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Meals contribution to dietary intake of rural communities in Senegal

Antoine Sambou[1]
[1]Department of Geosciences and Natural Resource Management, University of Copenhagen, Rolighedsvej 23, 1958 Frederiksberg C, Denmark

Abstract *Different meals and dishes eaten every day can contribute differently to daily nutrient intakes and diet status. This research aims to examine the contribution of meals and dishes to the macronutrient and micronutrient daily intake of rural communities. A repeated (3-day) 24 hour food recall was carried out. Analysis of macronutrient and micronutrient intakes using the table of content and averages and frequencies were performed for the meals and dishes. Lunch provided the greater proportion of total Energy (39.4%), Protein (39.6%), Lipids and Fat (52.5%), Vitamins D (64.1%), B12 (50.7%), C (41.8%) and A (46.7%). Dinner highly contributed to Vitamin B6 (42.6%), iron (44.7%) and zinc (40.6%). Breakfast was the first provider of carbohydrate (34.7%). For the dishes, "ceeb u jën" represented an important source of total Energy (19.9%), Protein (19.7%), lipids and fat (29.6%), Vitamins D (42.2%) and B12 (30%); "cere m'bum" for vitamin C (27.4%); "m'baxal jën" for vitamin A (18.5%); and "cere basse" for iron (18.7%) and zinc (16.8%). The deficiency of macro and micronutrient intakes was more accentuated for Vitamins B6, A and C, iron, Zinc, energy and lipids and fat with a proportion of households varying between 57 and 100% according the periods. Meals and dishes contributed differently to macro and micronutrients daily intakes by rural people. Meals and dishes content depended on food items mixed to prepare them.*

Key words: *meals, dishes, macro and micronutrients, dietary*

I. Introduction

Healthy nutrition is an important factor in preventing many specific health problems of rural communities of developing countries such as vitamin A and iron deficiency. Necessary nutrients for healthy nutrition depend on the quality of consumed food and the frequency of eating food per day.

The daily food intake is distributed over a certain number of meals. Three distinct meals (breakfast, lunch and dinner) are widespread around the world [1]. Food items are combined at different eating occasions (breakfast, lunch and dinner) into specific meal compositions (dishes). Meals have different structures and meanings according location, culture, economy of people [2,3]. The frequency of eating meals and its composition in term of food items mixed is an important indicator for the dietary status. Another way of understanding meals is by analyzing their nutrient content [4] and their contribution to daily nutrient intakes. De Graaf [4] defined meals as the frequency, distribution and variability of nutrient intakes during the day. In addition to specific eating occasions, there is interest in the number of daily eating occasions and its relation to nutrient intakes. Research on food, meals and nutrient intake has been on the agenda for more than century; however, the number of scientific studies has increased significantly since the middle of the twentieth century [5,6,4]. More information is needed regarding the contribution of meals to nutrient intakes and the relation of eating occasion frequency to daily nutrient intakes.

The purpose of this study was to determine and compare the contributions of meals and dishes in daily nutrient intakes of rural communities.

II. Method

Study area

The study was conducted at three sites located in Fatick region, Senegal. Two villages (Samba Dia and Poukham Tock) were selected in Fatick district and one (Boly Serere) in Foundiougne district (Fig 1). The three villages studied were selected based on their proximity to rich ecosystems including a range of landscape classes (forest reserve, cropland, fallow, tans and mangrove) and diverse agroforestry systems which could provide an important source of trees and shrub products (food, medicine, agroforestry, fodder, firewood, timber…) for the rural community. The characteristics of the selected villages are summarized in Table 1.

Table 1: Characteristics of the study sites

Villages	No.residents (2013)	Coordinates	Mean annual rainfall1994-2013(mm)
Samba Dia	3530	14◦08′00″N, 16◦43′35″W	666

Poukham Tock	1321	14◦20′57″N, 16◦21′04″W	653
Boly Serere	328	14◦04′28″N, 16◦18′49″W	715

The study area is a part of the groundnut basin which is an agriculture area that was developed for the cultivation and export of groundnuts since the late 19th century. The economic activities of the communities are heavily dependent upon agriculture, animal husbandry and collection of wild species. The main cultivated species are millet, groundnuts, maize, sorghum, cowpea, rice, bissap supplemented with vegetables.

