

Nutrition and Diet



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Nutrition and Diet

The Word of Wisdom contains the Lord's outline of the kinds of food that provide good nutrition.

Balanced nutrition (1) includes drinking plenty of clean water and regularly eating foods from each of six food groups: grains, vegetables, fruits, milk products, meat and beans, and oils. These foods contain six kinds of nutrients: proteins (2), carbohydrates (3), fats (4), minerals (5), vitamins (6), and water (8). A person should regularly eat or drink enough of all of these nutrients to grow and remain healthy. For infant nutrition (8), mother's milk itself provides an ideal balance of nutrients, with the gradual introduction of solid foods after four to six months of age.

If a variety from all food groups is eaten regularly, it is not usually necessary to take supplements (9). Even carefully chosen vegetarian (10) diets that include dairy products or eggs can be quite sufficient. But if little or no animal products are eaten, then grains must be eaten with legumes (beans, peas, peanuts, and lentils), nuts, and seeds to provide balanced protein.

Food and drink must also be clean and free from disease-causing germs (bacteria, viruses, and parasites) to be healthy. Purified water (10) (potable water) is prepared by removing dirt from the water and treating the water to remove or kill germs. In some areas, the government purifies water that is delivered through secured plumbing; this water is safe to use directly from the faucet for food and drink. In most of the world, however, water should be purified before use. Foods (11) should be washed free of dirt and then peeled, cooked, boiled, or sanitized before eating.

Food must be eaten in proper amounts (14, 15) to maintain good health.

Eating disorders (12) are serious, negative eating behaviors that can be fatal if untreated. Generally, obesity (12) results from eating more while malnutrition (13) results from eating less food than needed for growth, maintenance, and daily activity.

Daily energy needs (14, 18) can be estimated based on age, height, weight, and level of activity. The body mass index (14, 17) (BMI) can be a useful measure of the degree of under-nutrition or over-nutrition.

More details about each of the underlined topics can be found in this guide on the pages shown in parentheses. Additional information not provided by the Church can be obtained online by clicking on the underlined links throughout the PDF version of this document.

Balanced Nutrition

What foods should be eaten to provide a good balance of nutrients?

- Nutrition is best balanced by eating the right amounts of a large variety of foods.
 - This provides the protein, carbohydrates, fats, minerals, and vitamins needed for a healthy body.
 - The right amounts of water and exercise are also critical to good health.
- A balanced diet is often represented by different symbols
 - A wheel, plate, or circle symbol suggests a balance of foods is desirable.
 - The rainbow symbol emphasizes variety.
 - A pyramid symbol recommends the number of servings from various food groups decreases from a solid foundation at the bottom (or the base) to the top.
 - Different cultures may use different symbols of healthy food intake based on foods available to them.
 - All symbols have in common a variety of food intake from different food groups.
- **Grains** provide mostly carbohydrates as starches.
 - They also provide some protein that needs to be combined with legumes (beans), nuts, seeds, dairy, or meat to be complete.
 - Half of the grain category should be from whole grains for fiber and vitamins.
- **Vegetables** provide vitamins, minerals, and fiber.
 - Certain vegetables such as potatoes also provide carbohydrates and some vegetable protein, which needs to be eaten with another protein food to be complete.
- **Fruits** provide different vitamins, minerals, and fiber.
 - They also provide sugars for quick energy.
 - ½ to ¾ cup or 120 to 180 mL of fruit juice is the same as one serving of fruit. It is not wise to drink much more than this because the high sugar tends to replace other needed foods.
- **Dairy products** provide complete proteins and major minerals, particularly calcium.
 - They are commonly supplemented with vitamin D and vitamin A.
 - If dairy products are not consumed in the recommended amounts, special efforts should be made to eat other calcium-rich foods or take a calcium supplement. This is particularly important for women.
- **Complete protein** can be provided by meat, chicken, eggs, fish, and soybeans (e.g., tofu).
 - Legumes (e.g., beans) can also provide complete protein if nuts/seeds or grains such as rice or corn are eaten at the same meal to provide limiting amino acids.
- **Vegetable oils** can provide a balance of essential fatty acids.
 - Use them in food preparation (frying, salad dressings, spreads, etc.).
 - Canola and soy oils are preferred.
 - Mustard and hemp seed oils are similar but less common.
 - Olive oil is high in healthy monounsaturated fat and has a good ratio (although relatively low amounts) of essential fatty acids.
 - Peanut, corn, sesame, sunflower, and safflower oils are relatively low in essential omega-3 fatty acids.
 - Half of servings in the oil category should be one of the vegetable oils providing essential fatty acids each day. Tropical oils (e.g., coconut and palm) are extremely low in essential fatty acids.
- **Discretionary calories** should be limited to avoid excessive weight gain.
 - Satisfying appetite with sweets limits eating of vitamin-, mineral-, and protein-rich foods important to good health and function.
 - **Low fat** dairy products and **lean** meat should be used or discretionary calories reduced.

