

Nutritional Status of Puerto Rican Families in 1966 – What can be learned from Retrospective Surveys?

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Previous nutritional surveys have been conducted with Puerto Rican families, but extensive analyses of dietary results have been lacking due to databases with insufficient nutrient composition information. Herein, we determine the nutritional status of Puerto Rican families from the results of a survey conducted in 1966 using the Minnesota's Nutritional Data System for Research 2020 from which we report macronutrients, vitamins, minerals, and other nutrients, with the results being evaluated for compliance with current dietary recommendations. These data establish eating patterns that could have significance in trends for future nutrition. The survey population totaled 877 families, divided into rural (R) and urban (U) households. Main findings were that total energy intake was 2076 kcal/day in R and 2419 kcal/day in U households. Total fat, especially saturated fat and cholesterol, exceeded recommendations, while total carbohydrates fell below the recommended amounts. Total sugars and the glycemic load were above guideline levels. Total protein was satisfactory, as was total fiber. Water-soluble vitamins reached recommended levels, but fat-soluble vitamins were below recommendations. The amounts of most minerals were sufficient, with the exception of calcium, iron, magnesium, and potassium, which were low. Sodium was above the recommended levels. We conclude that Puerto Rican families of the mid-1960s made some beneficial dietary choices but too much fat, especially saturated fat, even more so in U households, resulted in a disproportion of several nutrients having the outcome of an eating pattern that, as expressed by the original authors, "if continued could lead to even greater nutritional imbalances."

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In this retrospective article, we look back to the mid-1960s in Puerto Rico, prior to the influx of modern supermarkets and quick eating establishments. Diet was primarily based more on traditional (for the time and culture) foods such as rice, beans, maize (corn), salted codfish, tubers, root vegetables, fruits, and pork, which diet had evolved as an amalgam of Taino, African, and Spanish cultures (1).

From July through November 1966, an island-wide survey was carried out in a representative sample of all Puerto Rican families (2). In the author's words: "The survey was done using a stratified master sample developed by the Office of Research at the Commonwealth Department of Health. Eight hundred and seventy-seven families were interviewed in their homes and information in regard to income, occupation, educational level, family composition and waste disposal facilities were obtained. Twenty-nine family interviews had to be refused because the information was incomplete or inaccurate, thus leaving a final sample of eight hundred and forty families (2)."

Finally, the author concluded: "The facilities for storage, preparation and serving of the foods were recorded (2)." Dietary findings were obtained from questionnaires and interviews. The database used for food composition was *Handbook No. 8*, published by the USDA in 1963 (3). Contained in it were 2000 foods; the book listed macromolecules, 5 vitamins, 6 minerals (including sodium), some fatty acids, and cholesterol. This paper aims to analyze nutritional data from past surveys and use modern software, the Minnesota Nutrition Data System for

Research(NDSR), 2020 which contains 18,000 foods, including 174 nutrients, nutrient ratios, and other food components (4), to assess the nutritional status of this population and to compare results for compliance with current dietary recommendations (5). The significance of this study is that information about eating behavior in the mid-1960s may be helpful in predicting future eating behavior.

Methods

The NDSR 2020 version (4), was used to determine the nutritional status of both rural (R)- and urban (U) families using data from the 1966 survey. Information about food consumption was obtained by recording the frequency with which a given family consumed foods (food frequency questionnaire [ffq]) and assessing those foods (and the food groups in which they fell): milk, cheese, meat, seafood, eggs, cereals, legumes, vegetables, fruit, fats and oils, desserts, and beverages during the preceding week (2). The ffq information allowed the prediction of which

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foods would be most frequently consumed; the foods for the population of interest are listed in Table 1. Portion sizes were not specified except for milk (cups), so recommended portion sizes (based on a diet of 2,000 calories/day) were used (as specified by My Plate) (6). Nutrient contents are presented in Tables 2 and 3 and compared with current dietary recommendations to evaluate compliance. Micronutrients were reported using suggested Daily Values (7) or, in the case of macronutrients, the Dietary Reference Intake (DRI) (8).

