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Report of the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) on the Nutritional Reference Intakes for the Spanish population

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Abstract

The nutritional reference intake levels for a population allow the development of dietary recommendations that ensure a balanced nutritional contribution for the maintenance of good health, as well as for the development of nutritional policies that allow the prevention of chronic and deficiency diseases.

In the case of Spain, the last available update of the Dietary Reference Intakes was carried out in 2010 by the Spanish Federation of Nutrition, Food and Dietetics Societies (FESNAD). At European level, the European Food Safety Authority (EFSA) has published Dietary Reference Values between 2010 and 2017, and other countries have also updated their nutritional references over the last decade.

The estimation of new nutritional reference intakes for the Spanish population, has followed a methodology that includes searching for reference intakes published by official international organisations, collecting data updated after 2010 and the harmonisation of recommendations by sex and age ranges. Finally, for each nutrient, vitamin or mineral, the nutritional reference intakes values for a healthy population have been determined by applying a decision-making algorithm based on that of FESNAD. In the case of macronutrients and energy, those established by EFSA are accepted.

The document establishes nutritional reference intakes for 15 minerals: calcium, chlorine, chromium, copper, fluoride, phosphorus, iron, iodine, magnesium, manganese, molybdenum, potassium, selenium, sodium and zinc, and 13 vitamins: vitamin A, vitamin B1 (thiamine), vitamin B2 (riboflavin), vitamin B3 (niacin), vitamin B5 (pantothenic acid), vitamin B6 (pyridoxine), vitamin B9 (dietary

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equivalents of folate), vitamin B12 (cobalamin), biotin, vitamin C, vitamin D , vitamin E (α-tocopherol) and vitamin K.

These nutritional reference intakes are based on healthy population data; therefore, they do not cover the specific demands of cases in which there are altered physiological needs and metabolic dysfunctions. The existing individual genetic, anthropometric and physiological variation, as well as physical activity, are only incompletely taken into account when estimating individual nutrient requirements. The use of these reference values at individual level requires the consideration of the existence of external and intrinsic factors to the person (sociocultural, nutritional, physiological or even genetic characteristics), as well as the bioavailability and interaction of nutrients, necessary for the adaptation of personal requirements.

Implementing these nutritional recommendations in daily practice must be accompanied by dietary recommendations, expressed in terms of food consumption. However, these dietary recommendations must consider compliance with nutritional requirements, considering the population's specific sociocultural factors.

In short, the nutritional reference intakes have different applications and must be updated periodically in order to implement them in the assessment of the population's nutritional status; to develop nutritional and agricultural policies; to design food guides, as well as to develop new products that consider the nutritional needs of specific population groups (children, the elderly, infants, etc.).

Other challenges on the horizon include considering the possibility of including nutritional reference intakes for people with chronic diseases, as well as treating toxicological aspects associated with disproportionate nutrient intakes.

Key words

Nutritional Reference Intakes.

1. Introduction

The reference intake levels for a population are those values from which dietary recommendations may be developed for purposes of ensuring a balanced nutritional contribution for maintaining the good health of this population, as well as for the development of nutritional policies that can help prevent chronic and deficiency diseases.

In Spain, the recommendations from the Spanish Federation of Nutrition, Food and Dietetics Societies (FESNAD) established the Dietary Reference Intakes (DRI) based on both the prevention of current chronic diseases and covering nutritional deficiencies. In Europe the concept of Population Reference Intake (PRI) is used (EFSA, 2017), which is the level of (nutrient) intake that is adequate for virtually all people (97-98 %) of a sample (Figure 1), and the average requirements (AR) which are the physiologically demanded intake levels of a nutrient that satisfy the metabolic needs of half of the people (50 %) in a population group. On the other hand, it also considers the concept of adequate intake (AI) which are nutrient intake intervals, conventionally accepted as a benchmark when PRIs cannot be established experimentally, which has been accepted by EFSA (European Food Safety Authority) and in the preparation of this report. EFSA also establishes the reference intake range (RI) for macronutrients and, finally, the tolerable upper intake level (UL).

To define these values, the assumption is that the individual requirements or demands for each nutrient follow a normal statistical distribution at the population level, with the exception of energy. In this context, there are various terms and definitions of reference intakes and intake recommendations for nutrients used by different countries when establishing the reference values or/the safety limits applicable in their respective areas of influence (Table A), such as the Recommended Nutrient Intake (RNI) in the United Kingdom; the *Apport journalier recommandé* (AJR) in Belgium; *Empfohlene Zufuhr* (EZ) by DACH (from Germany "D", Austria "A" and Switzerland "CH"); the Recommended Intake (RI) by the Nordic Council of Ministers (Denmark, Finland, Norway, Sweden and Iceland) or the Recommended Dietary Allowances (RDAs) in the United States and Canada.

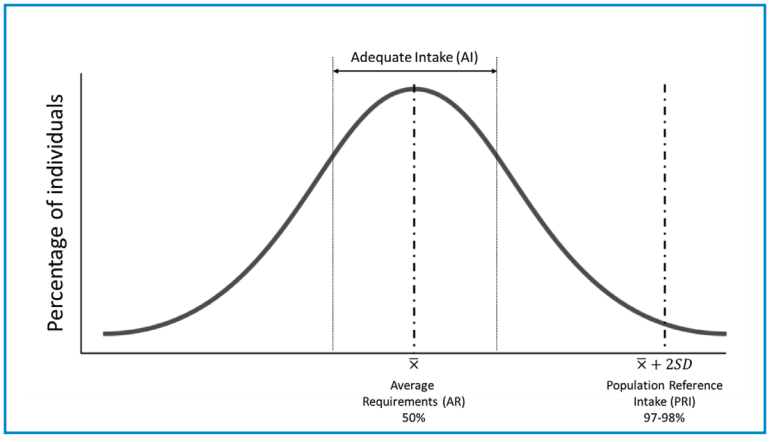

Figure 1. Reference intake measures. **Source:** (EFSA, 2017).

In this respect, for Spain, the use of the term *Ingestas Nutricionales de Referencia (INR)* or Nutritional Reference Intake (NRI) is proposed for this purpose, as a term that may be closer to its use in public health and understandable for the general population, and which covers 97-98 % of the population.