Fig 1: Location of study sites in Fatick Province, Senegal

Sample and Data Collection

Three villages which are Boly Serere, Poukham Tock and Samba Dia were selected in our study. These villages were chosen because the well geographical distribution to give an overall view of rural community diets in Fatick region (Fig 1).Twenty four, 50 and 40 households (114 in total) were randomly selected in Boly Serere, Poukham Tock and Samba Dia respectively. Three repeated 24 hour food recalls using a questionnaire were carried out to present the post-harvest period (February), start of scarcity period (June), and late scarcity period (October 2013) to cover different important economic periods of the year. Data were collected between Feb and Oct 2013 inclusive. Detailed information on dishes, recipes and preparation method was collected from the woman responsible for home meals to each eating occasion. The proportion sizes were estimated using common household measures such cups, glasses, bowls, teaspoons and tablespoons along with individual food items. Meal is a certain amount of food (dishes) eaten at a specific time or occasion (breakfast, lunch and dinner). Dishes are a mix of food items, recipes and ingredients to make food. Dishes were named in local name (Wolof) and the method of preparing each dish is clearly determined by Dop [7]. The dishes reported at least 10 times were considered in our analysis. In contrast, the dishes recorded by less than 10 times were grouped in other dishes. The frequency of eating dishes in each occasion was assessed. The diet history was evaluated with an estimated frequency of eating dishes.

III. Analysis

To determine the energy and nutrient content for foods consumed on the breakfast, lunch and dinner, food items were analyzed for Energy, Protein, Carbohydrate, Lipids and Fat, Vitamins D, B6, B12, C and A, Iron and zinc using the West African Food Composition Table [8]. For each food item, the nutrient content was expressed per 100 grams and was multiplied by the net gram weight after deducted the waste [7].

Daily Intakes of nutrients at breakfast, lunch and dinner and dishes as well a total daily intake were computed for each of three individual days in each household. Meals were evaluated for total nutrients (energy, Protein, Lipids and fat, Vitamins D, B6, B12, C and A, Iron and Zinc) and for the mean nutrient content. The proportions of breakfast, lunch, dinner and dishes contributions to total energy, protein, lipids and fat, carbohydrates, vitamins D, B6, B12, C and A, Iron and Zinc were determined. Means and standard errors were used to determine its contribution to the daily nutrient intake. Comparison of mean nutrients for each occasion (breakfast, lunch and dinner) and dishes was evaluated using one way ANOVA and Tukey's test. The intake of nutrients was calculated as daily intake from main meals. The daily nutrient was calculated based on Adult Male Equivalent. Daily nutrient intakes were compared the recommended intake [9-11]. The recommended intake is based on age and sex.

IV. Results

Population characterization

Characteristics of the studied population are shown in Table 2.The three surveys covered a cumulative total of 292 households and 4187 persons. The size of the households varied greatly; the smallest household had three individuals and the largest household included 47 persons. The average household sizes varied between 10.8 and 18.7. Among the studied population, 32% were Children, 22.5% of Adolescents, 38.9 % of Adults and 6.6% of elders.

Table2: The total number of households and age composition in three villages across the four periods of interviews

Categories	Boly Serere				Poukham Tock				Samba Dia		
	Februar y	June	October		Februar y	June	October		Februar y	June	Octobe r
Children											
0 -5years	35	45	39		65	77	84		96	112	94
5 -10years	50	66	40		74	105	81		85	106	86
Adolescents											
Boys(10-18years)	41	47	40		41	59	62		69	80	59
Girls(10-18years)	30	41	37		53	55	55		55	67	52
Adults											
Men (18-60years)	50	55	51		53	65	90		105	133	107
Women (18-60years)	32	38	40		61	76	84		124	142	124
Pregnant/lacting women	8	10	6		20	30	22		33	35	35
Elders											
Men(>60years)	7	5	7		4	6	9		22	26	23
Women(>60years)	10	11	11		16	23	21		26	30	18
Total	263	318	271		387	496	508		615	731	598
Mean HH sizes	12.5(6.3)	14.5(7.9)	12.3(6. 2)		10.8(5.0)	12.7(5.6)	12.4(5. 9)		17.1(9. 2)	18.7(9. 2)	16.2(8. 5)

HH: Household

Contribution of meals and dishes

The contribution of meals and dishes to total nutrient intakes are shown in Table 3 and table 4. Lunch provided the greater proportion of total Energy, Protein, Lipids and Fat, Vitamins D, B12, C and A. Dinner highly contributed to Vitamin B6, iron and zinc. In contrast, breakfast was the first provider of carbohydrate and the second for iron and zinc. The mean food items mixed to meals was higher in the lunch than dinner and breakfast (appendix 1). For the dishes, "ceeb u jën" represented an important source of total Energy, Protein, lipids and fat, Vitamins D and B12; "cere m'bum" for vitamin C; "m'baxal jën" for vitamin A; and "cere basse" for iron and zinc.

Comparison of daily mean nutrient intakes among breakfast, lunch and dinner and dishes was shown in Fig 2 and Fig 3. Significant difference was found between meals (breakfast, lunch and dinner) and dishes. Lunch was the largest contributor of mean daily Energy, Protein, lipids and fat, vitamins D, B12, C and A intakes. While, dinner and breakfast were the greatest contributors of iron and zinc. "ceeb u jën" and "yassa jën" for Energy, Lipids and fat, Vitamins D and B12; "cere m'bum" and "cere gang" for Vitamins B6 and C, iron and zinc; "mafe" and "cere jën" for protein; and "m'baxal jën" and "kaldu" for vitamin A.

