

## The Healthy Eating Indices of Puerto Rican Families, 1961 to 1966: A Retrospective Study, Calculated using Data from Previous Nutritional Surveys

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The 1960's were a transitional period in Puerto Rico. Advances in the betterment of the human condition was measurable, especially in highly populated areas but less so in isolated communities. To obtain a more exact picture of conditions in these communities, a committee was established to conduct surveys that would give information on the standard of living with special emphasis on nutrition. Families from barrios in 8 isolated municipalities were selected by random sampling and questioned about their economic situation, home conditions, general health and food consumption. Next, an island-wide survey asked the same questions, but sampling was conducted using a stratified Master Sample so that findings would apply to the population as a whole. This article incorporates combined results from these nine surveys. The Healthy Eating Indices (HEIs) for the isolated municipalities and for the Master Sample averaged 58 and 66, respectively. Both are classified as "Needs Attention" however, caloric intake in the isolated areas was only about three fourths that of the Master Sample and more than one third of these calories came from lard and sugar. Overall, of the 13 components of the HEI, 4 obtained "satisfactory" scores while 4 were scored as "deficient." These scores, although still needing improvement, show a greater compliance with recommendations of the HEI than those found in the 2015 US population where overall score was 57 with only 2 components having a "satisfactory" score while 4 components were also being classified as "deficient."

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According to the December, 1963 supplement of the Bulletin of the Medical Association of Puerto Rico (1): "The past fifteen years have brought great improvements in the economic situation and living conditions of Puerto Rico as a whole. The change, however, has been greater in the cities than in the country." The article goes on to state that the Commonwealth had, in 1961, established a Commission for the Improvement of Isolated Areas. To accomplish this mission, a team was formed which was composed of members from the University of Puerto Rico's Departments of Home Economics, Biochemistry and Nutrition, the Department of Medicine, the Commonwealth's Health Department and the U.S. Army's Tropical Research Medical Laboratory. Consequently, from 1961 through 1965 surveys were conducted in families living in barrios of eight rural municipalities, which examined the economic situation, home conditions, general health and food consumption (1-6). These limited surveys culminated in 1966 when an Island-wide survey was conducted, with the results being published in 1971 (7). To date, no one article has examined the combined results from these nine surveys. This present article cannot hope to describe all the living conditions of Puerto Rican families of the 1960's. It can, however, encapsulate economic situations and home conditions. The only portion of the surveys to be examined in detail will be food consumption of the families. From these findings, a healthy eating index will be calculated.

### Methods

A complete account of the procedures used for the surveys has been described previously (8). In brief, families from barrios in

8 isolated municipalities were selected by random sampling and questioned about their economic situation, home conditions, general health and food consumption. Food consumption was determined by using a food frequency questionnaire. The municipalities selected were Camuy, Ciales, Gurabo, Juana Díaz, Las Piedras, Moca, San German and Vega Alta. Figure 1 shows the locations of the municipalities and demonstrates their widespread distribution.

The island-wide survey asked the same questions, but sampling was conducted using a stratified Master Sample developed by the Office of Research at the Commonwealth Department of Health (7) so that findings would apply to the population as a whole rather than just one municipality. The Master Sample further reported results from both rural and urban households. Nutrient content of the food consumed was determined using Nutrition Data System for Research (NDSR) software version 2022, developed by the Nutrition Coordinating Center (NCC), University of Minnesota, Minneapolis, MN (9). In addition to food components the 2022 version includes the Healthy Eating Index 2015 (HEI) output files and a complete description of the HEI 2015 can be found in the Appendix (10). Basically, the HEI is a scoring system designed

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**Figure 1.** Municipalities sampled for the surveys of 1961-1965 to determine the Healthy Eating Index for each population.

to evaluate a set of foods based on the amounts suggested by the 2015-2020 Dietary Guidelines for Americans (11). Use of this metric will allow the nutritional intake during the 1960s to be evaluated by current dietary recommendations.

