

Nutrient Scoring Calculation Methodology

A Method for Simple Comparison

Abstract

Nutrient density is considered a gold standard in measuring a food's nutritional value. Nutrient density is the measure of the amount of nutrients in a food product in proportion to its energy content, weight or other measures [1]. This paper defines a methodology for comparing the nutrient density of different foods based on the presence of forty (40) essential nutrients (ENs) found in foods.

Keywords: Nutrient Density, Nutrient Score

1. Methodology explained

The methodology of this Nutrient Score is based on Daily Recommended Intake (DRIs) values required to meet a human's daily essential nutrient needs [2]. This Nutrient Score has been scaled to the FDA's Daily Value (DVs) of 2,000 calories [3].

The standard reference chosen is set against the DRI of a male (age 19-30) weighing 180 lbs. These recommendations were chosen as they meet the needs of most Americans [4].

A food's Nutrient Score is measured on a 100g portion and consists of 40 scoring measures. Since this Nutrient Score is standardized against the FDA's Daily Value of 2,000 calories, each scoring measure is worth a potential total of 50 points:

$$2,000 \text{ calories} / 40 \text{ scoring measures} = 50$$

Each scoring measure represents the proportion of the nutrient included relative to its daily DRI. For example, the DRI of Vitamin B2 is 1.2mg. If a single 100g portion of a food contained 0.6mg of Vitamin B2, it would capture 50% of the total 50 points available or 25.

Nutrient Score points are scored as follows:
0 - 50 points are available for each of 40 essential nutrients

- 14 vitamins
- 14 minerals
- 9 amino acids
- 2 fatty acids (Omega-3, Omega-6)
- Fiber

The Nutrient Score is the sum of each scoring measure.

2. Vitamins, Minerals, Amino Acids, Fatty Acids, and Fiber

There are 40 essential nutrients with DRIs across five nutrient categories; vitamins, minerals, amino acids, fatty acids, and fiber. Below a table details which nutrients comprise each of these five categories.

2.1 Essential Nutrients

Vitamins	Minerals	Amino Acids	Fatty Acids
<ul style="list-style-type: none"> ● Vitamin A ● Vitamin B1 ● Vitamin B2 ● Vitamin B3 ● Vitamin B5 ● Vitamin B6 ● Vitamin B7 ● Vitamin B9 ● Vitamin B12 ● Vitamin C ● Vitamin D ● Vitamin E ● Vitamin K ● Choline 	<ul style="list-style-type: none"> ● Calcium ● Chromium ● Copper ● Iodine ● Iron ● Magnesium ● Manganese ● Molybdenum ● Phosphorus ● Potassium ● Selenium ● Zinc ● Chloride ● Sodium 	<ul style="list-style-type: none"> ● Histidine ● Isoleucine ● Leucine ● Lysine ● Methionine + (Cysteine SAA) ● Phenylalanine + (Tyrosine) ● Threonine ● Tryptophan ● Valine 	<ul style="list-style-type: none"> ● Omega-3 ● Omega-6
			Fiber
			<ul style="list-style-type: none"> ● Fiber

2.2 Formula

For the 40 essential nutrients above, the points for the Nutrient Score is derived by dividing the weight of the essential nutrient in a 100g portion by the Dietary Reference Intake and multiplying the result by the points possible:

$$(\text{weight per 100g portion} / \text{DRI}) * 50.$$

3. Summary

This Nutrient Scoring methodology is a measure of nutrient density that can be used to compare nutrition across all foods and drinks.

APPENDIX

Daily Recommended Intake (DRIs)

Units of Measure key

g = grams

mg = milligrams

mcg = micrograms

mg NE = milligrams of niacin equivalents

mcg DFE = micrograms of dietary folate equivalents

mcg RAE = micrograms of retinol activity equivalents

Vitamins

Vitamin	Available Nutrient Score Points	DRI	Unit
Vitamin A	0 - 50	900	mcg RAE
Vitamin B1 (thiamin)	0 - 50	1.2	mg
Vitamin B2 (riboflavin)	0 - 50	1.3	mg
Vitamin B3(niacin)	0 - 50	16	mg NE
Vitamin B5 (pantothenic acid)	0 - 50	5	mg
Vitamin B6 (pyridoxine)	0 - 50	1.3	mg
Vitamin B7 (biotin)	0 - 50	30	ug
Vitamin B9 (folic acid, folate/total)	0 - 50	400	mcg DFE
Vitamin B12 (cobalamin)	0 - 50	2.4	mcg
Vitamin C (ascorbic acid)	0 - 50	90	mg
Vitamin D (vitamin D2 or Ergocalciferol and vitamin D3 or Cholecalciferol)	0 - 50	15	mcg
Vitamin E (tocopherol)	0 - 50	15	mg
Vitamin K (phylloquinone)	0 - 50	120	mcg
Choline (vitamin Bp)	0 - 50	550	mg
Total Available Vitamin Nutrient Score Points	700		

Minerals

Mineral	Available Nutrient Score Points	DRI	Unit
Calcium	0 - 50	1000	mg
Chromium	0 - 50	35	mcg
Copper	0 - 50	900	mcg
Iodine	0 - 50	150	mcg
Iron	0 - 50	8	mg
Magnesium	0 - 50	400	mg
Manganese	0 - 50	2.3	mg
Molybdenum	0 - 50	45	mcg
Phosphorus	0 - 50	700	mg

Potassium	0 - 50	3400	mg
Selenium	0 - 50	55	mcg
Zinc	0 - 50	11	mg
Chloride	0 - 50	2.3	g
Sodium	0 - 50	1500	mg
Total Available Mineral Nutrient Score Points	700		

Amino Acids

Amino Acid	Available Nutrient Score Points	DRI	Unit
Histidine	0 - 50	1143	mg
Isoleucine	0 - 50	1551	mg
Leucine	0 - 50	3429	mg
Lysine	0 - 50	3103	mg
Methionine + (Cysteine SAA)	0 - 50	1551	mg
Phenylalanine + (Tyrosine)	0 - 50	2694	mg
Threonine	0 - 50	1633	mg
Tryptophan	0 - 50	408	mg
Valine	0 - 50	1960	mg
Total Available Amino Acid Nutrient Score Points	450		

Fatty Acids

Fatty Acid	Available Nutrient Score Points	DRI	Unit
Omega 3 (Alpha-linolenic acid (ALA))	0 - 50	1.6	g
Omega-6 (Linoleic acid (LA))	0 - 50	17	g
Total Available Fatty Acid Nutrient Score Points	100		

Fiber

Fiber	Available Nutrient Score Points	DRI	Unit
Total Fiber	0 - 50	38	g
Total Available Fiber Nutrient Score Points	50		

References

- [1] Drewnowski A, “Concept of a nutritious food: toward a nutrient density score” *The American Journal of Clinical Nutrition*. Volume 82, Issue 4, October 2005, Pages 721–732
- [2] USDA National Agricultural Library. “DRI Nutrient Reports.”
URL: [www.nal.usda.gov/fnic/dri-nutrient-reports#:~:text=The%20Dietary%20Reference%20Intakes%20\(DRIs,Institute%20of%20Medicine%20\(IOM\),&text=The%20report%20updates%20the%20DRI,from%20the%20Institute%20of%20Medicine](http://www.nal.usda.gov/fnic/dri-nutrient-reports#:~:text=The%20Dietary%20Reference%20Intakes%20(DRIs,Institute%20of%20Medicine%20(IOM),&text=The%20report%20updates%20the%20DRI,from%20the%20Institute%20of%20Medicine)
- [3] U.S. Food and Drug Administration. “How to Understand and Use the Nutrition Facts Label.”
URL: <https://www.fda.gov/food/new-nutrition-facts-label/how-understand-and-use-nutrition-facts-label>
- [4] Fryar CD, Carroll MD, Gu Q, Afful J, Ogden CL. Anthropometric reference data for children and adults: United States, 2015–2018. *National Center for Health Statistics. Vital Health Stat 3(46)*. 2021.
- [5] US Department of Agriculture, Center for Nutrition Policy and Promotion. Report of the Dietary Guidelines Advisory Committee on the Dietary Guidelines for Americans, 2010.
URL: http://www.cnpp.usda.gov/sites/default/files/dietary_guidelines_for_americans/2010DGACReport-camera-ready-Jan11-11.pdf.
- [6] Myhrstad MCW, Tunsjø H, Charnock C, Telle-Hansen VH. Dietary Fiber, Gut Microbiota, and Metabolic Regulation-Current Status in Human Randomized Trials. *Nutrients*. 2020;12(3):859. Published 2020 Mar 23. doi:10.3390/nu12030859
- [7] National Academies of Sciences, Engineering, and Medicine. 2019. *Dietary Reference Intakes for Sodium and Potassium*. Washington, DC: The National Academies Press. <https://doi.org/10.17226/25353>.
- [8] Iwahori T, Miura K, Ueshima H. Time to Consider Use of the Sodium-to-Potassium Ratio for Practical Sodium Reduction and Potassium Increase. *Nutrients*. 2017;9(7):700. Published 2017 Jul 5. doi:10.3390/nu9070700
- [9] U.S. Department of Health and Human Services and U.S. Department of Agriculture. *2015 – 2020 Dietary Guidelines for Americans*. 8th Edition. December 2015.
- [10] Cohen HW, Hailpern SM, Fang J, Alderman MH. Sodium intake and mortality in the NHANES II follow-up study. *American Journal of Medicine*. 2006;119(3):275–e7-275.e14.

Nutrient Data

Nutrient Scores are typically calculated using data provided by manufacturers on their Nutrition Facts Label (NFL) or as otherwise disclosed by the manufacturer and can also be calculated using estimated nutrient data. If certain nutrient data are not provided, it should not be included in Nutrient Score calculations.

Disclaimer

These statements have not been evaluated by the Food and Drug Administration.