

Changes in consumption of native biodiversity in Brazil from 2002-3 to 2008-9: health, income, geographic diversity, or markets?

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Brazil harbors several thousand native edible species; hundreds long domesticated before European contact.\* For almost as long as the spans of food domestication in Europe, Asia, and Africa, foods native to Latin America were the only available building blocks for healthy eating practices on the continent.

We know that healthy eating practices existed in Latin America, just as in Africa and Eurasia, because of the assembled evidence of co-variation in skeletal nutritional status with social status among genetically homogeneous populations. These variations are evidence of hierarchies in nutritional knowledge, as well as economic resources.

\* IBGE, 2004, lists 56,000 vegetal species, 518 mammals, 1677 birds, 468 reptiles, 517 amphibians, 10 million insects and 3,000 fresh water fish. (“Indicators of sustainable development,” Table 30)

- In addition to hierarchies of nutritional status in large pre-contact Latin American states, current studies in nutritional anthropology report healthy diets relying on local biodiversity among indigenous peoples worldwide. In the period after European contact, the great Latin American states broke up into smaller communities, whose food systems, as soon as they are studied, accomplish a great deal more than their lack of scientific resources, absent wisdom, might suggest (“Indigenous Peoples’ Food Systems,” FAO 2009).
- European contact brought substantial change in the Brazilian diet. During the past half-millennium, wheat, beef and dairy, chicken, sugar and rice, all imported, became the staple components of population nutrition in Brazil. Very important ingredients, such as coffee, oranges, bananas, yams and mangos were imported from Africa and Asia for commercial exploitation. Presently, imported foods are the most important fraction of population nutrition. Though over 347 Brazilian fruits are catalogued by WikiProject Plants, only a few, such as pineapple, guava, mango, papaya, passion fruit, and cocoa are commercially exploited: .

So, one important question is whether the health benefits of traditional dietary biodiversity, as demonstrated for indigenous peoples' food systems, are also demonstrable in general food systems modeled from household budget surveys.

We are also interested in whether knowledge of health benefits influenced changes in the consumption of native biodiversity during the first decade of the 21<sup>st</sup> century, alongside other economic inducements, such as availability and prices.

POF

The Pesquisa de Orcamentos Familiares sampled 182,000 and 190,000 persons in 89 geographic regions during 7-7/2002-3, and 5-5/2008-9, collecting community, household, family and individual details, anthropometrics, food spending by individuals (30dy), and family consumption (7dy) of several thousand foods.

- Factors for investigation:
- Native origin: Native origin indentified from external sources (WikiProject Tree of Life, USDA Plants Database). Readily available information did not permit identification of native “Brazilian” species, so origin in Central or South America was included. The list includes preparations where one or more native foods is the sole or predominant ingredient.
- Possible or partial native origin: Species native to several continents including the Americas. Preparations containing some native ingredients (chocolate cookies, colas). Composites of native and non-native components (vegetables, unspecified).
- Biodiversity indicator status: POF catalog item descriptions for Grains and Legumes, Tubers, Flours, Starches and Doughs, Tree and Ground Nuts, Leafy, Fruity and Other Vegetables, and Fruits were reviewed against external sources. [Animals are left for ongoing research]. Items were tagged with indicator status if most cultivation is of a single species or variety, and items with many varieties listed, such as beans, rice, bananas, potatoes, etc., where descriptors contained “Foodname in own language” (INFOODS Food Composition Database for Biodiversity, version 1.0). For example,, “Feijao Piroco” and “Feijao Douradihno,” were tagged, “Feijao em Grao” was not tagged.

## Listing in Food Composition Tables

Does publication of food composition data bear any influence on market circumstances? Two databases: are tested:

“TCN” = IBGE, “Tabelas de Composição Nutricional dos Alimentos Consumidos no Brasil,” (TCN). Published 7/27/2011, with the POF 2008-9 intake estimates: “Análise do Consumo Alimentar Pessoal no Brasil,”. Theisdatabase suggests itself as a dietary guideline for Brazilians, and is necessary to reconcile subsample nutritional estimates are status against the POF population. \* Conclusions regarding Brazilian diets have been widely circulated.