## Results

The population of the eight isolated communities was truly impoverished, being accessed by dirt roads, not having a public water supply and often without electricity. These living conditions are comparable to those experienced in the aftermath of devastating hurricane Maria (2017), yet in a barrio of Moca, seventy four percent of the residents reported a “satisfactory lifestyle” (3). The population of the Master Sample had on average, much improved living conditions such as public water supply (12) and electrical service but still many inadequacies. A major difference was the average family income in the Master Sample being 3 to 4 times greater than families living in the isolated communities (\$7,027 vs \$26,870 where \$1{1962} = \$10.7{2025} and \$1{1966} = \$9.97 {2025}). The nutrient composition of

the Puerto Rican diet of the mid 1960s has been recently described, the principal finding being that inappropriate food choices by families resulted in the failure to meet several nutritional guideline recommendations (8). Consequently, attention will be focused on sources of calories, which are presented in table 1.

Mean values for individuals living in isolated municipalities were  $2086 \pm 484$  and  $1423 \pm 217$  kcal/day for men and for

**Table 1.** Daily caloric intake for Individuals in isolated areas and Master Sample of Puerto Rico

| Municipality  | kcalories/day  |                |                      |                |                  |
|---------------|----------------|----------------|----------------------|----------------|------------------|
|               | Males          | Females        | % Lard*              | % Sugar        | % Lard + % Sugar |
| Camuy         | 2296           | 1194           | 16.2 (6.5)           | 21.9           | 38.1             |
| Ciales        | 1990           | 1750           | 18.5 (7.4)           | 11.7           | 30.2             |
| Gurabo        | 1655           | 1533           | 17.6 (7.0)           | 18.5           | 36.1             |
| Juana Díaz    | 2653           | 1391           | 32.9 (13.2)          | 14.4           | 47.3             |
| Las Piedras   | 2895           | 1549           | 20 (8.0)             | 9.4            | 29.4             |
| Moca          | 1861           | 1466           | 17.4 (7.0)           | 17             | 34.4             |
| San German    | 1595           | 1052           | 24.5 (9.8)           | 13.5           | 38               |
| Vega Alta     | 1735           | 1449           | 18.5 (7.4)           | 7.7            | 26.2             |
| MEAN $\pm$ SD | $2086 \pm 484$ | $1423 \pm 217$ | $20.7 \pm 5.5$ (8.2) | $14.3 \pm 4.7$ | $35.0 \pm 6.6$   |
|               |                |                | *(% Sat fat)         |                |                  |
| Master Sample | Rural          | Urban          | % Lard Rural         | % Lard Urban   |                  |
|               | 2076           | 2419           | 25.5                 | 17.9           |                  |

women, respectively. The high standard deviation is a result of wide variance among municipalities. In the Master Sample, the rural intake of 2076 kcal/day is about the same as in the isolated municipalities while intake in urban families is 1.2 times greater at 2419 kcal/day. The 2020-2025 Dietary Guidelines for Americans recommends at least 1800 kcal/day for women and 2200 kcal/day for men in the age group 20-39 years (11). Consequently, the majority of men living in isolated municipalities and all of the women plus male members of families in rural areas of the Master Sample were calorie deficit. As also seen in table 1, more than one third of total calories in isolated municipalities come from lard and sugar which can provide energy but not essential nutrients (lard also contains saturated fat). No information was presented for percent of sugar intake in the Master Sample but the percent intake of lard was even higher for the rural population than that of the isolated municipalities. HEIs were calculated for each location. Specifically, results represent adults in the category of ages from 20-39 and are presented in Table 2. Other age groups would have their own values (11).

In the present context a trend is defined as >60% of the values in an individual component of the HEI. They are as follows: Master Sample-satisfactory for total HEI score; Combined Surveys-

satisfactory for whole fruit, sea food + plants, refined grains and sodium; needs attention for total protein and added sugar; deficient for whole grains, dairy, healthy fat and saturated fat.

