Development of a food frequency questionnaire (FFQ) and characterization of the food pattern consumption for low - income workers in the city of Goiânia, Goiás State, Brazil

Nélida Schmid Fornés and Maria Luiza Ferreira Stringhini*

*Faculdade de Nutrição, Universidade Federal de Goiás, Rua T 29, 119 Apto. 302, 74210-050, Setor Bueno, Goiânia, Goiás, Brasil. *Author for correspondence. e-mail: mluizastring@uol.com.br*

ABSTRACT. A food-frequency questionnaire (FFQ) was designed to assess the average consumption frequency of food items and to characterize the food pattern among workers. A list of consumed food and usual serving sizes was compiled from previous local survey, using single 24 hours dietary recalls and frequency questionnaires. The list was composed of 127 items and the nutrient composition was calculated by the computer program DietPro version 3.0. The FFQ was administered to each subject twice in a period of six months. To characterize food pattern consumption, the most frequently mentioned foods were identified. One hundred and four (104) workers were studied, randomly selected. Items consumed at least once a day by 50% of the workers were: white bread, margarine, black coffee, white sugar, red beans and white rice. Variety of daily consumed foods was small. The top 30 foods on a daily basis ranged from less than 1.5 to 92%. This FFQ is easy to administer when studying the dietary intake of low-income populations.

Key words: food-frequency questionnaire, food pattern, low-income workers.

RESUMO. Desenvolvimento de um questionário de freqüência alimentar e caracterização do padrão de consumo dos trabalhadores de baixo nível sócio-econômico da cidade de Goiânia, Estado de Goiás, Brasil. Um questionário de freqüência de consumo alimentar (QFA) foi planejado para avaliar a freqüência média de consumo de alguns alimentos e caracterizar o padrão alimentar entre os trabalhadores. Uma lista de alimentos consumidos e as porções servidas, usualmente, foram obtidas através de prévias entrevistas locais, usando-se o recordatório de 24 horas e o questionário de freqüência. Uma lista foi elaborada com 127 alimentos e a composição nutricional foi calculada utilizando-se o programa DietPro versão 3.0. O QFA foi aplicado, por duas vezes, em cada indivíduo num período de seis meses. Para caracterizar o padrão de consumo alimentar, os alimentos mais freqüentemente mencionados foram identificados. Foram estudados 104 trabalhadores selecionados ao acaso. Os itens consumidos, no mínimo uma vez ao dia, por 50% dos trabalhadores foram o pão branco, margarina, café preto, açúcar branco, feijão roxinho e arroz branco. A variedade dos alimentos diariamente consumidos foi pequena. Os 30 principais alimentos básicos diários variaram de menos que 1,5 a 92%. Este questionário é um instrumento de fácil aplicação para estudar o consumo alimentar de população semelhante ao do presente trabalho.

Palavras-chave: questionário de freqüência alimentar, padrão alimentar, trabalhadores de baixa renda.

Introduction

Measuring regular food consumption is necessary to study the relationship of diet and diseases (Kim and Choi, 2002). It becomes important to develop a dietary assessment instrument to evaluate food intake among population in which levels of literacy may be elementary among low-income population in most developing countries (Willett, 1998). Therefore, it is necessary to develop and evaluate simple dietary assessment methods to be applied to large population. Food frequency questionnaire (FFQ) obtains retrospective information on the patterns of food used during a longer, less precisely defined time period. Such method is most frequently used to assess usual intake of foods (Gibson, 1990). The FFQ imposes less burden on respondents than most of the other dietary assessment methods. Relatively small differences between FFQ designs can markedly influence certain dietary estimates within population.

The aim of the present research was to develop an interview-administered FFQ to assess the average frequency in which certain food items or food groups were consumed during a specific time period (long-term

diet), among Brazilian workers in the city of Goiânia and to characterize the food pattern of the study group.

Material and methods

Study population

The sample consisted of individuals (n=104), living in Goiânia City, representative in its demographic and socioeconomical characteristics. The data discussed were collected during the months of Nov/1999 and Apr/2000. The procedures were conducted according to an ethical protocol established by the Ethical Committee of the Federal University of Goiás, Goiânia, State Goiás.

Development of the food frequency questionnaire

A quantitative food frequency questionnaire (FFQ) was designed to assess the usual, long-term total diet for epidemiological studies, among low-income Brazilian workers. The FFQ was preceded by initial questions on demographic and social variables and population characteristics. The questionnaire has been validated and tested its reproducibility for dietary intakes of total energy, protein, carbohydrate, fat, retinol, vitamin C, calcium and iron, already published (Fornés *et al.*, 2003).

