

Short Communication

DEVELOPMENT OF A FOOD COMPOSITION TABLE TO ANALYZE SENEGALESE FOOD EXPENDITURE DATA

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ABSTRACT

Household Consumption and Expenditure Surveys (HCES) are increasingly used to estimate the potential of food fortification programs. Senegal's latest HCES, *Enquête de Suivi de la Pauvreté au Sénégal*, was completed in 2011. As no Senegalese food composition table exists, one had to be constructed to analyze Senegal's HCES, which contains 50 foods or food groups. These are millet, sorghum, maize, *fonio*, millet porridge, whole rice, broken rice, red rice, groundnut, peanut paste, groundnut paste, palm oil, vegetable oil, groundnut oil, soya oil, tomato paste, cabbage, tomato, onion, dried cowpea, bouillon cube, mango, fried egg sandwich, salt, herring, smoked catfish, dried whitefish, beef, goat, lamb, pork, chicken, sugar, coffee bean, instant coffee, green tea, hibiscus tea, Coca Cola, baobab fruit, beer, baguette, croissant, water biscuit, yoghurt, powder milk, milk, and gruyere cheese. A food composition table was constructed with 13 micronutrients (biotin, folate, iodine, iron, niacin, pantothenic acid, riboflavin, thiamin, vitamin A, vitamin B6, vitamin B12, vitamin D, and zinc) for the 50 food items in the Household Consumption and Expenditure Survey. Nutrient information was collected from the *Table de Composition des Aliments d'Afrique de l'Ouest*, United States Department of Agriculture's Food Composition Databases, Frida Fooddata, several journals, and books. In the survey, there were food groups such as alcoholic beverages that needed to be reclassified as a specific food, such as beer, to construct the food composition table. To accomplish this, food balance sheet data from the Food and Agriculture Organization of the United Nations were used as well as information from a Senegalese key informant. To consider the potential impact of food fortification on apparent nutrient intakes, nutrient information for ten fortified foods (bouillon cube, salt, palm oil, vegetable oil, groundnut oil, soya oil, and four wheat flour-containing foods such as baguette, croissant, water biscuit, and fried egg sandwich) were also included in the food composition table. With the newly developed Senegalese food composition table, it is possible to analyze Senegal's 2011 HCES.

Key words: Micronutrients, Nutrient Database, West Africa, Household Income and Expenditure Survey, Senegal

INTRODUCTION

Household Consumption and Expenditure Surveys (HCES) are increasingly used to estimate the potential of food fortification programs [1]. In the absence of nationally representative 24-hour dietary recall or food frequency data, HCES can estimate the apparent consumption of foods that can potentially be fortified or are already fortified [2]. In 2011, the *Agence Nationale de la Statistique et de la Démographie* collected the *Enquête de Suivi de la Pauvreté au Sénégal* survey. A food composition table was needed to use the survey to estimate the potential impact of fortification on apparent nutrient intake in the Senegalese population. As no Senegal food composition table exists, this project aimed to develop one.

MATERIALS AND METHODS

The French-language survey contained 50 foods items; these were translated into English using an internet translation tool. A native French speaker verified the results. Several sources were searched to identify the foods' content of 13 micronutrients: biotin, folate, iodine, iron, niacin, pantothenic acid, riboflavin, thiamin, vitamin A, vitamin B6, vitamin B12, vitamin D, and zinc. *Table de Composition des Aliments d'Afrique de l'Ouest* [3] was the main source, followed by USDA Food Composition Databases [4] and the Frida Fooddata [5]. For foods missing nutrient information, literature reviews were conducted in the Journal of Food Composition and Analysis [6] and Agricola database [7] and books were consulted [8 – 13]. When nutrient information could not be found for the genus and species of interest, these same sources were searched for foods in the same family. For example, goat (*Capra aegagrus*) and lamb (*Ovis aires*) are in the same subfamily (Bovidae). If a food item in the same family could not be found, then other shared characteristics were used. For some nutrients, potato values were used for cassava because they are both tubers.