## Discussion

The HEI is based on nutrient intake per 1000 kcal ingested and not on calories per day (10). For example, if an elite diet with an HEI of 90 is consumed the same HEI value would be obtained whether the intake is 1100 or 5000 kcal. Healthwise, one value would be too low and the other too high for normal individuals (11), but both would be classified as "healthy" since the score remains at 90. Therefore, results of the HEI when caloric intake is well below or well above guidelines can be misleading. In the Master Sample caloric intakes were 2076 and 2419 kcal/day respectively for the rural and urban populations (7). Intake of urban households met the recommendation of >2200 kcal/day but this was not in the case for rural households. However, it can be seen in table 2 that both have an HEI value of 66 which indicates that meal contents were similar but eaten in lesser amounts in rural households. More importantly, table 2 shows that 8 out of 13 components (61%) achieved the HEI standard of "satisfaction." In comparison, the

**Table 2.** HEI values for males and females living in isolated areas of Puerto Rico and the population of the Master Sample.

| Category            | Best Possible Score | Camuy |        | Ciales |        | Gurabo |        | Juana Diaz |        |
|---------------------|---------------------|-------|--------|--------|--------|--------|--------|------------|--------|
|                     |                     | Male  | Female | Male   | Female | Male   | Female | Male       | Female |
| Total Fruits        | 5.0                 | 5.0   | 5.0    | 5.0    | 4.0    | 4.0    | 1.0    | 1.0        | 1.0    |
| Whole Fruits        | 5.0                 | 5.0   | 5.0    | 5.0    | 5.0    | 4.0    | 1.0    | 2.0        | 2.0    |
| Total Vegetables    | 5.0                 | 3.0   | 2.0    | 3.0    | 1.0    | 2.0    | 5.0    | 2.0        | 2.0    |
| Greens and Beans    | 5.0                 | 5.0   | 4.0    | 5.0    | 2.0    | 5.0    | 5.0    | 5.0        | 4.0    |
| Whole Grains        | 10.0                | 1.0   | 1.0    | 2.0    | 2.0    | 1.0    | 1.0    | 2.0        | 2.0    |
| Dairy               | 10.0                | 4.0   | 2.0    | 5.0    | 10.0   | 3.0    | 4.0    | 4.0        | 4.0    |
| Total Protein Foods | 5.0                 | 4.0   | 4.0    | 5.0    | 3.0    | 5.0    | 5.0    | 4.0        | 4.0    |
| Seafood and Plants  | 5.0                 | 5.0   | 5.0    | 5.0    | 5.0    | 5.0    | 5.0    | 5.0        | 5.0    |
| Healthy Fats        | 10.0                | 1.0   | 1.0    | 2.0    | 0.0    | 5.0    | 3.0    | 1.0        | 2.0    |
| Refined Grains      | 10.0                | 10.0  | 10.0   | 7.0    | 9.0    | 9.0    | 8.0    | 6.0        | 7.0    |
| Sodium              | 10.0                | 10.0  | 10.0   | 5.0    | 9.0    | 10.0   | 10.0   | 10.0       | 10.0   |
| Added Sugars        | 10.0                | 2.0   | 1.0    | 6.0    | 8.0    | 1.0    | 6.0    | 9.0        | 2.0    |
| Saturated Fat       | 10.0                | 6.0   | 9.0    | 6.0    | 0.0    | 4.0    | 4.0    | 10.0       | 2.0    |
| Total               | 100.0               | 61.0  | 59.0   | 60.0   | 57.0   | 58.0   | 58.0   | 51.0       | 48.0   |

  

