

Nutrition Review

The Vitamins

Function: To promote and regulate body processes necessary for growth, reproduction, and the maintenance of health

Water Soluble	Fat soluble
B Vitamins;	A
Thiamin (B1)	D
Riboflavin (B2)	E
Niacin (B3)	K
Biotin	
Pantothenic acid	
Vitamin B6	
Folate	
Vitamin B12	
C	

Grain Products	Veggies and Fruits	Oils	Milk & Alternatives	Meat & Alternatives
Thiamin	Riboflavin	Vitamin E	Riboflavin	Thiamin
Riboflavin	Niacin		Vitamin A	Riboflavin
Niacin	Vitamin B6		Vitamin D	Niacin
Pantothenic acid	Folate		Vitamin B12	Pantothenic acid
Vitamin B6	Vitamin C			Vitamin B6
Folate	Vitamin A			Folate
	Vitamin E			Vitamin A
	Vitamin K			Vitamin K
				Vitamin D
				Vitamin B12
				Biotin

Fortification: Adding nutrients to foods that generally do not have those nutrients (I.e Adding calcium to OJ)

Enrichment: Adding nutrients back into food that lost them during food processing (I.e B vitamins to white rice)

Frozen VS. Fresh VS. Canned:

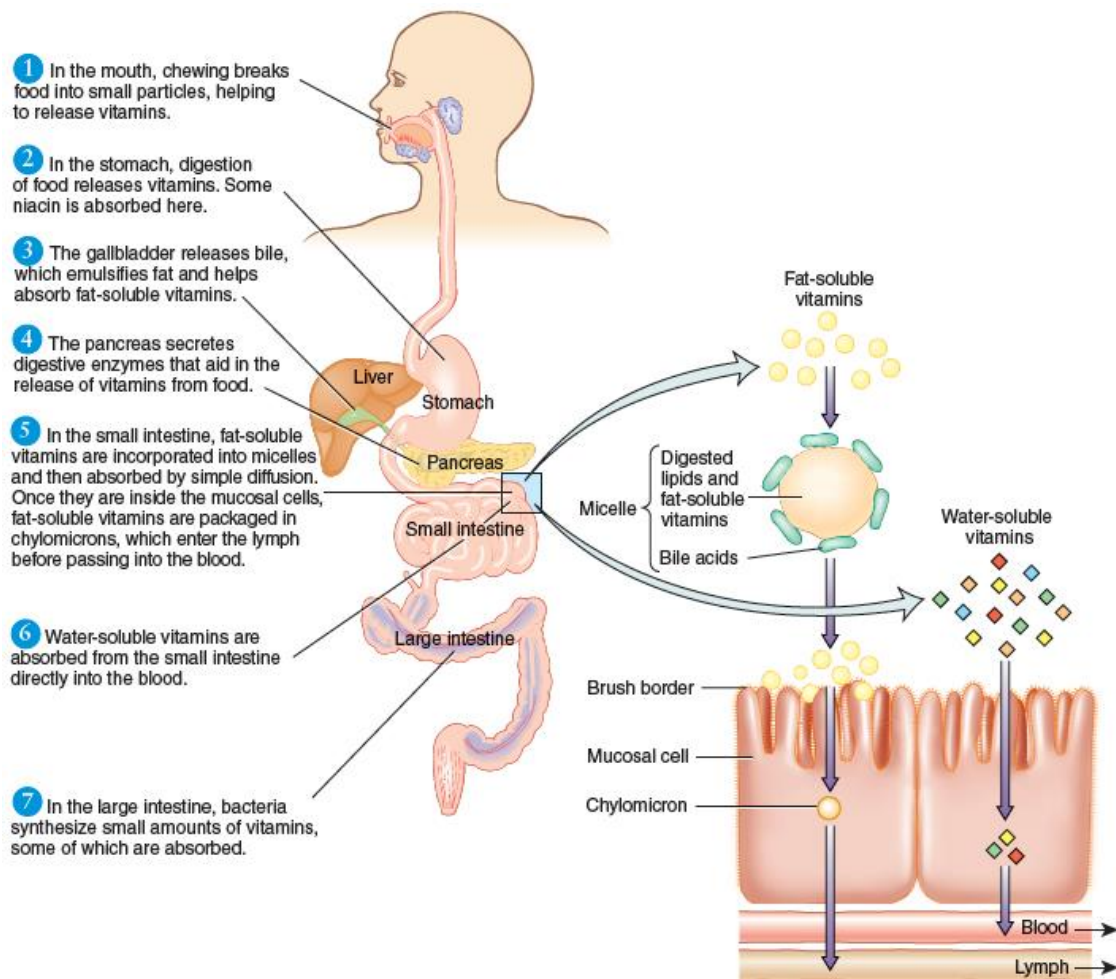
– Frozen foods are often frozen in the field so they usually supply more vitamins than fresh because the nutrients are not lost

– High temperatures used for canning foods can reduce the nutrients, but do not require refrigeration and can last a longer time.

– Fresh products are sometimes lower in nutrients depending on how long they've been sitting in the store/travel time/time spent in your house

Bioavailability: The extent to which the body can absorb nutrients.

- Affected by; 1. Absorption. 2. Transport in blood. 3. Conversion of inactive provitamins or vitamin precursors into active vitamins



	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions
Vitamin C	Antioxidant that protects from oxidative damage	Needed for healthy immune functions					Needed for bone health
Vitamin E	Antioxidant that protects from oxidative damage						
Provitamin A	Antioxidant that protects from oxidative damage						
Vitamin A		Needed for healthy immune functions		Needed for normal growth & development			Needed for bone health
Vitamin B6		Needed for healthy immune functions	Needed to keep blood healthy		Needed to produce ATP from carbs, fats & protein		Important for protein and AA metabolism
Vitamin D		Needed for healthy immune functions		Needed for normal growth & development			Needed for bone health
Folate		Needed for healthy immune functions	Needed to keep blood healthy				Important for protein and AA metabolism
Vitamin B12			Needed to keep blood healthy				Important for protein and AA metabolism

	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions	Vitamin Functions
Vitamin K			Needed to keep blood healthy			Needed for bone health	
Thiamin					Needed to produce ATP from carbs, fats & protein		
Riboflavin					Needed to produce ATP from carbs, fats & protein		
Niacin					Needed to produce ATP from carbs, fats & protein		
Biotin					Needed to produce ATP from carbs, fats & protein		
Pantothenic acid					Needed to produce ATP from carbs, fats & protein		

Water Soluble Vitamins:

- Dissolve in water
- Are easily absorbed and excreted
- Are not stored extensively in tissues
- Don't usually reach toxic levels

Fat Soluble Vitamins:

- Dissolve in lipid
- Require bile for absorption
- Are stored in tissues
- May be toxic in excess

Vitamins

	Thiamin (B1)	Riboflavin (B2)	Niacin (B3)	Biotin (B7)
Water or Fat Soluble	Water	Water	Water	Water
Roles/Functions	Coenzyme in Acetyl-CoA formation and CAC. Acetylcholine synthesis and nerve function	Coenzyme in CAC, lipid metabolism, & ETC. Supports vision and skin health. Converts other vitamins to active forms.	Coenzyme in glycolysis, CAC, ETC, & lipid synthesis/ breakdown	Coenzyme in glucose and fatty acid synthesis, as well as AA metabolism
DRI Intakes	W: 1.1 mg/d M: 1.2 mg/d	W: 1.1 mg/d M: 1.3 mg/d	W: 14 mg/d M: 16 mg/d	30 micrometers/ day
Foods	Pork, whole/ enriched grains, seeds, nuts, legumes	Dairy products, whole/enriched grains, leafy green veggies, meats	Beef, chicken, fish, peanuts, legumes, whole/enriched grains. Can be made from Tryptophan	Liver, egg yolk, synthesized by bacteria in the gut
Deficiency	Beriberi; wet or dry. Possible edema or muscle wasting. Enlarged heart, heart failure, muscle weakness, pain, poor co-ordination, paralysis.	Ariboflavinosis; inflammation of mouth and tongue, cracks at corners of the mouth	Pellagra; diarrhea, dermatitis, dementia, death (4 D's). Caused by a lack of variation in the diet	Dermatitis, nausea, depression and hallucinations
Toxicity	None reported	None reported	Flushing, nausea, rash, tingling extremities, blurred vision	None reported
UL	N/A	N/A	35 mg/d from fortified foods/ supplements	N/A

Vitamins Con't

	Pantothenic acid	Vitamin B6	Folate	Vitamin B12
Water or Fat Soluble	Water	Water	Water	Water
Roles/Functions	Coenzyme in CAC, and lipid synthesis/ breakdown	Coenzyme in protein and AA metabolism (transamination and deamination), neurotransmitter and hemoglobin synthesis	Coenzyme in DNA synthesis and AA metabolism	Coenzyme in folate and fatty acid metabolism. (New cell synthesis) Nerve function; helps maintain nerve cells.
DRI Intakes	5 mg/d	1.3 - 1.7 mg/d for (19 yrs - 50 yrs)	400 micrometers/ day	2.4 micrometers/ day
Foods	Meat, legumes, whole grains, widespread in foods	Meat, fish, poultry, liver, legumes, whole grains, nuts & seeds	Leafy green veggies, legumes, nuts & seeds, enriched grains, oranges, liver	Animal products
Deficiency	Fatigue, rash	Headache, convulsions, other neurological symptoms, decreased immune function, poor growth & anemia	Macrocytic anemia, inflammation of tongue, diarrhea, poor growth. Neural tube defects in newborns if mothers do not consume enough folate	Pernicious anemia, macrocytic anemia, nerve damage
Toxicity	None reported	Numbness and nerve damage	Masks Vitamin B12 symptoms	None reported
UL	N/A	100 mg/d	1000 micrometers/ day	N/A

