as well as for each group *(Perezgonzalez, 2012b[4])*. The BNI distribution for the whole sample as well as for each group was non-normal in skewness and kurtosis but not significantly so when being conservative in such assessment (sig≤0.001, *as per Tabachnick & Fidell, 2001[5]*). Furthermore, no extreme cases were found either for the whole sample or for individual groups.

The present stage of research on the BNI of foods offers little evidence for ascertaining the real distribution of nutritional balance in the population of food products, including that of corn chips. In theory, the nutritional distribution of well-balanced products would resemble a chi-square

distribution; thus, it can be expected that as products move up the scale towards greater unbalance, they may adopt a more normal distribution. Anecdotal evidence about the nutritional distribution of a sample of 1,000 food products seems to support such trend. Notwithstanding this, the nutritional distribution of corn chips resembles an F-distribution but in the opposite direction than that expected from theory, with a rather long tail towards less unbalanced products.

Given the uncertainty about the nutritional distribution of corn chips in the population, the sample data was not transformed in any way. Instead, the article provides results to cover both eventualities. On the one hand, that the sample represents the true nature of the population, this being skewed towards lower levels of unbalance, even when no significantly so; therefore non-parametric results are more appropriate under such assumption. On the other hand, that the population is normally distributed, therefore parametric results are more appropriate under such assumption.

In regards to linearity between relevant variables, the linear model was statistically significant, thus suggesting its use was adequate for capturing the true relationship between variables.

The main analyses carried out were both population descriptives (95% confidence intervals) and correlations, as well as tests of differences for independent groups with their corresponding statistical significance assessed following Fisher-Perez's approach with threshold set at sig≤0.05 (ie, results with 5% or more extreme probabilities), 2-tailed.

SPSS-v18 was used for the computation of variables, including BNI and international indexes, and for inferential statistical analyses.

Generalization potential

Most of the products were either produced locally or imported from Australia. The results of this study may, thus, be generalizable to the following populations (in order of decreasing generalization power):

- New Zealand, nationwide.
- Australia.
- Internationally, if one assumes these products to be of approximately similar nutritional composition anywhere.

The results of this study may also be of interest to the following populations:

- food researchers
- dietitians
- food policy makers
- consumers

References

1. **PEREZGONZALEZ Jose D (2011).** *Balanced Nutrition Index™ (BNI™).* Journal of Knowledge Advancement & Integration (ISSN 1177-4576), 2011, pages 20-21.
2. **PEREZGONZALEZ Jose D (2012a).** *Corn utopia.* The Balanced Nutrition Index (ISSN 1177-8849), 2012, issue 6.
3. **PEREZGONZALEZ Jose D (2012b).** *Nutritional balance of corn chips (descriptive statistics) (2e).* Journal of Knowledge Advancement & Integration (ISSN 1177-4576), 2012, pages 275-278.
4. **PEREZGONZALEZ Jose D (2012).** *BNI of kinds of corn chips (descriptive statistics).* Journal of Knowledge Advancement & Integration (ISSN 1177-4576), 2012, pages 300-304.
5. **TABACHNICK Barbara G & Linda S FIDELL (2001).** *Using multivariate statistics (4^{th} ed).* Allyn & Bacon (Boston, USA), 2001.

+++ **Notes** +++

6. Includes both corn chips and tortilla chips. Thus, they can be defined as thin shapes of pressed corn (usually cut into triangles or circles), and then oven-baked or deep-fried.
7. When interpreting the BNI as 0 = balanced, 1-9 = slightly unbalanced, 10-19 = moderately unbalanced, 20-29 = highly unbalanced, ≥30 = extremely unbalanced.

8. The lower and upper bounds for carbohydrates are reverse in order to keep the total energy count of the resulting profiles as similar as possible. Carbohydrates were selected for this reversal as they are the nutrient typically set by difference, after estimating proteins and fats.

Want to know more?

Wiki of Science - BNI of kinds of corn chips (further knowledge)
Two Wiki of Science pages provide further introductory and descriptive information about the nutritional balance of kinds of corn chips.

Wiki of Science - Kinds of food and nutritional balance
This Wiki of Science page provides more information about the nutritional balance of kinds of foods such as those sold under generic brands and those targeted to children.

Wiki of Science - Nutritional balance of corn chips
This Wiki of Science page provides an introduction to the BNI of corn chips, irrespective of brand.

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Other interesting sites

Journal KAI	Wiki of Science	AviationKnowledge	A4art	The Balanced Nutrition Index

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