| Category            | Best Possible Score | Las Piedras |        | Moca |        | San German |        | Vega Alta |        | Master Sample |       |
|---------------------|---------------------|-------------|--------|------|--------|------------|--------|-----------|--------|---------------|-------|
|                     |                     | Male        | Female | Male | Female | Male       | Female | Male      | Female | Rural         | Urban |
| Total Fruits        | 5.0                 | 5.0         | 5.0    | 4.0  | 5.0    | 3.0        | 2.0    | 5.0       | 5.0    | 5.0           | 5.0   |
| Whole Fruits        | 5.0                 | 5.0         | 5.0    | 5.0  | 5.0    | 5.0        | 4.0    | 5.0       | 5.0    | 5.0           | 5.0   |
| Total Vegetables    | 5.0                 | 1.0         | 1.0    | 2.0  | 3.0    | 1.0        | 5.0    | 3.0       | 4.0    | 5.0           | 5.0   |
| Greens and Beans    | 5.0                 | 2.0         | 1.0    | 2.0  | 2.0    | 1.0        | 4.0    | 4.0       | 3.0    | 5.0           | 5.0   |
| Whole Grains        | 10.0                | 0.0         | 0.0    | 0.0  | 1.0    | 3.0        | 1.0    | 1.0       | 0.0    | 0.0           | 0.0   |
| Dairy               | 10.0                | 2.0         | 2.0    | 3.0  | 5.0    | 4.0        | 4.0    | 6.0       | 4.0    | 6.0           | 8.0   |
| Total Protein Foods | 5.0                 | 3.0         | 3.0    | 3.0  | 2.0    | 3.0        | 4.0    | 4.0       | 4.0    | 5.0           | 5.0   |
| Seafood and Plants  | 5.0                 | 4.0         | 4.0    | 4.0  | 3.0    | 1.0        | 4.0    | 5.0       | 5.0    | 5.0           | 5.0   |
| Healthy Fats        | 10.0                | 7.0         | 7.0    | 6.0  | 6.0    | 2.0        | 3.0    | 2.0       | 4.0    | 2.0           | 3.0   |
| Refined Grains      | 10.0                | 10.0        | 10.0   | 9.0  | 7.0    | 6.0        | 10.0   | 8.0       | 10.0   | 10.0          | 10.0  |
| Sodium              | 10.0                | 10.0        | 10.0   | 10.0 | 9.0    | 10.0       | 10.0   | 10.0      | 10.0   | 8.0           | 5.0   |
| Added Sugars        | 10.0                | 9.0         | 8.0    | 4.0  | 5.0    | 6.0        | 6.0    | 8.0       | 10.0   | 10.0          | 10.0  |
| Saturated Fat       | 10.0                | 4.0         | 3.0    | 5.0  | 8.0    | 1.0        | 0.0    | 3.0       | 4.0    | 0.0           | 0.0   |
| Total               | 100.0               | 62.0        | 59.0   | 57.0 | 61.0   | 46.0       | 57.0   | 64.0      | 68.0   | 66.0          | 66.0  |

  

|           |                 |           |
|-----------|-----------------|-----------|
| Satisfied | Needs Attention | Deficient |
|-----------|-----------------|-----------|

5/5 10/10  
 ≥2.5/5 ≥5/10  
 0-2.4/5 0-4.9/10



HEI –2015 for Americans ages 20 – 39 was 57 and only 2 of 13 components achieved a “satisfactory” rating (11). Additionally, 3 of 13 components (23%) were rated deficient in the Master Sample which was better than results found in the US surveys.

Average caloric Intake for the isolated populations (eight municipalities) was  $2086 \pm 484$  for men and  $1422 \pm 217$  kcal/day for women. Lard plus sugar supplied more than one third of total calories (table 1). Consequently, although some components of the HEI are satisfied (2 to 6 out of 13), there is an insufficient amount of energy to provide for almost all nutrients within these components, especially for women. In fact, a “deficient” score ranged from 1 to 7 out of 13 components (table 2). To sum up, the HEI of “needs attention” presents a false impression of the nutritional status of isolated populations. The overall HEI score suggests equating it to the island wide average which was also “needs attention” when in reality the diet is bereft of nutrients.

Components of the HEI classified as “Satisfactory” were whole fruits, sea food + plants, refined grains and sodium. In the rural municipalities, almost all families had land reserved for agriculture so fresh fruit was available year-round. The most popular were bananas, plantains, mangoes, avocados and some citrus fruits. Likewise, urban families had easy access to whole fruit at local markets. For sea food and plants, dried cod was a staple of the diet for all Puerto Ricans. Tubers like name, yautia, batata, yuca (casava) and yam were a substantial part of every-day meals. Refined grains include white rice, bread and crackers. Rice was consumed every day and often more than once. Bread was a mainstay of the diet with many varieties to choose from. Crackers were part of meals and often eaten as a snack. Excess sodium in the diet was not a problem for populations in the 1960s where home cooked meals were the norm. This eating practice prioritizing whole foods which contrast greatly with eating choices of today where the diet consists of 70% unhealthy ultra processed foods (13).

