Overview on Dietary Reference Values for the EU population as derived by the EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA)

The term Dietary Reference Value (DRV) is an umbrella term for the complete set of nutrient reference values which include concepts like the Population Reference Intakes, the Average Requirement, Adequate Intakes and Reference Intake ranges for macronutrients (EFSA NDA Panel, 2011). The latter indicate the amount of an individual nutrient that people need for good health depending on their age and gender.

In its opinions, EFSA used four types of DRVs:

- The **Population Reference Intake (PRI)**, which is the level of (nutrient) intake that is adequate for virtually all people in a population group. On the assumption that the individual requirements for a nutrient are normally distributed within a population and the inter-individual variation is known, the PRI is calculated on the basis of the AR plus twice its standard deviation (SD). This will meet the requirements of 97.5% of the individuals in the population.

- The **Average Requirement (AR),** which is the level of (nutrient) intake estimated to satisfy the physiological requirement or metabolic demand, as defined by the specified criterion for adequacy for that nutrient, in half of the people in a population group, given a normal distribution of requirement.

- The **Adequate Intake (AI),** which is the value estimated when a PRI cannot be established because an AR cannot be determined. An Adequate Intake is the average observed or experimentally determined approximations or estimates of nutrient intake by a population group (or groups) of apparently healthy people that is assumed to be adequate. The practical implication of an AI is similar to that of a PRI, i.e. describe the level of intake that is considered adequate for health reasons. The terminological distinction relates to the different way in which these values are derived and to the resultant difference in the "firmness" of the value.

- The **Reference Intake range (RI),** which is the intake range for macronutrients, expressed as % of the energy intake. These apply to ranges of intakes that are adequate for maintaining health and associated with a low risk of selected chronic diseases.

The work done by EFSA in this area was based on a request from the European Commission, which asked EFSA to update previous European advice (SCF, 1993), taking into account new scientific evidence and recent recommendations issued at national and international level.

This document provides an overview about the outcome of EFSA's scientific deliberations. The detailed reasoning for establishing individual values can be found in the related opinions of the NDA Panel. Links to the respective documents are included in Table 7 of this document.

Table 1: Summary of Average Requirements (AR) for **energy** and Population Reference Intakes (PRIs) for **protein**

Age	Energy										Protein	
	AR (MJ/day)		AR [(a)] at PAL=1.4 (MJ/day)		AR [(a)] at PAL=1.6 (MJ/day)		AR [(a)] at PAL=1.8 (MJ/day)		AR [(a)] at PAL=2.0 (MJ/day)		PRI (g/day)	
	M	F	M	F	M	F	M	F	M	F	M	F
0.5 y											10	9
7 mo	2.7	2.4										
8 mo	2.8	2.5										
9 mo	2.9	2.6										
10 mo	3.0	2.7										
11 mo	3.1	2.8										
1 y			3.3	3.0							12	11
1.5 y											12	11
2 y			4.3	4.0							12	12
3 y			4.9	4.6							13	13
4 y			5.3	4.9	6.0	5.6	6.8	6.3			15	14
5 y			5.6	5.2	6.4	5.9	7.2	6.7			16	16
6 y			5.9	5.5	6.7	6.3	7.6	7.1			19	19
7 y			6.3	5.8	7.2	6.7	8.1	7.5			22	22
8 y			6.7	6.2	7.6	7.1	8.6	7.9			25	25
9 y			7.0	6.6	8.1	7.5	9.1	8.4			28	28
10 y					8.1	7.6	9.1	8.6	10.1	9.5	31	31
11 y					8.5	8.0	9.6	9.0	10.7	10.0	34	34
12 y					9.1	8.4	10.2	9.4	11.4	10.5	37	38
13 y					9.8	8.8	11.0	9.9	12.2	11.0	42	42
14 y					10.5	9.1	11.8	10.2	13.1	11.4	47	45
15 y					11.3	9.3	12.7	10.5	14.1	11.7	52	46
16 y					11.9	9.5	13.4	10.6	14.9	11.8	56	47
17 y					12.3	9.5	13.8	10.7	15.4	11.9	58	48
18-29 y			9.8	7.9	11.2	9.0	12.6	10.1	14.0	11.2	62	52
30-39 y			9.5	7.6	10.8	8.7	12.2	9.8	13.5	10.8	62	52
40-49 y			9.3	7.5	10.7	8.6	12.0	9.7	13.4	10.7	62	52
50-59 y			9.2	7.5	10.5	8.5	11.9	9.6	13.2	10.7	62	52
60-69 y			8.4	6.8	9.6	7.8	10.9	8.8	12.1	9.7	61	55
70-79 y			8.3	6.8	9.5	7.7	10.7	8.7	11.9	9.6	61	55
Pregnancy												
1st trimester	+ 0.29[(a)]										+1[(a)]	
2nd trimester	+ 1.1[(a)]										+9[(a)]	
3rd trimester	+ 2.1[(a)]										+28[(a)]	
Lactation												
0-6 mo *post partum*	+ 2.1[(a)]										+19[(a)]	
>6 mo *post-partum*	not given										+13[(a)]	