Vitamins Con't

	Vitamin C	Choline	Vitamin A	Vitamin D
Water or Fat Soluble	Water	Water	Fat	Fat
Roles/Functions	Coenzyme in collagen synthesis, hormone and neurotransmitter synthesis, antioxidant. Assists in production of collagen	Synthesis of cell membranes and neurotransmitters	Vision, health of cornea and other epithelial tissue, cell differentiation, reproduction, immune function	Absorption of calcium and phosphorus, maintenance of bone health
DRI Intakes	W: 75 mg/d M: 90 mg/d Smokers: +30 mg/d	W: 425 mg/d M: 550 mg/d	W: 700 micrometers/day M: 900 micrometers/day	15 micrometers/day (19 yrs - 70 yrs) 20 micrometers/day (70+ yrs)
Foods	Citrus fruits, broccoli, strawberries, greens, peppers, potatoes	Egg yolks, organ meats, leafy greens, nuts, body synthesis	Retinol: liver, fish, fortified milk/margarine, butter, eggs. Carotenoids: Carrots, leafy greens, sweet potatoes, broccoli, apricots, cantaloupe	Egg yolk, liver, fish oils, tuna, salmon, fortified milk, synthesis from the sun
Deficiency	Scurvy; poor wound healing, bleeding gums, loose teeth, bone fragility, joint pain, pinpoint hemorrhages	Liver dysfunction	Night blindness, xerophthalmia (blindness), cornea drying, poor growth, dry skin, impaired immunity	Rickets in children; abnormal growth, misshaped bones, bowed legs. Osteomalacia in adults; weak bones and bone/muscle pain
Toxicity	Nausea, abdominal cramps, diarrhea, rashes, GI stress	Sweating, low blood pressure, liver damage	Headache, vomiting, hair loss, liver damage. Increased activity of bone-dismantling cells	Calcium deposits in soft tissues, growth retardation, kidney damage
UL	2000 mg/d	3500 mg/d	3000 micrometers/day	100 micrometers/day

Vitamins Con't

	Vitamin E	Vitamin K
Water or Fat Soluble	Fat	Fat
Roles/Functions	Antioxidant, protects cell membranes, nerve development, immunity	Coenzyme for synthesis of blood clotting proteins and proteins in bone
DRI Intakes	15 mg/d	W: 90 micrometers/day M: 120 micrometers/day
Foods	Vegetable oils, leafy greens, seeds, nuts, peanuts	Vegetables oils, leafy greens, synthesis by intestinal bacteria
Deficiency	Broken red blood cells, nerve damage	Hemorrhage
Toxicity	Inhibition of Vitamin K activity	Opposes the effects of anti-clotting medication
UL	1000 mg/d	N/A

Water and Minerals

- Essential nutrients that are needed in small amounts in the body

Major minerals: Needed in the diet in amounts larger than 100 mg/d

Trace minerals: Needed in the diet in amounts less than 100 mg/d

Water

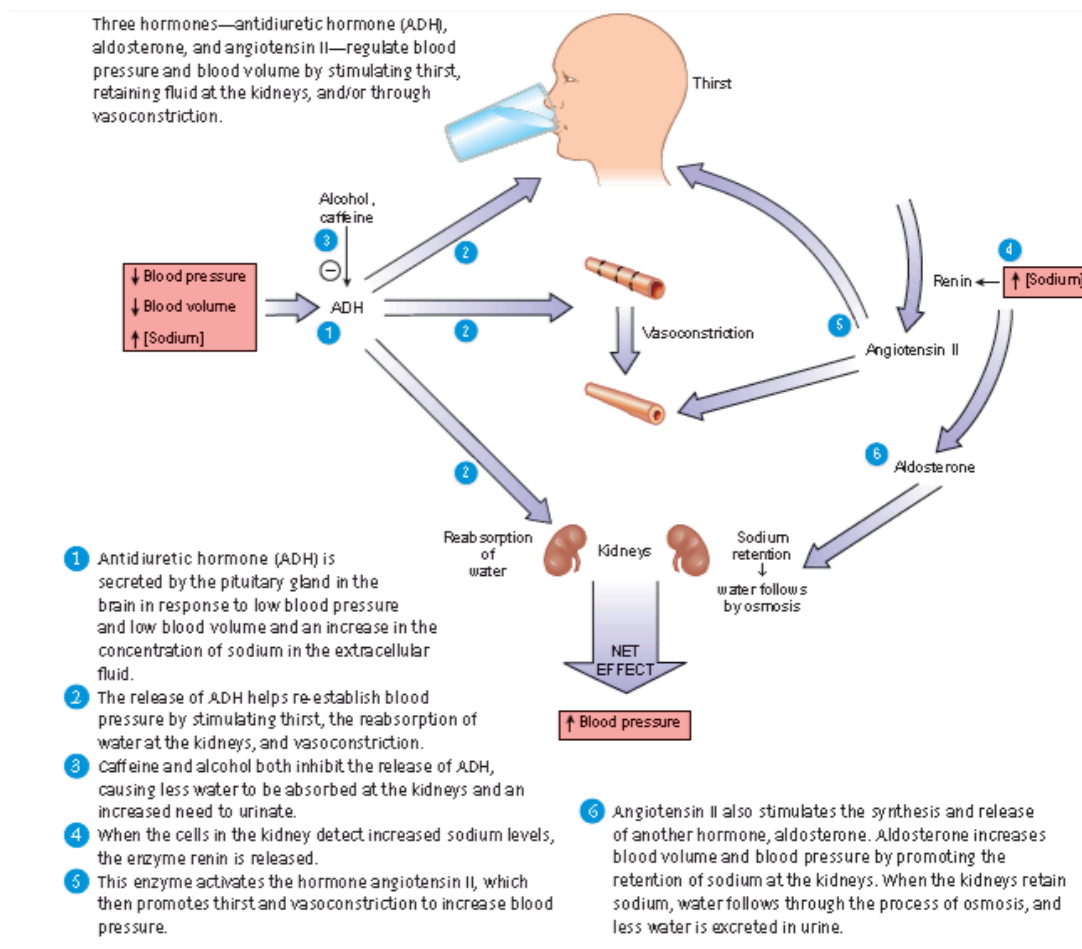
- Makes up approx. 60% of a person's weight
- Without water, cells would die quickly
- Has to be neutral pH
- Body water varies by pound

Roles:

- Serves as a solvent
- Carries nutrients throughout the body
- Works as a lubricant for joints
- Cleanses the tissues and blood of wastes
- Serves as a shock absorber
- Aids in maintaining body temperature
- Maintains proper level of acidity

Water balance

- Needs to be a balance between water intake and water excretion
- Dehydration: Loss of water
- Water intoxication: Excessive ingestion of plain water
- Thirst and satiety govern water intake (hypothalamus, pituitary gland, kidneys)



Dehydration:

- Urine colour reflects hydration;
 - Light: Well hydrated
 - Medium: Mild dehydration
 - Dark: Dehydration
- Diuretics such as coffee, tea, cola, etc., increase water loss and may lead to dehydration via inhibition of ADH secretion

Electrolytes:

- Correct combination of electrolytes are essential for life
- Distribution of electrolytes affects the distribution of water throughout the body
 - Sodium: Positive charge (+); lost a negative electron. Extracellular ion; outside of cells
 - Potassium: Positive charge (+); lost a negative electron. Intracellular ion; inside cells
 - Chloride: Negative (-) charge; gained a negative electron. Extracellular ion; outside of cells

Body fluids & Minerals:

- Water follows salt (Electrolytes). Water flows toward greater concentration (Osmosis)
- Fluid and electrolyte balance. Causes of imbalance; vomiting, diarrhea

- Acid-base balance. Buffers add or release H⁺ ions to maintain neutral balance

Sodium (Na⁺):

Roles:

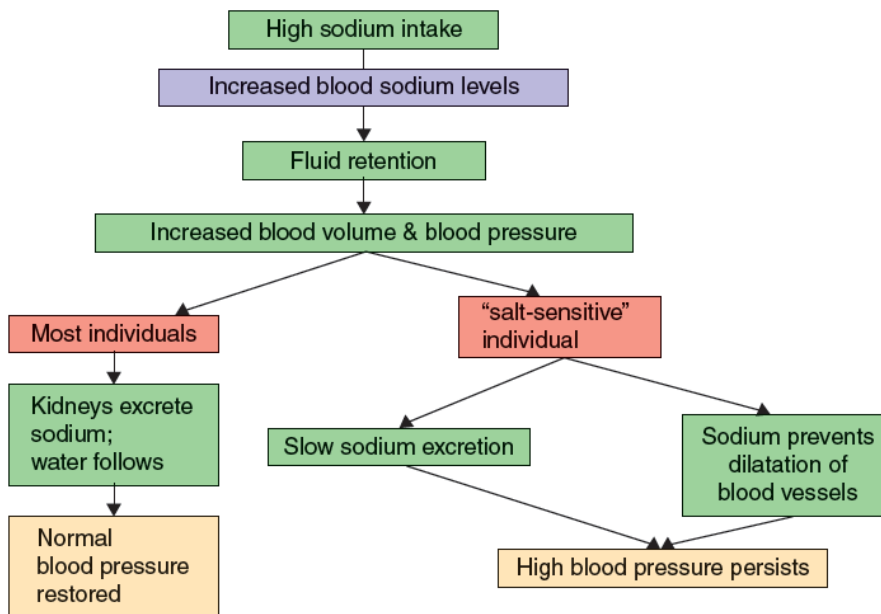
- Major part of fluid and electrolyte balance
- Helps maintain acid-base balance
- Essential to muscle contraction and nerve transmission