The FFQ was administered by well-trained interviewers, taking longer than typically required for the interview process to assess subjects food intake and asking participants to describe their usual consumed amount of specific foods and/or their usual portion size in words using as reference habitual regional utensils to reduce estimation error, according to Kim and Choi (2002).

The list of food, dishes consumed and usual serving sizes was compiled from data obtained from previous local survey, conducted among representative samples, using single 24 hours dietary recalls (24-HDR) and questionnaires to assess food frequency consumption. The list was composed of 127 Brazilian food items, excluding supplements, arranged into eleven food groups. Related food items with similar nutrient composition were clustered together.

A six-month retrospective FFQ was used to determine the pattern of food consumption. The FFQ was administered twice, at the beginning and at the end of the study period. The items frequency of consumption was coded into one of the nine categories (Fornés *et al.*, 2000, 2002): never, once a month or less, 2-4 times a month, 2-4 times a week, 5-6 times a week, once a day, 2-3 times a day; 4-5 times a day and, 6 or more times a day. To translate food consumption into daily nutrient intakes we used the computer program DietPro version 3.0. The standardized interview-administered FFQ taking twenty to thirty minutes to complete. Its instrument does not require literacy; it has low cost and was administered by face-to-face interview. The usual portion size in words using as reference habitual regional utensils was transformed into weight (Bowes and Church, 1989; Pennington, 1989; Pinheiro *et al.*, 2004).

The usual pattern of food consumption

The usual pattern of food consumption was evaluated from the two FFQ to reflect the pattern of consumption over the last six months. The respondents were asked about average use of specified foods over the last six months by indicating how often each food was eaten. The serving sizes for each food were multiplied by the number of times mentioned by the individual interviewed. For each of the food items, frequency of consumption was coded into one of the nine categories.

The data of the studied individuals were ranked to assess the proportion of the population with a particular pattern of food use.

Dietary data

The dietary information collection procedures used have been described elsewhere in detail in Fornés *et al.* (2003).

Results

Social-demographic and lifestyle characteristics are described in Table 1. The usual pattern of food consumption was evaluated from the two FFQ based on 104 workers, mean age 34.6 (±10.1), from which 66% reported elementary educational level or less, and 36.5 with low monthly family income.

Table 1. Social-demographic characteristics of the Brazilian workers participants from the city of Goiânia, State Goias.

Characteristics	Sex		Total	Percentage (%)
	Female	Male		
Number of Participants	62	42	104	100
Age Categories (years):				
15-25	7	15	22	21.2
26-35	19	25	44	42.3
36-45	21	2	23	22.1
46-55	13	-	13	12.5
≥ 56	2	-	2	1.9
Grade of instruction				
Illiterate	2	-	2	2.0
First primary school	10	8	18	17.3
Primary school	31	18	49	47.1
High school	19	16	35	33.6
Family income (MS*)				
< 1 MS	1	-	1	1.0
1 – 2.9 MS	26	12	38	36.5
3 – 4.9 MS	21	18	39	37.5
≥ 5 M S	14	12	26	25.0

*: 1 MS = 80.00 U$S

Table 2 is composed of 13 food groups with a total of 127 food items. The values in this table represent the proportion mean and standard deviation of workers by their food frequency on a weekly basis during the FFQ period. There were not large differences in food consumption between the two FFQ.

Table 2. Proportion mean and standard deviation among Brazilian workers by their food frequency of consumption on a weekly basis, Goiânia, 1999-2000 (n=104).