Table 3: contribution (%) of meals to the macronutrient and micronutrient intake

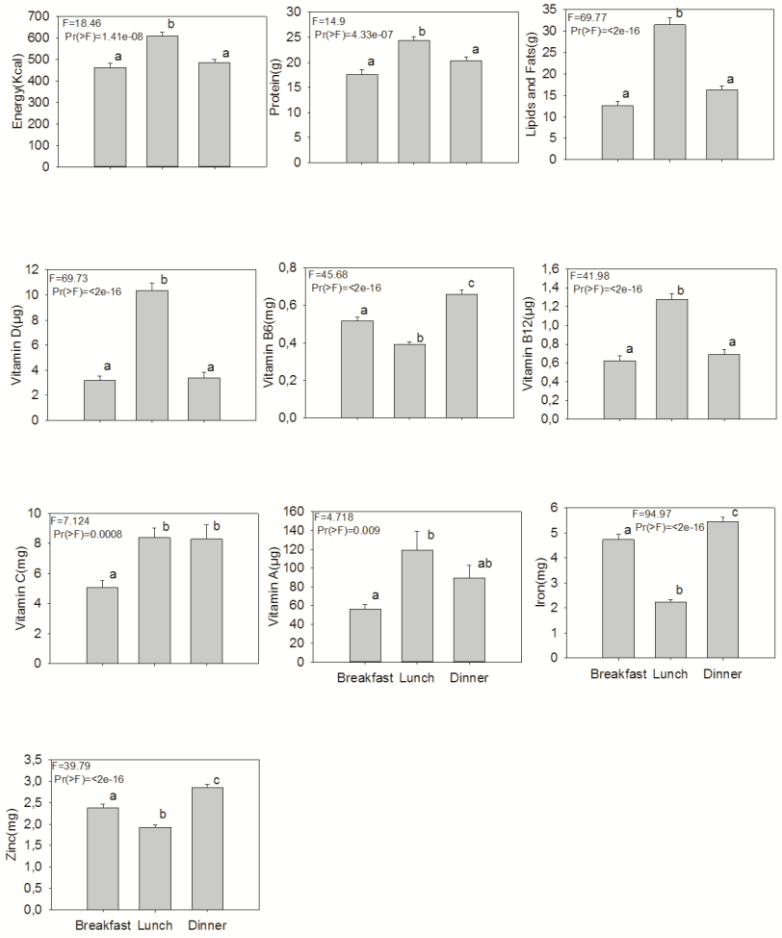
Meals	Energy(kcal)	Protein(g)	Lipids and Fat(g)	Carbohydrate (g)	Vitamins					Minerals	
					D(µg)	B6(mg)	B12(µg)	C(mg)	A(µg)	Fe(mg)	Zn(mg)
Breakfast	29.3	27.5	20.4	34.7	17.4	32.8	23	22.7	20.1	37.5	32.7
Lunch	39.4	39.6	52.5	32.8	64.1	24.6	50.7	41.8	46.7	17.8	26.7
Dinner	31.3	32.8	27.1	32.5	18.5	42.6	26.4	35.5	33.2	44.7	40.6
Grand Total	100	100	100	100	100	100	100	100	100	100	100

Table 4: contribution (%) of dishes to the macronutrient and micronutrient intake

Dishes*	Energy	Protein	Lipids and fat	Carbohydrate	Vitamins					Minerals	
					D	B6	B12	C	A	Fe	Zn
mburu	4.2	2.4	2.6	5.9	0.1	0.8	2.2	0.9	3.2	1	1.1
ceeb u jën	19.9	19.7	29.6	14.8	42.2	10.8	30	24.2	15.4	7.4	12.2
ceebu keccax	1.2	0.8	1.6	1.2	0.4	0.7	2.6	1.9	0.7	0.4	0.7
cere basse	12.7	12.4	10.8	13.6	2.2	17.5	7.1	5.2	4.8	18.7	16.8
cere gang	2.1	1.9	2	2	0.1	3	0.7	4.8	1	5	2.7
cere jën	11.4	14.4	7.1	12.6	23.6	15.1	16	6.3	6.1	16.3	15.9
cere keccax	0.8	0.7	0.5	1	0.2	1.3	1.6	0.6	0.3	1.5	1.2
cere m'bum	9	9.8	8.6	8.7	2	15.2	5.4	27.4	17.4	14.1	11.7
cere niebe	3.4	2.9	1.4	4.5	0	5.2	0.1	1.9	1.4	6.9	5.9
cere sim	3.8	3	1.9	5.1	0.4	5.7	0.9	2.8	1.9	7.1	5.8
cere sow	3.3	3.3	3.1	3.5	0.3	3.1	6.2	3	4.3	3	2.7
kaldu	2.3	2.2	1.9	2.5	4.3	1.3	3	2	10.7	1.2	1.7
mafe	5.7	7.2	6.2	5.2	7.1	4.8	5.5	5.1	3.3	3.4	4.5
m'baxal jën	3.2	3.4	4.1	2.7	4	2.1	3.2	0.9	18.5	1.8	2.4
m'baxal saloum	2.6	2.8	3.1	2.3	0.4	2.2	2.7	0.4	0.6	1.5	2.1
yassa jën	2.8	2.5	3.9	2.3	5.5	1.6	3.8	3	1.1	0.9	1.8
Other	11.7	10.5	11.8	12.1	7.2	9.4	9.2	9.6	9.6	9.8	10.9
Grand Total	100	100	100	100	100	100	100	100	100	100	100