Table A. Nutritional references terms specified in different international consensus

Country	Population nutritional reference	Nutritional average requirement	Adequate intake		Reference range	Tolerable upper level
Spain (FESNAD, 2010)	Ingesta Dietética de Referencia (IDR)	-	-	-	-	-
Europe (EFSA, 2017)	Population reference intake (PRI)	Average requirement (AR)	Lower threshold intake (LTI)	Adequate intake (AI)	Reference intake range (RI)	Tolerable upper intake level (UL)
France (ANSES, 2016)	Référence nutritionnelle pour la population (RNP)	Besoin nutritionnel moyen (BNM)	-	Apport satisfaisant (AS)	Intervalle de référence (IR)	Limite supérieure de sécurité (LSS)
United Kingdom (PHE, 2016)	Recommended nutrient intake (RNI)	-	-	-	-	-
Belgium (CSS, 2016)	Apport journalier recommandé (AJR)	-	-	Apport adéquat (AA)	-	Apport maximal tolérable (AMT) No observed adverse effect level (NOAEL)
Germany/ Austria/ Switzerland (DACH, 2018)	Empfohlene zufuhr (EZ)	-	-	Angemessene zufuhr (AZ)	-	Tolerierbare gesamtzufuhrmene
Nordic Countries (NORDEN, 2012)	Recomended intake (RI)	Average requirement (AR)	Lower intake level (LI)	-	-	Upper intake level (UL) No observed adverse effect level (NOAEL) Lowest adverse effect level (LOAEL)
United States (IOM, 2000)	Recommended dietary allowance (RDA)	Estimated average requirement (EAR)	-	Adequate intake (AI)	Acceptable macronutrient distribution ranges (AMDR)	Tolerable upper intake level (UL)

Table A. Nutritional references terms specified in different international consensus

Country	Population nutritional reference	Nutritional average requirement	Adequate intake		Reference range	Tolerable upper level
WHO (FAO/ WHO, 2005)	Recommended nutrient intake (RNI)	Estimated average requirement (EAR)	-	Recommended safe intake	-	Upper tolerable nutrient intake level (UL)
Australia and New Zealand (NHMRC, 2017)	Recommended dietary intake (RDI)	Estimated average requirement (EAR)	-	Adequate intake (AI)	Acceptable macronutrient distribution ranges (AMDR)	Upper intake level (UL)

Establishing these reference intake values provides various perspectives and possibilities in the assessment and planning of diets; for the labelling or development of new food products; or for educational and public health tasks such as those listed below:

- Assessing a population's nutritional status, since by comparing the nutrient intake data of a population group with the Nutritional Reference Intakes, we can estimate the existence of deficits or excess intake of a specific nutrient in each population group.
- Determining possible deviations from references in the population, which in turn allows government institutions to develop nutritional and agricultural policies, together with food production planning.
- Preparing dietary recommendations that makes possible to give a healthy eating guideline population advice that ensures that the nutritional needs in a healthy population are covered.
- Diet planning in mass catering sectors (schools, residences, etc.) that makes it possible to ensure that the nutritional contribution according to sex and age is covered.
- Designing new food products that take into account the nutritional needs of specific population groups (children, the elderly, infants, chronic patients...).
- Developing nutritional education tools that facilitate knowledge of specific needs for at-risk populations or that assist in reaching the population's daily nutritional requirements.
- Stipulating nutrient reference values for food products labelling; that provide consumers with nutritional information.

In the case of Spain, the last available update of the Dietary Reference Intakes (DRI) was carried out by FESNAD in 2010, establishing these values based on the information available on international references at that time, the main source of information being the guidelines created by the Food Nutrition Board of the Institute of Medicine (IOM) for the American population, as they had the most evidence at that time. However, in recent years, various international organisations with nutrition and health competencies in several countries have updated their nutritional recommendations based on new scientific evidence (Table B). Among these organizations is EFSA, which published the latest

version of the Dietary Reference Values (DRV) in 2017 for the European population. EFSA also collects scientific opinions on water, fats, carbohydrates, food fibre, protein, energy, vitamins and minerals, and updated a prior report published by the same in 2010 (EFSA, 2010). Furthermore, EFSA has recently created an interactive online tool that facilitates end users' access to reference values of the same, such as nutrition and health professionals, risk managers, policy makers, food manufacturers and scientists (EFSA, 2018). In this context, it should be mentioned that this situation is not contradictory with the coexistence of specific reference intakes in various European Union countries.

Since 2010 there have been scientific advances which have enabled the publication of new reference documents for nutritional intakes by organisations and institutions from different countries based on new scientific evidence (Table B). Therefore, the Scientific Committee of the Spanish Agency for Food Safety and Nutrition (AESAN) was requested to prepare a report on Nutritional Reference Intake for the Spanish population.

Table B. Compilation of dietary recommendations published after the establishment of IDRs for the Spanish population in 2010 (FESNAD, 2010)

Country/ Population	Publication responsable Institution	Last actualisation	Reference
Europe			
Belgium	Conseil Supérieur de la Santé	2016	(CSS, 2016)
France	ANSES	2016	(ANSES, 2011, 2016, 2017)
United Kingdom	PHE	2016	(PHE, 2016); based on (SACN, 1991, 2003, 2005, 2011, 2015, 2016)
Italy	SINU	2014	(SINU, 2014)
Out of Europe			
Australia and New Zealand	National Health and Medical Research Council	2017	(NHMRC, 2017)
Canada and United States	NAS/IOM/Food and Nutrition Board	2011	(IOM, 1997, 1998, 2000, 2001, 2005a, 2005b, 2011)
International Organisations			
Europe	D-A-CH	2018	(D-A-CH, 2018)
Europe	EFSA	2017	(EFSA, 2017)
Europe	Nordic Council of Ministers	2012	(NORDEN, 2012)
Worlwide	FAO/OMS	2010	(FAO/WHO, 2004, 2005, 2007, 2010)
Worlwide	OMS	2012	(WHO, 2012a, b)

FESNAD: *Federación Española de Sociedades de Nutrición, Alimentación y Dietética;* EFSA: European Food Safety Authority; ANSES: *Agence Nationale de Sécurité Sanitaire, Alimentation, Environnement, Travail;* PHE: Public Health England; FSAI: Food Safety Authority of Ireland; NAS: National academy of Science; SINU: *Società Italiana di Nutrizione Umana;* IOM: Institute of Medicine; Nordic Council of Ministers it is an international cooperation that includes Denmark, Finland, Iceland, Norway, Sweden and the Faroe Islands, Greenland and Åland Islands; D-A-CH is an international cooperation that includes the German Nutrition Society (DGE), the Austrian Nutrition Society (ÖGE) and the Swiss Nutrition Society (SGE).