Results and Discussion

Table 1 shows food consumption in times per family per day by R and U subgroups. During this period of time, Puerto Rico was undergoing rapid economic development, but advancements occurred more rapidly in urban areas than in rural areas. Consequently, their greater incomes gave U households the opportunity to purchase more expensive foods, such as fatty meats, eggs, butter, poultry, and desserts. In this instance, increased benefits did not lead to improved nutrition. Regarding Table 1, it

should be noted that entries represent families in general and not any 1 family in particular.

The list contains 43 foods, with 4 types of milk being listed. Using portion sizes as specified by the dietary guidelines (5), the total weight of food consumed by R families was found to be 62.5 oz/day or 3.85 lbs/day. Total weight consumed by U families was 73.2 oz/day or 4.58 lbs/day. These amounts are within the generally accepted values in the literature of 3 to 5 lbs/day (9), which lends creditability to our findings. It should also be mentioned that the original report states that families consumed several items that are not specified in the ffq, including breadfruit, yams, squash, string beans, beets, lettuce, tomatoes (although tomato sauce was included), oranges, West Indian cherries (acerolas) and cereals, such as maize, and pastes (spreads). Some of these items may be part of the catch all categories of "citrus fruits" and "other vegetables" but the reasons for their exclusion were given as their limited consumption and seasonal unavailability (2).

Macronutrient, vitamin, mineral, and other nutrient results are presented in Tables 2 and 3.

Table 1. Food Consumption with Portion Size – Times/Family/Day

Food	Portion size	Rural	Urban	Food	Portion size	Rural	Urban
Alcohol wine	1.5 oz	0.07oz	0.14oz	Milk dry skim	cup	0.0	0.45oz
Avocado	medium	1.86oz	1.71oz	Milk dry whole	cup	1.09oz	0.68oz
Beef hamburger	3 oz	0.51oz	0.86oz	Milk evaporated	cup	1.83oz	0.68oz
Bread	slice	0.48oz	0.59oz	Milk fresh	cup	9.60oz	14.88oz
Butter	tbsp	0.12oz	0.18oz	Onion	medium	6.21oz	5.57oz
Canned fruits	Cup	0.26oz	0.45oz	Other cereals	cup	0.73oz	1.04oz
Carbonated beverages	8oz	1.75oz	3.56oz	Other sea food	3 oz	0.11oz	0.14oz
Cheese american	1.5oz	0.40oz	0.69oz	Other starchy veg	cup	0.64oz	0.45oz
Chick peas	3 oz	0.10oz	0.14oz	Pigeon peas	cup	0.19oz	0.26oz
Citrus fruit	2.5oz	0.14oz	0.34oz	Pineapple	medium	2.41oz	4.79oz
Codfish	3 oz	1.06oz	0.51oz	Pork	3 oz	0.51oz	0.41oz
Coffee	6 oz	6.44oz	7.01oz	Potatoes	medium	3.28oz	3.20oz
Crackers	5 each	0.20oz	0.20 oz	Poultry	3 oz	0.66oz	0.79oz
Dessert Ice cream	Cup	0.34oz	1.04oz	Red kidney beans	3 oz	1.41oz	1.17oz
Eggs	1.7 oz 1 medium	0.76oz	1.05oz	Rice	0.5 cup	2.31oz	3.28oz
Green and yellow veg.	Cup	0.73oz	1.28oz	Ripe bananas	medium	0.96oz	1.20oz
Green bananas	medium	0.96oz	0.53oz	Ripe plantains	8 oz	1.19oz	1.73oz
Green plantain	med toston	1.83oz	1.73oz	Salami	3 oz	0.38oz	1.00oz
Lard	tbsp	0.37oz	0.30oz	Salted pork	3 oz	0.79oz	0.86oz
Malt beer	8 oz	2.47oz	2.92oz	Smoked ham	3 oz	1.10oz	1.24oz
Mango	medium	2.21oz	1.42oz	Tomato sauce	0.5 cup	2.03oz	1.94oz
Margarine	tbsp	0.11oz	0.13oz	Vegetable oils	tbsp	0.11oz	0.64oz
				White navy beans	cup	0.83oz	0.64oz