*: dishes name in national language (wolof)

Fig 2: comparison of Meals contribution to nutrient intakes. Error bars denote standard error (SE)



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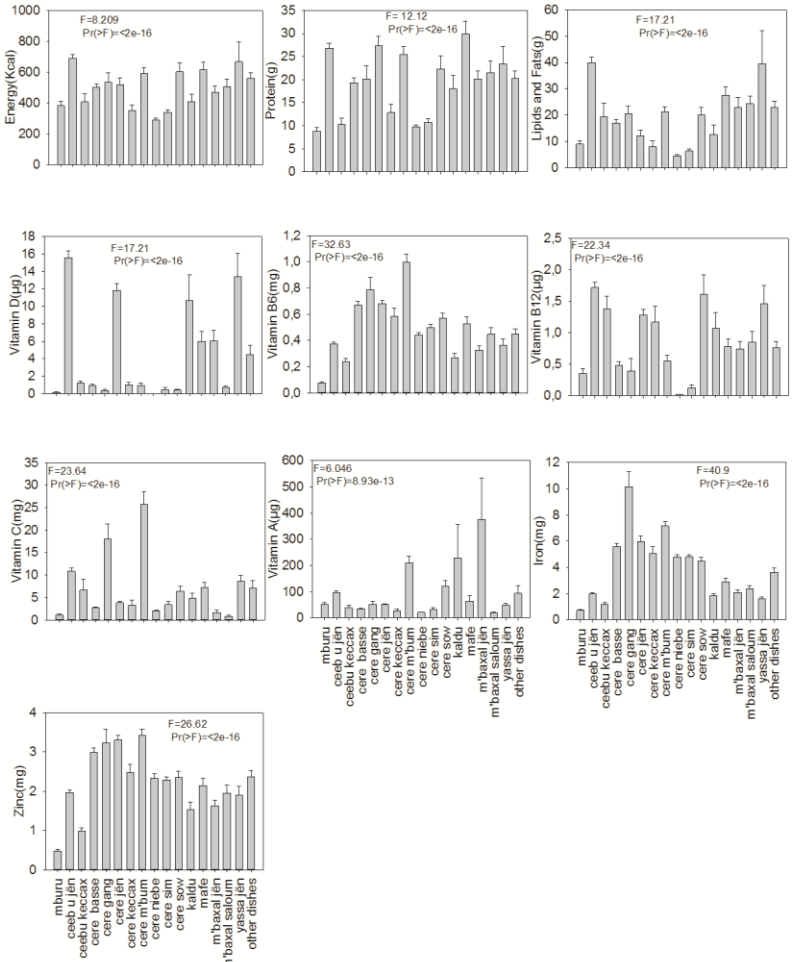

Fig 3: comparison of dishes contribution to nutrient intakes. Error bars denote standard error (SE).

Frequency of eating dishes

Frequency of eating meals and dishes was compared across meals (Table 5). People ate regularly the three daily meals (breakfast, lunch and dinner). ceeb u jën eaten mainly in lunch time is the most frequent eaten dishes with 15% of total number of dishes followed by cere jën (13%) and cere basse (11%) in dinner and breakfast. The frequency of eating dishes was associated with the contribution of meals and dishes to nutrient intakes. Most of dishes based on couscous (cere) were eaten in breakfast and dinner. The same dishes were eaten for breakfast and dinner in most of the households.

Table 6 showed the historical frequency of eating dishes. The dishes cocked for lunch such as ceeb u jën, ceeb u niebe, ceebu keccax, kaldu, mafe, m'baxal jën, m'baxal Saloum and yassa jën were mainly eaten once a day at lunch time. Whereas, millet based dishes (Cere sim, cere basse, cere dimb, cere gang, cere jën, cere keccax, cere m'bum, cere niebe and cere sow) were eaten twice a day at breakfast and dinner.