“Water weight”

- To keep body salt/water weight under control, is to control salt intake and drink more water

Hypertension:

- The lower amount of sodium in the diet, the lower the blood pressure
- Average sodium intake is 3400 mg. A reduction of 1000 - 1500 mg will reduce BP in those with hypertension
- Recommended that Canadians reduce sodium intake to less than 2300 mg/day
- Ways to manage it;
 - Eat fruits and veggies
 - Choose and prepare meals with less salt
 - Maintain a desirable body weight
 - Increase physical activity



DASH Diet (Dietary Approaches to Stop Hypertension)

- Lots of fruits/veggies, low-fat dairy, whole grains, legumes, nuts and moderate amounts of meat
- High K, Mg, Ca, and fibre; Low salt, saturated fat, cholesterol
- Similar to recommendations of eating well with Canadian food guide

Potassium (K⁺)

Deficiency:

- Results in acid-base imbalance, poor appetite, muscle cramps, confusion, apathy, constipation, irregular heart beat
- Caused by heavy sweating, chronic diarrhea/vomiting, kidney disorders or medication
- Excess potassium from supplements can cause the heart to stop

Chloride (Cl)

- Principle food source of salt
- Extracellular
- Negatively charged
- Roles; Crucial for fluid balance and part of HCl acid in stomach

Minerals

- Inorganic
- All essential
- Not created nor destroyed
- Uptake; small/large intestines
- Removal by kidneys, intestines, liver
- Structural/functional roles
- Available in unprocessed foods, some processed foods and dietary supplements
- Must be consumed in correct proportions to maintain health
- **Bioavailability** is important
- DRI's are expressed as RDA's, EAR's or AL's.
- Certain minerals can be toxic if taken in high amounts

Grain Products	Veggies and Fruits	Milk & Alternatives	Meat & Alternatives
Iron	Iron	Zinc	Iron
Zinc	Magnesium	Potassium	Zinc
Selenium	Potassium	Phosphorus	Copper
Copper	Calcium	Calcium	Selenium
Magnesium	Molybdenum	Molybdenum	Magnesium
Chromium		Iodine	Chromium
Sulfur			Sulfur
Manganese			Manganese
Sodium			Potassium
Potassium			Phosphorus
Phosphorus			Iodine

Fluoride

Minerals

	Calcium	Phosphorus	Magnesium	Sulfur
Roles/Functions	Bone/health structure, nerve transmission, muscle contraction, blood clotting, BP regulation, hormone secretion	Structure of bones and teeth, membranes, ATP/ DNA, acid-base balance. Part of phospholipids	Bone structure, ATP stabilization, enzyme activity, nerve/muscle function	Part of AA, vitamins, acid-base balance
DRI Intakes	1000 mg/d (19 yrs-50) 1200 mg/d (51+)	700 mg/d	W: 310 mg/d M: 400 mg/d	N/A
Foods	Milk&Alternatives, fish consumed with bone, leafy greens, veggies, fortified foods	Meat, milk products, cereals, baked goods	Greens, whole grains, nuts, seeds	High protein foods, preservatives
Deficiency	Increased risk of osteoporosis. Stunted growth/ weak bones in kids	Muscular weakness/bone pain. Lack of appetite	Nausea, vomiting, weakness, muscle pain, irregular heartbeat	None when protein needs are met
Toxicity	Elevated blood calcium, calcification of the kidney, kidney stones, reduced absorption of other minerals	Calcium reabsorption from bone. Calcification of soft tissues, particularly the kidneys	From nonfood sources: diarrhea, pH imbalance, dehydration	N/A
UL	2500 mg/d from food. 2000 mg/d (70+)	4000 mg/d	350 mg/d	N/A

Trace Elements

	Iron	Zinc	Copper	Manganese
Roles/Functions	Part of hemoglobin (delivers oxygen to cells), Myoglobin (holds oxygen in muscles), electron carriers in the ETC (makes new cells), needed for immune function. Two forms; Heme & Nonheme	Regulates protein synthesis, functions in growth, development, wound healing, immunity, and antioxidant protection. Activates enzymes, transports Vitamin A.	Part of proteins needed for iron absorption, lipid metabolism, collagen synthesis, nerve/immune function, antioxidant protection	Functions in carbohydrate/lipid metabolism, antioxidant protection
DRI Intakes	W: 18 mg/d (19-50) W: 8 mg/d (51+) M: 8 mg/d	W: 8 mg/d M: 11 mg/d	900 micrometers/day	1.8 - 2.3 mg/d
Foods	Red meats, leafy greens, dried fruit, whole/enriched grains. Increase absorption: Vitamin C Decrease absorption: Tea, coffee, calcium/ phosphorus	Meat, seafood, whole grains, eggs	Organ meats, nuts, seeds, whole grains, seafood, cocoa	Nuts, legumes, whole grains, tea
Deficiency	Iron deficiency anemia, fatigue, weakness, small pale RBC, low hemoglobin	Poor growth and development, skin rashes, decreased immune function, delayed sexual maturation, loss of appetite	Anemia, poor growth, bone abnormalities	Growth retardation
Toxicity	GI upset, liver damage. Most common form is hemochromatosis.	Decreased copper and iron absorption, depressed immune function, low HDL cholesterol	Vomiting	Nerve damage
UL	45 mg/d	40 mg/d	10 mg/d	11 mg/d

Trace minerals Con't

	Selenium	Iodine	Chromium	Fluoride	Molybdenum
Roles/ Functions	Antioxidant protection as part of glutathione, peroxidase, synthesis of thyroid hormones, spares Vitamin E	Needed for synthesis of thyroid hormones	Enhances insulin action	Strengthens tooth enamel, enhances remineralization of tooth enamel, reduces acid production by bacteria in the mouth	Cofactor for a number of enzymes
DRI Intakes	55 micrometers/day	150 micrometers/day	25-35 micrometers/day	3-4 mg/d	45 g/d
Foods	Organ meats, seafood, eggs, whole grains	Iodized salt, salt water fish, seafood, dairy products	Brewers yeast, nuts, whole grains, mushrooms	Fluoridated water, tea, fish, toothpaste	Milk, organ meats, grains, legume
Deficiency	Muscle pain, weakness, keshan disease	Goiter, cretinism, mental retardation, growth and developmental abnormalities	High blood glucose	Increased risk of dental caries	Unknown in humans
Toxicity	Nausea, diarrhea, vomiting, hair changes, fatigue	Enlarged thyroid	N/A	Mottled teeth, kidney damage, bone abnormalities. Fluorosis: discolouration of teeth	Arthritis and joint inflammation
UL	400 micrometers/day	1110 micrometers/day	N/A	10 mg/d	2 mg/d

Arsenic (As): Organic form found in food is non-toxic. Deficiency linked to nervous system disorders, blood vessel diseases, cancer

Boron (B): Involved in vitamin D and estrogen metabolism.

Nickel (Ni): Enzymes involved with amino and fatty acid metabolism.

Silicon (Si): Synthesis of collagen and calcification of bone.

Vanadium (V): Insulin-like actions, stimulation of cell proliferation and differentiation

Energy Balance and Healthy Body Weight

- Factors affecting balance;
 - Genetic predisposition
 - Energy intake
 - Energy-dense high calorie diet
 - Nutrient-dense food
 - Energy expenditure
 - Sedentary lifestyle
 - Physical activity

Converting food energy into ATP

Fat: 9 kcal/g

Carb: 4 kcal/g

Protein: 4 kcal/g

Alcohol: 7 kcal/g

Ex) 2 g fat = $2 \times 9 = 18$

20 g carb = $4 \times 20 = 40$

3 g protein = $3 \times 4 = 12$

Total = 110 kcal

Energy out: Kcalories used by the body

- Basal Metabolic rate (BMR)
 - The rate of energy expenditure under resting conditions
- Non-exercise activity thermogenesis (NEAT)
 - The energy expenditure for everything we do other than sleeping, eating or sports-like exercise
- Physical activity (PA)
- Thermic effect of food (TEF)
 - Energy required for digestion of food, and absorption, metabolism and storage of nutrients.
Equals approx. 10% daily value energy intake

Estimated Energy Requirements (EER)

- DRI recommendation for daily energy intake
- Accounts for age, gender, weight, height, physical activity

Women:

$$\text{EER} = 354 - 6.91 \times \text{age} + \text{PA} \times [(9.36 \times \text{wt}) + (726 \times \text{ht})]$$

Men:

$$\text{EER} = 662 - 9.53 \times \text{age} + \text{PA} \times [(15.91 \times \text{wt}) + (539.6 \times \text{ht})]$$

Body weight and Health

- There are health risks associated with overweight and underweight
- Misconceptions about weight
 - Focus on weight
 - Focus on controlling weight
 - Focus on short-term endeavours
- Focus should be on body composition
 - Proportion of lean to fat in your body