- A simple summary of food groups and good nutrition includes:
 - Grains for carbohydrates and fiber.
 - **Brightly colored** vegetables and fruits for vitamins, minerals, and fiber.
 - Dairy for calcium and protein.
 - Meats, legumes (beans), and nuts for proteins.
 - Fats (oils) scattered among the foods for essential fatty acids.
- **Iodized salt** should be used in all food preparation, even if it costs more, to avoid goiters which occur in many parts of the world.

See [Nutrition Calculations \(14\)](#) to determine the appropriateness of your weight, your daily calorie (energy) needs, the number of servings of each food group required to meet those needs, and the sizes of those food servings.

Additional resources:

[U.S. Department of Agriculture; Food Pyramid](#)
[U.S. Department of Agriculture; Dietary Guidelines](#)
[American Heart Association; food portion control](#)
[American Cancer Society; food portion control](#)

Proteins - “The biological essence of life”

What are proteins and where do they come from?

- **Proteins** are the “building blocks of life” and necessary for good health. Proteins are made of chains of up to 20 different amino acids. During digestion, proteins are broken down into amino acids for the body to use.
- **Amino acids** are generated by the body or obtained through food. There are eight “essential” amino acids that cannot be made by adult bodies and must be eaten.
- **“Complete” proteins** contain all the essential amino acids in adequate amounts. Foods with complete proteins include meats and animal products such as milk, yogurt, cheese, and eggs. Soybean proteins, as in tofu or “soy milk,” are also complete proteins.
- **“Partially complete” proteins** contain all the essential amino acids, but the amount of one or more of those essential amino acids is inadequate. Most proteins in a plant group are only “partially complete” but can be made “complete” if combined with another protein source:
 - legumes (beans) + grains = “complete” protein (e.g., peanut butter sandwich)
 - grains + dairy = “complete” protein (e.g., cereal and milk)
 - grains + nuts or seeds = “complete” protein (e.g., granola)

Why are proteins important?

- Provide needed components for gene and cell reproduction.
- Carry out the instructions of the genes in the cells.
- Form a major part of muscle, including the heart.
- Make up tendons and most connective tissues.
- Help make up collagen and cartilage, which determines the shape of the skeleton.
- Direct and control the chemical reactions of life as enzymes.
- Direct and balance body functions as hormones.
- Repair body damage by forming scar tissue.
- Defend against infection as antibodies.

How can babies receive an adequate amount of protein?

Breast milk is an ideal source of protein for the first 12 to 24 months of life, because it:

- Has a perfect balance of amino acids.
- Does not cause allergy.
- Provides all needed nutrients for normal-term infants.
 - Additional minerals, vitamins, and other nutrients are needed after the first 6 months.
 - Low-birth-weight infants may also need additional nutrients for rapid growth.

Additional resources:

[NIH Medline Encyclopedia, protein](#)
[Harvard Hospital nutrition source, protein](#)

Carbohydrates

What are carbohydrates?

- Most **carbohydrates** (“hydrated carbon”) contain atoms from one water molecule (H₂O) for each atom of carbon (C).
- A **monosaccharide** is the basic dietary carbohydrate and has six carbons. Examples are **glucose**, **fructose**, and **galactose**. Glucose is the sugar in blood. Fructose is twice as sweet as glucose and found in fruits. Galactose is less sweet than glucose and present in milk.
- **Disaccharides** form when two monosaccharides join together.

DIETARY DISACCHARIDES		
glucose + glucose	maltose	from starch
glucose + fructose	sucrose	table sugar
glucose + galactose	lactose	milk sugar

- **Starches** in vegetables and grains are long chains or polymers of glucose. Cornstarch is broken into short chains of glucose to make **corn syrup**; using special enzymes makes **high-fructose corn syrup**, a popular sweetener.
- **Cellulose** is also a long chain or polymer of glucose. It is one of several indigestible carbohydrates called **fiber**.

Why are carbohydrates important?

- Provide energy for brain, muscle, and other body functions.
- Combine with proteins or fats to form important parts of cartilage, connective tissue, the nervous system, and the immune system.
- Contribute to stool softness and normal bowel function as fiber. Large amounts of some fibers in the bowel can ferment to produce gas (flatus).

How are carbohydrates digested and controlled?

- Disaccharides and starches are digested into monosaccharides in the intestine.
- The monosaccharides are absorbed and carried to the liver.
- The liver uses the glucose or converts other monosaccharides to glucose for circulation or storage (glycogen).
- Circulating glucose fuels nerves, brain, eyes, and other tissues without requiring insulin.
- When blood glucose is high, insulin moves it into muscle and fat cells.
- When blood glucose lowers between meals, liver glycogen is broken down to maintain it.

- Glycogen lasts less than a day if not replenished from the diet and can be depleted within a few hours with intense activity.
- If carbohydrates are not replenished regularly, the body uses protein to make glucose for tissues which require it for energy.

Can eating or drinking certain carbohydrates cause diabetes mellitus to appear early if one is at risk (e.g., has a family history of diabetes, obesity, or sedentary lifestyle)?

- High-glycemic-index foods increase risk. They include sugary beverages, cornflakes, many bakery items (bread, crackers, cookies, pastries, etc.), rice, and potatoes.
 - They are easily digested and increase blood sugar quickly.
- Low-glycemic-index foods increase risk less. They include pasta, high-fiber foods, legumes, oatmeal, milk, yogurt, nuts, peanut butter, and whole fruits.
 - They are digested more slowly and influence blood sugar less.

Why are some people lactose intolerant?

- Lactose cannot be used until it is broken down into its two parts by the enzyme **lactase**.
- Virtually all infants have enough lactase to digest the lactose in milk.
- Lactase levels diminish with age in most populations causing **lactose intolerance**.
 - Undigested lactose passes through the intestine and into the large bowel.
 - Bacteria in the large bowel ferment the lactose into gas and acids.
 - Fermentation produces flatus (gas), cramps, and diarrhea.
 - Butter, cheese, yogurt, and even small amounts of milk (2-4 oz or 60-120 ml, especially with food) can generally be tolerated by these persons.
- However, certain populations of North European ancestry and a few in Africa have genes causing lactase to remain with no symptoms of lactose intolerance.

Additional resources:

[NIH Medline Encyclopedia, carbohydrate](#)
[Harvard Hospital nutrition source, carbohydrates](#)
[Harvard Hospital nutrition source, fiber](#)
[National Institute of Diabetes and Digestive and Kidney diseases \(NIDDK\), NIH, lactose intolerance](#)

Fats

What are fats?

- Fats are mostly made of carbon and hydrogen and do not mix well with water.
- Most dietary fats, called **triglycerides**, are made with three **fatty acids**.
- Fatty acids can be **saturated** (full of hydrogen), **monounsaturated**, or **polyunsaturated**, depending on how much hydrogen can be added to them.
- Saturated fats provide concentrated energy, tend to be solid (e.g., in butter and lard), and promote high blood cholesterol.
- Monounsaturated fats are a healthy form of concentrated energy (e.g., in olive, canola, and peanut oils) and are less likely to spoil than polyunsaturated fats.
- Certain polyunsaturated fatty acids (PUFA) in the diet are **essential** to good health and cannot be made by humans.
 - The **omega-3 fatty acid** (ω -3) family includes **ALA** (α -linolenic acid), **EPA** (eicosapentaenoic acid), and **DHA** (docosahexaenoic acid).
 - Rich vegetable oil sources are flax and canola. Fish oil (e.g., salmon) is rich in EPA and DHA.
 - Omega-3 refers to the last opening for hydrogen being 3 positions from the end of the fat molecule.
 - The **omega-6 fatty acid** (ω -6) family includes **LA** (linoleic acid) and **AA** (ARA or arachidonic acid).
 - Rich sources include corn, peanut, sesame, sunflower, and safflower oils.
 - Omega-6 refers to the last opening for hydrogen being 6 positions from the end of the fat molecule
 - The best ratios of the two essential fatty acid families are in **soy oil** and **canola oil**.
 - There is also a good ratio in the less common hemp seed, mustard, and rice bran oils.
 - **Olive oil** has a good ratio, but levels of the essential fatty acids are low.
 - Tropical oils (e.g., coconut oil and palm oil) are low in essential fatty acids.
 - Their fatty acids are saturated with hydrogen but remain fluid at room temperature.

- **Trans fatty acids** are formed when hydrogen is added to unsaturated fats to make them solid.
- **Cholesterol** is another type of fat found in all cell membranes in small amounts.

Why are fats important?

- Cell membranes are layers of fat which form cell walls and chambers.
 - They keep fluids separate for chemical reactions characteristic of life and require essential fatty acids to function normally.
- Fat is important insulation.
 - Fat just below skin insulates the body from extreme temperatures.
 - Layers of fat around important organs insulate them from physical shock or injury.
 - A special fat forms the layer around nerve cells that “electrically” insulates them from each other. Multiple sclerosis is an example of a condition where this layer is damaged.
- Fat is an efficient way to store energy.
 - A pound of fat contains about 3500 calories.
 - Fats contain 9 calories in each gram compared to 4 for proteins and carbohydrates.
 - If energy were stored as carbohydrates instead of fats, then body weight could be 30% greater.
- Cholesterol performs several functions.
 - It stabilizes cell membranes.
 - It is the basis for some hormones (e.g., hydrocortisone, estrogen, and testosterone) and for the production of vitamin D by sunlight on skin.
 - It is the basis for bile salts which help digestion of fat.
- However, excess cholesterol, saturated fats, and trans fats in the diet can increase bad cholesterol in blood and worsen atherosclerosis (clogging of the arteries) and associated diseases. Decreasing these fats or replacing them with monounsaturated fats can help reduce these effects.

Additional resources:

[Harvard Hospital nutrition source, fats](#)

[NIH Medline Encyclopedia, fats](#)

Minerals

Macrominerals – minerals required in large amounts in the diet.

- Over 200 mg of each macromineral is in a normal daily diet.
- Electrolytes include sodium, potassium, and chloride.
 - Generally, they are adequate in the diet.
 - They can become unbalanced if dehydration occurs
 - Fruits, vegetables, and meats are good sources of electrolytes.
- Calcium – The most abundant mineral in the body.
 - 99% of the body's calcium is combined with phosphorus in the skeleton to make bones strong.
 - 1% of the body's calcium is in various body and tissue fluids
 - This calcium is important for muscle tone, muscle contraction, and nervous system functions.
 - Muscle cramping may be an early symptom of low blood calcium.
 - Excellent diet sources include milk, yogurt, cheese, sardines, tofu, soy milk, and canned salmon (with bones).
 - If foods like these are not eaten, then a calcium supplement should be considered with meals and green leafy vegetables included in the diet, particularly for women.
 - Inadequate intake of calcium leads to early osteoporosis and complicating fractures.
 - Most bone calcium content accumulates by the end of adolescence and completes by about age 30. After that, skeletal calcium tends to decrease, especially in women after menopause. It is particularly critical for young women to maximize their bone mineral content before childbearing begins and to pay serious attention to calcium and vitamin D intake throughout their lives.

Office of Dietary Supplements, NIH, calcium
Harvard University nutrition source, calcium

- Phosphorus
 - Phosphorus combines with calcium to strengthen the skeleton.
 - It participates in numerous chemical reactions in the body.
 - It also forms part of the nucleic acid strands that make up genes.
 - Most normal diets have enough phosphorus, so diet deficiency is very rare. Certain diseases such

as kidney failure, however, can result in excessive loss of phosphorus, creating a deficiency in the body.

NIH Medline Encyclopedia, phosphorus

- Magnesium
 - About half of the body's magnesium is found in the bones, half within cells, and about 1% in the blood and tissue fluids.
 - It is important for normal muscle and nerve functions, keeps heart rhythm steady, supports a healthy immune system, and keeps bones strong. Magnesium also helps regulate blood-sugar levels and promotes normal blood pressure. Muscle cramping may be an early symptom of a deficiency.
 - The best sources are leafy green vegetables, nuts, and seafood, although other good sources include whole grains, meats, and dairy products.

Office of Dietary Supplements, NIH, magnesium

Trace elements or microminerals – minerals required in very small amounts in the diet.

- Less than 20 mg of each micromineral is in a normal daily diet, but each is essential to life and health.
- Microminerals are important helpers in various reactions throughout the body
- Some important microminerals are iron, iodine, zinc, copper, selenium, fluorine, and chromium.
- Iron
 - Iron makes up a central part of hemoglobin in red blood cells.
 - It carries life-giving oxygen throughout the body.
 - Insufficient iron or copper are two causes of anemia (low red blood cell count), which results in paleness, fatigue, tiredness, and loss of energy. Menstruating women lose blood regularly and easily develop iron deficiency.
 - Iron deficiency in the cells, even in the absence of anemia, also leads to tiredness, fatigue, and decreased energy.
 - