Dietary Reference Intakes
Definitions

Estimated Average Requirement (EAR)

- The EAR is the median daily intake value that is estimated to meet the requirement of half the healthy individuals in a life-stage and gender group. At this level of intake, the other half of the individuals in the specified group would not have their needs met.
- The EAR is based on a specific criterion of adequacy, derived from a careful review of the literature. Reduction of disease risk is considered along with many other health parameters in the selection of that criterion.
- The EAR is used to calculate the RDA. It is also used to assess the adequacy of nutrient intakes, and can be used to plan the intake of groups.

Recommended Dietary Allowance (RDA)

- The RDA is the average daily dietary intake level that is sufficient to meet the nutrient requirement of nearly all (97 to 98 percent) healthy individuals in a particular life-stage and gender group.
- The RDA is the goal for usual intake by an individual.

Adequate Intake (AI)

- If sufficient scientific evidence is not available to establish an EAR on which to base an RDA, an AI is derived instead.
- The AI is the recommended average daily nutrient intake level based on observed or experimentally determined approximations or estimates of nutrient intake by a group (or groups) of apparently healthy people who are assumed to be maintaining an adequate nutritional state.
- The AI is expected to meet or exceed the needs of most individuals in a specific life-stage and gender group.
- When an RDA is not available for a nutrient, the AI can be used as the goal for usual intake by an individual. The AI is not equivalent to an RDA.

Tolerable Upper Intake Level (UL)

- The UL is the highest average daily nutrient intake level likely to pose no risk of adverse health effects to almost all individuals in a given life-stage and gender group.
- The UL is not a recommended level of intake
- As intake increases above the UL, the potential risk of adverse effects increases.

Estimated Energy Requirement (EER)

- An EER is defined as the average dietary energy intake that is predicted to maintain energy balance in healthy, normal weight individuals of a defined age, gender, weight, height, and level of physical activity consistent with good health. In children and pregnant and lactating women, the EER includes the needs associated with growth or secretion of milk at rates consistent with good health.
- Relative body weight (i.e. loss, stable, gain) is the preferred indicator of energy adequacy.

Acceptable Macronutrient Distribution Range (AMDR)

- The AMDR is a range of intake for a particular energy source (protein, fat, or carbohydrate), expressed as a percentage of total energy (kcal), that is associated with reduced risk of chronic disease while providing adequate intakes of essential nutrients.

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Dietary Reference Intakes
Definitions

Total Fibre

- The sum of Dietary Fibre and Functional Fibre.

Dietary Fibre

- Non-digestible carbohydrates and lignin that are intrinsic and intact in plants.
- Dietary fibre includes plant non-starch polysaccharides (e.g. cellulose, pectin, gums, hemicellulose, β-glucans, and fibres contained in oat and wheat bran), plant carbohydrates that are not recovered by alcohol precipitation (e.g. inulin, oligosaccharides, and fructans), lignin, and some resistant starch.

Functional Fibre

- Isolated non-digestible carbohydrates that have been shown to have beneficial physiological effects in humans.
- Functional fibre includes isolated non-digestible plant (e.g. resistant starch, pectin, and gums), animal (e.g. chitin and chitosan), or commercially produced (e.g. resistant starch, polydextrose, polyols, inulin, and indigestible dextrins) carbohydrate.

Physical Activity Level (PAL)

- The ratio of total energy expenditure to basal energy expenditure.
- The Physical Activity Level categories were defined as sedentary (PAL 1.0-1.39), low active (PAL 1.4-1.59), active (PAL 1.6-1.89), and very active (PAL 1.9-2.5).
- Physical Activity Level should not be confused with the physical activity coefficients (PA values) used in the equations to estimate energy requirement.

Vitamin E

- The requirement for vitamin E is based on the *2R*-stereoisomeric forms of alpha-tocopherol only. This includes *RRR*-alpha-tocopherol, which occurs naturally in foods, and the *2R*-stereoisomeric forms (*RRR*- , *RSR*- , *RRS*- , and *RSS*- forms) that occur in supplements and fortified foods (*all racemic* alpha-tocopherol). Other forms of vitamin E do not contribute toward meeting the requirement.
- Previously, vitamin E activity was reported in alpha-tocopherol equivalents (αTE), which included all forms of vitamin E. Alpha-tocopherol equivalents should be converted to milligrams of alpha-tocopherol.
- The UL for vitamin E applies to any isomeric form of supplemental alpha-tocopherol.

REFERENCES:

- *Dietary Reference Intakes for Calcium, Phosphorus, Magnesium, Vitamin D, and Fluoride* (1997);
- *Dietary Reference Intakes for Thiamin, Riboflavin, Niacin, Vitamin B6, Folate, Vitamin B12, Pantothenic Acid, Biotin, and Choline* (1998);
- *Dietary Reference Intakes for Vitamin C, Vitamin E, Selenium, and Carotenoids* (2000);
- *Dietary Reference Intakes for Vitamin A, Vitamin K, Arsenic, Boron, Chromium, Copper, Iodine, Iron, Manganese, Molybdenum, Nickel, Silicon, Vanadium, and Zinc* (2001);
- *Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acids* (2002);
- *Dietary Reference Intakes for Water, Potassium, Chloride, and Sulfate* (2004).

Available at www.nap.edu

Dietary Reference Intakes
Abbreviations and Reference Heights and Weights

Abbreviations

See definitions and conversion factors for further details.

AI	Adequate Intake
AMDR	Acceptable Macronutrient Distribution Range
DFE	Dietary Folate Equivalent
EAR	Estimated Average Requirement
EER	Estimated Energy Requirement
g	gram
IU	International Unit
kcal	kilocalorie
kg	kilogram
m	metre
mg	milligram
N/A	Not Applicable
ND	Not Determinable
NE	Niacin Equivalent
PA	Physical Activity Coefficient
PAL	Physical Activity Level
RAE	Retinol Activity Equivalent
RDA	Recommended Dietary Allowance
RE	Retinol Equivalent
UL	Tolerable Upper Intake Level
µg	microgram
y	year

Reference Heights and Weights

	Reference Height (m)	Reference Weight (kg)	Reference Height (inches)	Reference Weight (pounds)
Infants				
2-6 mo	0.62	6	24	13
7-12 mo	0.71	9	28	20
Children				
1-3 y	0.86	12	34	27
4-8 y	1.15	20	45	44
Males				
9-13 y	1.44	36	57	79
14-18 y	1.74	61	68	134
19-30 y	1.77	70	70	154
Females				
9-13 y	1.44	37	57	81
14-18 y	1.63	54	64	119
19-30 y	1.63	57	64	126

Calculated from median height and median body mass index for ages 4 through 19 years from CDC/NCHS growth charts (http://www.cdc.gov/nchs/about/major/nhanes/growthcharts/clinical_charts.htm).

Since there is no evidence that weight should change with ageing if activity is maintained, the reference weights for adults 19-30 years of age apply to all adult age groups.

Dietary Reference Intakes
Unit Conversion Factors

Vitamin A	1 RAE = 1 µg retinol = 3.33 IU retinol For preformed vitamin A, 1 RE = 1 RAE.
Carotenoids	1 RAE = 12 µg beta-carotene 1 RAE = 24 µg alpha-carotene 1 RAE = 24 µg beta-cryptoxanthin To calculate RAE from RE of provitamin A carotenoids in foods, divide RE by 2.
Vitamin D	1 µg = 40 IU
Vitamin E	1 mg alpha-tocopherol = 1.25 mg alpha-tocopherol equivalents (αTE) 1 mg alpha-tocopherol = 1.49 IU *d*-alpha-tocopherol (natural, *RRR* form) 1 mg alpha-tocopherol = 2.22 IU *dl*-alpha-tocopherol (synthetic, *all racemic* form)
Folate	1 DFE = 1 µg food folate 1 DFE = 0.6 µg folic acid from fortified food or from a supplement consumed with food 1 DFE = 0.5 µg folic acid from a supplement taken on an empty stomach
Niacin	1 NE = 1 mg niacin 1 NE = 60 mg tryptophan
Sodium	1 g sodium = 2.53 g salt
Height	1 inch = 0.0254 m
Weight	1 pound = 0.454 kg
Metric Units	1000 µg = 1 mg 1000 mg = 1 g 1000 g = 1 kg
Energy yield of macronutrients	Carbohydrate = 4 kcal /g Protein = 4 kcal /g Fat = 9 kcal /g Alcohol = 7 kcal /g

Dietary Reference Intakes
Equations to estimate energy requirement

Infants and young children Estimated Energy Requirement (kcal/day) = Total Energy Expenditure + Energy Deposition	
0-3 months	EER = (89 × weight [kg] –100) + 175
4-6 months	EER = (89 × weight [kg] –100) + 56
7-12 months	EER = (89 × weight [kg] –100) + 22
13-35 months	EER = (89 × weight [kg] –100) + 20
Children and Adolescents 3-18 years Estimated Energy Requirement (kcal/day) = Total Energy Expenditure + Energy Deposition	
Boys	
3-8 years	EER = 88.5 – 61.9 × age [y] + PA× (26.7 × weight [kg] + 903 × height [m]) + 20
9-18 years	EER = 88.5 – 61.9 × age [y] + PA× (26.7 × weight [kg] + 903 × height [m]) + 25
Girls	
3-8 years	EER = 135.3 – 30.8 × age [y] + PA× (10.0 × weight [kg] + 934 × height [m]) + 20
9-18 years	EER = 135.3 – 30.8 × age [y] + PA× (10.0 × weight [kg] + 934 × height [m]) + 25
Adults 19 years and older Estimated Energy Requirement (kcal/day) = Total Energy Expenditure	
Men	EER = 662 – 9.53 × age [y] + PA× (15.91 × weight [kg] + 539.6 × height [m])
Women	EER = 354 – 6.91 × age [y] + PA× (9.36 × weight [kg] + 726 × height [m])
Pregnancy Estimated Energy Requirement (kcal/day) = Non-pregnant EER + Pregnancy Energy Deposition	
1st trimester	EER = Non-pregnant EER + 0
2nd trimester	EER = Non-pregnant EER + 340
3rd trimester	EER = Non-pregnant EER + 452
Lactation Estimated Energy Requirement (kcal/day) = Non-pregnant EER + Milk Energy Output – Weight Loss	
0-6 months postpartum	EER = Non-pregnant EER + 500 – 170
7-12 months postpartum	EER = Non-pregnant EER + 400 – 0

These equations provide an estimate of energy requirement. Relative body weight (i.e. loss, stable, gain) is the preferred indicator of energy adequacy.

Physical Activity Coefficients (PA values) for use in EER equations

	Sedentary (PAL 1.0-1.39)	**Low Active** (PAL 1.4-1.59)	**Active** (PAL 1.6-1.89)	**Very Active** (PAL 1.9-2.5)
	Typical daily living activities (e.g., household tasks, walking to the bus)	Typical daily living activities PLUS 30 - 60 minutes of daily moderate activity (ex. walking at 5-7 km/h)	Typical daily living activities PLUS At least 60 minutes of daily moderate activity	Typical daily living activities PLUS At least 60 minutes of daily moderate activity PLUS An additional 60 minutes of vigorous activity or 120 minutes of moderate activity
Boys 3 - 18 y	1.00	1.13	1.26	1.42
Girls 3 - 18 y	1.00	1.16	1.31	1.56
Men 19 y +	1.00	1.11	1.25	1.48
Women 19 y +	1.00	1.12	1.27	1.45

Dietary Reference Intakes
Reference Values for Vitamins

	Vitamin A [1, 2]						Vitamin D				Vitamin E [5]			Vitamin K	
Unit	µg/day (RAE)			IU/day (RAE)			µg/day		IU/day		mg/day			µg/day	
	EAR	RDA/AI	UL [3]	EAR	RDA/AI	UL [3]	AI [4]	UL	AI [4]	UL	EAR	RDA/AI	UL [6]	AI	UL [7]
Infants															
0-6 mo	*ND*	400*	600	*ND*	1333*	2000	5*	25	200*	1000	*ND*	4*	ND	2.0*	ND
7-12 mo	*ND*	500*	600	*ND*	1667*	2000	5*	25	200*	1000	*ND*	5*	ND	2.5*	ND
Children															
1-3 y	*210*	**300**	600	*700*	**1000**	2000	5*	50	200*	2000	*5*	**6**	200	30*	ND
4-8 y	*275*	**400**	900	*917*	**1333**	3000	5*	50	200*	2000	*6*	**7**	300	55*	ND
Males															
9-13 y	*445*	**600**	1700	*1483*	**2000**	5667	5*	50	200*	2000	*9*	**11**	600	60*	ND
14-18 y	*630*	**900**	2800	*2100*	**3000**	9333	5*	50	200*	2000	*12*	**15**	800	75*	ND
19-30 y	*625*	**900**	3000	*2083*	**3000**	10000	5*	50	200*	2000	*12*	**15**	1000	120*	ND
31-50 y	*625*	**900**	3000	*2083*	**3000**	10000	5*	50	200*	2000	*12*	**15**	1000	120*	ND
51-70 y	*625*	**900**	3000	*2083*	**3000**	10000	10*	50	400*	2000	*12*	**15**	1000	120*	ND
>70 y	*625*	**900**	3000	*2083*	**3000**	10000	15*	50	600*	2000	*12*	**15**	1000	120*	ND
Females															
9-13 y	*420*	**600**	1700	*1400*	**2000**	5667	5*	50	200*	2000	*9*	**11**	600	60*	ND
14-18 y	*485*	**700**	2800	*1617*	**2333**	9333	5*	50	200*	2000	*12*	**15**	800	75*	ND
19-30 y	*500*	**700**	3000	*1667*	**2333**	10000	5*	50	200*	2000	*12*	**15**	1000	90*	ND
31-50 y	*500*	**700**	3000	*1667*	**2333**	10000	5*	50	200*	2000	*12*	**15**	1000	90*	ND
51-70 y	*500*	**700**	3000	*1667*	**2333**	10000	10*	50	400*	2000	*12*	**15**	1000	90*	ND
>70 y	*500*	**700**	3000	*1667*	**2333**	10000	15*	50	600*	2000	*12*	**15**	1000	90*	ND
Pregnancy															
≤ 18 y	*530*	**750**	2800	*1767*	**2500**	9333	5*	50	200*	2000	*12*	**15**	800	75*	ND
19-30 y	*550*	**770**	3000	*1833*	**2567**	10000	5*	50	200*	2000	*12*	**15**	1000	90*	ND
31-50 y	*550*	**770**	3000	*1833*	**2567**	10000	5*	50	200*	2000	*12*	**15**	1000	90*	ND
Lactation															
≤ 18 y	*880*	**1200**	1800	*2933*	**4000**	6000	5*	50	200*	2000	*16*	**19**	800	75*	ND
19-30 y	*900*	**1300**	2000	*3000*	**4333**	6667	5*	50	200*	2000	*16*	**19**	1000	90*	ND
31-50 y	*900*	**1300**	2000	*3000*	**4333**	6667	5*	50	200*	2000	*16*	**19**	1000	90*	ND

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[1] As Retinol Activity Equivalents (RAE). See conversion factors for more details.
[2] No DRIs are established for beta-carotene or other carotenoids. However, existing recommendations for consumption of carotenoid-rich fruits and vegetables are supported.
[3] UL as preformed vitamin A only. Beta-carotene supplements are advised only to serve as a provitamin A source for individuals at risk of vitamin A deficiency.
[4] AI values are based on the absence of adequate exposure to sunlight.
[5] EAR and RDA/AI as alpha-tocopherol (*2R*-stereoisomeric forms) only. See conversion factors for more details.
[6] The UL for vitamin E applies only to synthetic vitamin E (all isomeric forms) obtained from supplements, fortified foods, or a combination of the two.
[7] Due to lack of suitable data, a UL could not be established for vitamin K. This does not mean that there is no potential for adverse effects resulting from high intakes.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Vitamins