Macronutrients (Table 2). The amounts of protein and the percentages of protein content are within accepted guidelines, with U families obtaining more protein from animal sources than R families due to the formers' greater meat consumption. The amounts of carbohydrates and the percentages of carbohydrate content are slightly below guideline recommendations, with R families having consumed greater amounts of carbohydrates than U families due to the former's having more traditional root crops in their diets. Dietary fiber and alcohol content fall within the recommended amounts for both populations. Although the percentage of total calories from carbohydrates is low, the amount of total sugar exceeds the DRI recommendation. One reason for this is that milk was a major item in most family meals, and lactose provides the highest percentage of sugar in the measure of total sugar. Added sugar, on the other hand, is not a contributor, being just under the recommended level of 10%. The amount of starch, which is found in some vegetables (potatoes, yams, etc.), is even greater than the amount of total sugar, reflecting the dietary patterns of the surveyed families. Regarding fat content, the percentages of monounsaturated, polyunsaturated, and trans fats meet guideline recommendations; however, the total amount and percentage of fat exceed these guidelines, mainly due to excess saturated fat content. Table 1 lists beef, milk, eggs, codfish, ham, salami, salted pork, poultry, cheese, ice cream, butter, margarine, lard, and vegetable oils, all of which are sources of fat, with certain types of beans and miscellaneous foods contributing lesser amounts. In terms of saturated fat (a type of dietary fat associated with adverse effects on health) regular ground beef contains at least 30% but can contain more; half the fat in whole milk and one-third in eggs is saturated fat and choice steaks, such as porterhouse and T-bone, are the cuts highest in saturated fat. Pork products such as bacon, pork chops, ham, and, especially, "chicharrones" (pork rinds) are major contributors of saturated fat. Processed meat such as salami has 76% saturated fat by weight of the total fat content. Lard is another source of saturated fat, and certain salad dressings also contribute to the total fat content. Since from fat are more than 2 times those of carbohydrates and proteins, it is not surprising that the percentages of fat in these kinds of foods dominate those of other macromolecules. Finally, the water in foods is only a part of an individual's total water intake. The amount of water from non-food sources was not included in the survey. By 1966, essentially 100% of urban households and 67% of rural households had municipal water supplies, all with fluoridation (12), ensuring that requirement would be met. In summary, the more prosperous economic status of U households did not result in superior nutritional outcomes. In their entirety, total fat, saturated fat, total sugars, added sugars, sodium, and the overall caloric intake

Table 2. Macronutrient Content of Family Meals Relative to Daily Values or Recommended Dietary Allowances

	Rural	Urban	DV or RDA	Rural %DV	or	Urban %RDA
Energy kcal	2076	2419		*		*
Total fat gm	104.5	124.1	78	134.1		159.1
Fat calories %	44.7	45.6	25-35	Over		Over
Total carbs gm	219.8	243		79.9		88.4
Carb calories %	41.3	39.2	45-65	Under		Under
Total prot gm	66.8	83	56	119.2		148.2
Prot calories %	12.7	13.8	10-35	Within		Within
Animal prot gm	44.2	59.2	¥			
Animal prot %	66.2	71.3	¥			
Vegetable prot gm	22.6	23.8	¥			
Vegetable prot %	33.8	28.7	¥			
Alcohol gm	3.9	4.6	†			
Alcohol cal%	1.3	1.3	†			
Total, SFA gm	40.2	44	≤ 15	Above		Above
SFA cal %	17.2	16.2	≤ 7	Above		Above
Total, MUFA gm	39.8	44.2	≤ 44	Within		Within
MUFA cal %	17	16.2	≤ 20	Within		Within
Total, PUFA gm	17.3	27.3	≤ 22	Within		Above
PUFA cal %	7.4	10	≤ 10	Within		Within
Total Trans FA gm	1.8	1.9	≤ 2	Within		Within
Trans FA cal %	0.8	0.8	≤ 1	Within		Within
Total sugar gm	77.4	94.3	≤ 40	Above		Above
Added sugar gm	8.4	14.5	≤ 10	Within		Above
Starch gm	97.7	104.5	¥			
Total fiber gm	28	27.1	28	Within		Within
Water gm	1439	1669	P	See text		

*Mean population requirement for each age group

¥ No DV nor RDA

† No recommendation DGA, moderate intake-2 drinks/day Men; 1 drink/day Women (5)

P Eight glasses/day 8 oz each = 64 oz water/day = 1811 g/day (9)

of U households exceeded that of R households that were still subsiding on traditional root crops and other lower fat options.

