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PERCENTAGE CALCULATION OF THE FOOD GROUPS FROM THE PORTUGUESE FOOD WHEEL BASED ON THE QUANTITIES OF FOODS CONSUMED

CÁLCULO PERCENTUAL DOS GRUPOS ALIMENTARES DA RODA DOS ALIMENTOS PORTUGUESA COM BASE NAS QUANTIDADES DE ALIMENTOS CONSUMIDOS

CÁLCULO PORCENTUAL DE LOS GRUPOS ALIMENTARIOS DE LA RUEDA DE LOS ALIMENTOS PORTUGUESA BASADO EN LAS CANTIDADES DE ALIMENTOS CONSUMIDOS

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Abstract

Introduction: In 2003, the New Food Wheel (NFW) adopted a structure of seven food groups and defined new percentage values based on quantities calculated from daily energy intake, along with recommended servings of food group equivalents. **Objective:** To review the criteria and calculation methodology used to determine the percentage distribution of the food groups in the NFW. **Methods:** This is a descriptive observational study employing relative statistical metrics. Foods were selected from the Portuguese food composition table and grouped into the seven categories defined by the NFW according to nutritional similarities. Foods with altered nutritional value due to the addition of other ingredients were excluded. For each group, the average content of macronutrients, micronutrients, and energy was calculated. These nutrient averages were then multiplied by the recommended quantities of each food group, until reaching the total energy and nutritional values that meet population requirements. The percentage values in the New Version of the Food Wheel (NVFW) were derived from the ratio between the weight of selected foods in each group and the total weight of foods at each defined energy level. **Results:** The application of revised criteria and calculation methodology yielded slightly different percentage values for some food groups when comparing the NVFW to the original NFW: Fats and oils – 2% vs 2%; Dairy – 19% vs 18%; Meat, fish, and eggs – 7% vs 5%; Legumes – 6% vs 4%; Cereals and derivatives, tubers – 21% vs 28%; Vegetables – 22% vs 23%; Fruit – 23% vs 20%. **Conclusion:** The calculation method, based on multiplying food quantities by the average nutrient content, is more suitable for educational and clinical practice, as it allows for an immediate assessment of whether the quantities of foods consumed reflect the recommended percentages.

Keywords: Food Group; Food Guide; Food Wheel; Portuguese Population.

Resumo

Introdução: Em 2003, a Nova Roda dos Alimentos (NRA) passa a utilizar 7 grupos alimentares e define novos valores percentuais com base em quantidades calculadas a partir da ingestão energética diária e recomenda as porções de equivalentes alimentares a ingerir. **Objetivo:** Rever os critérios e metodologia de cálculo na determinação das percentagens dos grupos de alimentos da NRA. **Metodologia:** Estudo observacional descritivo com utilização de métricas estatísticas relativas. Foram selecionados os alimentos a partir da tabela de composição dos alimentos portuguesa e agrupados de acordo com semelhanças nutricionais pelos 7 grupos definidos na NRA. Após exclusão dos alimentos, cujo valor nutricional foi alterado pela adição de outros ingredientes, foram calculados para cada grupo as médias de macronutrientes, micronutrientes e energia. Às médias de nutrientes de cada grupo foram multiplicadas as quantidades de alimentos a consumir, até totalizar os valores energéticos e nutricionais que abrangem as necessidades da população. As percentagens da Nova Versão da Roda dos Alimentos (NVRA) resultam da relação entre o peso do alimento selecionado por grupo alimentar e o peso total dos alimentos em cada um dos níveis energéticos definidos. **Resultados:** A aplicação de novos critérios e metodologia de cálculo apresentou percentagens ligeiramente diferentes para alguns dos grupos alimentares, entre a NVRA e a NRA, respetivamente: Gorduras e óleos – 2% vs 2%; Lacticínios – 19% vs 18%; Carnes, pescado e ovos – 7% vs 5%; Leguminosas – 6% vs 4%; Cereais e derivados, tubérculos – 21% vs 28%; Hortícolas – 22% vs 23%; Fruta – 23% vs 20%. **Conclusão:** O método de cálculo é baseado na multiplicação das quantidades de alimentos pela média de nutrientes e adequa-se melhor à prática educacional e clínica, uma vez que permite avaliar de imediato se as quantidades de alimentos consumidas refletem as percentagens recomendadas.

Palavras-Chave: Grupo de Alimentos; Guia Alimentar; População Portuguesa; Roda dos Alimentos.

Resumen

Introducción: En 2003, la Nueva Rueda de los Alimentos (NRA) comenzó a utilizar 7 grupos de alimentos y definió nuevos valores porcentuales basados en cantidades calculadas a partir de la ingesta diaria de energía y porciones recomendadas de equivalentes de alimentos a ingerir. **Objetivo:** Revisar los criterios y metodología de cálculo para la determinación de los porcentajes de los grupos de alimentos NRA. **Metodología:** Estudio observacional descriptivo utilizando métricas estadísticas relativas. Los alimentos se seleccionaron de la tabla de composición de alimentos portuguesa y se agruparon según similitudes nutricionales en los 7 grupos definidos en la NRA. Después de excluir los alimentos cuyo valor nutricional fue alterado por la adición de otros ingredientes, se calcularon los promedios de macronutrientes, micronutrientes y energía para cada grupo. Los promedios de nutrientes de cada grupo se multiplicaron por las cantidades de alimentos a consumir, hasta totalizar los valores energéticos y nutricionales que cubran las necesidades de la población. Los porcentajes de la Nueva Versión de la Rueda de Alimentos (NVRA) resultan de la relación entre el peso del alimento seleccionado por grupo de alimentos y el peso total del alimento en cada uno de los niveles energéticos definidos. **Resultados:** La aplicación de los nuevos criterios y metodología de cálculo presentó porcentajes ligeramente diferentes para algunos de los grupos de alimentos, entre NVRA y NRA, respectivamente: Grasas y aceites – 2% vs 2%; Lácteos – 19% vs 18%; Carne, pescado y huevos – 7% vs 5%; Legumbres – 6% vs 4%; Cereales y derivados, tubérculos – 21% vs 28%; Verduras – 22% vs 23%; Frutas – 23% vs 20%. **Conclusión:** El método de cálculo se basa en multiplicar las cantidades de alimentos por los nutrientes promedio y se adapta mejor a la práctica educativa y clínica, ya que permite evaluar inmediatamente si las cantidades de alimentos consumidas reflejan los porcentajes recomendados.

Descriptores: Grupo de Alimentos; Guía Alimentaria; Población Portuguesa; Rueda de los Alimentos.

Introdução

The Food Wheel (FW), as a food guide, is a broadly applicable tool for the Portuguese population, easy to interpret, adapted in content, and based on current scientific knowledge and public health needs[1].

The first version of the FW, launched in 1977[2], emphasized the complementarity, balance, and variety of food groups according to their nutritional similarities. To better visualize and understand these concepts, it graphically represented the proportionality between each of the food groups using a wheel[3], without quantifying the portions to be consumed daily[4]. Adjustments were noted for children, adolescents, pregnant and breastfeeding women, and physically active adults[1].

For 25 years, despite not knowing the methodology used to calculate the percentages in the FW, the amounts (weight of food) to be consumed by the adult population in order to achieve a healthy diet were disseminated[4].

As years passed and along with the advancements in scientific evidence regarding the importance of human nutrition and diet, there was a growing need to create a dietary guide that included the recommended food portions[4]. The NFW emerged in 2003 as a result of a partnership between the Faculty of Nutrition Sciences and the Consumer Institute. The new guide was prepared in 9 steps:

1th) research different experts in the field of food and nutrition on the division of foods into groups and subgroups;

2th) define nutritional goals that cover energy recommendations for 13 population groups of both sexes (children over 1 year old to adults). The reference energy value for the majority of the population was 2200 Kcal, which resulted from the median of the range between 1300 Kcal and 3000 Kcal;

3rd) distribution of food into 7 groups and 21 food subgroups according to the nutritional characteristics and eating habits of the Portuguese population;

4th) define the standard portions for each food group according to the usual weight of household measurements;

5th) determine the equivalent portion for the nutrient present in the greatest quantity in each food group according to the defined standard measurements;

6th) calculate the number of daily portions of each food group based on the three stipulated energy values and their distribution among macronutrients, taking into account the recommendations of the Eurodiet Core Report 2000 and FAO/WHO 1990. This calculation allowed the number of doses for each of the 7 food groups to be ranged between 1300 Kcal and 3000 Kcal and the respective intermediate value to 2200 Kcal;

7th) check whether the final value of the quantities of each food group was in line with the nutritional needs stipulated in the second stage, with only sodium and iodine values being found to be out of line with the recommendations;

8th) prepare a food guide with defined quantities. For this purpose, the initial format of the Food Wheel circle was maintained. The percentage represented in each of the NWF slices was obtained by multiplying the number of portions to be eaten by the value of the food with the highest weight found in the list of equivalents for each food group. Although the methodology used in the previous version of the WF is unknown, the percentages obtained were relatively close;

9th) instrumentalize NWF and create promotional materials so that it becomes a working tool for lay people and health professionals[4].