	Vitamin C [8]			Thiamin			Riboflavin			Niacin [10]			Vitamin B6		
Unit	mg/day			mg/day			mg/day			mg/day (NE)			mg/day		
	EAR	RDA/AI	UL	EAR	RDA/AI	UL [9]	EAR	RDA/AI	UL [9]	EAR	RDA/AI	UL [11]	EAR	RDA/AI	UL
Infants															
0-6 mo	*ND*	40*	ND	*ND*	0.2*	ND	*ND*	0.3*	ND	*ND*	2* [a]	ND	*ND*	0.1*	ND
7-12 mo	*ND*	50*	ND	*ND*	0.3*	ND	*ND*	0.4*	ND	*ND*	4*	ND	*ND*	0.3*	ND
Children															
1-3 y	*13*	**15**	400	*0.4*	**0.5**	ND	*0.4*	**0.5**	ND	*5*	**6**	10	*0.4*	**0.5**	30
4-8 y	*22*	**25**	650	*0.5*	**0.6**	ND	*0.5*	**0.6**	ND	*6*	**8**	15	*0.5*	**0.6**	40
Males															
9-13 y	*39*	**45**	1200	*0.7*	**0.9**	ND	*0.8*	**0.9**	ND	*9*	**12**	20	*0.8*	**1.0**	60
14-18 y	*63*	**75**	1800	*1.0*	**1.2**	ND	*1.1*	**1.3**	ND	*12*	**16**	30	*1.1*	**1.3**	80
19-30 y	*75*	**90**	2000	*1.0*	**1.2**	ND	*1.1*	**1.3**	ND	*12*	**16**	35	*1.1*	**1.3**	100
31-50 y	*75*	**90**	2000	*1.0*	**1.2**	ND	*1.1*	**1.3**	ND	*12*	**16**	35	*1.1*	**1.3**	100
51-70 y	*75*	**90**	2000	*1.0*	**1.2**	ND	*1.1*	**1.3**	ND	*12*	**16**	35	*1.4*	**1.7**	100
>70 y	*75*	**90**	2000	*1.0*	**1.2**	ND	*1.1*	**1.3**	ND	*12*	**16**	35	*1.4*	**1.7**	100
Females															
9-13 y	*39*	**45**	1200	*0.7*	**0.9**	ND	*0.8*	**0.9**	ND	*9*	**12**	20	*0.8*	**1.0**	60
14-18 y	*56*	**65**	1800	*0.9*	**1.0**	ND	*0.9*	**1.0**	ND	*11*	**14**	30	*1.0*	**1.2**	80
19-30 y	*60*	**75**	2000	*0.9*	**1.1**	ND	*0.9*	**1.1**	ND	*11*	**14**	35	*1.1*	**1.3**	100
31-50 y	*60*	**75**	2000	*0.9*	**1.1**	ND	*0.9*	**1.1**	ND	*11*	**14**	35	*1.1*	**1.3**	100
51-70 y	*60*	**75**	2000	*0.9*	**1.1**	ND	*0.9*	**1.1**	ND	*11*	**14**	35	*1.3*	**1.5**	100
>70 y	*60*	**75**	2000	*0.9*	**1.1**	ND	*0.9*	**1.1**	ND	*11*	**14**	35	*1.3*	**1.5**	100
Pregnancy															
≤ 18 y	*66*	**80**	1800	*1.2*	**1.4**	ND	*1.2*	**1.4**	ND	*14*	**18**	30	*1.6*	**1.9**	80
19-30 y	*70*	**85**	2000	*1.2*	**1.4**	ND	*1.2*	**1.4**	ND	*14*	**18**	35	*1.6*	**1.9**	100
31-50 y	*70*	**85**	2000	*1.2*	**1.4**	ND	*1.2*	**1.4**	ND	*14*	**18**	35	*1.6*	**1.9**	100
Lactation															
≤ 18 y	*96*	**115**	1800	*1.2*	**1.4**	ND	*1.3*	**1.6**	ND	*13*	**17**	30	*1.7*	**2.0**	80
19-30 y	*100*	**120**	2000	*1.2*	**1.4**	ND	*1.3*	**1.6**	ND	*13*	**17**	35	*1.7*	**2.0**	100
31-50 y	*100*	**120**	2000	*1.2*	**1.4**	ND	*1.3*	**1.6**	ND	*13*	**17**	35	*1.7*	**2.0**	100

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[8] Because smoking increases oxidative stress and metabolic turnover of vitamin C, the requirement for smokers is increased by 35 mg/day.
[9] Due to lack of suitable data, ULs could not be established for thiamin and riboflavin. This does not mean that there is no potential for adverse effects resulting from high intakes.
[10] As Niacin Equivalents (NE). See conversion factors for more details.
[11] The UL for niacin applies only to synthetic forms obtained from supplements, fortified foods, or a combination of the two.
[a] As preformed niacin, not NE, for this age group.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Vitamins

	Folate [12]			Vitamin B12			Pantothenic Acid		Biotin		Choline [15]	
Unit	**µg/day (DFE)**			**µg/day**			**mg/day**		**µg/day**		**mg/day**	
	EAR	RDA/AI	UL [13]	EAR	RDA/AI	UL [14]	AI	UL [14]	AI	UL [14]	AI	UL
Infants												
0-6 mo	*ND*	65*	ND	*ND*	0.4*	ND	1.7*	ND	5*	ND	125*	ND
7-12 mo	*ND*	80*	ND	*ND*	0.5*	ND	1.8*	ND	6*	ND	150*	ND
Children												
1-3 y	*120*	**150**	300	*0.7*	**0.9**	ND	2*	ND	8*	ND	200*	1000
4-8 y	*160*	**200**	400	*1.0*	**1.2**	ND	3*	ND	12*	ND	250*	1000
Males												
9-13 y	*250*	**300**	600	*1.5*	**1.8**	ND	4*	ND	20*	ND	375*	2000
14-18 y	*330*	**400**	800	*2.0*	**2.4**	ND	5*	ND	25*	ND	550*	3000
19-30 y	*320*	**400**	1000	*2.0*	**2.4**	ND	5*	ND	30*	ND	550*	3500
31-50 y	*320*	**400**	1000	*2.0*	**2.4**	ND	5*	ND	30*	ND	550*	3500
51-70 y	*320*	**400**	1000	*2.0*	**2.4** [d]	ND	5*	ND	30*	ND	550*	3500
>70 y	*320*	**400**	1000	*2.0*	**2.4** [d]	ND	5*	ND	30*	ND	550*	3500
Females												
9-13 y	*250*	**300**	600	*1.5*	**1.8**	ND	4*	ND	20*	ND	375*	2000
14-18 y	*330*	**400** [b]	800	*2.0*	**2.4**	ND	5*	ND	25*	ND	400*	3000
19-30 y	*320*	**400** [b]	1000	*2.0*	**2.4**	ND	5*	ND	30*	ND	425*	3500
31-50 y	*320*	**400** [b]	1000	*2.0*	**2.4**	ND	5*	ND	30*	ND	425*	3500
51-70 y	*320*	**400**	1000	*2.0*	**2.4** [d]	ND	5*	ND	30*	ND	425*	3500
>70 y	*320*	**400**	1000	*2.0*	**2.4** [d]	ND	5*	ND	30*	ND	425*	3500
Pregnancy												
≤ 18 y	*520*	**600** [c]	800	*2.2*	**2.6**	ND	6*	ND	30*	ND	450*	3000
19-30 y	*520*	**600** [c]	1000	*2.2*	**2.6**	ND	6*	ND	30*	ND	450*	3500
31-50 y	*520*	**600** [c]	1000	*2.2*	**2.6**	ND	6*	ND	30*	ND	450*	3500
Lactation												
≤ 18 y	*450*	**500**	800	*2.4*	**2.8**	ND	7*	ND	35*	ND	550*	3000
19-30 y	*450*	**500**	1000	*2.4*	**2.8**	ND	7*	ND	35*	ND	550*	3500
31-50 y	*450*	**500**	1000	*2.4*	**2.8**	ND	7*	ND	35*	ND	550*	3500

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[12] As Dietary Folate Equivalents (DFE). See conversion factors for more details.

[13] The UL for folate applies only to synthetic forms obtained from supplements, fortified foods, or a combination of the two.

[14] Due to lack of suitable data, ULs could not be established for vitamin B12, pantothenic acid or biotin. This does not mean that there is no potential for adverse effects resulting from high intakes.

[15] Although AIs have been set for choline, there are few data to assess whether a dietary supply of choline is needed at all stages of the life cycle, and it may be that the choline requirement can be met by endogenous synthesis at some of these stages.

[b] In view of evidence linking the use of supplements containing folic acid before conception and during early pregnancy with reduced risk of neural tube defects in the fetus, it is recommended that all women capable of becoming pregnant take a supplement containing 400µg of folic acid every day, in addition to the amount of folate found in a healthy diet.

[c] It is assumed that women will continue consuming 400 µg folic acid from supplements until their pregnancy is confirmed and they enter prenatal care. The critical time for formation of the neural tube is shortly after conception.

[d] Because 10 to 30 percent of older people may malabsorb food-bound vitamin B12, it is advisable for those older than 50 years to meet the RDA mainly by consuming foods fortified with vitamin B12 or a supplement containing vitamin B12.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Elements

	Arsenic [16]		Boron		Calcium		Chromium		Copper			Fluoride		Iodine		
Unit	N/A		mg/day		mg/day		µg/day		µg/day			mg/day		µg/day		
	AI	UL [17]	AI	UL	AI	UL	AI	UL [17]	EAR	RDA/AI	UL	AI	UL	EAR	RDA/AI	UL
Infants																
0-6 mo	ND	ND	ND	ND	210*	ND	0.2*	ND	*ND*	200*	ND	0.01*	0.7	*ND*	110*	ND
7-12 mo	ND	ND	ND	ND	270*	ND	5.5*	ND	*ND*	220*	ND	0.5*	0.9	*ND*	130*	ND
Children																
1-3 y	ND	ND	ND	3	500*	2500	11*	ND	*260*	**340**	1000	0.7*	1.3	*65*	**90**	200
4-8 y	ND	ND	ND	6	800*	2500	15*	ND	*340*	**440**	3000	1*	2.2	*65*	**90**	300
Males																
9-13 y	ND	ND	ND	11	1300*	2500	25*	ND	*540*	**700**	5000	2*	10	*73*	**120**	600
14-18 y	ND	ND	ND	17	1300*	2500	35*	ND	*685*	**890**	8000	3*	10	*95*	**150**	900
19-30 y	ND	ND	ND	20	1000*	2500	35*	ND	*700*	**900**	10000	4*	10	*95*	**150**	1100
31-50 y	ND	ND	ND	20	1000*	2500	35*	ND	*700*	**900**	10000	4*	10	*95*	**150**	1100
51-70 y	ND	ND	ND	20	1200*	2500	30*	ND	*700*	**900**	10000	4*	10	*95*	**150**	1100
>70 y	ND	ND	ND	20	1200*	2500	30*	ND	*700*	**900**	10000	4*	10	*95*	**150**	1100
Females																
9-13 y	ND	ND	ND	11	1300*	2500	21*	ND	*540*	**700**	5000	2*	10	*73*	**120**	600
14-18 y	ND	ND	ND	17	1300*	2500	24*	ND	*685*	**890**	8000	3*	10	*95*	**150**	900
19-30 y	ND	ND	ND	20	1000*	2500	25*	ND	*700*	**900**	10000	3*	10	*95*	**150**	1100
31-50 y	ND	ND	ND	20	1000*	2500	25*	ND	*700*	**900**	10000	3*	10	*95*	**150**	1100
51-70 y	ND	ND	ND	20	1200*	2500	20*	ND	*700*	**900**	10000	3*	10	*95*	**150**	1100
>70 y	ND	ND	ND	20	1200*	2500	20*	ND	*700*	**900**	10000	3*	10	*95*	**150**	1100
Pregnancy																
≤ 18 y	ND	ND	ND	17	1300*	2500	29*	ND	*785*	**1000**	8000	3*	10	*160*	**220**	900
19-30 y	ND	ND	ND	20	1000*	2500	30*	ND	*800*	**1000**	10000	3*	10	*160*	**220**	1100
31-50 y	ND	ND	ND	20	1000*	2500	30*	ND	*800*	**1000**	10000	3*	10	*160*	**220**	1100
Lactation																
≤ 18 y	ND	ND	ND	17	1300*	2500	44*	ND	*985*	**1300**	8000	3*	10	*209*	**290**	900
19-30 y	ND	ND	ND	20	1000*	2500	45*	ND	*1000*	**1300**	10000	3*	10	*209*	**290**	1100
31-50 y	ND	ND	ND	20	1000*	2500	45*	ND	*1000*	**1300**	10000	3*	10	*209*	**290**	1100