F, female; M, male; mo, months; PAL, physical activity level; y, years

[(a)] in addition to the AR (energy)/PRI (protein) for non-pregnant women

Table 2: Summary of Reference Intake Ranges (RI) for **total fat** and **carbohydrates** and Adequate Intakes (AIs) for **fatty acids**, **dietary fibre** and **water**

Age group (years)	Total fat (E%)[a]	SFA	LA (E%)[b]	ALA (E%)[b]	EPA+DHA (mg/d)[b]	DHA (mg/d)[b]	TFA	Age group (years)	Total carbohydrates (E%)[a]	Dietary fibre (g/d)[b]	Age group (years)	Water (l/d)[b], [c]	
												M	F
7-11 mo[d]	40[b]	ALAP	4	0.5		100	ALAP				6-12 mo	0.8-1.0	
1	35-40	ALAP	4	0.5		100	ALAP	1-3	45-60	10	1	1.1-1.2	
2-3	35-40	ALAP	4	0.5	250		ALAP				2-3	1.3	
4-17	20-35	ALAP	4	0.5	250			4-6	45-60	14	4-8	1.6	
								7-10	45-60	16	9-13	2.1	1.9
								11-14	45-60	19	14-17	2.5	2.0
								15-17	45-60	21			
≥ 18	20-35	ALAP	4	0.5	250		ALAP	≥ 18	45-60	25	≥ 18	2.5	2.0
Pregnancy													
	20-35	ALAP	4	0.5	250	+100-200[e]	ALAP						2.3
Lactation													
	20-35	ALAP	4	0.5	250	+100-200[e]	ALAP						2.7

ALA; α-linolenic acid; ALAP, as low as possible; d, day; DHA, docosahexaenoic acid; E% percentage of energy intake; EPA, eicosapentaenoic acid; F, female; LA, linoleic acid; M, male; mo, months, SFA, saturated fatty acids; TFA, trans-fatty acids

[a] RI
[b] AI
[c] includes water from beverages of all kind, including drinking and mineral water, and from food moisture
[d] i.e. the second half of the first year of life (from the beginning of the 7th month to the 1st birthday)
[e] in addition to combined intakes of EPA and DHA of 250 mg/day

Table 3: Population Reference Intakes (PRIs) and Adequate Intakes (AIs) for **minerals**[1,2] **- MALES**

Age group (years)	Calcium (mg/d)	Age group (years)	Fluoride (mg/d)	Iodine (µg/d)	Manganese (mg/d)	Molybdenum (µg/d)	Phosphorus (mg/d)	Potassium (mg/d)	Selenium (µg/d)	Age group (years)	Iron (mg/d)	Age group (years)	Copper (mg/d)	Magnesium (mg/d)	Age group (years)	Zinc (mg/d)	
																LPI (mg/d)	
7–11 mo[a]	280	7–11 mo[a]	0.4	70	0.02–0.5[b]	10	160	750	15	7–11 mo[a]	**11**	7–11 mo[a]	0.4	80	7–11 mo[a]	[c]	**2.9**
1–3	**450**	1–3	0.6	90	0.5	15	250	800	15	1–6	**7**	1–2	0.7	170	1–3	[c]	**4.3**
4–10	**800**	4–6	1.0	90	1.0	20	440	1,100	20			3–9	1.0	230	4–6	[c]	**5.5**
		7–10	1.5	90	1.5	30	440	1,800	35	7–11	**11**	10–17	1.3	300	7–10	[c]	**7.4**
11–17	**1150**	11–14	2.2	120	2.0	45	640	2,700	55						11–14	[c]	**10.7**
		15–17	3.2	130	3.0	65	640	3,500	70	12–17	**11**				15–17	[c]	**14.2**
18–24	**1000**	≥ 18	3.4	150	3.0	65	550	3,500	70	≥ 18	**11**	≥ 18	1.6	350	≥ 18	300	**9.4**
≥ 25	**950**															600	**11.7**
																900	**14.0**
																1,200	**16.3**

d, day; LPI, level of phytate intake; mo, months

PRIs are presented **in bold type** and AIs in ordinary type

[a] i.e. the second half of the first year of life (from the beginning of the 7th month to the 1st birthday)
[b] In view of the wide range of manganese intakes that appear to be adequate, a range is set for the AI of this age group
[c] The fractional absorption of zinc considered in setting PRIs for children was based on data from mixed diets expected to contain variable quantities of phytate; therefore, no adjustment for phytate intake has been made

[1] For chromium, setting an AI or a PRI was considered not appropriate
[2] The evaluation for sodium and chloride is ongoing (status: November 2016)

Table 4: Population Reference Intakes (PRIs) and Adequate Intakes (AIs) for **minerals**[3,4] **- FEMALES**

Age group (years)	Calcium (mg/d)	Age group (years)	Fluoride (mg/d)	Iodine (µg/d)	Manganese (mg/d)	Molybdenum (µg/d)	Phosphorus (mg/d)	Potassium (mg/d)	Selenium (µg/d)	Age group (years)	Iron (mg/d)	Age group (years)	Copper (mg/d)	Magnesium (mg/d)	Age group (years)	Zinc (mg/d)	
																LPI (mg/day)	
7–11 mo[a]	280	7–11 mo[a]	0.4	70	0.02–0.5[b]	10	160	750	15	7–11 mo[a]	**11**	7–11 mo[a]	0.4	80	7–11 mo[a]	[c]	**2.9**
1–3	**450**	1–3	0.6	90	0.5	15	250	800	15	1–6	**7**	1–2	0.7	170	1–3	[c]	**4.3**
4–10	**800**	4–6	0.9	90	1.0	20	440	1,100	20			3–9	1.0	230	4–6	[c]	**5.5**
		7–10	1.4	90	1.5	30	440	1,800	35	7–11	**11**	10–17	1.1	250	7–10	[c]	**7.4**
11–17	**1150**	11–14	2.3	120	2.0	45	640	2,700	55						11–14	[c]	**10.7**
		15–17	2.8	130	3.0	65	640	3,500	70	12–17	**13**				15–17	[c]	**11.9**
18–24	**1000**	≥ 18	2.9	150	3.0	65	550	3,500	70	≥ 18		≥ 18	1.3	300	≥ 18	300	**7.5**
≥ 25	**950**															600	**9.3**
										Premenopausal	**16[d]**					900	**11.0**
										Postmenopausal	**11**					1,200	**12.7**
Pregnancy																	
18–24	**1000**		2.9	200	3.0	65	550	3,500	70		**16[d]**		1.5	300			**+1.6[e]**
≥ 25	**950**																
Lactation																	
18–24	**1000**		2.9	200	3.0	65	550	4,000	85		**16[d]**		1.5	300			**+2.9[e]**
≥ 25	**950**																

d, day; LPI, level of phytate intake; mo, months

PRIs are presented **in bold type** and AIs in ordinary type

[a] i.e. the second half of the first year of life (from the beginning of the 7th month to the 1st birthday)
[b] In view of the wide range of manganese intakes that appear to be adequate, a range is set for the AI of this age group

[3] For chromium, setting an AI or a PRI was considered not appropriate
[4] The evaluation for sodium and chloride is ongoing (status: November 2016)

[c] The fractional absorption of zinc considered in setting PRIs for children was based on data from mixed diets expected to contain variable quantities of phytate; therefore, no adjustment for phytate intake has been made
[d] The PRI covers the requirement of approximately 95 % of premenopausal women
[e] In addition to the PRIs for non-pregnant, non-lactating women

Table 5: Population Reference Intakes (PRIs) and Adequate Intakes (AIs) for **vitamins**[5] **- MALES**

Age group (years)	α-Tocopherol (mg/d)	Age group (years)	Biotin (µg/d)	Choline (mg/d)	Folate (µg DFE/d) [(a)]	Niacin (mg NE/MJ) [(b)]	Pantothenic acid (mg/d)	Thiamin (mg/MJ)	Vitamin A (µg RE/d) [(c)]	Vitamin B6 (mg/d)	Vitamin B_{12} (µg/d)	Vitamin C (mg/d)	Vitamin D (µg/d)
7–11 mo[(d)]	5	7–11 mo[(d)]	6	160	80	**1.6**	3	**0.1**	**250**	0.3	1.5	**20**	10
1–2	6	1–3	20	140	**120**	**1.6**	4	**0.1**	**250**	**0.6**	1.5	**20**	15[(e)]
3–9	9	4–6	25	170	**140**	**1.6**	4	**0.1**	**300**	**0.7**	1.5	**30**	15[(e)]
		7–10	25	250	**200**	**1.6**	4	**0.1**	**400**	**1.0**	2.5	**45**	15[(e)]
10–17	13	11–14	35	340	**270**	**1.6**	5	**0.1**	**600**	**1.4**	3.5	**70**	15[(e)]
		15–17	35	400	**330**	**1.6**	5	**0.1**	**750**	**1.7**	4.0	**100**	15[(e)]
≥ 18	13	≥ 18	40	400	**330**	**1.6**	5	**0.1**	**750**	**1.7**	4.0	**110**	15[(e)]

d, day; mo, months

PRIs are presented **in bold type** and AIs in ordinary type

[(a)] DFE: dietary folate equivalents. For combined intakes of food folate and folic acid, DFEs can be computed as follows: µg DFE = µg food folate + (1.7 x µg folic acid)
[(b)] NE: niacin equivalent (1 mg niacin = 1 niacin equivalent = 60 mg dietary tryptophan)
[(c)] RE: retinol equivalent, 1 µg RE equals 1 µg of retinol, 6 µg of β-carotene and 12 µg of other provitamin A carotenoids
[(d)] i.e. the second half of the first year of life (from the beginning of the 7th month to the 1st birthday)
[(e)] Under conditions of assumed minimal cutaneous vitamin D synthesis. In the presence of endogenous cutaneous vitamin D synthesis, the requirement for dietary vitamin D is lower or may be even zero

[5] The evaluation for riboflavin and vitamin K is ongoing (status: November 2016)

Table 6: Population Reference Intakes (PRIs) and Adequate Intakes (AIs) for **vitamins[6] – FEMALES**

Age group (years)	α-Tocopherol (mg/d)	Age group (years)	Biotin (µg/d)	Choline (mg/d)	Folate (µg DFE/d) [(a)]	Niacin (mg NE/MJ) [(b)]	Pantothenic acid (mg/d)	Thiamin (mg/MJ)	Vitamin A (µg RE/d) [(c)]	Vitamin B6 (mg/d)	Vitamin B_{12} (µg/d)	Vitamin C (mg/d)	Vitamin D (µg/d)
7–11 mo[(d)]	5	7–11 mo[(d)]	6	160	80	**1.6**	3	**0.1**	**250**	0.3	1.5	**20**	10
1–2	6	1–3	20	140	**120**	**1.6**	4	**0.1**	**250**	**0.6**	1.5	**20**	15[(e)]
3–9	9	4–6	25	170	**140**	**1.6**	4	**0.1**	**300**	**0.7**	1.5	**30**	15[(e)]
		7–10	25	250	**200**	**1.6**	4	**0.1**	**400**	**1.0**	2.5	**45**	15[(e)]
10–17	11	11–14	35	340	**270**	**1.6**	5	**0.1**	**600**	**1.4**	3.5	**70**	15[(e)]
		15–17	35	400	**330**	**1.6**	5	**0.1**	**650**	**1.6**	4.0	**90**	15[(e)]
≥ 18	11	≥ 18	40	400	**330**	**1.6**	5	**0.1**	**650**	**1.6**	4.0	**95**	15[(e)]
Pregnancy													
	11		40	480	600	**1.6**	5	**0.1**	**700**	**1.8**	4.5	**105**	15[(e)]
Lactation													
	11		45	520	**500**	**1.6**	7	**0.1**	**1300**	**1.7**	5.0	**155**	15[(e)]

d, day; mo, months

PRIs are presented **in bold type** and AIs in ordinary type

[(a)] DFE: dietary folate equivalents. For combined intakes of food folate and folic acid, DFEs can be computed as follows: µg DFE = µg food folate + (1.7 x µg folic acid)
[(b)] NE: niacin equivalent (1 mg niacin = 1 niacin equivalent = 60 mg dietary tryptophan)
[(c)] RE: retinol equivalent, 1 µg RE equals 1 µg of retinol, 6 µg of β-carotene and 12 µg of other provitamin A carotenoids
[(d)] i.e. the second half of the first year of life (from the beginning of the 7th month to the 1st birthday)
[(e)] Under conditions of assumed minimal cutaneous vitamin D synthesis. In the presence of endogenous cutaneous vitamin D synthesis, the requirement for dietary vitamin D is lower or may be even zero

[6] The evaluation for riboflavin and vitamin K is ongoing (status: November 2016)

Table 7: Links to Scientific Opinions on dietary reference values

General principles	Energy, macronutrients and water
http://www.efsa.europa.eu/en/efsajournal/pub/1458	Energy: http://www.efsa.europa.eu/en/efsajournal/pub/3005 Fats: http://www.efsa.europa.eu/en/efsajournal/pub/1461 Carbohydrates and dietary fibre: http://www.efsa.europa.eu/en/efsajournal/pub/1462 Protein: http://www.efsa.europa.eu/en/efsajournal/pub/2557 Water: http://www.efsa.europa.eu/en/efsajournal/pub/1458
Vitamins	**Minerals**
Alpha-tocopherol: http://www.efsa.europa.eu/en/efsajournal/pub/4149.htm Choline: https://www.efsa.europa.eu/en/efsajournal/pub/4484.htm Biotin: http://www.efsa.europa.eu/en/efsajournal/pub/3580.htm Folate: http://www.efsa.europa.eu/en/efsajournal/pub/3893.htm Niacin: http://www.efsa.europa.eu/en/efsajournal/pub/3759.htm Pantothenic acid: http://www.efsa.europa.eu/en/efsajournal/pub/3581.htm Thiamin: https://www.efsa.europa.eu/en/efsajournal/pub/4653.htm Vitamin A: http://www.efsa.europa.eu/en/efsajournal/pub/4028.htm Vitamin B6: https://www.efsa.europa.eu/en/efsajournal/pub/4485.htm Vitamin B_{12}: http://www.efsa.europa.eu/en/efsajournal/pub/4150.htm Vitamin C: http://www.efsa.europa.eu/en/efsajournal/pub/3418.htm Vitamin D: http://www.efsa.europa.eu/en/efsajournal/pub/4547.htm	Calcium: http://www.efsa.europa.eu/en/efsajournal/pub/4101.htm Chromium: http://www.efsa.europa.eu/en/efsajournal/pub/3845.htm Copper: http://www.efsa.europa.eu/en/efsajournal/pub/4253 Fluoride: http://www.efsa.europa.eu/en/efsajournal/pub/3332.htm Iodine: http://www.efsa.europa.eu/en/efsajournal/pub/3660.htm Iron: http://www.efsa.europa.eu/it/efsajournal/pub/4254 Magnesium: http://www.efsa.europa.eu/it/efsajournal/pub/4186.htm Manganese: http://www.efsa.europa.eu/en/efsajournal/pub/3419.htm Molybdenum: http://www.efsa.europa.eu/en/efsajournal/pub/3333.htm Phosphorus: http://www.efsa.europa.eu/en/efsajournal/pub/4185.htm Potassium: https://www.efsa.europa.eu/en/efsajournal/pub/4592.htm Selenium: http://www.efsa.europa.eu/en/efsajournal/pub/3846.htm Zinc: http://www.efsa.europa.eu/en/efsajournal/pub/3844.htm

References

EFSA Panel on Dietetic Products, Nutrition, and Allergies (NDA), 2010. Scientific Opinion on principles for deriving and applying Dietary Reference Values. EFSA Journal 2010; 8(3):1458, 30 pp. doi:10.2903/j.efsa.2010.1458

SCF (Scientific Committee for Food), 1993. Nutrient and energy intakes for the European Community. Reports of the Scientific Committee for Food, 31st Series. Food - Science and Technique, European Commission, Luxembourg, 248 pp.