Considering that the percentages of each Food Wheel group could be directly calculated from the weight of the foods to be consumed, rather than by multiplying the number of portions by the weight of the food with the highest equivalent value, an alternative calculation methodology for the Wheel's percentages was tested.

In the review of the NWF calculation methodology, the energy values and groups from the Wheel were maintained, but the calculation of requirements was made based on the quantities of food recommended based on new averages of macronutrients from the Portuguese food composition table from INSA (Table 1).

Objective

Review the criteria and methodology used to calculate the percentages of the food groups in the NWF.

Methodology

In this descriptive observational study, we used relative statistical metrics, such as means, percentages, and ratios, to demonstrate the need for NWF revision.

The same total energy value was maintained for the 13 age groups of both sexes (children over 1 year old to adults), of 1300 Kcal, 2200 kcal and 3000 Kcal[4]. However, the distribution of macronutrients was considered in accordance with the current EFSA recommendations: fats – 35% to 40% (1 to 3 years), 20% to 35% (4 years to ≥ 18 years); carbohydrates – 45% to 60% (1 year to ≥ 18 years); proteins – 1.14 g/kg (1 year), 1.03 g/kg (18 months to 0.83 g/kg (≥ 18 years))[5,6].

The 7 food groups were also maintained, however, the selection of foods was made only from the Portuguese food composition table from INSA[7].

Regarding the foods exported from the Portuguese food composition table of INSA, selection criteria were applied that were not validated by experts in the area of food and nutrition. The following food exclusion and inclusion criteria sought to more faithfully reproduce the nutritional composition of the foods used in the first Food Wheel in the 1970s, and also because they reduce the bias generated by the addition of other ingredients to the food at its origin:

- Maintain, as mentioned in the selection of subgroups of the NWF, only the foods in the form they are consumed[4]. Raw foods like potatoes, raw beans, and raw wheat flour are excluded;
- Select whole or processed foods that do not alter their nutritional value by the addition of other ingredients. Examples such as roasted pork with margarine, fried chicken breast, tuna in oil, and canned fruit were excluded;
- Eliminate ultra-processed foods whose transformation adds or removes ingredients and changes the nutritional composition of the original food. Examples include sweetened liquid yogurt, biscuits, sandwich bread, toast, breakfast cereals, sausages, etc.;
- Eliminate adapted or enriched foods that alter the nutritional profile. For instance, lactose-free milk and enriched bread.

After selecting the food groups according to the aforementioned criteria and calculating the average value for each of the macronutrients, it was found that in some food groups, there was a need to create subgroups given the range of values and the need to reduce their deviation. In the case of the dairy group, the average values for cheese, fresh cheese and cottage cheese were calculated separately from milk and yogurt (Table 1).

In the fruit group, nuts and seeds were calculated as a subgroup of meat, fish, and eggs but with separate average nutritional values. In the case of chestnut kernels, they were included in the cereals and derivatives group due to nutritional similarities.

In some instances, deviations from the averages required the removal of certain foods from the table, as they could not form subgroups, such as dried fruits and dried fruits (e.g., dried plums, dried figs, etc.).

From the final selection of foods according to the aforementioned criteria, the average value for each of the nutrients per food group was calculated (Table 1).

Subsequently, in the spreadsheet, the average nutrient values for each food group were used and multiplied by the amounts of food to be consumed to achieve the energy levels and nutritional reference values for macro and micronutrients, based on EFSA recommendations by age and sex[5,6](Table 5-7).

The choice of foods and the distribution of quantities for each food group in the Wheel followed the recommendations of the National Program for Healthy Eating Promotion (PNPAS)[8], the recommendations for the adult population defined by the Mediterranean Diet Pyramid(9), the Guide for Brief Counseling – 10 Steps for Promoting Healthy Eating[10], and the Guide for Healthy School Snacks[11].

When choosing foods for energy calculation, two aspects were considered:

- A fixed amount of 20 g of cheese per day was used in all calculations for each energy level. This amount was selected based on its nutritional importance[11-13] and its presence in the Mediterranean diet[9,14];
- A fixed amount of 15 g of nuts and seeds per day was used in all calculations for each energy level, based on the recommendation to consume 30 g four times a week for its nutritional value and its presence in the Mediterranean diet[8,9,11-18].

The determination of the percentages was calculated from the ratio between the weight of the food selected by food group and the total weight of the food in each of the energy levels defined (Table 8).

Results

The average values of the macronutrients were significantly different, as the authors of the NWF selected raw foods from the INSA food composition table and cooked foods from the English table. Additionally, differences may exist in the selection of processed and ultra-processed foods (Table 1).

In the methodology used by the authors of the NWF[4], the percentages of the food groups were derived from multiplying the number of portions obtained from the energy calculation by the value of the food with the highest weight found in the list of equivalents. After adding the parts, the relative percentage of that group in relation to the total food weight is calculated (Table 2).

Table 1: Comparison of Average Values for Each Nutrient by Food Group According to the Applied Methodology
Model A (NWF) – Values used for the development of the NWF; **Model B (NVWF)** – Values obtained by averaging data exported exclusively from the Portuguese Food Composition Table (INSA), according to previously established criteria.

A	Portuguese Table (Raw Foods)/English Table (Cooked Foods) Macronutrients and Energy per 100 g				B	Portuguese Table (INSA) (Raw and Cooked Foods) Macronutrients and Energy per 100 g			
	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)		Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)
Fats and Oils	1.4	76.3	1.0	696	Fats and Oils	0.0	92.8	0.2	836
Dairy	19.7	19.8	1.8	264	Dairy **(Milk and Yogurt)**	3.8	1.4	5	48
					Dairy (Cheese, Fresh Cheese and Ricotta)	17.6	19	2.1	251
Meat, Fish, and Eggs	23.9	11.9	0.0	203	Meat, Fish, and Eggs	20.5	9	0.1	163
					Nuts and Seeds	20.4	50.1	9.5	593
Pulses	7.8	1.6	14.1	99	Pulses	8.5	1.4	12	106
Tubers and Cereals	6.5	2.3	57.6	268	Tubers and Cereals	5	1.3	37	188
Vegetables	1.7	0.5	3.5	24	Vegetables	2.2	0.5	3.2	30.6
Fruits	0.8	0.7	12.1	59	Fruits	0.8	0.9	9.4	56

Table 2: Determination of the percentage values of the NRA according to energy value.

Food Group	1300 Kcal			2200 Kcal			3000 Kcal		
	Portions x Equivalent Weight	Total Weight (g)	% Value	Portions x Equivalent Weight	Total Weight (g)	% Average value	Portions x Equivalent Weight	Total Weight (g)	% Value
Fats and Oils 4 tablespoons of cream (30 ml)	1 x 30 g	30 g	1.4%	2 x 30 g	60 g	1.7%	3 x 30 g	90 g	2.1%
Dairy 1 cup of milk (250 ml)	2 x 250 ml	500 g	22.6%	2.5 x 250 ml	625 g	19.1%	3 x 250 ml	750 g	17.4%
Meat, Fish, and Eggs 1 Egg (55 g)	1.5 x 55 g	82.5 g	3.7%	3 x 55 g	165 g	5%	4.5 x 55 g	247.5 g	5.7%
Pulses 3 tablespoons of fresh/dry cooked legumes (80 g)	1 x 80 g	80 g	3.6%	1.5 x 80 g	120 g	3.7%	2 x 80 g	160 g	3.7%
Tubers and Cereals 1 ½ Potato (125 g)	4 x 125 g	500 g	22.6%	7.5* x 125 g	937.5 g	28.7%	11 x 125 g	1375 g	31.8%
Vegetables 2 Cups of raw vegetables (180 g)	3 x 180 g	540 g	24.4%	4 x 180 g	720 g	22.0%	5 x 180 g	900 g	20.8%
Fruits 1 Piece of Fruit (160 g)	3 x 160 g	480 g	21.7%	4 x 160 g	640 g	19.6%	5 x 160 g	800 g	18.5%
								4322.5 g	
		2212.5 g			3267.5 g				

*The intermediate value of the equivalent portions calculated during the development of the NWF was 7.0, with a total weight of 3205 g.