For some food items, the survey collected data on food groups instead of specific foods such as alcoholic beverage. Two steps were followed to identify a suitable specific food to represent a group. Food and Agriculture Organization food balance sheet data from Senegal were used to identify leading foods in a category such as beer for alcoholic beverages [14]. A Senegalese chef was the final arbiter in identifying the most suitable specific food.

Senegal has mandatory fortification of oil, salt and wheat flour and voluntary fortification of bouillon cube. Fortified versions of ten foods were also added to the table. For palm oil, vegetable oil, groundnut oil, soya oil [15], and salt [16], the nutrient values in the Senegal fortification standard were added to the nutrient values of unfortified food to obtain the fortified food's total nutrient values. For example, 9000 µg of iodine must be added per 100 g of fortified salt [16]. Unfortified salt is estimated to have 42 µg of iodine per 100 g. Fortified salt was calculated to contain 9042 µg of iodine per 100 g. For fortified bouillon cube, Maggi bouillon cube served as the source of micronutrient levels [17]. Because bouillon cube is a processed food with no natural counterpart, it was established that non-fortified bouillon cube does not contain any micronutrients. For nutrients that were not included in fortification standards such as iron for salt, the level for the non-fortified version of the product was used for the fortified version as well.

Four foods contain wheat flour, oil, and salt: baguette, croissant, water biscuits, and fried egg sandwich. Fortified and non-fortified versions of these foods were included in the table. To calculate the nutrient content of the fortified version, the country's fortification standards for wheat flour [18], oil [15], and salt [16] were used together with recipes for those four foods (i.e. manual calculation). For example, water biscuits contain 120 g of wheat flour, 14.2 g of vegetable oil, and 2.8 g of salt. Iron values for wheat flour, vegetable oil, and salt were provided by the *Table de Composition des Aliments d'Afrique de l'Ouest*. Multiplying the iron value from the source by the amount used in the recipe and dividing by 100 yielded the iron value of each ingredient. The final amount of iron (mg/100 g) for water biscuits was calculated by summing the iron value of each ingredient, dividing that by the total grams of recipe ingredients, and multiplying by 100. Emory University's Institutional Review Board determined that this study did not require ethics review because the data are de-identified.

RESULTS AND DISCUSSION

The food composition table contains 13 micronutrients (expressed per 100 g of food) for 60 foods (50 unfortified and 10 fortified) as shown in **Table 1**. Several limitations were encountered while compiling the table. First, biotin, iodine, and pantothenic acid are not available in the *Table de Composition des Aliments d'Afrique de l'Ouest*, nor are biotin and iodine included in the USDA Food Composition Databases. Since Frida Fooddata includes these nutrients, it was the main source of the information. Second, for some fortified food products, nutrients values were calculated manually using recipes. It is possible that nutrient values are overestimated as nutrient losses caused by storage, preparation, and cooking were not taken into account. Third, for some foods, it was necessary to use the nutrient value of a food in the same family, but not genus or species. It is possible that these values do not accurately represent the nutrients in the foods of interest. Fourth, for some foods we were unable to find different food composition values and thus the nutrient profile is the same for two foods. Lastly, foods selected to represent a food category may not accurately reflect Senegalese consumption, and the nutrient values extracted from multiple sources may not accurately reflect the nutrient levels of foods as grown or sold in Senegal.

The main strength is that the compiled table allows the analysis of HCES data that otherwise could not be used to estimate food-intake patterns, nutrient-intake patterns, and the potential for fortified foods to improve nutrient intakes for particular sociodemographic groups in Senegal.

CONCLUSION

A food composition table was constructed to analyze Senegal's most recent HCES. It has data on 13 micronutrients for 50 non-fortified and 10 fortified foods. The food composition table is available for any researcher interested in analyzing Senegal's 2011 HCES for apparent nutrient intake.

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Disclaimer

The findings and conclusions of this report are those of the authors and do not necessarily represent the official position of the US Centers for Disease Control and Prevention.