Vitamins (Table 3). Levels of the water-soluble vitamins (B-complex and C) met the recommended amounts because of the abundance of fruits and vegetables in the diets of both populations. Likewise, sufficient amounts of animal protein satisfied the requirement for vitamin B12. Of the fat-soluble vitamins (A, D, E, K), none were found at levels that met dietary requirements. Vitamin A is found in many vegetables, some fruits and most dairy products and is the fat-soluble vitamin that comes the closest to meeting the nutritional requirement. Vitamin D is found in a few foods; fish oil and mushrooms are sources but not in sufficient amounts to meet dietary requirements. However, it should not be concluded that individuals with low vitamin D consumption will necessarily develop a vitamin D deficiency, as exposure to sunlight—which is abundant year-round in Puerto Rico—facilitates the dermal conversion of precursors to the active form of vitamin D (13). Vitamin E, which was determined to be below recommended amounts, can be found in vegetable oils and, notably, in nuts, which are not commonplace on most food lists of that nature. Finally, good sources of vitamin K, also found to be deficient in the diets of the survey takers, are cruciferous vegetables

Table 3. Micronutrient and Other Nutrient Content of Family Meals Relative to Daily Values

	Rural Per Day	Urban Per Day	Daily Value	%DV Rural	%DV Urban
Vit A (retinol) mcg	826	768	900	91.7	85.3
Vit D (cholecalciferol) mcg	7.3	9.9	20	36.5	49.5
Vit E (y tocopherol) mg	7.6	7.8	15	50.7	52.0
Vit K mcg	65.7	95.7	120	54.8	79.8
Vit C mg	129.6	149.6	90	144.0	166.2
Vit B1 mg	1.5	1.8	1.2	125.0	150.0
Vit B2 mg	1.8	2.3	1.3	138.5	176.9
Niacin mg	15.5	18.6	16	96.8	116.2
Pantothenic acid mg	6.7	7.7	5.0	134.0	154.0
Vit B6 mg	2.2	2.3	1.7	129.4	135.3
Total folate mcg	450	468	400	112.5	117
Vit B12 mcg	3.2	4.8	2.4	133.4	200
Calcium mg	799	1,051	1,300	61.4	80.8
Copper mg	1.4	1.5	0.9	155.5	166.7
Iron mg	9	10.3	18	50.0	57.2
Magnesium mg	296	319	420	70.5	76.0
Manganese mg	3.1	3.9	2.3	134.8	169.6
Phosphorous mg	1,187	1,448	1,250	95.0	115.8
Potassium mg	3,620	3,802	4,700	77.0	80.9
Selenium mg	73.1	105.2	55.0	132.9	191.3
Sodium mg	2,666	3,687	2,300	115.9	160.3
Zinc mg	8.7	10.4	11.0	79.1	94.5
Alpha linolenic acid (ALA) g	1.9	3.0	1.6	118.8	187.5
Eicosapentanoic acid	25	31	€	Below	Below
Docosahexanoic acid	47	56	€	Below	Below
Cholesterol mg	306	369	≤ 300	Above	Above
Caffeine	78	89	*	Within DV	
Glycemic Load -bread ref	57	58	†	Above DV	

€ EPA + DHA = 250-500 mg/day (10)

* ≤ 400 mg (5)

† Glycemic Load (or GL) combines both the quantity and quality of carbohydrates .

Low GL is between 1 and 10; a moderate GL is 11 to 19; and a high GL is 20 or higher [11]

(including kale, cabbage, broccoli, and brussels sprouts) and foods such as spinach, asparagus, and lettuce; few of these kinds of foods were included in the family meals of the participants.