The average percentages obtained within the range of 1300 Kcal to 3000 Kcal do not correspond to the published values, as the authors likely calculated the average for the Cereals and Derivatives item with 7 portions instead of 7.5, which altered the final percentages. This is because the total weight of the foods was 3267.5 g, not 3205 g as indicated in the study[4] (Table 2).

If we consider the quantitative values (Table 2) obtained by the NWF and apply them to the table of average values from the NWF (Table 1), the energy values increase. For example, for energy values of 1300 kcal and 3000 kcal, when the quantities defined in the NWF are tested against tables calculated with the average nutrient values, we obtain 3528 kcal and 7640 kcal, respectively. This result was expected, given the total quantities calculated in the NWF, which were 2213 g and 4323 g, respectively (Tables 3 and 4).

Tabela 3: Calculation of Energy and Nutritional Value Based on Estimated Food Quantities for the 1300 Kcal Energy Value in the NWF, Using Reference Nutrient Averages.

Quantities		Macronutrients							
Number of Servings x Quantity of Food (g)	Food Group	Average Value Protein (g)	Protein (g)	Average Value Fat (g)	Fat (g)	Average Value Carbohydrates (g)	Carbohydrates (g)	Average Value Energy (Kcal)	Energy (Kcal)
30	Fats and Oils	1.4	0.4	76.3	22.9	1	0.3	696	208.8
500	Dairy	19.7	98.5	19.8	99.0	1.8	9.0	264	1320.0
82,5	Meat, Fish, and Eggs	23.9	19.7	11.9	9.8	0	0.0	203	167.5
80	Pulses	7.8	6.2	1.6	1.3	14.1	11.3	99	79.2
500	Tubers and Cereals	6.5	32.5	2.3	11.5	57.6	288.0	268	1340.0
540	Vegetables	1.7	9.2	0.5	2.7	3.5	18.9	24	129.6
480	Fruits	0.8	3.8	0.7	3.4	12.1	58.1	59	283.2
			170.4		150.5		385.6		3528.3

Table 4: Calculation of Energy and Nutritional Value Based on Estimated Food Quantities for the 3000 Kcal Energy Value in the NWF, Using Reference Nutrient Averages.

Quantities		Macronutrients							
Number of Servings x Quantity of Food (g)	Food Group	Average Value Protein (g)	Protein (g)	Average Value Fat (g)	Fat (g)	Average Value Carbohydrates (g)	Carbohydrates (g)	Average Value Energy (Kcal)	Energy (Kcal)
90	Fats and Oils	1.4	1.3	76.3	68.7	1	0.9	696	626.4
750	Dairy	19.7	147.8	19.8	148.5	1.8	13.5	264	1980.0
247.5	Meat, Fish, and Eggs	23.9	59.2	11.9	29.5	0	0.0	203	502.4
160	Pulses	7.8	12.5	1.6	2.6	14.1	22.6	99	158.4
1375	Tubers and Cereals	6.5	89.4	2.3	31.6	57.6	792.0	268	3685.0
900	Vegetables	1.7	15.3	0.5	4.5	3.5	31.5	24	216.0
800	Fruits	0.8	6.4	0.7	5.6	12.1	96.8	59	472.0
			331.7		290.9		957.3		7640.2

In the tested hypothesis, the percentages are obtained by summing the quantities of food multiplied by the average nutrient values and calculating their ratio to the total weight for each of the defined energy levels (Table 5-7).

Thus, the following percentages were obtained for the food groups in the New Version of the Food Wheel the NVWF: Fats and Oils – 2%; Dairy – 19%; Meat, Fish, and Eggs – 7%; Pulses – 6%; Cereals and Derivatives, Tubers – 21%; Fruit – 23%; Vegetables – 22% (Table 8).

With this methodology, when the calculated values were compared with the nutritional references defined by EFSA[5,6], an adequate distribution of macronutrients was observed for each of the energy levels, with only vitamin D showing a quantity lower than the defined value.

Discussion

When comparing the percentages obtained in the NVRA and the NRA (Figure 1), they differ essentially in relation to the groups of cereals, legumes and meat/fish/eggs/nuts/seeds. The nutritional values used for the calculation come from different food composition tables, and the selection criteria are different.

Interestingly, when analyzing the results obtained from the first version of the Food Wheel from the 1970s, and converting the values into just 5 groups, the percentages do not differ significantly. This is noteworthy, considering that in the calculation used in the NVWF, different criteria were applied in the selection of food groups and nutritional averages for

Table 5: Calculation of energy and macronutrient values based on average values after selecting different food groups for 1300 kcal.