“UBC” = Rodriguez-Amaya, Et Al., “Updated Brazilian database on food carotenoids,” JFCA, 2008. This database reports carotenoids, meeting biodiversity indicator status where appropriate, and sampling origin by Brazilian State and crop year. *Mammea Americana* (Mamey), [Couepia bracteosa](#) (Pajura),

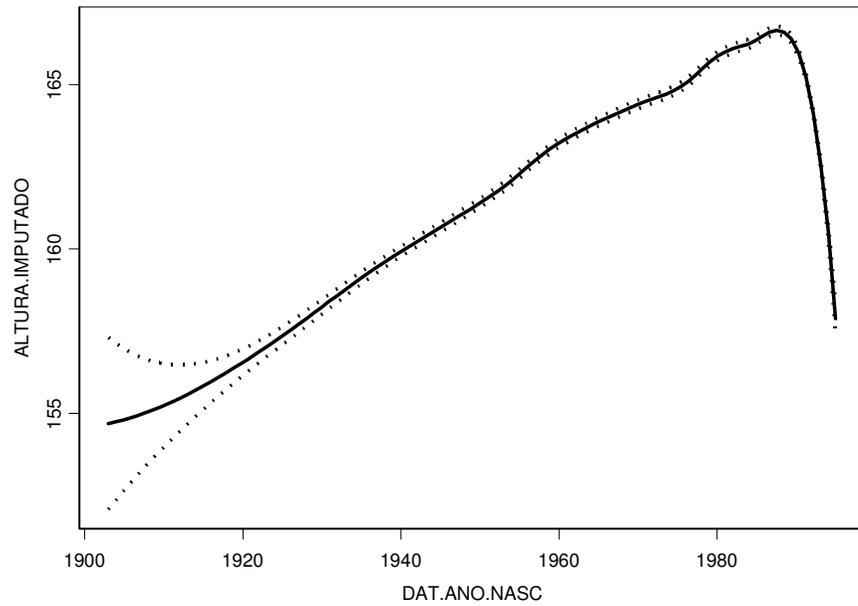
Items listed in the databases are utilized here as factors here. ENDEF, USDA, EUROFIR , etc., are to be added.

\*[www.ibge.gov.br](http://www.ibge.gov.br)

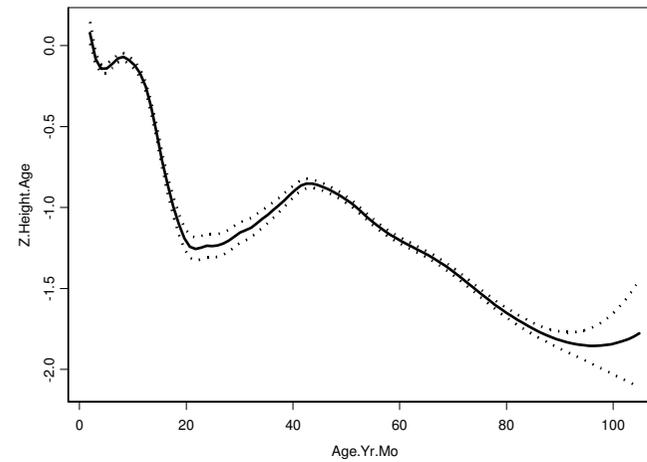
Food Categories: Average Household Consumption, POF 2008-9						
Food Category		KG. / HH	Food Category		KG. / HH	
Cereal Legume		2.81	Dairy		2.59	
Tubers		0.66	Baked Goods		1.26	
Flours Doughs		1.36	Industrialized Foods		0.35	
Cocos Nuts		0.11	Non-Alcoholic Drinks		2.49	
Vegetables		1.00	AlcoholicDrinks.KG		0.35	
Fruits		1.69	Oils.KG		0.47	
Sugar Confections		1.37	TravelFoods.KG		0.17	
Condiments		0.36				
Meats		1.38	Constructed Category			
Fish Saltwater		0.12	Biodiversity Indicator Status		2.14	
Fish Freshwater		0.16	Carotenoids DB Foods		2.05	
Fish Unspec		0.06	Native Foods		3.43	
Canned Preserved		0.06	Possibly Native		1.59	
Poultry Eggs		1.10	IBGE Composition Table, 2011		8.29	

# Principal Measures – Height for Age and BMI for Age Z-Scores

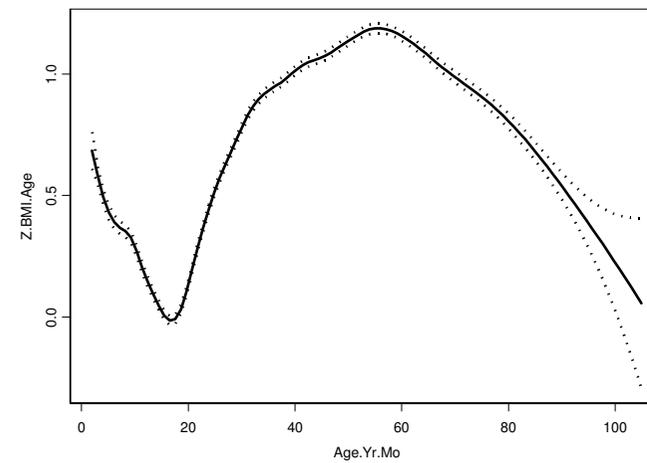
Average Stature by Birth Year, Ages 14 +, POF, Brazil, 2008-9



Average Height-For-Age Z-Scores by Age, POF, Brazil, 2008-9



Average BMI for Age Z-scores, by Age, POF, Brazil, 2008-9



INFLUENCES ON HEALTH						
Dependent Variable :	Z-Score, Height for Age			Z-Score, BMI for Age		
	Value	Std. Error	t - value	Value	Std. Error	t - value
(Intercept)	-0.857	0.0089	-96.86	0.6769	0.0044	155.2294
Cereal.Legume.KG	-0.005	0.001	-5.241	-0.0016	0.0005	-3.3283
Tubers.KG	0.0113	0.0038	2.9794	0.006	0.0019	3.2086
Flours.Doughs.KG	-0.009	0.0022	-4.272	-0.0078	0.0011	-7.1372
Cocos.Nuts.KG	-0.007	0.0038	-1.912	0.0014	0.0019	0.7325
Vegetables.KG	0.0114	0.004	2.8479	0.01	0.002	5.1082
Fruits.KG	-0.002	0.0023	-0.771	0.0025	0.0011	2.1905
Sugar.Confections.KG	-0.001	0.0021	-0.601	-0.0108	0.001	-10.6256
Condiments.KG	0.0058	0.0042	1.3703	0.0055	0.0021	2.6567
Meats.KG	0.0025	0.0019	1.3332	0.0021	0.0009	2.2581
Fish.Saltwater.KG	-0.049	0.008	-6.146	-0.0152	0.0039	-3.8512
Fish.Freshwater.KG	-0.069	0.0064	-10.72	-0.0154	0.0032	-4.86
Fish.Unspec.KG	-0.074	0.0147	-5.033	-0.0161	0.0073	-2.2214
Canned.Preserved.KG	0.0313	0.0217	1.4412	0.0333	0.0107	3.1178
Poultry.Eggs.KG	-0.022	0.0033	-6.66	0.0005	0.0016	0.2867
Dairy.KG	0.0112	0.0012	9.5127	0.0032	0.0006	5.4539
Baked.Goods.KG	0.0351	0.0037	9.4919	-0.0109	0.0018	-6.0051
IndustrializedFoods.KG	0.0484	0.0069	7.0573	0.0212	0.0034	6.2835
NonAlcoholicDrinks.KG	0.0004	0.0007	0.5418	0.0018	0.0003	5.6098
AlcoholicDrinks.KG	0.0115	0.0027	4.2437	0.0046	0.0013	3.4349
Oils.KG	-0.012	0.0056	-2.054	0.0056	0.0028	2.0323
TravelFoods.KG	0.045	0.0075	6.0226	0.0221	0.0037	6.0234
<b>BioDiverStat.KG</b>	<b>0.0038</b>	<b>0.0017</b>	<b>2.2202</b>	0.0002	0.0008	0.2821
<b>CarotenDB.Foods.KG</b>	<b>0.0046</b>	<b>0.002</b>	<b>2.2534</b>	<b>0.0021</b>	<b>0.001</b>	<b>2.0987</b>
<b>Native.Foods.KG</b>	-0.002	0.0018	-0.858	<b>-0.0021</b>	<b>0.0009</b>	<b>-2.2594</b>
<b>Poss.Native.KG</b>	<b>0.0113</b>	<b>0.002</b>	<b>5.7228</b>	<b>0.0073</b>	<b>0.001</b>	<b>7.4761</b>
<b>CompTabela.KG</b>	<b>-0.003</b>	<b>0.0011</b>	<b>-2.445</b>	0.0007	0.0005	1.3409
R- Squared	0.0057			0.006082		