2. Methodology for the updating of Reference Nutritional Intakes for the Spanish population

The establishment of the new Nutritional Reference Intake (NRI) for the Spanish population is based on the review of the existing recommendations in the international guidelines published subsequent to the latest update completed by FESNAD in 2010 (Table A).

The methodology used was as follows:

1. Search for the most recent documents regarding reference intakes published by official international bodies on their websites or in scientific publications.
2. Collection of existing data on all available nutrients from those tables for which updated data were available after 2010.
3. Harmonisation of recommendations according to age range and sex as previously described for the 2010 tables for the Spanish population.
4. Determination of each nutrient's NRI values by applying the updated decision-making algorithm (Figure 2).

In the case of macronutrients and energy, the nutritional reference intake determined by EFSA (Tables 1 to 5 of Annex I) have been directly adopted, while the algorithm described in Figure 2 has been applied for vitamins and minerals.

The justification for the using the algorithm to establish the NRI of vitamins and minerals is based on its application by FESNAD in 2010, in which the mode and median of the corresponding nutrient were defined among the selected reference sources. Subsequently, the algorithm's decision tree considers, following statistical centrality criteria, also including the mean, if the value appears in the reference bibliography, in which case the mean is accepted or alternatively calculated and the values closest to the average in the available reference literature are considered (Figure 2). The use of the algorithm adopted from FESNAD from 2010 gathers similarities between the population-based reference values (PRI, AI and other specific values from each country) and adequate intakes of each nutrient, making it possible to determine the Nutritional Reference Intake (NRI) from the most widely accepted values in other countries that are similar to Spain. In our case, the terms PRI and AI were translated from the terminology 'Population Reference Intake' and 'Adequate intake' respectively, and the use of AI has been applied as criteria in the absence of PRI. The reference data used come from countries of primarily European descent.

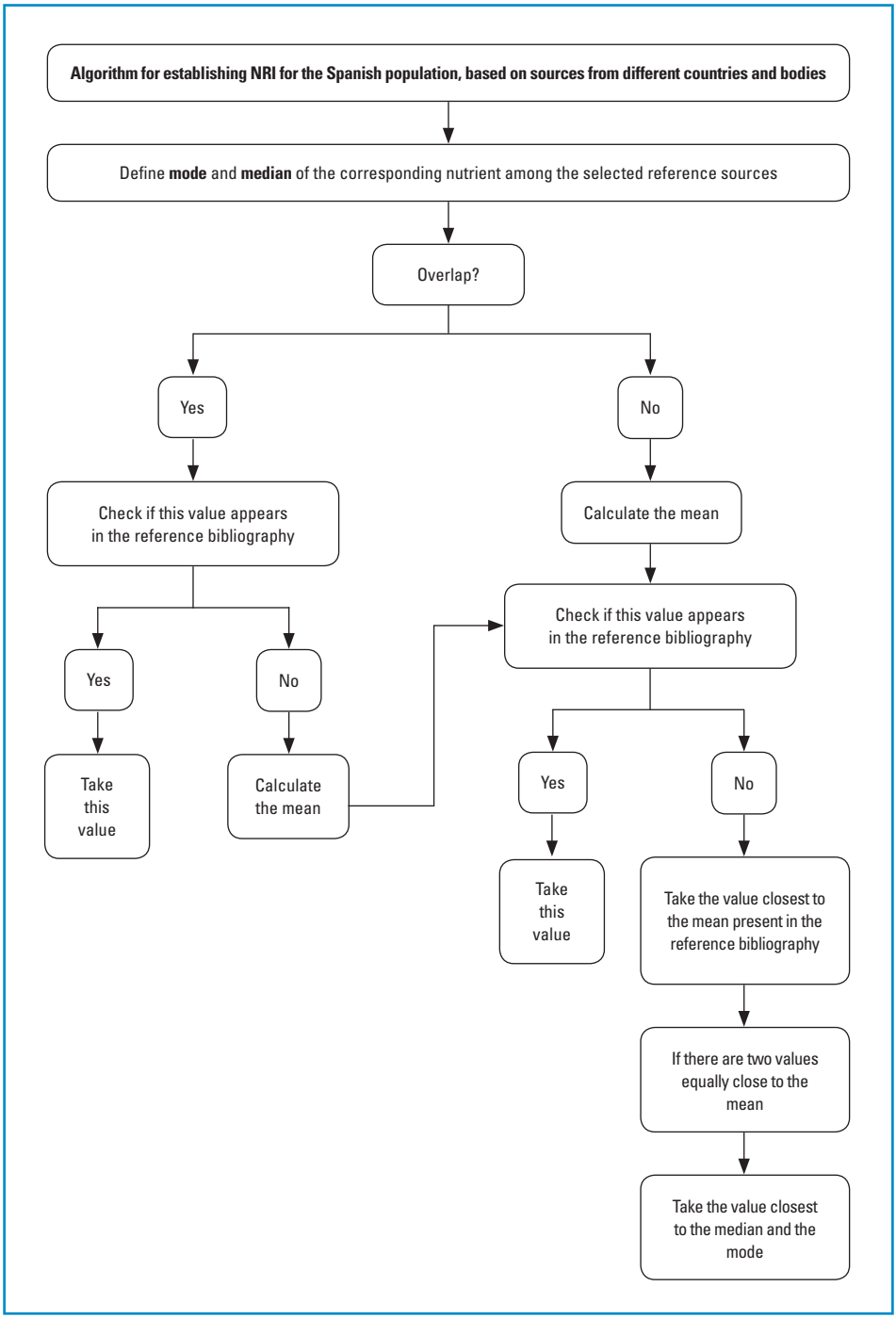

Figure 2. Decision making algorithm for establishing Nutritional Reference Intake of vitamins and minerals for the Spanish population. **Note:** when the data comes from intervals due to age segmentation, the mean is calculated.