Food Group	Quantities (g)	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)
Fats and Oils	25	0.0	23.2	0.1	209.1
Pulses	80	6.8	1.1	9.6	84.9
Meat, Fish, and Eggs	50	10.2	4.5	0.1	81.8
Fatty Fruits/Seeds*	**15**	3.1	7.5	1.4	88.9
Milk and Yogurt	250	9.5	3.5	12.4	120
Cheese and Cottage Cheese*	**20**	3.5	3.8	0.4	50.1
Tubers and Cereals	240	11.9	3.1	89.1	450
Fruits	320	2.5	1.8	30.8	171.6
Vegetables	300	6.6	1.4	9.7	91.9
TOTAL	1300	54.1	49.8	153.6	1348.3

*Fixed amount of fatty fruits and seeds (15 g) and Cheese and Cottage Cheese (20 g).

Table 6: Calculation of energy and macronutrient values based on average values after selecting different food groups for 2200 kcal.

Food Group	Quantities (g)	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)
Fats and Oils	35	0.0	32.5	0.1	292.7
Pulses	120	10.3	1.7	14.5	127.4
Meat, Fish, and Eggs	150	30.7	13.5	0.2	245.5
Fatty Fruits/Seeds*	**15**	3.1	7.5	1.4	88.9
Milk and Yogurt	375	14.3	5.2	18.6	180
Cheese and Cottage Cheese*	**20**	3.5	3.8	0.4	50.1
Tubers and Cereals	440	21.9	5.7	163.4	825
Vegetables	480	3.7	2.6	46.2	257.4
Fruits	460	10.1	2.1	14.8	140.9
TOTAL	2095	97.5	74.6	259.5	2207.8

*Fixed amount of fatty fruits and seeds (15 g) and Cheese and Cottage Cheese (20 g).

Table 7: Calculation of energy and macronutrient values based on average values after selecting different food groups for 3000 kcal.

Food Group	Quantities (g)	Protein (g)	Fat (g)	Carbohydrates (g)	Energy (Kcal)
Fats and Oils	45	0.0	41.8	0.1	376.3
Pulses	160	13.7	2.2	19.3	169.9
Meat, Fish, and Eggs	200	40.9	18	0.3	327.3
Fatty Fruits/Seeds*	**15**	3.1	7.5	1.4	88.9
Milk and Yogurt	500	19.1	6.9	24.8	240
Cheese and Cottage Cheese*	**20**	3.5	3.8	0.4	50.1
Tubers and Cereals	660	32.8	8.5	245	1237.5
Vegetables	640	4.9	3.5	61.6	343.1
Fruits	600	13.1	2.8	19.3	183.8
TOTAL	2840	131.1	95.1	372.2	3016.9

*Fixed amount of fatty fruits and seeds (15 g) and Cheese and Cottage Cheese (20 g).

Table 8: Calculation of the final percentage based on the average of the sums of food quantities relative to total weights for the energy levels.

	1300 Kcal		2200 Kcal		3300 Kcal		Average
Food Group	Quantities (g)	Value %	Quantities (g)	Value %	Quantities (g)	Value %	Value %
Fats and Oils	25	2	35	1	45	2	2
Pulses	80	6	120	6	160	6	6
Meat/Fish/Eggs/ Fatty Fruits/Seeds	65	5	165	8	215	8	7
Milk/Yogurt/Cheese	270	21	395	19	520	18	19
Tubers and Cereals	240	18	440	21	660	23	21
Fruits	320	25	480	23	640	22	23
Vegetables	300	23	460	22	600	21	22
TOTAL	1300		2095		2840		