Body Mass Index (BMI)

- Body weight in $\text{kg}/\text{height}^2$
- General guidelines:
 - Underweight; ($<18.5 \text{ kg}/\text{m}^2$)
 - Overweight; ($>25 \text{ kg}/\text{m}^2$)
 - Obesity; ($>30 \text{ kg}/\text{m}^2$)

BMI	Category	Level of Risk
<18.5	Underweight	Increased risk
18.5–24.9	Normal weight	Least risk
25.0–29.9	Overweight	Increased risk
30 and over	Obese	
30.0–34.9	Obese Class I	High risk
35.0–39.9	Obese Class II	Very high risk
≥ 40.0	Obese Class III	Extremely high risk

Source: Canadian Guidelines for Body Weight Classification in Adults, Health Canada, http://www.hc-sc.gc.ca/fn-an/nutrition/weights-poids/guide-ld-adult/weight_book_tc-livres_des_poids_tm_e.html

Risks of Underweight	Risks of Overweight
Siege or famine	Chronic diseases; hypertension, heart disease, diabetes
Hospital stays	Is declared as a chronic disease by some health organizations
Wasting disease	Numerous other risks
Cancer	
Heart disease	

Central Obesity

- Visceral fat
 - Accumulates within the abdominal cavity
 - Fat is readily released into the bloodstream

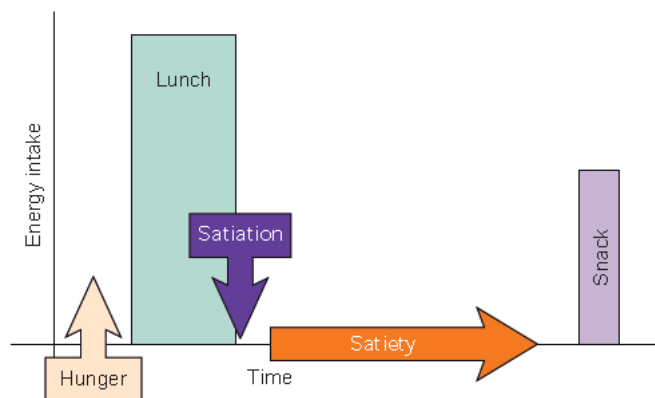
- Increased risk of death from all causes
- Subcutaneous fat
 - Accumulates just below the skin surface
- Fat distribution
 - Apple vs. pear

Measures of body composition and fat distribution

- Bioelectrical impedance Analysis
- Skinfold thickness
- Density (underwater weighing)
 - Measurement of body weight compared with volume
- Dilution methods
- Radiographic techniques

Regulation of Energy Balance

- Set point theory
 - Theory that when people finish growing, their weight remains relatively stable for long period despite periodic changes in energy intake and output
- Obesity genes
 - Genes that code for proteins involved in the regulation of food intake, energy expenditure, or the disposition of body fat
- Short term: Regulations food intake from meal to meal
 - Hunger: Physiological drive to consume food; promotes food consumption
 - Satiety: Feeling of fullness after a meal; determines desire to eat again
 - Satiation: Feeling of fullness and satisfaction, eliminating the desire to continue eating
- Long term: Regulating the amount of body fat
 - Signal from adipose tissue; adjusts both food intake and energy expenditure



Hormones and Weight control

- Ghrelin: Released by the stomach to stimulate the desire to eat at usual mealtimes

- Peptide YY: Released by the GI tract after a meal in proportion to the number of calories consumed to reduce appetite
- Leptin: Secreted from adipocytes in proportion to their size, to regulate energy intake and expenditure
 - Lack of leptin continues to signal someone to eat

Factors that contribute to obesity:

- Genetics
- Inheriting a thrifty metabolism
- Adaptive thermogenesis (the change in energy expenditure induced by factors such as changes in ambient temperature and food intake)
- Futile Cycling (Molecule is formed using ATP and broken down)
- Brown adipose tissue (Type of fat tissue that has a greater number of mitochondria than the more common white adipose tissue)
- Low birth weight

Lifestyle and Rising Obesity Rates

- Obesogenic Environment
 - Environment that promotes weight gain by encouraging over eating and physical inactivity
- Appetite
 - The desire to consume specific foods that is independent of hunger
- Less physical activity

Treatment for the overweight/obese

- Monitor BMI
- Assess for comorbidities (blood profile, hypertension)
- Lifestyle modification program
- Pharmacotherapy
- Bariatric surgery

Weight loss diets:

- Effective programs promote that weight loss can be maintained over the long term, healthy weight loss and healthy changes in lifestyle
- To maintain weight loss, fewer calories need to be consumed
- Remember ABCMV

Prescription weight loss-drugs

- Regulated by Health Canada
- Reduce appetite by affecting brain neurotransmitters
- Decrease fat absorption
- Weight is usually regained

Weight loss supplements

- Not strictly regulated by HC
- Safety and effectiveness are not fully tested, may have side effects

Weight loss surgery

- Alter the GI tract to reduce food intake and absorption
- Gastric bypass: Reduce stomach's size and bypasses part of small intestine
- Adjustable gastric banding: Adjustable band limits the volume that the stomach can hold
- Liposuction: A large hollow needle is inserted under the skin into a fat deposit to vacuum out the fat = cosmetic

Nutrition during Pregnancy and Lactation

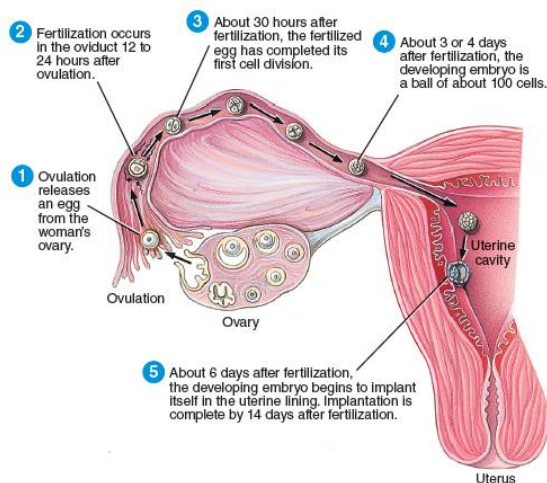
	0-3 months	3-6 months	7-12 months
Infancy			
Childhood	1-3 years (toddler)	4-8 years (early childhood)	
Adolescence	9-13 years	14-18 years	
Young adulthood	19-30 years		
Middle age	31-50 years		
Adulthood	51-70 years		
Older Adults	> 70 years		

Pregnancy: 1st (0-12 weeks), 2nd (13 to 28 weeks), 3rd (29 to 40 weeks) trimesters

Lactation: 1st 6 months, 2nd 6 months

Prenatal Growth:

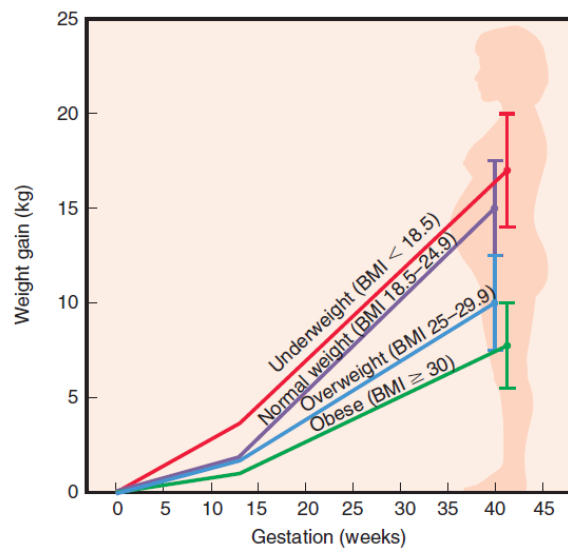
- Embryonic period
 - Pre-embryonic phase
 - Zygote starts as a single cell and divides into many cells
 - Implantation: Completed 2 weeks after fertilization (placenta begins to grow)
 - Malnutrition may lead to failure of implantation and may affect quality of placenta



- Embryonic phase
 - 3-8 weeks after fertilization
 - Rapid growth/development that follows specific time table
 - Critical periods for developing different organs
 - Effects of malnutrition during critical periods are irreversible
- Fetal period
 - 9th week to birth
 - Now called the Fetus (has complete CNS, beating heart, digestive system, fingers, toes and face)

Table 14.1 Recommendations for Weight Gain During Pregnancy

Prepregnancy Weight Status ^a	Recommended Total Gain
Underweight (BMI <18.5 kg/m ²)	13–18 kg (28–40 lb)
Normal weight (BMI 18.5–24.9 kg/m ²)	11.5–16 kg (25–35 lb)
Overweight (BMI 25.0–29.9 kg/m ²)	7–11.5 kg (15–25 lb)
Obese (BMI ≥30.0 kg/m ²)	5–9 kg (11–20 lb)



Pregnancy and Physical Activity

- Guidelines for exercise developed by Society of Obstetricians and Gynaecologists of Canada and Canadian Society of Exercise Physiology
- Consult physician before doing strenuous activity
- Don't exceed pre-pregnancy levels
- Prevent dehydration, high internal temperatures, and reduce risk of loss of balance

Discomforts of pregnancy	Complications of pregnancy	Impact of nutrition of pre-pregnancy	Nutritional need during pregnancy
Physiological changes can cause uncomfortable side effects	Pregnancy-induced hypertension	Establishing eating habits before pregnancy	Healthy placenta and other organs (umbilical cord, amniotic sac)
Edema	Gestational hypertension	Pre-pregnancy weight (Appropriate body weight before)	Poor maternal nutrition impacts generations
Morning sickness	Preeclampsia	Low birthweight infant (Potent indicator of an infants future health)	
Heartburn	Eclampsia		
Constipation/hemorrhoids	Gestational Diabetes Mellitus. Larger birth weight and delivery complications.		
	Increased risk of developing type 2 diabetes		

The placenta

- Performs functions of the digestive system, lungs and kidneys for the fetus
- Supply depot and waste-removal system
- Maternal and fetal bloods never mix
- Metabolically active organ

Risks factors for nutrient deficiencies during pregnancy

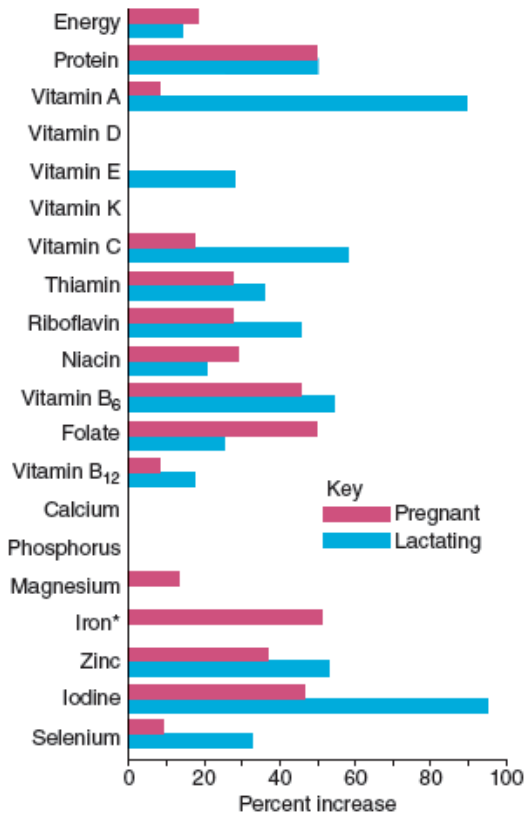
- Young adolescents
- Short interval between pregnancies
- Lack of nutrition knowledge
- Inadequate diet
- Smoking, drugs, drinking
- Lactose intolerant or need for special diet
- Underweight/overweight at time of conception

Increased need for nutrients during pregnancy

- Energy
 - Varies with progression of pregnancy
 - First trimester: no additional energy needed
 - Second trimester: Additional 340 calories daily
 - Third trimester: Additional 450 calories daily

- Carbohydrate
 - Ideally 175 g or more daily
- Protein
 - DRI is 25 g higher than non pregnant women
- Fat
 - The brain depends on heavily long-chain omega-3 and omega-6 fatty acids for growth, function and structure

Nutritional needs



Increased need for Nutrients:

Folate

- Neural tube defects
- Anencephaly
- Spina bifida
- Enrichment of grain products

Vitamin B12

- Assists folate with manufacturing new cells
- Foods of animal origin

Zinc

- Involved in the synthesis of DNA, RNA and Protein
- Absorption inhibited by high iron intake

Calcium

- Absorption doubles during pregnancy
- DRI recommendations should be met with calcium-rich foods

Iron

- The iron needs of the fetus take priority
- Iron absorption increases threefold during pregnancy
- Iron supplements

Vitamin D may need to be supplemented

Vitamin C needs to be increased by 10 mg/d

- Energy and nutrient needs during pregnancy can be met by following the recommendations of CFG.
 - Additional grains, vegetables, and fruits provide energy, protein, folate, vitamin C and fibre, particularly if whole grains are chosen.
 - An extra serving of milk provides energy, protein, calcium, vitamin D, and riboflavin.
 - Additional lean meat provides energy, protein, vitamins B6 and B12, iron, and zinc.

Supplements are recommended even when CFG is followed

- Folic acid before and during pregnancy
- Iron during 2nd and 3rd trimesters
- Multivitamin/mineral supplement for those with limited food choices

Cravings

- Common cravings; Ice cream, sweet, candy, fish, fruit
- Pica: Craving for and ingestion of nonfood substances (clay, laundry starch, ashes) with little or no nutrition
- Common aversions: Coffee, highly seasoned foods, fried foods
- Could be caused by hormones or physiological changes

Table 14.4 Factors That Increase Pregnancy Risks

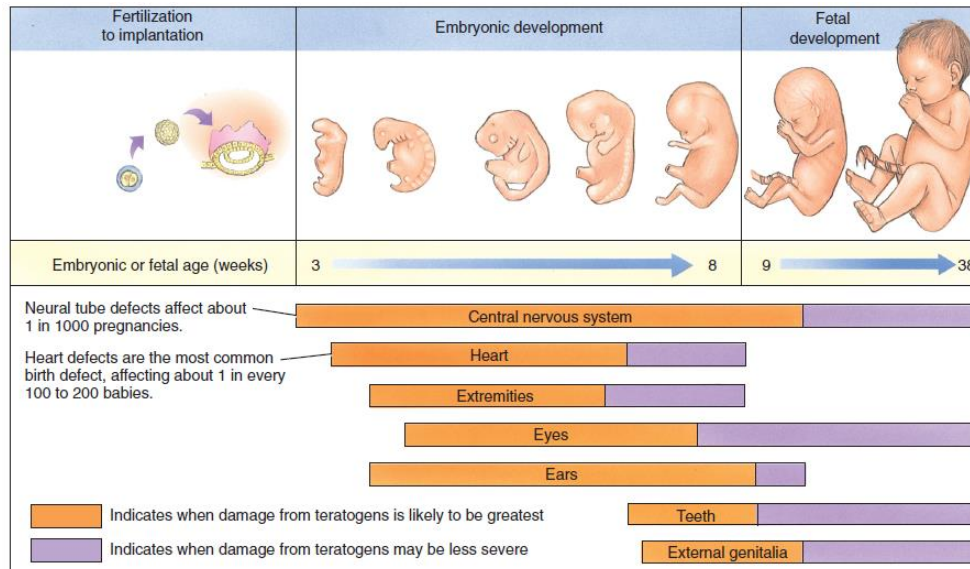
Maternal Factor	Maternal Risk	Infant/Fetal Risk
Prepregnant BMI < 19.8 or gaining too little weight during pregnancy	Anemia, premature rupture of the membranes, hemorrhage after delivery	Low birth weight, preterm birth
Prepregnant BMI > 26 or gaining too much weight during pregnancy	Hypertensive disorders of pregnancy, gestational diabetes, difficult delivery, Caesarean section	Large-for-gestational-age, low Apgar scores (a score used to assess the health of a baby in the first minutes after birth), and neural tube defects
Malnutrition	Decreased ability to conceive, anemia	Fetal growth retardation, low birth weight, birth defects, preterm birth, spontaneous abortion, stillbirth, increased risk of chronic disease later in life
Phenylketonuria	High blood levels of phenylketones	Mental retardation if low phenylalanine diet is not carefully followed by mother
Hypertension	Stroke, heart attack, premature separation of the placenta from the uterine wall	Low birth weight, fetal death
Diabetes	Difficulty adjusting insulin dose, pre-eclampsia, Caesarean section	Large-for-gestational-age, congenital abnormalities, fetal death
Frequent pregnancies: 3 or more during a 2-year period	Malnutrition	Low birth weight, preterm birth

Table 14.4 (Continued)

Maternal Factor	Maternal Risk	Infant/Fetal Risk
Poor obstetric history or history of poor fetal outcome	Recurrence of problem in subsequent pregnancy	Birth defects, death
Age:		
Adolescent	Malnutrition, hypertensive disorders of pregnancy	Low birth weight
Older than 35	Hypertensive disorders of pregnancy, gestational diabetes	Down syndrome and other chromosomal abnormalities
Alcohol consumption	Poor nutritional status	Alcohol-related birth defects, alcohol-related neurodevelopmental disorders, fetal alcohol syndrome
Cigarette smoking	Lung cancer and other lung diseases, miscarriage	Low birth weight, miscarriage, stillbirth, preterm birth, sudden infant death syndrome, respiratory problems
Cocaine use	Hypertension, miscarriage, premature labour and delivery	Intrauterine growth retardation, low birth weight, preterm birth, birth defects, sudden infant death syndrome

Teen pregnancy:

- Special cases of intense nutrient needs
 - Challenging to meet their own needs
 - Many enter pregnancy with nutrient deficiencies
- Less likely to receive prenatal care
 - Needs early medical intervention/nutritional counselling
- More likely to smoke
- Mother: higher risk to develop hypertension
- Infant: Miscarriage, premature birth, stillbirths, low-birth weight



Pregnancy, smoking and environment

- Pregnant women need to be aware of potential toxins in their food, water and environment
- Cigarette smoking
 - Damage to fetal DNA
 - Developmental defects or diseases
 - Complications of birth and low birth weight baby
 - Risks of SIDS
- Environmental contaminants
 - Lead
 - Mercury (fish consumption)
- Caffeine and herbs
 - Limit caffeine consumption to 200 mg (1-2 cups)
 - Herbal teas may help relieve some discomfort during pregnancy (ginger) but avoid others until proven safe

Foodborn illness

- To protect from Listeriosis, pregnant women should
 - Use only pasteurized dairy products
 - Eat only thoroughly cooked meat, poultry, and seafood