Table 5: Frequency of eating dishes across meals

Dishes*	Breakfast	Lunch	Dinner	Total	%
mburu	51	0	0	51	5.8
ceeb u jën	0	126	4	130	14.8
ceebu keccax	0	12	0	12	1.4
cere basse	31	1	63	95	10.8
cere gang	10	0	12	22	2.5

cere jën	64	1	46	111	12.6
cere keccax	7	0	4	11	1.3
cere m'bum	26	0	50	76	8.6
cere niebe	22	0	32	54	6.1
cere sim	34	0	28	62	7.1
cere sow	13	0	10	23	2.6
kaldu	0	28	2	30	3.4
mafe	0	40	1	41	4.7
m'baxal jën	1	23	5	29	3.3
m'baxal saloum	0	19	5	24	2.7
Other	34	26	31	91	10.4
yassa jën	0	17	0	17	1.9
Total	293	293	293	879	100.0

*: dishes name in national language (wolof)

Table 6: Frequency of eating dishes

Dishes	once/day	More than one/day	2-3 times/week	More than 4 times/week	saltdom	Never
mburu	38	0	4	33	2	1
ceeb u jën	280	3	128	139	18	0
ceeb u niebe	7	0	6	1	0	0
ceebu keccax	23	0	16	2	4	0
Cere sim	10	45	18	32	6	0
cere basse	27	153	87	50	39	0
cere dimb	0	22	8	0	9	5
cere gang	0	64	35	24	1	2
cere jën	7	80	46	36	6	0
cere keccax	0	9	4	4	1	0
cere m'bum	24	183	114	77	15	2
cere niebe	3	39	14	25	3	0
cere sow	5	11	9	5	2	0
kaldu	149	2	82	15	54	2
mafe	238	4	164	24	49	3
m'baxal jën	148	3	104	12	32	0
m'baxal saloum	113	0	71	20	21	1
yassa jën	201	2	138	11	55	1

Dietary status

Overall, the reported mean daily nutrient intakes showed that most of households did not meet the daily nutrient intakes recommended (Table 7 and appendix1). High proportion of households was in nutrient deficiency situation. The critical deficiency was noticed for energy, lipids and fat, vitamins B6, C and A, iron and zinc. The proportion of household in deficiency increased from February (post-harvest period) to June (beginning of scarcity period) and October (beginning of harvesting period).

Table 7: proportion of households with low daily nutrient intakes compared to daily nutrient intakes recommended by FAO

Nutrients	Boly Serere			Poukham Tock			Samba Dia		
	February	June	October	February	June	October	February	June	October
Energy	66.7	72.7	81.8	72.2	84.6	92.7	80.6	84.6	89.2

Protein	9.5	9.1	13.6	16.7	35.9	68.3	11.1	48.7	54.1
Lipids and Fat	61.9	77.3	77.3	63.9	92.3	95.1	72.2	69.2	83.8
Vitamin D	4.8	9.1	22.7	36.1	51.3	63.4	2.8	17.9	10.8
VitaminB6	100	100	100	100	100	100	100	100	100
Vitamin B12	23.8	27.3	27.3	41.7	43.6	78.0	22.2	43.6	62.2
Vitamin C	57.1	95.5	95.5	63.9	87.2	95.1	88.9	87.2	100
Vitamin A	81.0	86.4	81.8	86.1	92.3	100	88.9	92.3	100
Iron	95.2	95.5	95.5	97.2	97.4	100	100	100	100
Zinc	85.7	90.9	90.9	83.3	94.9	97.6	88.9	97.4	94.6

V. Discussion

Breakfast was lowest contributor to energy, protein, lipids and fat, vitamins and minerals but the highest for carbohydrate. Previous studies have confirmed the smallest contribution of breakfast to total energy, protein, lipids and fat, vitamins and minerals [12-15]. In contrast, breakfast was the largest contribution to carbohydrate (34.7%). Two studies reported breakfast as a relatively large contributor of carbohydrate [14,16].

Lunch provided the greater proportion of total Energy, Protein, Lipids and Fat, Vitamins D, B12, C and A. Lunch as large contributor to fat [17] and energy [18]. It is surprising results, many studies showed that Dinner constituted the largest contributor to energy, protein, carbohydrate, fat, vitamins A, B6, B12, C and E, iron and zinc followed by lunch [12,17]. Most energy and protein consumed came from lunch and dinner [18,13]. Dinner highly contributed to Vitamin B6, iron and zinc [12].

Eating regular meals and the composition of meals are important factors for healthy nutrition. Analysis of eating dishes frequencies revealed that the three meals (breakfast, lunch and dinner) were regularly eaten in the study area. The most frequently eaten dishes were ceeb u jën eaten mainly in lunch time, cere basse and cere jën in dinner and breakfast.

Dietary intake in these studied households was low for most of the evaluated nutrients compared to the daily nutrient recommended. Critical nutrients below the recommended with more than half of the households were energy, lipids and fat, vitamins B6, C, and A, iron and zinc. Deficiency in iron and vitamin A in west Africa was reported by Lopriore and Muehlhoff [19]. A greater percentage of the populations in rural areas of Mexico were found to have inadequate intakes of vitamin A, vitamin C and zinc [20]. Similar study in rural area of Rajasthan found a deficiency of energy and protein intakes [21]. Our assessment of dietary intake was only based on main meals. The snacks were not considered.

VI. Conclusion

This study provides an important finding regarding eating meals and dishes and their contribution to macro and micronutrients intakes. The importance of consuming more consistent and frequent eating meals and dishes as well as distributing total nutrient intakes more evenly throughout the day were addressed. Lunch and dinner were mostly more macro and micronutrient dense. Dishes such as ceeb u jën, yassa jën, cere m'bum, mafe, cere jën and m'baxal jën were the highest contributors to Energy, Protein, lipids and fat, Vitamins D, B12, C and A, iron and zinc. These informations about the contribution of dishes and meals in daily nutrient intakes could be used to improve the dietary status of rural people, which was deficient for mostly of the macro and micronutrients.

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Appendix 1: Variations in dietary intake across the year in the three villages from meals. Values are expressed per adult male equivalent (AME) and compared to mean recommended intakes.

Sites/Period/Nutrients	Breakfast	Lunch	Dinner	intake	Recommended
Boly Serere					
February					
FI	10.0(0.5)	10.2(0.6)	9.9(0.5)		
Energ(kcal)	601.6(45.6)	742.2(67.0)	635.7(65.8)	1979.5(15.0)	2063.5(15.1)
Protein(g)	29.4(2.1)	29.9(2.2)	31.1(3.5)	90.3(6.5)	45.4(0.6)
Lipids and fat(g)	17.6(3.0)	39.7(6.2)	21.5(3.8)	78.7(10.0)	84.9(0.7)
Vitamin D(µg)	9.8(1.3)	9.0(1.6)	4.9(1.2)	23.7(2.1)	5.5(0.1)
Vitamin B6(mg)	0.8(0.1)	0.4(0.0)	1.0(0.2)	2.2(0.2)	13.0(0.2)
Vitamin B12(µg)	1.3(0.2)	1.1(0.2)	0.6(0.1)	3.0(0.3)	2.0(0.0)
Vitamin C(mg)	10.3(2.5)	12.5(2.7)	15.9(6.8)	38.8(7.59	39.9(0.4)
Vitamin A(µg)	118.6(26.3)	380.0(208.7)	173.5(69.8)	672.1(207.3)	543.0(4.5)
Iron(mg)	6.6(0.5)	2.4(0.2)	7.5(0.8)	16.5(1.4)	30.9(0.6)
Zinc(mg)	3.4(0.2)	2.0(0.1)	3.6(0.3)	9.0(0.6)	12.4(0.1)
June					
FI	9.2(0.4)	10.4(0.6)	8.7(0.5)		
Energ(kcal)	683.1(219.0)	591.9(68.1)	515.0(41.6)	1790.0(25.7)	2048.3(21.0)
Protein(g)	30.1(8.9)	23.5(2.5)	23.1(2.1)	76.7(9.5)	44.6(0.8)
Lipids and fat(g)	19.9(10.0)	29.7(6.3)	12.6(3.1)	62.2(11.7)	84.1(0.9)
Vitamin D(µg)	7.6(1.2)	7.8(1.5)	7.5(1.2)	22.9(2.2)	5.4(0.1)
Vitamin B6(mg)	0.6(0.0)	0.4(0.1)	0.7(0.1)	1.7(0.1)	12.8(0.2)
Vitamin B12(µg)	0.9(0.1)	0.9(0.1)	0.9(0.1)	2.7(0.2)	2.0(0.0)
Vitamin C(mg)	2.7(0.5)	7.2(1.6)	6.9(2.8)	16.8(3.2)	39.7(0.4)
Vitamin A(µg)	49.4(5.0)	212.5(118.4)	79.8(27.6)	341.7(117.2)	541.1(4.8)
Iron(mg)	7.0(1.9)	2.6(0.3)	5.5(0.4)	15.1(2.1)	30.6(0.6)
Zinc(mg)	3.2(0.4)	1.9(0.2)	3.0(0.2)	8.1(0.5)	12.3(0.2)
October					
FI	6.9(0.5)	7.2(0.7)	6.3(0.5)		
Energ(kcal)	551.4(38.2)	546.2(67.3)	593.9(47.8)	1691.5(12.8)	2040.2(20.4)
Protein(g)	27.0(3.3)	20.4(3.3)	25.9(3.0)	73.3(6.3)	44.7(0.8)
Lipids and fat(g)	11.6(1.6)	27.1(6.2)	15.2(2.7)	53.9(7.0)	84.3(0.8)
Vitamin D(µg)	8.5(2.4)	7.0(2.5)	5.9(2.0)	21.4(3.1)	5.5(0.1)
Vitamin B6(mg)	0.7(0.1)	0.3(0.0)	0.7(0.1)	1.7(0.2)	12.9(0.2)
Vitamin B12(µg)	1.3(0.3)	0.8(0.3)	1.4(0.3)	3.5(0.5)	2.0(0.0)
Vitamin C(mg)	5.0(2.1)	3.7(1.2)	6.5(2.2)	15.2(4.8)	39.7(0.4)