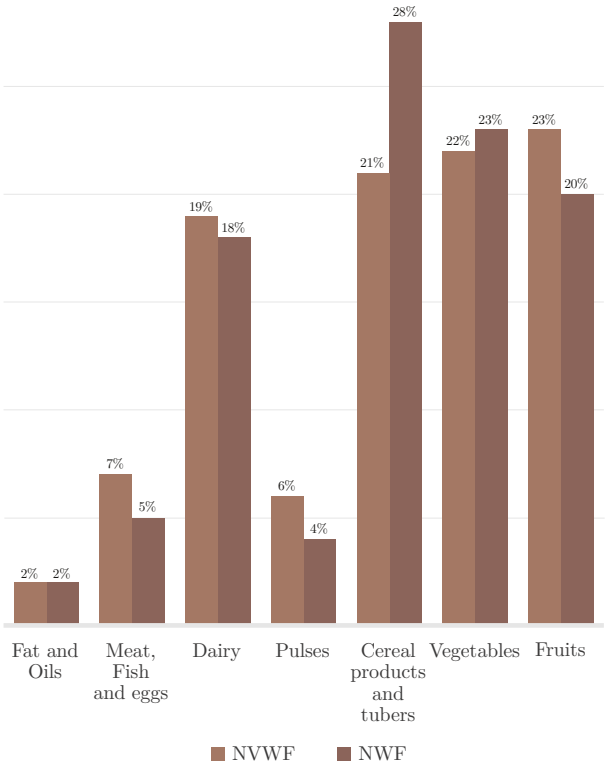

Figure 1: Comparison of percentage values between the calculation models of the New Food Wheel Version (NVWF) and the New Food Wheel (NWF).

Dairy (with Milk and Yogurt separated from Cheese, Fresh Cheese, and Ricotta) and Meat, Fish, and Eggs, complemented by Nuts and Seeds. This trend suggests that the methodology used to calculate the percentages in the first Food Wheel could have been similar (Table 9).

Tabela 9: Comparison between the percentages of food groups calculated in the Food Wheel (1977 version), the New Food Wheel (NWF – 2003) and the hypothesis tested for the New Version of the Food Wheel (NVWF).

Food Wheel (1977) (5 Food Groups)		New Food Wheel (NWF – 2003) (7 Food Groups)		New Version of the Food Wheel (NVWF) (7 Food Groups)	New Version of the Food Wheel (NVWF) (5 Food Groups)
Fruits and Vegetables	43%	Fruits	20%	23%	45%
		Vegetables	23%	22%	
Cereal products, pulses and tubers	30%	Cereal products and tubers	28%	21%	27%
		Pulses	4%	6%	
Dairy	14%	Dairy	18%	19%	19%
Meat, Fish and Eggs	10%	Meat, Fish and Eggs	5%	7%	7%
Fats and Oils	3%	Fats and Oils	2%	2%	2%

The change in the procedure for calculating percentages in the NVRA proposes a more practical way of evaluating, qualitatively and quantitatively, the foods consumed daily. The applicability of the new calculation model based on the sum of the quantities of food by food groups, whether in the evaluation of an institutional menu, or in the evaluation of food consumption in clinical practice, becomes immediate and extremely efficient in adapting the Food Wheel as a dietary guide. In the NRA, the exercise of comparing the quantities of food consumed with the defined percentages generates a discrepancy in results, due to the fact that the Wheel presents recommendations for portions and also for percentages. Therefore, in the NRA, the assessment of food consumption presents some difficulty in matching the quantities of food consumed with the recommended percentage values.

Although the food selection criteria, which form the basis of the calculation, are debatable and have not been supervised by experts in the field of nutrition, the methodology for calculating percentages is an asset for future work in the area of nutritional education and in clinical practice to evaluate and correct food choices.

Conclusion

The calculation method used in 2003 to determine the NWF, based on multiplying the number of servings by the amount of equivalent food, presents different percentage values compared to the sum of the quantities of foods calculated from the average nutrients. It is argued that the latter approach is more suitable for educational and clinical practice, as it immediately allows for evaluating whether the quantities of food consumed align with the recommended percentages.

In turn, the calculation applied in this proposed revision of the methodology showed that the values obtained more accurately reflect the nutritional and energy values compared to the NWF calculation, despite differences in the selection criteria for foods based on the Portuguese food composition table.

This proposed review of the methodology does not replace the NWF, but constitutes a complementary tool for analysis and food education. The NVWF does not intend that the calculated percentages be scrupulously adhered to, even if inaccuracies exist in any of the methods, but rather to reflect on the new calculation model in order to make the teaching possibilities that the Food Wheel has assumed since the beginning more practical.

The continuous updating of the Portuguese food composition table and the inclusion of more foods is essential for the development of other tools that will ensure better effectiveness in the assessment of eating habits in practice. The adaptation of the Food Wheel to other dietary patterns, such as vegetarianism, would be another challenge in the short term.

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LO: Study coordination, study design, data collection, storage and analysis, review and discussion of results.
NN: Study design, collection, storage, analysis and review and discussion of results.
AC: Data analysis, review and discussion of results.
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