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[16] Although a UL was not determined for arsenic, there is no justification for adding arsenic to food or supplements.
[17] Due to lack of suitable data, ULs could not be established for arsenic and chromium. This does not mean that there is no potential for adverse effects resulting from high intakes.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Elements

	Iron [18]			Magnesium			Manganese		Molybdenum			Nickel		Phosphorus		
Unit	mg/day			mg/day			mg/day		µg/day			mg/day		mg/day		
	EAR	RDA/AI	UL	EAR	RDA/AI	UL [19]	AI	UL	EAR	RDA/AI	UL	AI	UL	EAR	RDA/AI	UL
Infants																
0-6 mo	*ND*	0.27*	40	*ND*	30*	ND	0.003*	ND	*ND*	2*	ND	ND	ND	*ND*	100*	ND
7-12 mo	*6.9*	**11**	40	*ND*	75*	ND	0.6*	ND	*ND*	3*	ND	ND	ND	*ND*	275*	ND
Children																
1-3 y	*3.0*	**7**	40	*65*	**80**	65	1.2*	2	*13*	**17**	300	ND	0.2	*380*	**460**	3000
4-8 y	*4.1*	**10**	40	*110*	**130**	110	1.5*	3	*17*	**22**	600	ND	0.3	*405*	**500**	3000
Males																
9-13 y	*5.9*	**8**	40	*200*	**240**	350	1.9*	6	*26*	**34**	1100	ND	0.6	*1055*	**1250**	4000
14-18 y	*7.7*	**11**	45	*340*	**410**	350	2.2*	9	*33*	**43**	1700	ND	1.0	*1055*	**1250**	4000
19-30 y	*6*	**8**	45	*330*	**400**	350	2.3*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
31-50 y	*6*	**8**	45	*350*	**420**	350	2.3*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
51-70 y	*6*	**8**	45	*350*	**420**	350	2.3*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
>70 y	*6*	**8**	45	*350*	**420**	350	2.3*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	3000
Females																
9-13 y	*5.7* [e]	**8** [e]	40	*200*	**240**	350	1.6*	6	*26*	**34**	1100	ND	0.6	*1055*	**1250**	4000
14-18 y	*7.9* [e]	**15** [e]	45	*300*	**360**	350	1.6*	9	*33*	**43**	1700	ND	1.0	*1055*	**1250**	4000
19-30 y	*8.1* [e]	**18** [e]	45	*255*	**310**	350	1.8*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
31-50 y	*8.1* [e]	**18** [e]	45	*265*	**320**	350	1.8*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
51-70 y	*5* [e]	**8** [e]	45	*265*	**320**	350	1.8*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	4000
>70 y	*5* [e]	**8** [e]	45	*265*	**320**	350	1.8*	11	*34*	**45**	2000	ND	1.0	*580*	**700**	3000
Pregnancy																
≤ 18 y	*23*	**27**	45	*335*	**400**	350	2.0*	9	*40*	**50**	1700	ND	1.0	*1055*	**1250**	3500
19-30 y	*22*	**27**	45	*290*	**350**	350	2.0*	11	*40*	**50**	2000	ND	1.0	*580*	**700**	3500
31-50 y	*22*	**27**	45	*300*	**360**	350	2.0*	11	*40*	**50**	2000	ND	1.0	*580*	**700**	3500
Lactation																
≤ 18 y	*7*	**10**	45	*300*	**360**	350	2.6*	9	*35*	**50**	1700	ND	1.0	*1055*	**1250**	4000
19-30 y	*6.5*	**9**	45	*255*	**310**	350	2.6*	11	*36*	**50**	2000	ND	1.0	*580*	**700**	4000
31-50 y	*6.5*	**9**	45	*265*	**320**	350	2.6*	11	*36*	**50**	2000	ND	1.0	*580*	**700**	4000

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[18] The requirement for iron is 1.8 times higher for vegetarians due to the lower bioavailability of iron from a vegetarian diet.

[19] The UL for magnesium represents intake from a pharmacological agent only and does not include intake from food and water.

[e] For the EAR and RDA, it is assumed that girls younger than 14 years do not menstruate and that girls 14 years and older do menstruate. It is assumed that women 51 years and older are post-menopausal.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Elements

	Selenium			Silicon [20]		Vanadium [22]		Zinc [23]			Potassium [24]		Sodium [25]		Chloride [26]		Sulfate [27]	
Unit	µg/day			N/A		mg/day		mg/day			mg/day		mg/day		mg/day		N/A	
	EAR	RDA/AI	UL	AI	UL [21]	AI	UL	EAR	RDA/AI	UL	AI	UL [21]	AI	UL	AI	UL	AI	UL [21]
Infants																		
0-6 mo	*ND*	15*	45	ND	ND	ND	ND	*ND*	2*	4	400*	ND	120*	ND	180*	ND	ND	ND
7-12 mo	*ND*	20*	60	ND	ND	ND	ND	*2.5*	**3**	5	700*	ND	370*	ND	570*	ND	ND	ND
Children																		
1-3 y	*17*	**20**	90	ND	ND	ND	ND	*2.5*	**3**	7	3000*	ND	1000*	1500	1500*	2300	ND	ND
4-8 y	*23*	**30**	150	ND	ND	ND	ND	*4.0*	**5**	12	3800*	ND	1200*	1900	1900*	2900	ND	ND
Males																		
9-13 y	*35*	**40**	280	ND	ND	ND	ND	*7.0*	**8**	23	4500*	ND	1500*	2200	2300*	3400	ND	ND
14-18 y	*45*	**55**	400	ND	ND	ND	ND	*8.5*	**11**	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	*45*	**55**	400	ND	ND	ND	1.8	*9.4*	**11**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	*45*	**55**	400	ND	ND	ND	1.8	*9.4*	**11**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
51-70 y	*45*	**55**	400	ND	ND	ND	1.8	*9.4*	**11**	40	4700*	ND	1300*	2300	2000*	3600	ND	ND
>70 y	*45*	**55**	400	ND	ND	ND	1.8	*9.4*	**11**	40	4700*	ND	1200*	2300	1800*	3600	ND	ND
Females																		
9-13 y	*35*	**40**	280	ND	ND	ND	ND	*7.0*	**8**	23	4500*	ND	1500*	2200	2300*	3400	ND	ND
14-18 y	*45*	**55**	400	ND	ND	ND	ND	*7.3*	**9**	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	*45*	**55**	400	ND	ND	ND	1.8	*6.8*	**8**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	*45*	**55**	400	ND	ND	ND	1.8	*6.8*	**8**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
51-70 y	*45*	**55**	400	ND	ND	ND	1.8	*6.8*	**8**	40	4700*	ND	1300*	2300	2000*	3600	ND	ND
>70 y	*45*	**55**	400	ND	ND	ND	1.8	*6.8*	**8**	40	4700*	ND	1200*	2300	1800*	3600	ND	ND
Pregnancy																		
≤ 18 y	*49*	**60**	400	ND	ND	ND	ND	*10.5*	**12**	34	4700*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	*49*	**60**	400	ND	ND	ND	ND	*9.5*	**11**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	*49*	**60**	400	ND	ND	ND	ND	*9.5*	**11**	40	4700*	ND	1500*	2300	2300*	3600	ND	ND
Lactation																		
≤ 18 y	*59*	**70**	400	ND	ND	ND	ND	*10.9*	**13**	34	5100*	ND	1500*	2300	2300*	3600	ND	ND
19-30 y	*59*	**70**	400	ND	ND	ND	ND	*10.4*	**12**	40	5100*	ND	1500*	2300	2300*	3600	ND	ND
31-50 y	*59*	**70**	400	ND	ND	ND	ND	*10.4*	**12**	40	5100*	ND	1500*	2300	2300*	3600	ND	ND

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[20] Although silicon has not been shown to cause adverse effects in humans, there is no justification for adding silicon to supplements.

[21] Due to lack of suitable data, ULs could not be established for silicon, potassium, and sulfate. This does not mean that there is no potential for adverse effects resulting from high intakes.

[22] Although vanadium in food has not been shown to cause adverse effects in humans, there is no justification for adding vanadium to food and vanadium supplements should be used with caution. The UL is based on adverse effects in laboratory animals and this data could be used to set a UL for adults but not children and adolescents.

[23] The requirement for zinc may be as much as 50 percent greater for vegetarians, particularly for strict vegetarians whose major food staples are grains and legumes, due to the lower bioavailability of zinc from a vegetarian diet.

[24] The beneficial effects of potassium appear to be mainly from the forms of potassium found naturally in foods such as fruits and vegetables. Supplemental potassium should only be provided under medical supervision because of the well-documented potential for toxicity.

[25] Grams of sodium × 2.53 = grams of salt.

[26] Sodium and chloride are normally found in foods together as sodium chloride (table salt). For this reason, the AI and UL for chloride are set at a level equivalent on a molar basis to those for sodium, since almost all dietary chloride comes with sodium added during processing or consumption of foods.

[27] An AI for sulfate was not established because sulfate requirements are met when dietary intakes contain recommended levels of sulfur amino acids (protein).

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Macronutrients

	Carbohydrate (Digestible)			Total Protein [29]				Total Fat		Linoleic Acid (n-6)		α-linolenic Acid (n-3)		Total Fibre [31]		Total Water [33]	
Unit	g/day			g/kg/day		g/day [30]		g/day		g/day		g/day		g/day		Litres/day	
	EAR	RDA/AI	UL [28]	EAR	RDA/AI	RDA/AI	UL [28]	AI	UL [28]	AI	UL [28]	AI	UL [28]	AI [32]	UL [28]	AI	UL [28]
Infants																	
0-6 mo	*ND*	60*	ND	*ND*	1.52*	9.1*	ND	31*	ND	4.4*	ND	0.5*	ND	ND	ND	0.7*	ND
7-12 mo	*ND*	95*	ND	*1.1*	**1.5**	**13.5**	ND	30*	ND	4.6*	ND	0.5*	ND	ND	ND	0.8*	ND
Children																	
1-3 y	*100*	**130**	ND	*0.88*	**1.10**	**13**	ND	ND	ND	7*	ND	0.7*	ND	19*	ND	1.3*	ND
4-8 y	*100*	**130**	ND	*0.76*	**0.95**	**19**	ND	ND	ND	10*	ND	0.9*	ND	25*	ND	1.7*	ND
Males																	
9-13 y	*100*	**130**	ND	*0.76*	**0.95**	**34**	ND	ND	ND	12*	ND	1.2*	ND	31*	ND	2.4*	ND
14-18 y	*100*	**130**	ND	*0.73*	**0.85**	**52**	ND	ND	ND	16*	ND	1.6*	ND	38*	ND	3.3*	ND
19-30 y	*100*	**130**	ND	*0.66*	**0.80**	**56**	ND	ND	ND	17*	ND	1.6*	ND	38*	ND	3.7*	ND
31-50 y	*100*	**130**	ND	*0.66*	**0.80**	**56**	ND	ND	ND	17*	ND	1.6*	ND	38*	ND	3.7*	ND
51-70 y	*100*	**130**	ND	*0.66*	**0.80**	**56**	ND	ND	ND	14*	ND	1.6*	ND	30*	ND	3.7*	ND
>70 y	*100*	**130**	ND	*0.66*	**0.80**	**56**	ND	ND	ND	14*	ND	1.6*	ND	30*	ND	3.7*	ND
Females																	
9-13 y	*100*	**130**	ND	*0.76*	**0.95**	**34**	ND	ND	ND	10*	ND	1.0*	ND	26*	ND	2.1*	ND
14-18 y	*100*	**130**	ND	*0.71*	**0.85**	**46**	ND	ND	ND	11*	ND	1.1*	ND	26*	ND	2.3*	ND
19-30 y	*100*	**130**	ND	*0.66*	**0.80**	**46**	ND	ND	ND	12*	ND	1.1*	ND	25*	ND	2.7*	ND
31-50 y	*100*	**130**	ND	*0.66*	**0.80**	**46**	ND	ND	ND	12*	ND	1.1*	ND	25*	ND	2.7*	ND
51-70 y	*100*	**130**	ND	*0.66*	**0.80**	**46**	ND	ND	ND	11*	ND	1.1*	ND	21*	ND	2.7*	ND
>70 y	*100*	**130**	ND	*0.66*	**0.80**	**46**	ND	ND	ND	11*	ND	1.1*	ND	21*	ND	2.7*	ND
Pregnancy																	
≤ 18 y	*135*	**175**	ND	*0.88*[f]	**1.1**[f]	**71**[f]	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
19-30 y	*135*	**175**	ND	*0.88*[f]	**1.1**[f]	**71**[f]	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
31-50 y	*135*	**175**	ND	*0.88*[f]	**1.1**[f]	**71**[f]	ND	ND	ND	13*	ND	1.4*	ND	28*	ND	3.0*	ND
Lactation																	
≤ 18 y	*160*	**210**	ND	*1.05*	**1.1**	**71**	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND
19-30 y	*160*	**210**	ND	*1.05*	**1.1**	**71**	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND
31-50 y	*160*	**210**	ND	*1.05*	**1.1**	**71**	ND	ND	ND	13*	ND	1.3*	ND	29*	ND	3.8*	ND

This table presents *Estimated Average Requirements (EARs) in italics*, **Recommended Dietary Allowances (RDAs) in bold type** and Adequate Intakes (AIs) in ordinary type followed by an asterisk (*). Tolerable Upper Intake Levels (ULs) are in shaded columns.

[28] Although a UL was not set for any of the macronutrients, the absence of definitive data does not signify that people can tolerate chronic intakes of these substances at high levels.

[29] Available evidence does not support recommending a separate protein requirement for vegetarians who consume complimentary mixtures of plant proteins, as these can provide the same quality of protein as that from animal proteins.

[30] Recommendations for total protein are determined as the amount needed per kg body weight multiplied by the reference weight.

[31] Total fibre is defined as the sum of dietary fibre and functional fibre. See definitions for further details.

[32] The AI for total fibre is based on 14 g/1000 kcal multiplied by the median usual daily energy intake from the Continuing Survey of Food Intakes by Individuals (CSFII 1994-1996, 1998).

[33] Total water includes drinking water, water in beverages, and water that is part of food.

[f] The EAR and RDA for pregnancy are only for the second half of pregnancy. For the first half of pregnancy, protein requirements are the same as those of the nonpregnant woman.

NOTE: These are reference values for normal, apparently healthy individuals eating a typical mixed North American diet. An individual may have physiological, health, or lifestyle characteristics that may require tailoring of specific nutrient values.

Dietary Reference Intakes
Reference Values for Macronutrients

Acceptable Macronutrient Distribution Ranges (AMDR)

Males & Females [34]	Total Carbohydrate	Total Protein	Total Fat	n-6 polyunsaturated fatty acids (linoleic acid)	n-3 polyunsaturated fatty acids (α-linolenic acid)
	Percent of Energy	Percent of Energy	Percent of Energy	Percent of Energy	Percent of Energy [35]
1-3 years	45 – 65 %	5 – 20 %	30 – 40 %	5 – 10 %	0.6 – 1.2 %
4-18 years	45 – 65 %	10 – 30 %	25 – 35 %	5 – 10 %	0.6 – 1.2 %
19 years and over	45 – 65 %	10 – 35 %	20 – 35 %	5 – 10 %	0.6 – 1.2 %

[34] Includes pregnant and lactating women.
[35] Up to 10% of the AMDR can be consumed as eicosapentaenoic acid (EPA) and/or docosahexaenoic acid (DHA).

Additional Macronutrient Recommendations

Saturated fatty acids	As low as possible while consuming a nutritionally adequate diet
Trans fatty acids	
Dietary cholesterol	
Added sugars [g]	Limit to no more than 25% of total energy

A UL was not set for saturated fatty acids, trans fatty acids, dietary cholesterol, or added sugars.
[g] Added sugars are defined as sugars and syrups that are added to foods during processing or preparation. Although there were insufficient data to set a UL for added sugars, this maximal intake level is suggested to prevent the displacement of foods that are major sources of essential micronutrients.

Protein Quality Scoring Pattern (age 1 year and older)

Amino Acid	Recommended pattern
	mg/g protein
Histidine	18
Isoleucine	25
Leucine	55
Lysine	51
Methionine + Cysteine	25
Phenylalanine + Tyrosine	47
Threonine	27
Tryptophan	7
Valine	32

Reference amino acid pattern for use in evaluating the quality of food proteins using the protein digestibility corrected amino acid score (PDCAAS). Based on Estimated Average Requirements for both indispensable amino acids and for total protein for 1-3 year olds.

Physical Activity Recommendation

To prevent weight gain and accrue additional health benefits of physical activity, **60 minutes of daily moderate intensity activity** is recommended in addition to the activities required by a sedentary lifestyle. This amount of physical activity leads to an “active” lifestyle.