Foods and utensils #	Portion size ml or g	Mean Daily % ± SD*	Mean 5-6x/week % ± SD*	Mean 2-4x/week % ± SD*
Dairy				
01. Low fat milk (glass)	large 240	4	†	2
02. Whole milk (glass)	large 240	45.5± 6.4	9± 1.4	21.5± 3.5
03. Yogurt, unit	med 200	1.5± 0.7	†	10± 1.4
04. Curdled milk (glass)	med 200	†	0.5± 0.7	2.5± 3.5
05. Mozzarella cheese (slice)	med 20	0.75	1.5± 0.7	13.5± 0.7
06. Soft cheese, part skin (piece)	small 25	1	1.5± 0.7	13.5± 0.7
Beans/Nuts				
07. Peanuts, roasted (T)	med 20	0.5 ± 0.7	†	1.5± 0.7
08. Red beans, cooked (cup)	½ 120	86 ± 1.4	5.5± 3.5	4± 2.8
Eggs, meats, etc.				
09. Egg, chicken (unit)	med 45	0.5± 0.7	2.5± 2.1	28
10. Beef, roast, broil or grill (unit)	small 80	10.5	9± 2.8	21± 1.4
11. Ground beef, lean (T)	large 25	1	2	1.5± 0.7
12. Stewed beef meat, cubes (T)	large 35	14.5 ± 2.1	11.5± 2.1	20.5± 2.1
13. Chicken, w/ skin, leg or thigh (U)	med 65	2.5 ± 3.5	12± 1.4	63.5± 2.1
14. Chicken, w/o skin (U)	med 60	†	†	†
15. Dried beef, stewed, cubes (piece)	med 65	†	†	2.5± 2.1
16. Pork meat (piece)	med 90	0.5 ± 0.7	1.5± 0.7	6.5± 4.9
17. Ham, cured or boiled (slice)	med 15	0.5± 0.7	0.5± 0.7	6± 1.4
18. Liver beef (unit)	med 100	0.5± 0.7	0.5± 0.7	5
19. Part of chicken, stewed[1] (T)	large 45	†	†	3.5± 0.7
20. Fish, breaded & fried (unit)	med 115	†	†	6
21. Sausage, pork & beef (link)	med 33	0.5± 0.7	†	3.5± 0.7
22. Sardines, cnd (unit)	med 40	†	†	0.5 ± 0.7
23. Chorizo, pork & beef (link)	med 60	†	†	3± 1.4
Cereals & Grains Products				
24. Rice, white, cooked (cup)	½ = 100	92± 2.8	3	2 ± 1.4
25. Oatmeal, dry (T)	small 8	1.5± 0.7	†	3.5± 0.7
26. Corn flour, dry (T)	large 20	†	†	4.5 ± 2.1
27. Corn meal, dry (T)	large 20	†	†	5.5± 0.7
28. Cassava flour, dry (T)	med 15	11± 1.4	4.5± 0.7	32± 4.2
Biscuit, Pasta, Entrees				
29. Biscuit, from cassava flour (unit)	5 = 15	1	3± 1.4	20± 5.7
30. Cheese bread & biscuits (unit)	med 20	2± 1.4	9.5± 4.9	62± 11.3
31. Cake, plain, from mix (piece)	med 60	1± 1.4	0.5± 0.7	24± 2.8
32. Cracked, wheat, plain (unit)	4 = 24	3.5± 0.7	6.5± 2.1	33± 5.7
33. Cookies, plain (unit)	5 = 30	1± 1.4	0.5± 0.7	21± 1.4
34. Pie stuffed w/ meat, potatoes[2] (U)	med 220	0.5± 0.7	†	1.5± 0.7
35. Pastry, stuffed w/ meat[3] (U)	med 55	†	†	2.5± 2.1
36. Cheese/ hot dog roll (U)	med 30	†	†	3± 1.4
37. Arabian pastry stuf. w/beef & onions (U)	med 50	0.5± 0.7	†	1.5± 2.1
38. Tamale (U)	med 160	1	†	10± 2.8
39. French bread, roll (U)	med 50	54.5± 0.7	8.5± 2.1	19± 1.4
40. Pie stuffed w/ cheese or beef, fried[4] (U)	large 40	1.5± 0.7	1± 1.4	5.5± 3.5
41. Popcorn, popped (bag)	med 20	†	0.5± 0.7	5.5± 3.5
42. Pizza, slice (piece)	med 80	0.5± 0.7	†	3.5± 2.1
43. Spaghetti w/ tomato sce (cup)	med 220	3	2.5± 0.7	39.5± 6.4
Food				
Sweets & Baked Good				
44. Sugar, white granulated (T)	med 20	64.5± 13.4	4.5± 0.7	3.5± 2.1
45. Milk chocolate, bon-bon (U)	med 15	1	0.5± 0.7	4± 1.4
46. Compote, from mixed fruits (cup)	½ = 128	†	0.5± 0.7	4± 1.4
47. Jams/preserves (T)	med 20	†	†	6± 1.4
48. Milk & sugar jam (T)	med 20	†	0.5± 0.7	6± 2.8
49. Gelatin, from mix (cup)	½ = 140	0.5± 0.7	†	10.5± 2.1
50. Fruits jelly (t)	7	†	†	2 ± 2.8
51. Gelatin, from calve's feet (T)	25	†	†	2
52. Honey (T)	15	1.5± 0.7	†	7.5± 0.7
53. Brown sugar, in block (piece)	med 30	3.5± 2.1	†	9± 7.1
54. Ice cream (scoop)	100	0.5± 0.7	0.5± 0.7	14± 1.4
55. Cake, homemade (piece)	med 85	†	0.5± 0.7	5± 1.4
Fruits				
56. Avocado, raw (U)	½ = 215	†	†	1± 1.4
57. Pineapple, raw (slice)	med 75	3± 1.4	3.5± 0.7	27
58. Plum, raw (U)	med 42	0.5± 0.7	†	1.5± 0.7
59. Banana, raw (maça) (U)	med 65	1.5 ± 0.7	3.5± 0.7	34± 4.2
60. Banana, raw (nanica) (U)	med 100	0.5± 0.7	2.5± 0.7	13.5± 4.9
61. Cashew, raw (U)	med 25	0.5± 0.7	0.5± 0.7	1.5± 0.7