- Wash all fruits and veggies
- Do not eat refrigerated smoked seafood, unless it is an ingredient in a dish Do not eat pâté or meat spreads.
- Toxoplasmosis parasitic infection
 - Parasite found in cat feces, soil and undercooked infected meat

Drinking during pregnancy

- Alcohol crosses the placenta and is directly toxic to the fetus
 - Limits oxygen delivery to fetus
 - Slows cell division
 - Reduces # of cells that organs produce and inflict abnormalities on those produced
 - Affects fetal brain; 100000 new brain cells a min in first month
 - Interferes with transport of nutrients; malnutrition
- Fetal Alcohol Syndrome (FAS)
 - Fetal alcohol spectrum disorders (FASD)
 - Alcohol related neurodevelopment disorder (ARND)
 - Alcohol related birth defects (ARBD)
 - There is no safe amount to drink during pregnancy

Cautions for pregnant women

- Vitamin-mineral megadoses
 - Vitamin A in megadoses can cause birth defects
- Restrictive dieting
 - Hazardous during pregnancy
- Sugar substitutes
 - Avoid excessive amounts of aspartame and other artificial sweeteners

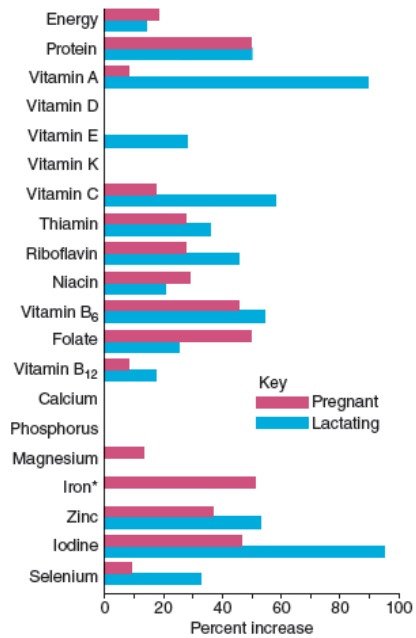
Pregnancy and drugs

- Medicinal drugs and herbal supplements are a NO (no advil, ibuprofen, aspirin)
- Prescription only with doctors advice
- Drug abuse directly crosses with the placenta and some complications include low birth weight, heartbeat irregularities, pain of withdraw

Nutrition during Lactation

- Nutrient needs are higher during lactation than during pregnancy
- Human milk contains 65 kcal/100 ml
- Extra energy comes from maternal fat stores and 330 kcal from E-intake
- RDA for protein increased by 25 g/d
- Water intake increases by 1 L/d
- Increased need for micronutrients
- No need for extra calcium or iron

Nutrition during lactation



Energy/nutrient needs for infants

Table 14.6 Energy and Nutrient Needs of Infants Compared to Adults

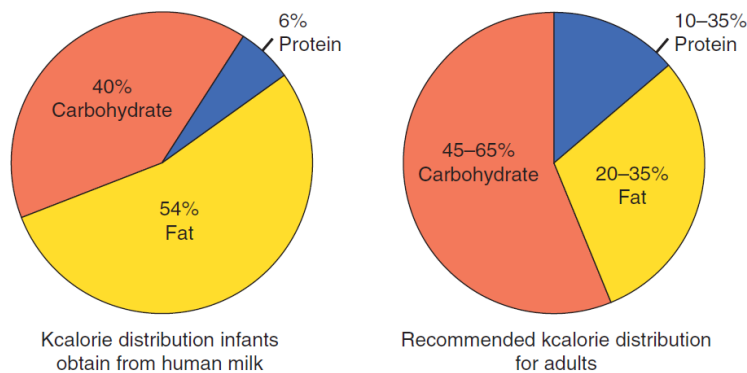
Nutrient/Energy	Newborn Recommendation (0–6 mo)	Adult Recommendation
Energy ^a	493–606 kcal/day (~100 kcal/kg/day)	2,403–3,067 kcal/day (~30 kcal/kg/day)
Protein	9.1 g/day 1.52 g/kg/day	46–56 g/day 0.8 g/kg/day
Carbohydrate	at least 60 g/day 40% of energy intake ^b	at least 130 g/day 45%–65% of energy intake
Fat	50% of energy ^b	20%–35% of energy
Linoleic acid	4.4 g/day ^c	12–17 g/day
α-linolenic acid	0.5 g/day ^d	1.1–1.6 g/day
Fluid	0.7 L	2.7–3.7 L

^aThe energy values are based on EER prediction equations for infants 0–6 months of age and for adults >19 years of age.

^bBased on the composition of human milk.

^cRefers to all omega-6 polyunsaturated fatty acids.

^dRefers to all omega-3 polyunsaturated fatty acids.



Micronutrient needs of infants

Iron

- Low up to 6 months (stores)
- Include in solid foods after 6 months

Vitamin D

- Breast milk contains little vitamin D, so breastfed babies require a supplement
- All infants receive 10 micrometers/day for first year (up to 20 from oct-apr)

Vitamin K

- All infants receive a single intramuscular injection at birth

Vitamin B12

- May be low in vegan mother

Breastfeeding

- HC recommends all babies only be breastfed during the first 6 months
- Instant formula and solid foods should not be introduced until after 6 months

10 Reasons to breastfeed

1. **Nutrients and Protection:** Breast milk contains the perfect amount of nutrients for baby and antibodies that prevent disease.
2. **Brain Power:** Children who were breastfed score higher on IQ tests.
3. **Convenient and Portable:** Breast milk is always safe, fresh, and exactly the right temperature.
4. **Size Doesn't Matter:** Whatever size a breast is, it will produce enough milk for baby.
5. **Benefits Mothers Too:** Breastfeeding can help mothers lose weight and may reduce the risk of some cancers.
6. **Continues the Special Relationship:** Breastfeeding can help mothers bond with their babies.
7. **Benefits Don't Stop:** Breast milk is all babies need for the first six months of life. After six months babies need additional solid food, but continue to benefit from the nutrients in breast milk.
8. **Easy on the Budget:** No need to buy formula.
9. **Works for Working Mothers:** Breast milk can be expressed with a breast pump so that others can help with the feedings.

10. Good for the Environment: Breast milk does not contribute to waste, pollution, or unnecessary packaging.

- A women should NOT breastfeed if they are drinking alcohol, smoking, taking other drugs, or have a maternal illness

Formula Feeding

- Offers an acceptable alternative to breastfeeding
- Regulations specify amount of carbs, fat, proteins, vitamins and minerals
- Limits on additives or ingredients
- Never transition to cows milk before 12 months of age

Table 14.7 Advantages and Disadvantages of Breast- and Formula-Feeding		
Advantage/ Disadvantage	Breastfeeding	Formula-Feeding
Nutrients	Ideal food for babies. Composition changes as they eat and grow.	Modelled after human milk, but certain components cannot be duplicated. Composition does not change with time. Must be prepared carefully to supply the correct nutrient mix and ratio of nutrients to fluid.
Amount	Underfeeding can be a problem in newborns if the mother is not well versed in breastfeeding and the signs of dehydration in the infant.	Overfeeding is a risk because of the desire of caregivers to have the baby empty the bottle.
Immunity	Immune factors are transferred from mother to infant.	There are no immune factors in formula.
Allergies	Allergies to breast milk are very rare and the risk of food allergies is reduced.	There are a variety of choices if the infant is allergic to one type of formula.
Risk from mother	Certain contaminants such as environmental pollutants, medications, illicit drugs, and disease-causing organisms such as HIV can pass from mother to baby.	None.
Environmental contamination	Breast milk is sterile, but pumped milk can become contaminated if stored improperly.	Bacterial contamination is a risk if formula is prepared under unsanitary conditions or stored improperly.
Ease for caregivers	No equipment to wash, always available, but may require more time from the mother.	Requires more preparation and washing, but other family members can share responsibility for feeding.
Ease for baby	Suckling is harder for the baby but aids in development of teeth and facial muscles needed for speech. Weak or sick infants can easily consume pumped breast milk.	Easier for baby, which is especially important for weak or sick infants.*
Benefit to mother	Promotes uterine contractions, which help the uterus return to prepregnancy size. May promote loss of weight and body fat. May reduce risk of breast cancer.	May allow more sleep.*
Cost	Cheaper, but the mother must be well nourished.	More expensive than nursing and cost includes formula as well as equipment and energy used in preparation.

*Breast milk fed from a bottle can be used to nourish weak or sick infants and can give the mother a break from breastfeeding.

Infant growth and Development

- Growth is the best indicator of adequate nutrition to an infant
 - Birth weight should double by 4 months and triple by 1 year
- Growth charts; compare weight, length or head circumference to the population
 - Ranking indicates where the infant's growth falls in relation to population standards

Food allergies

- Common in infants due to immature digestive tracts that allow absorption of incompletely digested proteins, triggering immune response
 - Risk of developing food allergies reduced after 3
 - Allergies up until 3 most kids grow out of, remaining after 3 years will most likely remain
- To reduce risk its best to breastfeed the baby the first 4-6 months
- Appropriate introduction of solid and semisolid foods:
 - First: Iron fortified infant rice cereal mixed with formula/breast milk
 - Then: other grains can be introduced
 - Last: wheat cereal
- Each new food should be offered for a few days without the addition of any other food

Infant feeding

- Solid and semisolid foods can be introduced starting at 4-6 months
- Cow's milk should NEVER be fed to infants
 - 1 year of age, cows milk can be offered
 - 2 yeas of age, reduced fat or low fat milk can be used
- Fruit juice when an infant is 9-10 months old
- Added sugars in moderation
- Unpasteurized honey should not be fed to children under 1

				
Age	Birth to 4 months	4 to 6 months	6 to 9 months	9 to 12 months
Developmental Milestones	The infant takes milk by means of a licking motion of the tongue called suckling, which strokes or milks the liquid from the nipple. Solid food placed in the mouth at an early age is usually pushed out as the tongue thrusts forward.	The tongue is held farther back in the mouth, allowing solid food to be accepted without being expelled. The infant can hold his or her head up and is able to sit, with or without support.	The infant can sit without support, chew, hold food, and easily move hand to mouth.	The infant can drink from a cup and feed him/herself.
Foods	Breast milk or iron-fortified infant formula.	Breast milk or formula, iron-fortified infant cereal. Rice cereal is usually the first solid food introduced because it is easily digested and less likely than other grains to cause allergies. After cereals, puréed vegetables and fruits can be introduced.	Breast milk or formula, iron-fortified infant cereal, puréed or strained vegetables, fruits, meats and beans, limited finger foods.	Breast milk or formula, iron-fortified infant cereal, chopped vegetables, soft fruits, meats and beans, fruit juice, nonchoking finger foods such as dry cereal, cooked pasta, and well-cooked vegetables.

Nutrition over the Life Span

Children

Age in Years	Children			Teens		Adults			
	2-3	4-8	9-13	14-18		19-50		51+	
	Sex	Girls and Boys		Females	Males	Females	Males	Females	Males
Vegetables and Fruit	4	5	6	7	8	7-8	8-10	7	7
Grain Products	3	4	6	6	7	6-7	8	6	7
Milk and Alternatives	2	2	3-4	3-4	3-4	2	2	3	3
Meat and Alternatives	1	1	1-2	2	3	2	3	2	3

Early and Middle Childhood:

- Rapid changes during second year
 - Dietary changes; milk to solid
 - Growth; 12.5 cm (2nd year), 10 cm (3rd year)
 - Body composition; increased bone and muscle mass
- Appetite regulation
 - Decreased appetite after first year
 - Fluctuation of appetite ongoing

Diet-related Disease conditions in Children

- High kcalorie, high saturated fat diets combined with low-activity lifestyles can lead to the following;
 - Obesity
 - Type 2 diabetes
 - Elevated serum cholesterol
 - Heart disease
 - Hypertension

Nutrient needs of children

Calories	2 years old: 1000 Kcals	6 years old: 1600 Kcal	12 year old GIRL: 1600-2600 Kcal	12 year old BOY: 1800-2800 Kcal
Protein	2 years old: 13 g/d	6 years old: 19 g/d	12 year old GIRL: 34 g/d	12 year old BOY: 34 g/d
Carbohydrates	45-65%			
Fat	1-3 year olds: 30-40%	4-18 years: 25-35%		
Water	meet needs by drinking enough to satisfy thirst			
Micronutrients	Smaller amounts than adults			

Bone health in Children

Calcium	Vitamin D	Iron
1-3 years: RDA = 700 mg/d	RDA = 15 micrometers/d for children, adolescents & young kids	Toddlers: RDA = 700 mg/d
4-8 years: 1000 mg/d	Required for calcium absorption	Young children: 10 mg/d
9-13 years: 1300 mg/d		Required for growth
Adequate intake/weight bearing activities during childhood essential for max peak bone mass		Iron defence anemia can impair learning ability and intellectual performance

- Limit amounts of fruit juice children get
- 125-250 mL per day (1/2 to 1 cup)
- Don't let kids sip on it throughout the day. That can cause dental cavities, they should finish it at one meal. Don't put it in a closed lid cup

Healthy Eating Habits

- What we learn as kids affects our habits as adults
- Caregivers decide which foods, when and where they will be eating but the children decide whether to eat, what foods and how much to consume.
- Eating habits are affected by social activities, school, and what peers are eating as they get older
- Offer small, nutrient dense meals and snacks
 - Ideally every 2-3 hours
 - Should be as nutritious as meals and include calcium and iron when you can

- Establish a consistent pattern and make sure they eat breakfast
- Eating meals together helps children connect as a family. Leads to better culture and better performance in school
- Caregivers are role models and influence what children learn to eat
- Foods should not be used as a reward or punishment and meals should not be rushed to eat

Typical meal and snack patterns for 3- and 8-year-old children Table 12.1

Food	Amount		Food	Amount	
	3-year-old	8-year-old		3-year-old	8-year-old
Breakfast			Snack		
Cereal	125 g (1/2 cup)	250 g (1 cup)	Yogurt	125 g (1/2 cup)	250 g (1 cup)
Milk, 2%	125 mL (1/2 cup)	250 mL (1 cup)	Berries	85 g (3/8 cup)	170 g (3/4 cup)
Banana	1/2 medium	1 medium	Dinner		
Snack			Rice	125 g (1/2 cup)	250 g (1 cup)
Peanut butter	30 mL (2 Tbsp)	30 mL (2 Tbsp)	Chicken drumsticks	1	2
Wheat crackers	5	5	Broccoli	4 florets	6 florets
Lunch			Milk, 2%	125 g (1/2 cup)	250 mL (1 cup)
Vegetable soup	125 mL (1/2 cup)	250 mL (1 cup)	Snack		
Grilled tuna sandwich	half	1	Graham crackers	1	2
Tomato	1/4 medium	1/2 medium	Milk	125 mL (1/2 cup)	125 mL (1/2 cup)
Orange	1/2 medium	1 medium			
Milk, 2%	125 mL (1/2 cup)	250 mL (1 cup)			

Food allergy

- Triggers immune response to an antigen (Antibodies and histamine)
- May lead to anaphylactic shock (epinephrine required)
- Prevalence: 3 to 5% of children are diagnosed with a true food allergy
- Must label whether products contain these 8 food allergens:
 - Milk
 - Eggs
 - Fish
 - Shellfish
 - Peanuts
 - Tree nuts
 - Wheat
 - Soy
- To detect an allergy you can;
 - Eliminate suspected food for 1-2 weeks and reintroduce it/watch for reactions
 - Medical tests are available
 - Reaction time

Food intolerance

- No immune response (I.e lactose intolerance)

Food Aversion

- Intense dislike for food (biological and psychological response)

Nutrition and Health concerns in children

- A number of diet and lifestyle factors put children at risk for illness/malnutrition.
- These include:
 - Dental caries
 - Lead toxicity
 - Hyperactivity
 - Childhood obesity

Dental Caries	Lead toxicity	Hyperactivity	Obesity
Sticky, high CARBOHYDRATE snack foods get stuck to teeth and provide an ideal environment for growth of mouth bacteria	Absorption rates are 50% for young children compared to 10-15% for adults	Involves extreme PA, excitability, impulsiveness, short attention span and frustration	Screen time plays a huge role in obesity <ul style="list-style-type: none"> - Reduces metabolic rate - Uses time spent for PA - Increases snacking - Least likely to eat fruits/veggies
Prevent by <ul style="list-style-type: none"> - limiting snacking between meals - brushing/rinsing after eating - brushing/flossing daily - choosing foods that won't stick - snacking on crisp or fibrous foods to stimulate saliva release 	May lead to <ul style="list-style-type: none"> - Iron deficiency anemia - learning disabilities - behavioural problems 	Misconception: Caused by eating sugar. NOT true	
		Other possible causes: Caffeine, lack of sleep, overstimulation, lack of PA	
		Insufficient evidence for dietary treatment of ADHD. Some children are sensitive to specific additives and may benefit from eliminating those from diet	

Adolescents

- Organ systems develop and grow, puberty occurs and body composition changes
- Puberty: Period of rapid growth and physical changes that ends in the attainment of sexual maturity

- Changes with sexual maturation, social and psychological changes in adolescence influence nutrient intake
 - Increase nutritional needs for further development
 - Different requirements for boys and girls
- Adolescent growth spurt is an 18-24 month period where peak growth velocity beings
 - Girls: 10-13 years
 - Boys: 12-15 years

Calories	Energy needed usually exceeds adult needs	Boys require more energy than girls due to muscles and larger bodies	Energy needs vary with PA	
Protein	Requirements per kg/body weight same for boys & girls	Boys require more TOTAL protein because they are heavier	Recommended proportions of calories (AMDR) - similar to adults	
Carbohydrates	Recommended proportions of calories (AMDR) - similar to adults			
Fat	Recommended proportions of calories (AMDR) - similar to adults			
B Vitamins	Recommendations much higher than childhood			
Vitamin A	Common defence			
Iron	Girls: 15 mg/d (14-18 yrs)	Boys: 11 mg/d (14-18 yrs)		
Calcium	1300 mg/d (9-18 yrs)	Essential for achieving max peak bone mass	Encouraged to consume low-fat dairy products, calcium fortified cereals	

Dietary Concerns for Teens

- Teens inadequate vitamin A intake comes from not consuming recommended # of fruits and veggies
- Girls inadequate iron intake is because of the high needs they have. Tend to eat fewer iron-rich foods and consume less kcals.
- Inadequate calcium intake is due to their increased consumption of soft drinks

- Adolescence is a time of independence and they are eating more meals on the go and have more peer pressure
- Dietary choices can lead to nutrient deficiencies

Vegetarian Diets

- Can be a healthy choice if it is carefully planned to meet nutrient requirements. A poorly planned vegetarian diet is no better than a poorly planned regular diet
- Meatless diets can be low in iron and zinc
- May be at risk of B12 deficiency, inadequate calcium/Vitamin D intake

Concerns for Adolescents

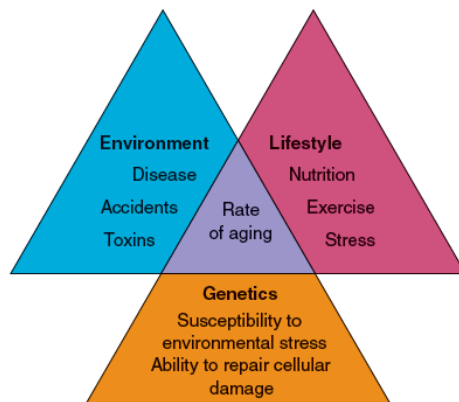
Athletics:

- Increased nutrient needs
- Require more water, energy, protein, carbohydrates and micronutrients
- Steroids can stunt growth in adolescence and cause sexual/reproductive disorders, heart disease, liver damage, acne, aggressive/violent behaviour
- Weight restriction may affect nutritional status, maturation and increase eating disorder risk

Nutrition and Aging

Aging

- How long individuals live and rate of aging determined by genes, lifestyles, avoiding accidents, disease and environmental toxins



- Characteristics of those who reach and old age:
 - Nutrition and successful aging

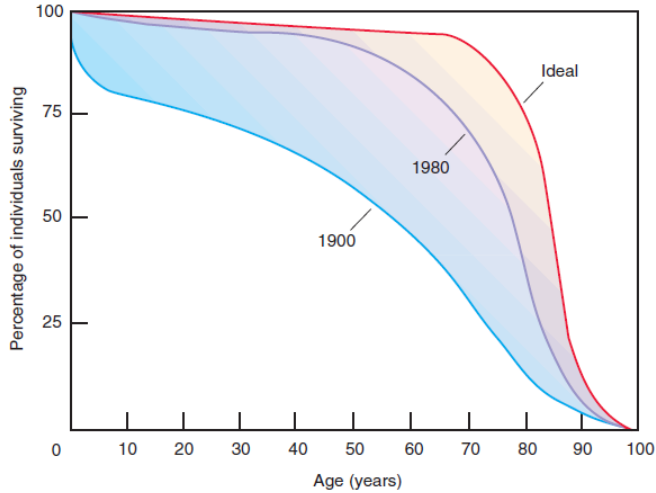
Life expectancy

- 82 years of age for Women
- 77 years of age for Men
 - 70-80% depends on health related behaviours
 - 20-30% depends on genetics

Life span

- Estimated to be 120 years

Compression of Morbidity: Postponing the onset of chronic disease so that a smaller proportion of the lifespan is spent in disability



Nutrition for Adult years

- **Energy and energy-yielding nutrient recommendations:** Decrease with age as BMR decreases
- **Protein, fat & carbohydrate needs:** Do not change with age
- **Water:** Same however thirst may decline
- **Vitamin & mineral needs:** No change except;
 - B6 and B12
 - Antioxidant vitamins
 - Vitamin A
 - Calcium and Vitamin D
 - Iron
 - Zinc

Vitamin B6	RDA is greater in adults > 51 years because higher dietary intakes are needed to maintain same function		
Vitamin B12	Recommended that people > 50 consume fortified foods/ supplements	Food bound B12 is not absorbed efficiently due to atrophic gastritis (inflammation of the stomach lining causing reduced stomach acid)	Atrophic gastritis reduces iron, folate, calcium, vitamin K absorption
Iron	RDA Women > 51 = 8 mg/d	Same for adult men of all ages	

Calcium	RDA Men > 51 years = 1000 mg/d	Women > 51 years, men&women > 70 years = 1200 mg/d	
Vitamin D	RDA > 51 years = 15 micrometers/d	RDA adults > 70 = 20-25 micrometers/d	

Nutrient	Effects of Aging	Comments
Energy	Need decreases.	Physical activity moderates the decline.
Fibre	Low intakes make constipation likely.	Inadequate water intakes and physical inactivity compound constipation.
Protein	Needs stay the same.	Low-fat, high-fibre legumes and grains meet both protein and other needs.
Vitamin A	Absorption increases.	Supplements normally not needed.
Vitamin D	Increased likelihood of inadequate intake; skin synthesis declines.	Daily moderate exposure to sunlight may be of benefit.
Vitamin B₁₂	Malabsorption of some forms.	Foods fortified with synthetic vitamin B ₁₂ or a low-dose supplement may be of benefit in addition to a balanced diet.
Water	Lack of thirst and increased urine output make dehydration likely.	Mild dehydration is a common cause of confusion.
Iron	In women, status improves after menopause; deficiencies linked to chronic blood losses and low stomach acid output.	Stomach acid required for absorption; antacid or other medicine use may aggravate iron deficiency; vitamin C and meat enhance absorption.
Zinc	Intakes are often inadequate and absorption may be poor, but needs may also increase.	Medications interfere with absorption; deficiency may depress appetite and sense of taste.
Calcium	Intakes may be low; osteoporosis becomes common.	Lactose intolerance commonly prevents milk intake; substitutes are needed.

Factors that affect risk of malnutrition

Table 16.1 Factors That Increase the Risk of Malnutrition Among the Elderly

Reduced food intake due to:

- Decreased appetite due to lack of exercise, depression, or social isolation
- Changes in taste, smell, and vision
- Dental problems
- Limitations in mobility
- Medications that restrict mealtimes or affect appetite
- Lack of money to buy food
- Lack of nutrition knowledge

Reduced nutrient absorption and utilization due to:

- Gastrointestinal changes
- Medications that affect absorption
- Diseases such as diabetes, kidney disease, alcoholism, and gastrointestinal disease

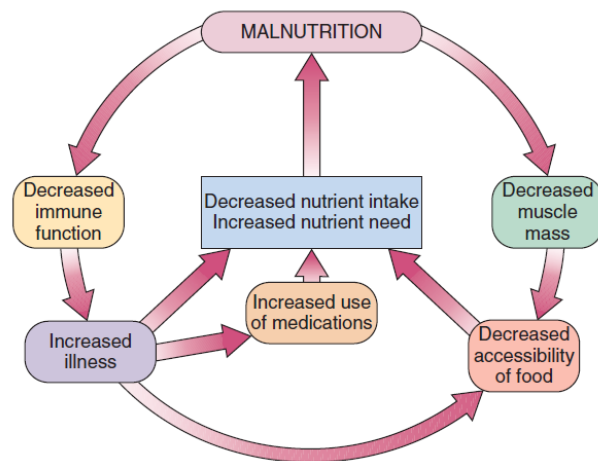
Increased nutrient requirements due to:

- Illness with fever or infection
- Injury or surgery

Increased nutrient losses due to:

- Medications that increase excretion of nutrients
- Diseases such as gastrointestinal and kidney disease

Consequence of malnutrition



Physiological Changes that occur with Aging

- Difficult to determine which changes are from aging that are inevitable or which are from disease
- Altered GI function decreases digestion and absorption
- Change in body composition
- Change in immune function
- Some changes from aging
 - Sensory decline: Decrease affect food gathering and preparation (vision), appetite an food intake (smell, taste)
 - Cataracts
 - Atrophic gastritis
 - Alzheimer's disease
 - Reduced hormone levels
 - Decrease in mobility
 - Dementia
 - Increase in body fat, decrease in lean body tissue

Disease and Nutrition

- Macular degeneration
- Cataracts
- Periodontal disease
- Sarcopenia
- Arthritis
- Cancer
- Type 2 diabetes

Nutrition and Arthritis

- Fats and arthritis
 - Osteoarthritis
 - Associated with being overweight
 - Focus on body weight loss is helpful
- Rheumatoid arthritis
 - Immune system malfunction
 - Focus on diet low in saturated fats, high in fruits/veggies, whole grains and fish oils

Medication

- Can affect nutritional status by interfering with taste, chewing, and swallowing. This causes loss of appetite, GI upset, constipation or nausea. Increases nutrient losses or decreasing nutrient absorption
- Some components slow down/enhance absorption and metabolism of drugs

- Nutritional needs change over our life cycle
- Certain nutrients are essential during different stages of our lives (Maturation, maintenance, senescence)
- Variety of factors influencing food choices in teens/older adults

Two widely used drugs:

- Caffeine
 - Interactions are subtle
 - Stimulant
 - Health effects
- Tobacco
 - Health effects
 - Depresses hunger and body fatness

Keeping older adults healthy

- A variety of social and economic changes often accompany aging
- Factors are interrelated and can affect nutritional status by decreasing the motivation to shop, prepare and enjoy food
- Changes include
 - Income level

- Dependant living
- Depression

Recommended Number of Food Guide Servings per Day

Age in Years	Children			Teens		Adults			
	2-3	4-8	9-13	14-18		19-50		51+	
	Sex	Girls and Boys		Females	Males	Females	Males	Females	Males
<i>Vegetables and Fruit</i>	4	5	6	7	8	7-8	8-10	7	7
<i>Grain Products</i>	3	4	6	6	7	6-7	8	6	7
<i>Milk and Alternatives</i>	2	2	3-4	3-4	3-4	2	2	3	3
<i>Meat and Alternatives</i>	1	1	1-2	2	3	2	3	2	3