Table 1: Food Composition Table (nutrient values are expressed per 100 g)

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Food	1	Millet (Mil)	9.5	29	0	0	0	1.47	0.30	0.13	0.73	1.7	5	0.848	1.9	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[4]	((5) ²)
Code ⁴			01_015	01_015	01_015	01_015	01_015	01_015	01_015	01_015	01_015	01_015	01_015	01_015	385	20031
Food	2	Sorghum (Sorgho)	3.4	30	0	0	0	1.97	0.36	0.16	0.25	3.3	0.5	0.367	19	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	((5) ²)	[4]	((5) ²)
Code ⁴			01_041	01_041	01_041	01_041	01_041	01_041	01_041	01_041	01_041	01_041	01_041	01_041	59	20067
Food	3	Maize (Maïs)	3.5	26	50	0	0	1.70	0.33	0.15	0.40	2.2	0.5	0.54	0.5	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			01_006	01_006	01_006	01_006	01_006	01_006	01_006	01_006	01_006	01_006	01_006	01_006	31	31
Food	4	Fonio (Fonio)	8.5	29	0	0	0	1.50	0.25	0.10	0.73	1.7	5	0.848	1.9	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	((5) ²)	((4) ²)	((5) ²)
Code ⁴			01_001	01_001	01_001	01_001	01_001	01_001	01_001	01_001	01_001	01_001	01_001	01_001	385	20031
Food	5		3.22	14.67	19.06	0.35	0.06	0.69	0.11	0.145	0.25	0.58	8.8	0.47	2	

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)
Source ³		Millet	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	[10]
Code ⁴		porridge (Bouillie de millet)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	6	Imported	0.7	20	0	0	0	1.10	0.07	0.03	0.13	0.4	2.2	0.55	3
Source ³		whole rice	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴		(Riz entier importé)	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	1252	1252	1252
Food	7	Imported	0.7	20	0	0	0	1.10	0.07	0.03	0.13	0.4	2.2	0.55	3
Source ³		broken rice	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴		(Riz brisé importé)	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	01_036	1252	1252	1252
Food	8	Red rice	1.7	95	0	0	0	5.96	0.06	0.10	0.391	2.0	4.5	1.074	3
Source ³			[3]	[4]	[3]	[3]	[3]	[4]	[3]	[3]	[4]	[3]	((5)) ²	[4]	((5)) ²
Code ⁴		(Riz local)	01_067	20088	01_067	01_067	01_067	20088	01_067	01_067	20088	01_067	156	20088	156

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Food	9	Groundnut	3.91	110	0	0	0	2.5	0.87	0.14	0.59	15.5	0.5	2.8	34	
Source ³		(Arachide	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]	
Code ⁴		décortiquée)	06_010	06_010	06_010	06_010	06_010	06_010	06_010	06_010	06_010	06_010	06_010	150	150	150
Food	10	Peanut paste	4.0	110	0	0	0	2.0	0.39	0.14	0.59	15.3	0.5	1.04	30	
Source ³		(Pâte	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	CMR ¹	
Code ⁴		d'arachide)	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	1162	1162	NA
Food	11	Groundnut	4.0	110	0	0	0	2.0	0.39	0.14	0.59	15.3	0.5	1.04	30	
Source ³		paste	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	CMR ¹	
Code ⁴		(Pâte d'arachide)	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	06_026	1162	1162	NA
Food	12	Palm oil	0.01	0	0	0	0	0	0	0	0	0	0	0	0	
Source ³		(Huiles de	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[5]	([5]) ²
Code ⁴		palme)	11_007	11_007	11_007	11_007	11_007	11_007	11_007	11_007	11_007	11_007	11_007	1345	1355	1415
Food	12 (Fortified)	Palm oil	0.01	0	1750	0	0	0	0	0	0	0	0	0	0	
Source ³			[3]	[3]	CMR ¹	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[5]	([5]) ²