Relationships of Categories With Income			
Dependent Variable - Total Household Income			
	Coefficient	Std. Error	t - value
(Intercept)	2124.1368	21.6454	98.1335
Biodiversity Indicator Status	75.3825	4.1237	18.2804
Carotenoids DB Foods	91.5322	4.5368	20.1756
Native Foods	-88.6623	3.8315	-23.1405
Possibly Native	124.7822	5.5418	22.5167
IBGE Composition Table, 2011	41.5994	2.2206	18.7338

## Geographic Factors

POF4.Domicile.Foods				
Urbanization:1				
	Poss.Native.KG	Native.Foods.KG	CarotenDB.Foods.KG	BioDiverStat.KG
Mean:	1.8557	2.717568	1.856668	1.923723
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Urbanization:2				
	Poss.Native.KG	Native.Foods.KG	CarotenDB.Foods.KG	BioDiverStat.KG
Mean:	1.768713	2.573225	1.635586	1.845463
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Urbanization:3				
	Poss.Native.KG	Native.Foods.KG	CarotenDB.Foods.KG	BioDiverStat.KG
Mean:	1.527402	2.93809	1.944887	2.052344
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Urbanization:4				
	Poss.Native.KG	Native.Foods.KG	CarotenDB.Foods.KG	BioDiverStat.KG
Mean:	1.440998	5.224839	2.517092	2.583713

## Discussion

It does appear that IBGE gathered food information from existing markets rather than food science sources. If lacking from the biodiversity indicator perspective. This method at least gives some idea of extent that biodiversity has infused the market. Accordingly, adjustments to IBGE method should be undertaken, a more careful survey of foods available in regional markets, ramping up existing efforts in order to improve nutritional and economic well-being.

Focuses on preparation methods. Some recipes quite detailed, some less (“Galeto,” interpreted as chicken, in S. Brazil is Passeriformes (perching birds)). Biodiversity indicator varieties not sampled. Item selection doesn’t match most important varieties economically, or some recipes. Among inappropriate references; paca, capivara, cotia = “beaver”; siri, goia, caranguelo = “Alaskan King crab”; unspecified fish = “cod”; fish eggs = herring roe; salted freshwater fish = bacalao (cod), mutum (Cracidae)

- Most studies suggest that the economics of labor conservation, were powerful in forcing adaptation upon indigenous food systems. Economics as well as cultural interests drove development of food system.
- The modern response to insufficient cultivation of native foods is not likely to involve corporate, so much as network-oriented agronomy. Perhaps the fact that many samples for the “Updated Brazilian database on food carotenoids,” were grown in gardens rather than purchased serves to indicate the possible method. Native foods cultivation as avocation, as well as vocation.