Minerals (Table 3). Of the 10 listed nutrients, calcium, iron, magnesium, potassium, and zinc fall short of the recommended levels, while sodium exceeds the requirements. That sodium is in excess is no surprise given that the preparation of many foods, such as ham and codfish, require salting, but that calcium does not meet the guidelines is a surprise, given the levels of milk and animal protein in the participants' diets. It is probable that the total amounts of these foods were just not enough to meet the recommended guidelines.

Other nutrients (Table 3). Alpha linolenic acid, an omega-3 essential fatty acid, meets the recommended guideline due to its presence in plant and vegetable oils. Eicosatetraenoic acid (EPA) and docosahexanoic acid (DHA), found in fish oils, supply only about half the dietary requirements. Dried codfish, which was, at the time of the survey, a mainstay in the diets of the participants, is a poor source of EPA and DHA. Tuna has 5.5 times the amount of healthful fatty acids as cod, and salmon has 11.6 times as much (14). The participating families would need 5 times the

normally ingested amounts of cod to meet dietary requirements. Cholesterol is above the limit of 300 mg/day due to the number of fat-containing foods, such as eggs and marbled meats. Caffeine is well below the suggested limit of 400 mg/day. The glycemic index is high due to the total carbohydrates present but not due to added sugar which would allow normal blood sugar levels can be maintained (11).

Conclusions

From the 1920s through the mid-1960s Puerto Rico transitioned from an agrarian and simple society to an industrial and more complex one. Government initiatives and advances in agro-industry combined to stimulate economic growth and improve nutritional status. These factors made the mid-1960s a transitional period for traditional eating patterns, as a greater range of food options became obtainable and new preparation methods were introduced that had not been available in a previous survey conducted in 1946 (15).

The main effect on food consumption was that fatty foods, especially saturated fat-containing foods, became the primary choices of families, resulting in the failure of their diets to meet several guideline recommendations. The authors of the original survey expressed concern that if the economic status of Puerto Ricans continued to improve, such improvement could lead to the replacement of the traditional diet by an unhealthy one that could shape future eating behavior and provoke even greater nutritional imbalances.

Resumen

Se han realizado encuestas nutricionales previas con familias puertorriqueñas, pero ha faltado un análisis extenso de los resultados alimenticios debido a bases de datos con composiciones nutricionales insuficientes. En este análisis, determinamos el estado nutricional de las familias puertorriqueñas a partir de los resultados de una encuesta realizada en 1966 utilizando la investigación del Minnesota Sistema de Datos Nutricionales 2020, de la cual reportamos macronutrientes, vitaminas, minerales y otros nutrientes con los resultados siendo evaluados para el cumplimiento de las recomendaciones dietéticas actuales. Estos datos establecen patrones alimenticios que podrían tener importancia en las tendencias de la nutrición futura. La población encuestada fue de 877 familias divididas en hogares rurales (R) y urbanos (U). Los principales resultados fueron que la ingesta total de energía fue de 2,076 kcal/día en los hogares R y 2,419 kcal/día en los hogares U. Las grasas totales, especialmente las saturadas y el colesterol, superaban las recomendaciones, mientras que los carbohidratos totales estaban por debajo de las cantidades

requeridas. Los azúcares totales y la carga glucémica estaban por encima de los niveles recomendados. La proteína total fue satisfactoria, al igual que la fibra total. Las vitaminas hidrosolubles alcanzaron los niveles requeridos, pero las liposolubles estaban por debajo de las recomendaciones. La cantidad de minerales era suficiente, a excepción del calcio, el hierro, el magnesio y el potasio, que eran bajos. El sodio estaba por encima de los niveles recomendados. Concluimos que las familias puertorriqueñas de mediados de la década de 1960 tenían algunas selecciones dietéticas beneficiosas, pero demasiada grasa, especialmente grasa saturada, más aún en los hogares urbanos, lo que resultó en una desproporción de varios nutrientes con un resultado de un patrón alimentario que, de continuar, podría conducir a desequilibrios nutricionales aún mayores.

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