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)
Code ⁴		(Huiles de palme)	11_007	11_007	NA	11_007	11_007	11_007	11_007	11_007	11_007	11_007	1345	1355	1415
Food	13	Vegetable oil	0	0	0	0	0	0	0	0	0	0	0	0	0
Source ³		(Huiles végétales)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[4]	[10] ²
Code ⁴				11_010	11_010	11_010	11_010	11_010	11_010	11_010	11_010	11_010	11_010	1345	04513
Food	13 (Fortified)	Vegetable oil	0	0	1750	0	0	0	0	0	0	0	0	0	0
Source ³		(Huiles végétales)	[3]	[3]	CMR ¹	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[4]	[10] ²
Code ⁴				11_010	11_010	NA	11_010	11_010	11_010	11_010	11_010	11_010	11_010	1345	04513
Food	14	Groundnut oil	0.03	0	0	0	0	0	0	0	0	0	0	0	0
Source ³		(Huiles d'arachide)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[5]	([5]) ²
Code ⁴				11_003	11_003	11_003	11_003	11_003	11_003	11_003	11_003	11_003	11_003	1345	1380
Food	14 (Fortified)	Groundnut oil	0.03	0	1750	0	0	0	0	0	0	0	0	0	0
Source ³			[3]	[3]	CMR ¹	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[5]	([5]) ²
Code ⁴				11_003	11_003	NA	11_003	11_003	11_003	11_003	11_003	11_003	11_003	1345	1380

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)
		(Huiles d'arachide)													
Food	15	Soya oil	0.1	0	0	0	0	0	0	0	0	0	0	0	0
Source ³		(Huile de soja)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			11_009	11_009	11_009	11_009	11_009	11_009	11_009	11_009	11_009	11_009	1461	1461	1461
Food	15 (Fortified)	Soya oil	0.1	0	1750	0	0	0	0	0	0	0	0	0	0
Source ³		(Huile de soja)	[3]	[3]	CMR ¹	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			11_009	11_009	NA	11_009	11_009	11_009	11_009	11_009	11_009	11_009	1461	1461	1461
Food	16	Tomato paste	3.0	10	75.1	0	0	0.40	0.06	0.153	0.216	3.08	4.4	0.44	3
Source ³		(Concentré de tomates)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			04_066	04_066	04_066	04_066	04_066	04_066	04_066	04_066	04_066	04_066	1216	1216	1216
Food	17	Cabbage	0.6	48	8	0	0	0.20	0.05	0.04	0.10	0.3	0.1	0.324	0.1
Source ³		(Choux)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			04_005	04_005	04_005	04_005	04_005	04_005	04_005	04_005	04_005	04_005	44	44	44

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Food	18	Tomato (Tomates)	0.6	21	52	0	0	0.70	0.06	0.04	0.09	0.6	0.2	0.33	1.5	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			04_021	04_021	04_021	04_021	04_021	04_021	04_021	04_021	04_021	04_021	04_021	04_021	52	52
Food	19	Onion (Oignons)	0.3	16	0	0	0	0.26	0.05	0.04	0.10	0.2	0.9	0.13	0.9	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			04_018	04_018	04_018	04_018	04_018	04_018	04_018	04_018	04_018	04_018	04_018	04_018	716	716
Food	20	Dried cowpea (Niébé sec)	7.3	417	3	0	0	4.61	0.71	0.15	0.36	3.1	0.5	2	0.5	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			03_004	03_004	03_004	03_004	03_004	03_004	03_004	03_004	03_004	03_004	03_004	03_004	592	592
Food	21	Cassava (Manioc frais)	0.7	24	1.25	0	0	0.34	0.04	0.05	0.088	0.677	1.2	0.107	0.47	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	([5]) ²	[5]	([5]) ²
Code ⁴			02_001	02_001	02_001	02_001	02_001	02_001	02_001	02_001	02_001	02_001	02_001	02_001	4	939
Food	22	Carrot (Carotte)	0.7	31	713	0	0	0.26	0.06	0.05	0.23	0.7	3	0.28	3.4	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			04_006	04_006	04_006	04_006	04_006	04_006	04_006	04_006	04_006	04_006	04_006	04_006	24	24

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)
Food	23	Bouillon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Source ³		cube	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Code ⁴		(Bouillon)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	23 (Fortified)	Bouillon	63.0	32	0	1	0	0.21	0.20	0.21	1.00	3.3	2800	0	0
Source ³		cube	Reed	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	Reed	[5]	[5]
Code ⁴		(Bouillon)	NA	13_008	13_008	13_008	13_008	13_008	13_008	13_008	13_008	13_008	NA	1253	1253
Food	24	Mango	0.6	21	59	0	0	0.10	0.04	0.03	0.09	0.3	0.32	0.16	0
Source ³		(Mangue)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[11]
Code ⁴			05_037	05_037	05_037	05_037	05_037	05_037	05_037	05_037	05_037	05_037	05_037	545	545
Food	25	Fried egg	1.65	63.83	54.76	0.30	0.71	1.45	0.19	0.23	0.19	0.96	10.80	0.98	10.46
Source ³		sandwich	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴		(Sandwich aux œufs frits)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	25		4.50	284.44	100.18	0.30	0.71	1.45	0.19	0.23	0.19	0.96	99.41	0.98	10.46

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Source ³	(Fortified)	Fried egg	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	
Code ⁴		sandwich (Sandwich aux œufs frits)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	26	Salt (Sel)	1.2	0	0	0	0	0.10	0.00	0.00	0.00	0.0	42	0	0	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	556	556	556
Food	26 (Fortified)	Salt (Sel)	1.2	0	0	0	0	0.10	0.00	0.00	0.00	0.0	9042	0	0	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	CMR	[5]	[5]
Code ⁴			13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	13_015	NA	556	556
Food	27	Herring (Hareng)	1.3	1.10	28	13.7	4.2	0.99	0.092	0.23	0.302	3.2	26.5	0.615	6.4	
Source ³			[3]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[5]	[5]	[5]
Code ⁴			09_041	15039	15039	15039	15039	15039	15039	15039	15039	15039	15039	48	48	48
Food	28		1.11	8	28.8	2.39	10.71	0.44	0.227	0.060	0.260	1.560	0.92	2.51	8.82	

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)
Source ³		Smoked	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	[4]	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴		catfish (Poisson-caht fumé)	NA	NA	NA	NA	NA	NA	15233	NA	NA	NA	NA	NA	NA
Food	29	Dried	4.10	11	39	18.40	(0)	5.00	0.053	0.438	0.37	11.200	230	2.57	0
Source ³		whitefish	[4]	[4]	[4]	[4]	[5]	[4]	[4]	[4]	[4]	[4]	((5)) ²	[4]	((5)) ²
Code ⁴		(Corégone séchée)	35165	35165	35165	35165	948	35165	35165	35165	35165	35165	948	35165	948
Food	30	Beef	2.9	5.5	16	1.1	0.6	3.4	0.06	0.28	0.32	5.6	1	0.47	0
Source ³		(Viande de	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴		bœuf)	07_002	07_002	07_002	07_002	07_002	07_002	07_002	07_002	07_002	07_002	1053	1053	1053
Food	31	Goat	2.4	5	0	1.1	(0.278)	3.45	0.18	0.29	0.40	6.1	0.7	0.55	1
Source ³		(Chèvre)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	((5)) ²	((5)) ²	((5)) ²
Code ⁴			07_046	07_046	07_046	07_046	07_004	07_046	07_046	07_046	07_046	07_046	71	71	71
Food	32	Lamb	2.1	2	10	2.9	0.278	3.33	0.13	0.19	0.40	3.5	0.7	0.55	1

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Source ³		(Agneau)	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]	
Code ⁴			07_004	07_004	07_004	07_004	07_004	07_004	07_004	07_004	07_004	07_004	71	71	71	
Food	33	Pork (Porc)	1.4	2	0	0.8	0.7	3.60	0.72	0.22	0.32	3.8	1	0.6	2.6	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			07_006	07_006	07_006	07_006	07_006	07_006	07_006	07_006	07_006	07_006	07_006	1112	1112	1112
Food	34	Chicken (Poulet)	1.31	30	232	1.11	0.2	1.48	0.061	0.186	0.34	6.6	0.9	0.885	2	
Source ³			[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[5]	[5]	[5]
Code ⁴			05001	05001	05001	05001	05001	05001	05001	05001	05001	05001	05001	1037	1037	1037
Food	35	Sugar (Sucre)	0.05	0	0	0	0	0.01	0	0.02	0	0	0	0	0	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	876	77	77
Food	36	Sugar (Sucre)	0.05	0	0	0	0	0.01	0	0.02	0	0	0	0	0	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	13_002	876	77	77
Food	37	Coffee bean	4.10	22.00	0.50	0.00	0.00	0.79	0.07	0.20	0.00	15.00	0.5	0.23	0.14	

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Source ³		(Café en	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[5]	[(13)] ²	
Code ⁴		grains)	1075	1075	1075	1075	1075	1075	1075	1075	1075	1075	1075	1075	1075	NA
Food	38	Instant	4.4	2	0	0	0	0.73	0.02	0.08	0.03	28.2	0.5	0.4	0.14	
Source ³		coffee	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[(13)] ²
Code ⁴		(Café moulu)	12_005	12_005	12_005	12_005	12_005	12_005	12_005	12_005	12_005	12_005	12_005	720	720	NA
Food	39	Green tea	0.00	0	0	0	0	0.01	0.00	0.00	0.00	0.0	0.22	0	0.14	
Source ³		(Thé vert)	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[5]	[5]	[(13)] ²
Code ⁴			14261	14261	14261	14261	14261	14261	14261	14261	14261	14261	14261	115	115	NA
Food	40	Hibiscus tea	0.08	1.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.04	2	0	0.14	
Source ³		(Thé à	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[12]	[4]	[(13)] ²
Code ⁴		l'hibiscus)	14649	14649	14649	14649	14649	14649	14649	14649	14649	14649	14649	NA	14649	NA
Food	41	Coca-cola	0.00	0	0	0	0	0.013	0.00	0.00	0.00	0.0	0.9	0	0	
Source ³		(Coca-cola)	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[9]	[10]	[10]
Code ⁴			45130960	45130960	45130960	45130960	45130960	45130960	45130960	45130960	45130960	45130960	45130960	NA	878	878
Food	42		1.07	(3)	1.16	0.00	0.00	0.70	0.07	0.01	0.003	0.41	1.3	0.12	1	

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Source ³		Baobab fruit	CMR ¹	[5]	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	[(5)] ²	[(10)] ²	[(10)] ²	
Code ⁴		juice (Jus de fruit de baobab)	NA	191	NA	NA	NA	NA	NA	NA	NA	NA	NA	191	879	879
Food	43	Beer (Bière)	0.1	5	0	0.02	0	0.01	0.01	0.03	0.07	0.7	4.1	0.065	0.5	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[4]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			12_001	12_001	12_001	12_001	12_001	12_001	12_001	14006	12_001	12_001	12_001	12_001	198	198
Food	44	Baguette (Baguette)	2.20	83.75	22.29	0.11	0.31	1.82	0.29	0.17	0.220	1.54	6.69	0.87	7.12	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	44 (Fortified)	Baguette (Baguette)	7.45	455.53	22.29	0.11	0.31	1.82	0.29	0.17	0.220	1.54	156.01	0.87	7.12	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	45	Croissant (Croissant)	1.63	57.6	227.9	0.23	0.38	1.36	0.210	0.170	0.160	1.150	5.8	0.57	3.62	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Food	45 (Fortified)	Croissant (Croissant)	5.38	321.3	330.6	0.23	0.38	1.36	0.210	0.170	0.160	1.150	111.69	0.57	3.62	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	46	Water biscuit (Craquelin)	1.78	21.02	0.00	0.00	0.00	1.58	0.250	0.090	0.180	1.050	2.54	0.44	1.66	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	46F	Water biscuit (Craquelin)	7.03	393.18	36.33	0.00	0.00	1.58	0.250	0.090	0.180	1.050	189.39	0.44	1.66	
Source ³			CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹	CMR ¹
Code ⁴			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Food	47	Yoghurt (Yaourt)	0.10	12	30.0	0.3	0.1	0.58	0.04	0.20	0.040	0.1	12	0.28	1.8	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			10_005	10_005	10_005	10_005	10_005	10_005	10_005	10_005	10_005	10_005	10_005	12	12	12
Food	48	powder milk	0.7	39	228	3.3	1.2	3.51	0.30	1.32	0.25	0.71	115	3.6	10	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]