Vitamin A(µg)	80.6(22.8)	115.7(45.3)	105.1(26.9)	301.4(68.8)	538.0(4.5)
Iron(mg)	5.4(0.4)	1.9(0.2)	5.3(0.4)	12.5(0.9)	32.2(0.7)
Zinc(mg)	3.2(0.2)	1.6(0.2)	3.0(0.2)	7.9(0.5)	12.2(0.2)
Poukham Tock					
February					
FI	7.3(0.4)	9.2(0.5)	7.9(0.4)		
Energ(kcal)	477.3(38.5)	792.3(84.0)	524.1(40.7)	1793.7(18.4)	2002.4(20.2)
Protein(g)	21.3(2.4)	32.5(3.8)	23.7(2.3)	77.6(7.0)	43.2(0.7)
Lipids and fat(g)	13.0(1.6)	43.2(7.6)	19.6(2.6)	75.8(9.4)	82.4(0.8)
Vitamin D(µg)	5.8(1.7)	12.7(2.6)	3.6(1.2)	22.0(3.6)	5.3(0.1)
Vitamin B6(mg)	0.7(0.1)	0.6(0.1)	0.9(0.1)	2.2(0.2)	12.6(0.2)
Vitamin B12(µg)	0.8(0.2)	1.6(0.2)	0.6(0.1)	3.0(0.4)	2.0(0.0)
Vitamin C(mg)	11.2(1.9)	12.1(3.3)	19.5(4.1)	42.8(5.9)	39.8(0.3)
Vitamin A(µg)	82.1(17.0)	87.7(19.1)	103.2(25.3)	273.0(41.4)	536.5(4.5)
Iron(mg)	6.7(0.4)	3.5(0.5)	7.8(0.6)	18.0(1.2)	32.5(0.8)
Zinc(mg)	3.1(0.2)	2.6(0.3)	3.4(0.2)	9.1(0.6)	11.9(0.2)
June					
FI	5.6(0.4)	8.6(0.4)	6.2(0.5)		
Energ(kcal)	424.6(33.6)	492.3(34.4)	398.1(32.8)	1314.9(15.1)	1993.7(16.4)
Protein(g)	14.7(1.5)	23.0(2.1)	14.9(1.6)	52.6(4.1)	43.3(0.5)
Lipids and fat(g)	10.5(1.3)	19.7(2.8)	11.8(2.1)	42.0(4.7)	81.8(0.6)
Vitamin D(µg)	1.4(0.7)	8.1(1.7)	1.6(0.8)	11.2(2.0)	5.5(0.1)
Vitamin B6(mg)	0.5(0.0)	0.4(0.0)	0.6(0.1)	1.5(0.1)	12.5(0.2)
Vitamin B12(µg)	0.4(0.1)	1.3(0.2)	0.5(0.1)	2.3(0.3)	2.0(0.0)
Vitamin C(mg)	4.7(1.2)	4.6(1.2)	7.4(2.5)	16.7(3.2)	39.9(0.3)
Vitamin A(µg)	29.6(4.4)	119.0(52.3)	38.1(12.4)	186.7(54.1)	538.1(4.0)
Iron(mg)	5.6(0.5)	2.2(0.2)	5.5(0.6)	13.3(1.2)	31.2(0.5)
Zinc(mg)	2.5(0.2)	1.9(0.2)	2.6(0.2)	7.0(0.4)	11.9(0.1)
October					
FI	6.0(0.3)	8.6(0.5)	6.9(0.3)		
Energ(kcal)	333.9(32.9)	469.0(31.8)	322.5(20.6)	1125.4(13.8)	2028.9(17.0)
Protein(g)	11.7(1.4)	16.5(1.8)	11.4(0.9)	39.7(3.4)	44.7(0.6)
Lipids and fat(g)	7.6(1.9)	21.6(2.7)	7.9(1.3)	37.1(4.5)	84.1(0.8)
Vitamin D(µg)	1.1(0.6)	6.9(1.5)	0.8(0.7)	8.9(2.1)	5.5(0.1)
Vitamin B6(mg)	0.5(0.0)	0.3(0.0)	0.4(0.0)	1.2(0.1)	12.8(0.2)
Vitamin B12(µg)	0.2(0.1)	0.8(0.2)	0.1(0.1)	1.2(0.2)	2.0(0.0)
Vitamin C(mg)	3.9(1.3)	3.5(0.6)	4.1(1.3)	11.5(2.7)	40.3(0.3)
Vitamin A(µg)	21.5(2.6)	43.0(6.7)	22.5(2.8)	87.0(10.5)	540.1(3.4)
Iron(mg)	4.6(0.3)	2.0(0.1)	4.7(0.2)	11.2(0.5)	32.5(0.7)
Zinc(mg)	2.3(0.2)	1.5(0.1)	2.5(0.1)	6.3(0.4)	12.1(0.1)
Samba Dia					
February					
FI	7.1(0.7)	13.7(0.5)	8.8(0.4)		
Energ(kcal)	523.7(56.5)	723.4(48.2)	572.9(49.0)	1820.0(17.8)	2024.5(17.7)
Protein(g)	17.0(2.3)	32.7(2.3)	25.5(2.5)	75.2(5.1)	45.2(0.6)
Lipids and fat(g)	17.3(2.8)	38.0(3.3)	23.0(2.8)	78.4(7.1)	84.4(0.7)
Vitamin D(µg)	0.5(0.1)	17.8(1.6)	3.5(1.3)	21.8(2.4)	5.6(0.1)
Vitamin B6(mg)	0.4(0.1)	0.5(0.0)	0.7(0.1)	1.6(0.1)	12.9(0.2)
Vitamin B12(µg)	0.7(0.1)	2.0(0.2)	0.9(0.1)	3.5(0.3)	2.0(0.0)
Vitamin C(mg)	4.6(1.2)	12.9(1.9)	8.3(1.7)	25.9(3.5)	40.9(0.3)
Vitamin A(µg)	73.9(16.0)	145.3(47.5)	131.7(49.8)	350.9(98.3)	541.2(4.0)
Iron(mg)	3.9(0.6)	2.4(0.3)	5.5(0.4)	11.8(0.9)	32.9(0.6)
Zinc(mg)	2.1(0.3)	2.3(0.1)	3.1(0.2)	7.5(0.5)	12.0(0.1)
June					
FI	7.3(0.6)	14.0(0.7)	9.0(0.4)		

Energ(kcal)	379.4(33.3)	602.5(35.8)	487.2(39.0)	1469.1(15.0)	2037.8(18.1)
Protein(g)	11.0(1.4)	21.1(1.5)	20.0(2.2)	52.1(3.8)	45.4(0.6)
Lipids and fat(g)	12.0(2.0)	35.3(3.0)	20.3(2.5)	67.6(6.1)	84.8(0.7)
Vitamin D(µg)	0.6(0.2)	10.5(1.4)	4.3(2.0)	15.4(3.1)	5.5(0.1)
Vitamin B6(mg)	0.3(0.0)	0.3(0.0)	0.6(0.1)	1.2(0.1)	12.9(0.2)
Vitamin B12(µg)	0.4(0.1)	1.3(0.1)	1.0(0.2)	2.6(0.3)	2.0(0.0)
Vitamin C(mg)	2.7(1.0)	10.5(1.6)	5.6(1.6)	18.9(2.9)	40.7(0.3)
Vitamin A(µg)	51.7(12.3)	72.8(10.7)	137.2(72.3)	261.7(75.2)	541.2(3.6)
Iron(mg)	2.5(0.3)	1.7(0.1)	4.4(0.4)	8.6(0.6)	32.9(0.6)
Zinc(mg)	1.4(0.2)	1.8(0.1)	2.6(0.2)	5.7(0.4)	12.1(0.1)
October					
FI	6.6(0.6)	14.6(0.7)	9.1(0.6)		
Energ(kcal)	391.6(40.6)	578.3(40.6)	462.9(44.4)	1432.8(15.3)	2036.5(18.7)
Protein(g)	11.3(1.4)	21.4(1.6)	16.8(1.8)	49.5(3.7)	45.6(0.6)
Lipids and fat(g)	9.8(1.7)	31.7(3.7)	15.8(2.8)	57.3(5.8)	85.1(0.8)
Vitamin D(µg)	0.4(0.2)	11.2(1.2)	2.2(1.0)	13.9(2.0)	5.5(0.1)
Vitamin B6(mg)	0.3(0.0)	0.3(0.0)	0.5(0.1)	1.1(0.1)	13.0(0.2)
Vitamin B12(µg)	0.4(0.1)	1.3(0.1)	0.5(0.1)	2.2(0.3)	2.0(0.0)
Vitamin C(mg)	2.0(0.4)	8.7(1.0)	3.3(0.6)	14.0(1.3)	41.2(0.3)
Vitamin A(µg)	42.4(7.9)	54.4(5.4)	60.9(12.8)	157.7(14.7)	543.2(3.9)
Iron(mg)	2.4(0.4)	1.7(0.1)	4.0(0.5)	8.1(0.8)	33.5(0.6)
Zinc(mg)	1.4(0.2)	1.6(0.1)	2.4(0.2)	5.4(0.4)	12.0(0.1)

FI: food items