3. Comments on the determined values

In these NRI for vitamins and minerals (Tables 6a to 7d of Annex I), the vitamin data are presented in mg/µg per day, although in some cases these correspond to equivalents of the vitamin considering the information available for its transformation (retinols, tocopherols...). The data for some vitamins, including vitamin A, B1, B2, B5, B9, B12, biotin, vitamin C, D, E and vitamin K present changes with respect to FESNAD (2010) as a result of the updated application of the algorithm. NRIs for vitamin D refer to conditions of presumed minimal cutaneous synthesis of vitamin D. It should be considered that, if the endogenous synthesis of cutaneous vitamin D is greater, the requirement for dietary vitamin D would be lower or even zero (EFSA, 2017).

Tables 7a-7d reflect the NRI for minerals. In the case of the reference intake for iron (Table 7b), the NRI considers the combination of hemo and nonhemo iron.

For establishing the NRI for Zinc (Table 7c), phytate intake was estimated at 600 mg/day by type of diet (mixed, with meat and fish as the main source of protein) and by proximity to the intakes in Spain.

The use of the algorithm designed by FESNAD in 2010 has allowed us to gather similarities between the population-based reference values and adequate intakes of each nutrient, in determining the NRI from the most widely accepted values worldwide. The differences that have arisen in this review are explained by the changes that have occurred in other countries, which are collected by the algorithm. In all possible cases the comparable data to the term PRI or RDA have been respected, although sometimes it has been necessary to apply the AI as an alternative, according to international consensus in this regard (Table A). NRI has always been used in this report, both when the data came from PRI/RDA and when they were defined as AI. In fact, the EFSA tables reflect both PRI/AI terms as specified in the tables' headings. Furthermore, it is needed to acknowledge that in some specific circumstances adjustments have been made regarding age groups, where there is no unanimous agreement among national committees regarding their inclusion, although they are accepted by the World Health Organization (WHO).

The document also contains special considerations for some vitamins and minerals, such as: vitamin D (solar transformation), vitamin A (retinols), E (interaction with fatty acids), pantothenic acid, folic acid (dietary equivalents of folates), niacin and vitamin E (equivalents) and some minerals such as fluoride (fluorosis), calcium and zinc (phytates) and iron (hemo/nonhemo), whose bioavailability differs according to sources and foods or interactions with other nutrients or differences depending on the physiological situation (pregnancy, menopause...). Furthermore, choline and other bioactive compounds were not included in this report, as there is no minimum consensus among the data from the reference agencies considered in this study (Table B). In these NRI, the vitamin data are presented in mg/µg per day, although in some cases these correspond to equivalents of the vitamin, considering the information available for its transformation (retinols, folate, tocopherols or vitamin K).

In some specific cases, the series of values were harmonised when there were slight discrepancies in the nutrient intake sequence, as a result of the different age studies, always selecting the lowest or that which facilitated homogeneity.

Furthermore, due to the lack of data on nutrient requirements and methodological limitations, some reference values still have a weak basis and cannot be established reliably, therefore they

can only be estimated approximately. In the same way, the determination of the original data itself, by definition, is aimed at a high percentage of the population, but not the population as a whole. On the other hand, we must highlight the absence of some nutrients for which reference values have not yet been able to be determined.

Conclusions of the Scientific Committee

This document presents the Nutritional Reference Intake (NRI) for energy and nutrients for the Spanish population starting with the review of reference values from other countries and international organisations by means of applying an algorithm for their selection.

The type of methodology employed makes it possible to optimise current resources in order to establish baseline reference values from which the specific population needs can be established.

Changes in the reference values are derived from the evolution of evidence-based scientific knowledge, as well as the practical application of this knowledge in diverse situations, such as its implementation in personalised medicine/nutrition or in specific population groups. The adjustment of these values must be periodically evaluated based on the progression of the population intake data, thus enabling the adaptation of the Spanish populations' needs or the determination of new age ranges that may be required.

It is important to emphasise that the NRI are based on healthy population data, therefore they do not cover the specific demands of cases in which there are altered physiological needs and metabolic dysfunctions. Differences in nutrient requirements related to growth, change in endocrine status and differences in nutritional functions of the body are the basis for the definition of NRIs. So far, the existing individual genetic, anthropometric and physiological variation, as well as physical activity, are only incompletely taken into account when estimating individual nutrient requirements.

In addition, the defined reference values for vitamins and minerals are aimed at achieving an effective, not just satisfactory, contribution in order to promote of an excellent state of health. Intake levels that are much higher than those recommended should be monitored in order to avoid possible harmful effects, for which the range of adequacy set by EFSA must be taken into account. The specific characteristics of some vitamins and minerals in terms of their availability in different sources and foods, as well as their metabolism and nutritional use, should be the specific focus of attention in the application of NRIs, as is the case of nutritional equivalents for some vitamins.

The use of these reference values on an individual level requires taking into account the existence of external and intrinsic factors to the person, such as sociocultural, nutritional, physiological or even genetic characteristics and peculiarities, as well as the bioavailability and interaction of nutrients, necessary for the adaptation of personal requirements.

The AESAN Scientific Committee is aware that the implementation of these nutritional recommendations in daily practice must be accompanied by recommendations, expressed in terms of food consumption. However, the design of food-based dietary guidelines should be carried out based on compliance with nutritional requirements, bearing in mind the population's specific sociocultural factors. Other challenges on the horizon include considering the possibility of including NRI for

chronically ill people, a task for which there is already some existing consensus among scientific societies, and addressing toxicological aspects associated with disproportionate nutrient intakes.

In short, the NRI have different applications and must be updated periodically in order to implement them in the assessment of the population's nutritional status; to develop nutritional and agricultural policies; to design food guides, as well as to develop new products that consider the nutritional needs of specific population groups (children, the elderly, infants...).

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Annex I

Table 1. Average requirements for Energy (kcal/day) (EFSA, 2017)[a]

Age			Sedentary (PAL= 1.4)		Moderately active (PAL= 1.6)		Active (PA= 1.8)		Very active (PAL= 2.0)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
7 months	645	573	-	-	-	-	-	-	-	-
8 months	669	597	-	-	-	-	-	-	-	-
9 months	693	621	-	-	-	-	-	-	-	-
10 months	716	645	-	-	-	-	-	-	-	-
11 months	740	669	-	-	-	-	-	-	-	-
1 year	-	-	788	716	-	-	-	-	-	-
2 years	-	-	1027	955	-	-	-	-	-	-
3 years	-	-	1170	1099	-	-	-	-	-	-
4 years	-	-	1266	1170	1433	1337	1624	1505	-	-
5 years	-	-	1337	1242	1529	1409	1720	1600	-	-
6 years	-	-	1409	1314	1600	1505	1815	1696	-	-
7 years	-	-	1505	1385	1720	1600	1935	1791	-	-
8 years	-	-	1600	1481	1815	1696	2054	1887	-	-
9 years	-	-	1672	1576	1935	1791	2173	2006	-	-
10 years	-	-	-	-	1935	1815	2173	2054	2412	2269
11 years	-	-	-	-	2030	1911	2293	2149	2555	2388
12 years	-	-	-	-	2173	2006	2436	2245	2723	2508
13 years	-	-	-	-	2341	2102	2627	2364	2914	2627
14 years	-	-	-	-	2508	2173	2818	2436	3129	2723
15 years	-	-	-	-	2699	2221	3033	2508	3368	2794
16 years	-	-	-	-	2842	2269	3200	2532	3559	2818
17 years	-	-	-	-	2938	2269	3296	2555	3678	2842
18-29 years	-	-	2341	1887	2675	2149	3009	2412	3344	2675
30-39 years	-	-	2269	1815	2579	2078	2914	2341	3224	2579
40-49 years	-	-	2221	1791	2555	2054	2866	2317	3200	2555
50-59 years	-	-	2197	1791	2508	2030	2842	2293	3153	2555
60-69 years	-	-	2006	1624	2293	1863	2603	2102	2890	2317
70-79 years	-	-	1982	1624	2269	1839	2555	2078	2842	2293
Pregnancy (in addition to the average requirements)										
1st trimester + 69 2nd trimester + 263 3rd trimester + 502										
Lactation (in addition to the average requirements)										
0-6 months *post partum* + 502										

[a]Accessible via the DRV Finder application: https://www.efsa.europa.eu/en/interactive-pages/drvs. The energy values were calculated multiplying the resting energy expenditure (REE) estimates, derived from predictive equations, with physical activity (PA) values. In order to estimate REE in adults, anthropometric data were used from nationally representative surveys in European Union Member States. The energy values were not calculated for adults≥ 80 years given the lack of anthropometric data from EU countries for this age group. PA values of 1.4, 1.6, 1.8 and 2.0 reflect sedentary life styles, moderately active, active and very active (EFSA, 2013).

Table 2. Average requirements for protein (g/kg body weight per day) (EFSA, 2017)[a]

Age	Male	Female
6 months	1.31	
1 year	1.14	
1.5 years	1.03	
2 years	0.97	
3 years	0.9	
4 years	0.86	
5 years	0.85	
6 years	0.89	
7 years	0.91	
8 years	0.92	
9 years	0.92	
10 years	0.91	
11 years	0.91	0.9
12 years	0.9	0.89
13 years	0.9	0.88
14 years	0.89	0.87
15 years	0.88	0.85
16 years	0.87	0.84
17 years	0.86	0.83
18-59 years	0.83	
≥ 60 years	0.83	
Pregnancy (in addition to the average requirements)		
1st trimester	+1 g/day	
2nd trimester	+9 g/day	
3rd trimester	+28 g/day	
Lactation (in addition to the average requirements)		
0-6 months *post partum*	+19 g/day	
>6 months *post partum*	+13 g/day	

[a]Accessible via the DRV Finder application:
https://www.efsa.europa.eu/en/interactive-pages/drvs.

Table 3. Reference intake range for total fat and average requirements for fatty acids (EFSA, 2017)[a]

Age	Total fat (energy %)	Satured fat	Linoleic acid (energy %)	α-Linoleic acid (energy %)	EPA + DHA (mg/day)	DHA (mg/day)	*Trans*-fatty acids
7-11 months	40	[b]	4	0.5	-	100	[b]
1 year	35-40	[b]	4	0.5	-	100	[b]
2-3 years	35-40	[b]	4	0.5	250	-	[b]
4-17 years	20-35	[b]	4	0.5	250	-	[b]
≥18 years	20-35	[b]	4	0.5	250	-	[b]
Pregnancy	20-35	[b]	4	0.5	250	+100-200	[b]
Lactation	20-35	[b]	4	0.5	250	+100-200	[b]

[a]Accessible via the DRV Finder application: https://www.efsa.europa.eu/en/interactive-pages/drvs.
[b]As low as possible.

Table 4. Reference intake range for carbohydrates and average requirements for dietary fibre (EFSA, 2017)[a]

Age	Carbohydrates (energy %)	Dietary fibre (g/day)
1-3 years	45-60	10
4-6 years	45-60	14
7-10 years	45-60	16
11-14 years	45-60	19
15-17 years	45-60	21
≥18 years	45-60	25

[a]Accessible via the DRV Finder application: https://www.efsa.europa.eu/en/interactive-pages/drvs.

Table 5. Average requirements for water (EFSA, 2017)[a]

Age	Water (l/day)	
	Male	Female
6-12 months	0.8-1.0	
1 year	1.1-1.2	
2-3 years	1.3	
4-8 years	1.6	
9-13 years	2.1	1.9
14-17 years	2.5	2
≥18 years	2.5	2
Pregnancy	2.3	
Lactation	2.7	

[a]Accessible via the DRV Finder application: https://www.efsa.europa.eu/en/interactive-pages/drvs.

Table 6a. Nutritional Reference Intake for vitamins

Age	Sex	Condition	Vitamin A			Vitamin B1 (Thiamin)			Vitamin B2 (Riboflavin)			Vitamin B3 (Niacin)		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
		Reference value:	NRI	IDR	PRI	NRI	IDR	PRI	NRI	IDR	PRI / AI	NRI	IDR	PRI
		Units:	µg/day	µg/day	µg RE/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg NE/day
0-6 months	-	-	400	400	-	0.2	0.2	-	0.4	0.4	-	3	3	-
7-12 months	-	-	400	350	250	0.3	0.3	0.3	0.4	0.4	0.4	5	5	4.4
1-3 years	-	-	350	400	250	0.5	0.5	0.5	0.6	0.8	0.6	7	8	7.4
4-5 years	-	-	400	400	300	0.6	0.7	0.6	0.7	0.9	0.7	9	11	9.9
6-9 years	-	-	500	450	400	0.8	0.8	0.7	1	1.1	1	11	12	11.5
10-13 years	Male	-	600	600	600	1	1.1	0.9	1.2	1.3	1.4	14	15	14.1
	Female	-	600	600	600	0.9	1	0.8	1.1	1.2	1.4	14	14	13.1
14-19 years	Male	-	750	800	750	1.2	1.2	1.1	1.5	1.5	1.6	17	15	16.8
	Female	-	650	600	650	1.1	1	0.9	1.2	1.2	1.6	15	14	14.6
20-29 years	Male	-	750	700	750	1.2	1.2	1.1	1.5	1.6	1.6	17	18	17.9
	Female	-	650	600	650	1.1	1	0.9	1.2	1.3	1.6	14	14	14.4
30-39 years	Male	-	750	700	750	1.2	1.2	1.1	1.5	1.6	1.6	17	18	17.3
	Female	-	650	600	650	1.1	1	0.9	1.2	1.3	1.6	14	14	13.9
40-49 years	Male	-	750	700	750	1.2	1.2	1.1	1.5	1.6	1.6	17	19	17.1
	Female	-	650	600	650	1.1	1	0.9	1.2	1.3	1.6	14	14	13.8
50-59 years	Male	-	750	700	750	1.2	1.2	1.1	1.5	1.6	1.6	17	17	16.8
	Female	-	650	600	650	1.1	1	0.9	1.2	1.3	1.6	14	14	13.6
60-69 years	Male	-	750	700	750	1.2	1.1	1	1.5	1.6	1.6	16	17	15.4
	Female	-	650	600	650	1	1	0.8	1.2	1.2	1.6	14	14	12.5
>70 years	Male	-	750	700	750	1.2	1.1	1	1.4	1.4	1.6	16	16	15.2
	Female	-	650	600	650	1	1	0.8	1.2	1.2	1.6	14	14	12.3
-	Female	Pregnancy	800	700	700	1.4	1.2	1	1.5	1.6	1.9	17	15	16
-	Female	Lactation	1300	950	1300	1.4	1.4	1.1	1.7	1.7	2	18	16	17.5

In these INRs, vitamins are expressed in mg/µg per day, although in some cases they correspond to vitamin equivalents, taking in account the available information for their transformation: RE: retinol equivalent (1 µg RE equivalent= 1 µg of retinol, 6 µg of β-carotene and 12 µg of other pro-vitamin A carotenoids); NE: niacin equivalents (1 mg of niacin= 1 niacin equivalent= 60 mg of tryptophan in the diet) (EFSA, 2017).

Table 6b. Nutritional Reference Intake for vitamins

Age	Sex	Condition	Vitamin B5 (Pantothenic acid)			Vitamin B6 (Pyridoxine)			Vitamin B9 (Folate)			Vitamin B12 (Cobalamin)		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
Reference value:			**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**PRI / AI**	**NRI**	**IDR**	**PRI / AI**	**NRI**	**IDR**	**AI**
Units:			**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**µg/day**	**µg/day**	**µg DFE/day**	**µg/day**	**µg/day**	**µg/day**
0-6 months	-	-	1.7	1.7	-	0.2	0.2	-	65	60	-	0.4	0.4	-
7-12 months	-	-	2.2	1.8	3	0.3	0.4	0.3	80	50	80	0.8	0.5	1.5
1-3 years	-	-	3.5	2	4	0.6	0.6	0.6	120	100	120	0.9	0.7	1.5
4-5 years	-	-	3	3	4	0.7	0.9	0.7	150	150	140	1.2	1.1	1.5
6-9 years	-	-	4	3	4	1	1	1	200	200	200	1.6	1.2	2.5
10-13 years	Male	-	5	4	5	1.2	1.2	1.4	270	250	270	2.2	1.8	3.5
	Female	-	4.5	4	5	1.1	1.1	1.4	270	250	270	2.2	1.8	3.5
14-19 years	Male	-	5	5	5	1.5	1.4	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.2	1.3	1.6	330	300	330	2.4	2	4
20-29 years	Male	-	5	5	5	1.7	1.5	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.3	1.2	1.6	330	300	330	2.4	2	4
30-39 years	Male	-	5	5	5	1.7	1.5	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.3	1.2	1.6	330	300	330	2.4	2	4
40-49 years	Male	-	5	5	5	1.7	1.5	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.3	1.2	1.6	330	300	330	2.4	2	4
50-59 years	Male	-	5	5	5	1.7	1.5	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.3	1.2	1.6	330	300	330	2.4	2	4
60-69 years	Male	-	5	5	5	1.7	1.6	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.5	1.2	1.6	330	300	330	2.4	2	4
>70 years	Male	-	5	5	5	1.7	1.6	1.7	330	300	330	2.4	2	4
	Female	-	5	5	5	1.5	1.2	1.6	330	300	330	2.4	2	4
-	Female	Pregnancy	6	6	5	1.9	1.5	1.8	500	500	600	2.6	2.2	4.5
-	Female	Lactation	7	7	7	2	1.6	1.7	500	400	500	2.8	2.6	5

In these INR, vitamins are expressed in mg/µg per day, although in some cases they correspond to vitamin equivalents, taking in account the available information for their transformation. DFE: dietary folate equivalents. For the combined intakes of folate and folic acid, DFE can be calculated as follows: µg DFE= µg of food folate + (1.7 x µg of folic acid) (EFSA, 2017).

Table 6c. Nutritional Reference Intake for vitamins

Age	Sex	Condition	Biotin			Vitamin C			Vitamin D			Vitamin E (α-Tocopherol)		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
Reference value:			NRI	IDR	AI	NRI	IDR	PRI	NRI	IDR	AI	NRI	IDR	AI
Units:			µg/day	µg/day	µg/day	mg/day	mg/day	mg/day	µg/day	µg/day	µg/day	mg/day	mg/day	mg/day
0-6 months	-	-	5	5	-	35	35	-	10	8.5	-	4	4	-
7-12 months	-	-	6	6	6	30	35	20	10	10	10	5	5	5
1-3 years	-	-	12.5	8	20	30	40	20	10	7.5	15	6	6	9
4-5 years	-	-	15	12	25	30	45	30	10	5	15	7	7	9
6-9 years	-	-	20	12	25	45	45	45	10	5	15	7	7	9
10-13 years	Male	-	25	20	35	60	60	70	10	5	15	11	11	13
	Female	-	25	20	35	60	60	70	10	5	15	11	11	11
14-19 years	Male	-	30	25	35	75	60	100	12.5	5	15	13	15	13
	Female	-	30	25	35	75	60	90	12.5	5	15	11	15	11
20-29 years	Male	-	30	30	40	75	60	110	12.5	5	15	13	15	13
	Female	-	30	30	40	75	60	95	12.5	5	15	11	15	11
30-39 years	Male	-	30	30	40	75	60	110	12.5	5	15	13	15	13
	Female	-	30	30	40	75	60	95	12.5	5	15	11	15	11
40-49 years	Male	-	30	30	40	75	60	110	12.5	5	15	13	15	13
	Female	-	30	30	40	75	60	95	12.5	5	15	11	15	11
50-59 years	Male	-	30	30	40	75	60	110	12.5	5	15	13	15	13
	Female	-	30	30	40	75	60	95	12.5	5	15	11	15	11
60-69 years	Male	-	30	30	40	75	70	110	12.5	7.5	15	13	15	13
	Female	-	30	30	40	75	70	95	12.5	7.5	15	11	15	11
>70 years	Male	-	30	30	40	75	70	110	15	10	15	13	15	13
	Female	-	30	30	40	75	70	95	15	10	15	11	15	11
-	Female	Pregnancy	35	30	40	85	80	105	15	10	15	12	15	11
-	Female	Lactation	35	35	45	120	100	155	15	10	15	15	19	11

Table 6d. Nutritional Reference Intake for vitamins

Age	Sex	Condition	Vitamin K		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
		Reference value:	NRI	IDR	AI
		Units:	µg/day	µg/day	µg/day
0-6 months	-	-	5	2	-
7-12 months	-	-	10	2.5	10
1-3 years	-	-	25	30	12
4-5 years	-	-	35	55	20
6-9 years	-	-	35	55	30
10-13 years	Male	-	45	60	45
	Female	-	45	60	45
14-19 years	Male	-	70	75	65
	Female	-	65	75	65
20-29 years	Male	-	70	120	70
	Female	-	70	90	70
30-39 years	Male	-	70	120	70
	Female	-	70	90	70
40-49 years	Male	-	70	120	70
	Female	-	70	90	70
50-59 years	Male	-	80	120	70
	Female	-	70	90	70
60-69 years	Male	-	80	120	70
	Female	-	90	90	70
>70 years	Male	-	80	120	70
	Female	-	90	90	70
-	Female	Pregnancy	70	90	70
-	Female	Lactation	70	90	70

Table 7a. Nutritional Reference Intake for minerals

Age	Sex	Condition	Calcium			Chloride			Chromium			Copper		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
Reference value:			**NRI**	**IDR**	**PRI / AI**	**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**-**	**NRI**	**IDR**	**AI**
Units:			**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**µg/day**	**µg/day**	**-**	**mg/day**	**mg/day**	**mg/day**
0-6 months	-	-	300	400	-	180	180	-	0.2	0.2	-	0.3	0.3	-
7-12 months	-	-	400	525	280	450	570	300	5.5	5.5	-	0.3	0.3	0.4
1-3 years	-	-	600	600	450	1000	1500	1700	11	11	-	0.4	0.4	1
4-5 years	-	-	750	700	800	1400	1900	2000	15	15	-	0.7	0.6	1
6-9 years	-	-	800	800	800	1900	1900	2600	15	15	-	0.7	0.7	1
10-13 years	Male	-	1150	1100	1150	2300	2300	3100	25	17	-	1	1	1.3
	Female	-	1100	1100	1150	2300	2300	3100	21	13	-	1	1	1.1
14-19 years	Male	-	1150	1000	1150	2300	2300	3100	35	35	-	1.3	1	1.3
	Female	-	1150	1000	1150	2300	2300	3100	24	24	-	1	1	1.3
20-29 years	Male	-	950	900	950	2300	2300	3100	35	35	-	1.3	1.1	1.6
	Female	-	950	900	950	2300	2300	3100	25	25	-	1.1	1.1	1.3
30-39 years	Male	-	950	900	950	2300	2300	3100	35	35	-	1.3	1.1	1.6
	Female	-	950	900	950	2300	2300	3100	25	25	-	1.1	1.1	1.3
40-49 years	Male	-	950	900	950	2300	2300	3100	35	35	-	1.3	1.1	1.6
	Female	-	950	900	950	2300	2300	3100	25	25	-	1.1	1.1	1.3
50-59 years	Male	-	950	900	950	2300	2000	3100	30	30	-	1.3	1.1	1.6
	Female	-	950	900	950	2300	2000	3100	25	20	-	1.1	1.1	1.3
60-69 years	Male	-	1000	1000	950	2300	2000	3100	30	30	-	1.3	1.1	1.6
	Female	-	1000	1000	950	2300	2000	3100	20	20	-	1.2	1.1	1.3
>70 years	Male	-	1000	1000	950	2300	1800	3100	30	30	-	1.3	1.1	1.6
	Female	-	1000	1000	950	2300	1800	3100	20	20	-	1.2	1.1	1.3
-	Female	Pregnancy	1000	1000	975	2300	2300	3100	30	30	-	1.2	1.1	1.5
-	Female	Lactation	1000	1200	975	2300	2300	3100	45	45	-	1.5	1.4	1.5

Table 7b. Nutritional Reference Intake for minerals

Age	Sex	Condition	Fluoride			Phosphorus			Iron			Iodine		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
Reference value:			**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**AI**	**AI**	**IDR**	**PRI**	**NRI**	**IDR**	**AI**
Units:			**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**µg/day**	**µg/day**	**µg/day**
0-6 months	-	-	0.25	0.01	-	120	300	-	4.3	4.3	-	70	60	-
7-12 months	-	-	0.5	0.5	0.4	275	400	160	8	8	11	80	80	70
1-3 years	-	-	0.7	0.7	0.6	460	460	250	8	8	7	90	80	90
4-5 years	-	-	1	1	1	500	500	440	8	8	11	90	90	90
6-9 years	-	-	1.5	1	1.5	600	600	440	10	9	11	110	120	90
10-13 years	Male	-	2	2	2.2	900	900	640	11	12	11	120	135	120
	Female	-	2	2	2.3	900	900	640	15	15	13	120	130	120
14-19 years	Male	-	3.2	3	3.2	800	800	640	11	11	11	150	150	130
	Female	-	3	3	2.8	800	800	640	15	15	13	150	150	130
20-29 years	Male	-	3.8	4	3.4	700	700	550	9.1	9	11	150	150	150
	Female	-	3	3	2.9	700	700	550	18	18	16	150	150	150
30-39 years	Male	-	3.8	4	3.4	700	700	550	9.1	9	11	150	150	150
	Female	-	3	3	2.9	700	700	550	18	18	16	150	150	150
40-49 years	Male	-	3.8	4	3.4	700	700	550	9.1	9	11	150	150	150
	Female	-	3	3	2.9	700	700	550	18	18	16	150	150	150
50-59 years	Male	-	3.8	4	3.4	700	700	550	9.1	9	11	150	150	150
	Female	-	3	3	2.9	700	700	550	15	15	16	150	150	150
60-69 years	Male	-	3.8	4	3.4	700	700	550	9.1	10	11	150	150	150
	Female	-	3	3	2.9	700	700	550	9	10	11	150	150	150
>70 years	Male	-	3.8	4	3.4	700	700	550	9.1	10	11	150	150	150
	Female	-	3	3	2.9	700	700	550	9	10	11	150	150	150
-	Female	Pregnancy	3	3	2.9	800	800	550	27	25	16	200	175	200
-	Female	Lactation	3	3	2.9	800	990	550	15	15	16	200	200	200

Table 7c. Nutritional Reference Intake for minerals

Age	Sex	Condition	Magnesium			Manganese			Molybdenum			Potassium		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
Reference value:			**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**AI**	**NRI**	**IDR**	**AI**
Units:			**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**mg/day**	**µg/day**	**µg/day**	**µg/day**	**mg/day**	**mg/day**	**mg/day**
0-6 months	-	-	40	40	-	0.003	0.003	-	2	2	-	400	650	-
7-12 months	-	-	75	75	80	0.6	0.6	0.3	10	3	10	700	700	750
1-3 years	-	-	85	85	170	1.2	1.2	0.5	17	17	15	1100	800	800
4-5 years	-	-	120	120	230	1.5	1.5	1	22	22	20	1800	1100	1100
6-9 years	-	-	170	170	230	1.5	1.5	1.5	30	22	30	2000	2000	1800
10-13 years	Male	-	280	280	300	2	1.9	2	45	34	45	3100	3100	2700
	Female	-	250	250	250	2	1.6	2	45	34	45	2900	2900	2700
14-19 years	Male	-	350	350	300	3	2.2	3	60	43	65	3500	3100	3500
	Female	-	300	300	250	3	1.6	3	60	43	65	3500	3100	3500
20-29 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	300	300	300	3	1.8	3	65	45	65	3500	3100	3500
30-39 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	300	300	300	3	1.8	3	65	45	65	3500	3100	3500
40-49 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	300	300	300	3	1.8	3	65	45	65	3500	3100	3500
50-59 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	300	300	300	3	1.8	3	65	45	65	3500	3100	3500
60-69 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	280	320	300	3	1.8	3	65	45	65	3500	3100	3500
>70 years	Male	-	350	350	350	3	2.3	3	65	45	65	3500	3100	3500
	Female	-	280	320	300	3	1.8	3	65	45	65	3500	3100	3500
-	Female	Pregnancy	300	360	300	3	2	3	65	50	65	3500	3100	3500
-	Female	Lactation	300	360	300	3	2.6	3	65	50	65	3900	3100	4000

Table 7d. Nutritional Reference Intake for minerals

Age	Sex	Condition	Selenium			Sodium			Zinc		
			Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)	Scientific Committee AESAN (2019)	FESNAD (2010)	EFSA (2017)
		Reference value:	NRI	IDR	AI	NRI	IDR	AI	NRI	IDR	PRI
		Units:	µg/day	µg/day	µg/day	mg/day	mg/day	mg/day	mg/day	mg/day	mg/day
0-6 months	-	-	12	10	-	120	120	-	2.8	3	-
7-12 months	-	-	15	15	15	200	370	200	3	4	2.9
1-3 years	-	-	19	20	15	700	1000	1100	4.1	4	4.3
4-5 years	-	-	22	20	20	900	1200	1300	5.5	6	5.5
6-9 years	-	-	30	25	35	1200	1200	1700	6.5	6.5	7.4
10-13 years	Male	-	45	35	55	1500	1500	2000	9	8	7.4
	Female	-	45	35	55	1500	1500	2000	8	8	7.4
14-19 years	Male	-	60	50	70	1500	1500	2000	11	11	10.7
	Female	-	60	45	70	1500	1500	2000	9	8	10.7
20-29 years	Male	-	70	55	70	1500	1500	2000	11	9.5	11.7
	Female	-	55	55	70	1500	1500	2000	8	7	9.3
30-39 years	Male	-	70	55	70	1500	1500	2000	11	9.5	11.7
	Female	-	55	55	70	1500	1500	2000	8	7	9.3
40-49 years	Male	-	70	55	70	1500	1500	2000	11	9.5	11.7
	Female	-	55	55	70	1500	1500	2000	8	7	9.3
50-59 years	Male	-	70	55	70	1500	1300	2000	11	9.5	11.7
	Female	-	55	55	70	1500	1300	2000	8	7	9.3
60-69 years	Male	-	70	55	70	1500	1300	2000	11	10	11.7
	Female	-	55	55	70	1500	1300	2000	8	7	9.3
>70 years	Male	-	60	55	70	1500	1200	2000	11	10	11.7
	Female	-	55	55	70	1500	1200	2000	7	7	9.3
-	Female	Pregnancy	60	55	70	1500	1500	2000	10	10	10.9
-	Female	Lactation	70	70	85	1500	1500	2000	12	12	12.2