Table 02 (continued)

62. Coconut, raw (piece)	small 40	†	0.5± 0.7	0.5± 0.7
63. Dried fruits (raisins, prunes) (T)	med 15	†	†	†
64. Guava, raw (U)	½ = 90	0.5± 0.7	†	5± 2.8
65. Orange, raw (U)	med 180	9.5± 3.5	15± 1.4	49.5± 0.7
66. Lemon, raw (U)	med 50	6± 1.4	5	14.5± 0.7
67. Apple, raw, w/skin (U)	med 150	1.5± 0.7	2.5± 0.7	28.5± 0.7
68.Papaya, raw (U med)	½ = 170	0.5± 0.7	2	29± 4.2
69. Mango, raw "espada" (U)	med 140	3 ± 4.2	3± 4.2	13.5± 12
70. Passion fruit, raw (U)	med 45	†	0.5± 0.7	7.5± 3.5
71. Watermelon, raw (slice)	med 200	1	1± 1.4	30± 5.6
72. Tangerine, raw (U)	med 135	0.5	†	6.5± 0.7
73. Grapes, raw (cup)	170	†	†	2.5± 0.7
Vegetables				
74. Yellow squash, ckd, cubes (T)	med 30	†	1.5± 2.1	38± 1.4
75. Zucchini, stewed, slices (T)	med 30	†	†	21± 2.8
76. Kale, raw, shredded (T)	med 10	0. 5 ± 0.7	†	10± 5.7
77. Watercress, raw-chopped (cup)	½ = 20	0.5± 0.7	1 ± 1.4	6.5± 2.1
78. Lettuce, raw (leave)	med 10	7± 1.4	14.5± 4.9	46± 4.2
79. Potato, boiled w/o skin (U)	med 135	0.5± 0.7	1.5± 0.7	31± 4.2
80. Potato, french-fried (U)	10 = 50	0.5± 0.7	1.5± 0.7	30.5± 6.3
81. Sweet potato, boiled (slice)	med 70	†	0.5± 0.7	6.5± 2.1
82. Sweet potato, fried (slice)	med 65	†	†	3± 2.8
83. Egg plant, stewed w/sce (T)	med 25	†	†	2.5± 0.7
84. Egg plant, fried (slice)	med 20	†	†	3
85. Beet, raw, grated (T)	med 16	†	0.5± 0.7	0.5± 0.7
86. Beet, boiled (slice)	med 12	0.5± 0.7	†	27± 5.6
87. Yams, boiled (slice)	med 50	†	0.5± 0.7	4± 1.4
88. Carrot, raw, grated (T)	large 12	0.5 ± 0.7	1± 1.4	1
89. Carrots, boiled, rings (T)	large 25	1.5± 0.7	1.5± 0.7	37± 5.7
90. Chayote, boiled, chopped (T)	med 14	0.5 ± 0.7	3± 2.8	25.5± 4.9
91. Cole, stewed (T)	med 20	†	2± 1.4	30± 8.4
92. Cauliflower, boiled (T)	large 25	†	†	6± 1.4
93. Peas, cnd (T)	large 27	†	†	†
94. Spinach, boiled (T)	large 25	†	†	1± 1.4
95. Cassava, boiled (piece)	med 60	†	0.5± 0.7	31.5± 9.1
96. Cassava, fried (piece)	med 40	†	1± 1.4	13± 2.8
97. Petit manioc, stewed w/sce, chopped (T)	med 25	†	†	†
98. Corn, yellow, boiled (T)	24	†	1	25± 4.2
99. Corn, yellow, cnd (T)	24	†	†	4.5± 2.1
100. Mustard, boiled 10' (T)	med 28	0.5± 0.7	†	3.5± 3.5
101. Turnip, raw, grated (T)	med 12	†	†	†
102. Turnip, boiled (T)	med 25	†	†	0.5± 0.7
103. Cucumber, raw, chopped (T)	med 18	1	2± 1.4	20.5± 0.7
104. Potatoes, mashed homemade(T)	med 35	†	†	6.5± 0.7
105. Okra, stewed, chopped (T)	med 20	†	1	17.5± 2.1
106. Radish, raw (U)	med 25	†	0.5± 0.7	3.5± 2.1
107. Cabbage, green, shredded (T)	med 10	0.5± 0.7	2.5± 2.1	32.5± 0.7
108. Tomato, raw (slice)	med 15	18.5± 6.4	22± 7.1	43± 1.4
109. String beans, chopped, stewed (T)	35	†	1± 1.4	18± 7.1
Fats				
110. Cream, dairy (T)	15	†	†	4± 1.4
111. Lard, (pork fat) (t)	8	4± 1.4	0.5± 0.7	3.5± 2.1
112. Mayonnaise (T)	27	3± 1.4	0.5± 0.7	8.5± 0.7
113. Butter (t)	5	4.5± 0.7	†	3
114. Margarine (t)	5	57.5± 3.5	10.5± 0.7	13± 1.4
115. Oil, (soybean, corn, etc.) (T)	8l	90	2± 1.4	2± 1.4
116. Bacon, chopped (t)	8	1	†	1.5± 2.1
117. Fried scrap (pork meat w/ fat) (T)	30	†	†	4± 2.8
Condiments				
118. Salt (t)	5	100	†	†
Alcoholic Beverages				
119. Rum or brandy (short drink)	50	1	†	2.5± 0.7
120. Beer (can)	350	1± 1.4	0.5± 0.7	12± 4.2
121. Wine (glass)	½ = 85	0.5± 0.7	0.5± 0.7	1± 1.4
Non-Alcoholic Beverages				
122. Water (glass)	165	100	†	†
123. Coffee, black (short cup)	50	59	1.5± 0.7	1.5± 0.7
124. Carbonated beverage (can)	350	13± 1.4	12± 9.9	41± 5.6
125. Fruit flavored beverages (glass)	165	6± 1.4	9± 1.4	20.5± 3.5
126. Fruit flavored beverages w/ sugar (glass)	165	10± 1.4	13± 4.2	33.5± 6.4
127.Refreshment from fruit jce & water(glass)	165	†	†	†

*SD: standard deviation; †: food not consumed; [1]: liver, kidney, heart, stomach; [2]: *empadão;* [3]: *empadinha;* [#]: Abbreviations and symbols are showed in Table 3.

The 30 foods most frequently mentioned by the study group, over the two six months retrospectives FFQ period are almost identical. The five most daily frequently consumed foods, in descending order, were: white rice, soybean oil, red beans, white sugar and black coffee, ranked from 59% to 92%. Red beans (86%), whole milk (45.5%), and beef meat (25%) were the protein-rich foods consumed. The commonly used fruits were: orange (9.5%), lemon (6%), pineapple (3%), and mango (3%). Tomato (18.5%) and lettuce (7%) were the vegetables most frequently daily reported. The proportion of workers consuming the top 30 foods on a daily basis range from less than 1.5% to 92%.

Table 3. Abbreviations and symbols.

cnd	canned
ckd	cooked
g	gram(s)
jce	juice
med	medium
prep	prepared
sce	sauce
stuf	stuffed
t	teaspoon
T	tablespoon
U	unit
w/	with
w/o	without
/	per / or
&	and

The items consumed on at least once a day by approximately 50% of the workers surveyed were: white rice, soybean oil, red beans, white sugar, black coffee, margarine, and white bread.

Marked variations exist in the frequency which foods and beverages were consumed on the weekly basis. There were differences in food consumption between the weekly categories of consumption. On a daily basis, and on the category of 5 to 6 times a week, the number of foods consumed was almost similar 77 and 76, respectively. The number of items consumed (120), on the 2 to 4 times a week category was greater when compared to the others weekly categories.

Comparisons of the mean percentage distribution of workers by daily frequency consumption of different food groups are shown in Figure 1.

Individuals daily consumption of specific food group is very low, for example, fruits 28%, vegetables 32.5%, meat (30%) and dairy products (50%). The number of foods daily consumed, among the workers, contains few items by food group.

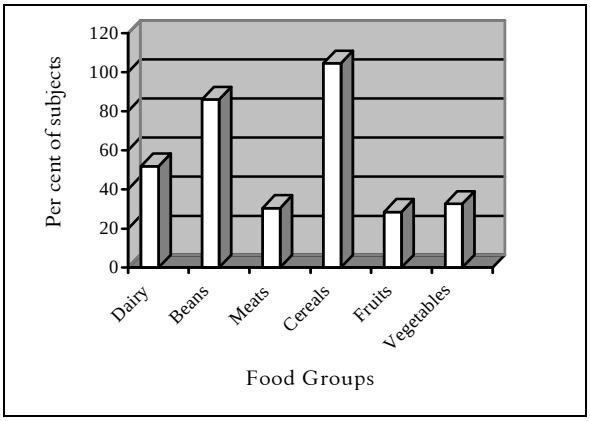

Figure 1. Mean percentage distribution among Brazilians workers by food groups daily frequency consumption, 1999-2000 (n=104).

Discussion

Diet has a significant role in determining health status. Therefore, evaluation of research hypothesis about the health consequences of diet requires accurate information about the dietary intake of individuals (Willett, 1998). Collecting information about the dietary intake of individuals has been recognized as a challenging problem in nutrition and epidemiology (Block, 1982). Interest in food-frequency questionnaire (FFQ) for assessment of past diet has been increased recently, which are relatively inexpensive and easy to administer, it has been established as the primary method for assessing dietary intake in epidemiological studies (Willett, 1998). Food frequency procedures require respondents to provide information about their (quantity and frequency) intake of each food and beverage items, during the study period. The best method of assessing the pattern of food use for a group and/or individual involves using a FFQ (Gibson, 1990; Willett, 1998).

The study surveys represented by seven metropolitan Brazilian areas were conducted over 1961-62, 1974-75 and 1987-88. They found similar changes in the Northeastern and Southeastern cities: reduction in the consumption of cereals, beans, roots and tubercles; replacement of lard, bacon and butter by vegetable oil and margarine and increase in the relative consumption of egg, milk and dairy products (Mondini and Monteiro, 1994).

Concerning the weekly consumption of food items, the data of this study show the same differences of the previous study: high consumption of beans and rice, low consumption of eggs and dairy products. The data confirm the replacement of animal fats by vegetables oils, hydrogenated or not.

None of the present study participants reported consumption of chicken without skin and, the daily consumption of fruits and vegetables was low. Numerous researchers established association between these groups of foods and prevention of chronic disease (Kant *et al.*, 2000; Frank and Willett, 2002). Nicklas *et al.*(1989) reported higher levels of HDL in the participants with more consumption of fruits, vegetables and, less consumption of fats, pasta, coffee and, sugar.

The diet of low-income women studied by Block *et al.* (1995) was similar in frequency of various foods, for example: milk consumption, meat, white bread and, the Brazilian workers appear with higher daily consumption of: rice, beans, oranges than the low-income Hispanic-American women. The data also reveal that the Brazilians reported lower consumption of green salad and tomato than the studied women.

Sichieri and Everhart (1998) reported the daily consumption of rice 81.3%, beans 60.4%, white bread 54.9% among 44 Brazilian University staff, showing lower consumption of fruits and vegetables when comparing with the present study.

Diets of poor populations in nonindustrialized areas are homogeneous. Where economic resources are severely restricted, food intake is strongly linked to income, so that even small economic differences are directly reflected in diet. Within developing countries, lower economic status has been shown to be associated with higher within-person variability in energy and protein intake (Willett, 1998).

Beans and rice daily consumption 86% and 92%, respectively, represented the staple foods (Leterme, 2002) in the workers group. Because of the nutritional importance of these foods among Brazilians they were called cultural superfood (Jelliffe, 1967). It will usually be the main source of protein, as well as calories. These foods together are source of good protein quality and, also some minerals, vitamins and fiber (Dutra de Oliveira and Marchini, 1998).

For most epidemiological studies, long-term diet is a relevant exposure parameter. The average use of specified foods in population groups can be used for regional, national and/or international comparisons of the relationship of patterns of food use to health and susceptibility to non-communicable diseases (Gibson, 1990). Knowledge of foods that serve as the basis of diet for a majority of persons and the amounts typically eaten would be useful for targeting changes in eating behavior and persons designing nutrition intervention programs (Van'T Veer, 1994).

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