Components of the HEI rated as “need attention” were total protein (not enough) and added sugar (too much). The result of too little protein was due to the reports from the isolated communities. None reached satisfactory levels. Main sources of protein-rich foods were milk, cod, chicken, eggs and some pork products. Beef was almost absent as were other types of meat. The population of the Master Sample had a “satisfactory” score which was partly determined by greater income allowing purchase of higher quality protein foods including beef. As for added sugar, data in table 1 shows a mean of 14% of total calories with a high of 22% in Camuy. The World Health Organization recommends less than 10% and the American Heart Association sets the level at 6% of total calories. Components of the HEI classified as “deficient” were whole grains, dairy, healthy fat and saturated fat. The reason for the deficiency of whole grains is explained by its definition.

“Whole grains are composed of three parts- the bran which is the multi-layered outer skin of the edible kernel, the middle layer, the germ and the inner layer, the endosperm” (14). White rice is polished to remove the bran and germ so the form in the diet, even if fortified is not a whole grain. The same is true for bread and crackers. Although milk as a pure beverage and in coffee was consumed on a daily basis (8), there were few other dairy products in the Puerto Rican diet, even for families in the higher earning Master Sample. Healthful fats are found in plant and fish oils. Isolated municipalities

had better scores than households in the Master Sample due to the abundance of home-grown plants products. However, cod, the primary fish eaten by everyone, is a poor source of healthy fats. Most other fatty fish have multiple times the amounts of omega 3 fatty acids as cod. Saturated fat was ubiquitous in the Puerto Rican diet. A complete listing of saturated fat-laden foods is available (8). Pork dishes, processed meat like salami and lard were principal sources. It is thought provoking to speculate that if the traditional staples of white rice and cod had been substituted with brown rice, which is a whole grain and tuna which has 5.5 times the healthy fat content as cod (15), then the HEI would have increased 20 points making it comparable to those of elite diets.

## Resumen

La década de 1960 fue un período de transición en Puerto Rico. Los avances en salud y desarrollo socioeconómico fueron medibles, especialmente en las áreas densamente pobladas, aunque en menor medida en las comunidades aisladas. Para obtener una imagen más precisa de las condiciones en estas comunidades, se estableció un comité encargado de realizar encuestas que brindaran información sobre el nivel de vida, con énfasis especial en la nutrición. Se seleccionaron familias de barrios en 8 municipios aislados mediante muestreo aleatorio y se las entrevistó sobre su situación económica, condiciones de vivienda, salud general y consumo de alimentos. Posteriormente, se realizó una encuesta a nivel isla que incluía las mismas preguntas, pero utilizando una Muestra Maestra estratificada, de manera que los resultados fueran representativos de toda la población. Este artículo incorpora los resultados de estas 9 encuestas. Los puntajes del Índice de Alimentación Saludable (Healthy Eating Index, HEI) para los municipios aislados y para la Muestra Maestra fueron en promedio 58 y 66, respectivamente. Ambos puntajes se clasifican como “Requiere Atención” (puntaje HEI entre 51 y 79), lo que indica dietas que podrían mejorar. Sin embargo, la ingesta calórica en las áreas aisladas fue solo alrededor de las tres cuartas partes de la observada en la Muestra Maestra, y más de un tercio de esas calorías provenían de manteca de cerdo y azúcar. En general, de los 13 componentes del HEI, 4 obtuvieron puntajes que indican cumplimiento adecuado con las recomendaciones, mientras que 4 fueron clasificados como deficientes. Estos puntajes, aunque todavía necesitan mejorar, mostraron un mayor cumplimiento con las recomendaciones del HEI que los encontrados en la población de EE. UU. en 2015, cuyo puntaje general fue de 57, con solo 2 componentes con puntajes satisfactorios y 4 clasificados como deficientes.

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## Appendix

The HEI is a scoring system to evaluate a set of foods. The scores range from 0 to an ideal of 100. The overall HEI-2015 score is composed of 13 components that reflect the different food groups and key recommendations in the 2015-2020 Dietary Guidelines for Americans (11). Values for each component range from 0 to 5 or 10 depending on the degree of compliance with the guidelines. The following 9 components should meet dietary adequacy. (Maximum value is in parentheses): Total fruits (5), Whole fruits (5), Total vegetables (5), Greens and beans (5), Whole grains (10), Dairy (10), Total protein foods (5), Sea food and Plant protein (5) and Healthy fats (10). The following 4 components are recommended in moderation: Refined grains (10), Sodium (10), Added sugars (10) and Saturated fats (10).

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