Classification	Food Number	English food name (French name)	Iron (mg)	Folate (µg)	Vit A-RAE (µg)	Vit B12 (µg)	Vit D (µg)	Zinc (mg)	Thiamin (mg)	Riboflavin (mg)	Vit B6 (mg)	Niacin (mg)	Iodine (µg)	Pantothenic acid (mg)	Biotin (µg)	
Code ⁴		(Lait en poudre)	10_002	10_002	10_002	10_002	10_002	10_002	10_002	10_002	10_002	10_002	511	511	511	
Food	49	Milk (Lait)	0.05	10	33.0	0.6	0.1	0.39	0.038	0.180	0.05	0.090	10.7	0.356	1.56	
Source ³			[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[5]	[5]	[5]
Code ⁴			10_001	10_001	10_001	10_001	10_001	10_001	10_001	10_001	10_001	10_001	10_001	6	6	6
Food	50	Gruyere cheese (Gruyère)	0.17	10	271	1.6	0.6	3.90	0.06	0.279	0.081	0.106	10.4	0.3	1.7	
Source ³			[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[4]	[5]	[5]	[5]
Code ⁴			01023	01023	01023	01023	01023	01023	01023	01023	01023	01023	01023	341	341	341

¹CMR: Calculation using the mixed recipe calculation system; NA: not applicable; RAE: Retinol Activity Equivalents.

²(): Figures in parentheses are estimates taken from related foods.

³Source: Resource provides food micronutrient information.

⁴Code: Within that source, codes are assigned to each food item

REFERENCES

1. **Dary O and B Imhoff-Kunsch** Measurement of Food Consumption to Inform Food Fortification and Other Nutrition Programs: An Introduction to Methods and Their Application. *Food. Nutr. Bull.* 2012; **33(3 Suppl)**: S141-5.
2. **Bermudez OI, Lividini K, Smitz MF and JL Fiedler** Estimating Micronutrient Intakes from Household Consumption and Expenditures Surveys (HCES): An Example from Bangladesh. *Food. Nutr. Bull.* 2012; **33(3 Suppl)**:S208-13.
3. **Barbara S** Table de Composition des Aliments d'Afrique de l'Ouest. FAO 2012: Rome.
4. **United States Department of Agriculture.** USDA Food Composition Databases. National Agricultural Library. Version 3.7.1. 2017.
5. **National Food Institute.** Frida Fooddata. Technical University of Denmark. Version 2. 2015.
6. **Pennington JAT, Bowes ADP and HN Church** Bowes & Church's Food Values of Portions Commonly Used. Lippincott, Philadelphia. 1998.
7. **United States of Department of Agriculture.** AGRICOLA. National Agricultural Library. 2006.
8. **Souci SW, Fachmann W, Kraut H, Scherz H, Kloos G and F Senser** Food Composition and Nutrition Tables. *J. Appl. Botany. Food. Qual.* 2016.
9. **Pinndal K and W Hjarde** Jodindholdet i den danske kost. Husholdningsrådet. 1982.
10. **McCane R and E Widdowson** The Composition of Foods, 4th edition. HM Stationery Office, London. 1978.
11. **James D** Nicotinic Acid, Pantothenic Acid and Biotin in Fruits, Vegetable and Nuts. University of Bristol Research Station, 1950: Long Ashton.
12. **Pennington JAT** Food Values of Portions Commonly Used. 17th ed. New York: Harper & Row, 1998.
13. **Staggs CG, Sealey WM, McCabe BJ, Teague AM and DM Mock** Determination of the Biotin Content of Select Foods Using Accurate and Sensitive HPLC/avidin Binding. *J. Food. Compost. Anal.* 2004.
14. **Food and Agriculture Organization of the United Nations.** FAO. 2017: Rome

15. **Traore T** Report of Regional Consensus Meeting on Harmonizing Standards and the Regulatory Framework for Food Fortification in ECOWAS Member States, 2013: Accra.
16. **Le President de la Republique.** Decret Rendant Obligatoire l'Iodation du sel. Republique du Senegal. 2000.
17. **Nestlé Nigeria PLC.** Nutritional Information of Maggi Seasoning Cubes. 2016: Lagos.
18. **Le President de la Republique.** Soft Wheat Flour Fortified with Iron and Vitamin B9, Specifications. 2013: Senegal.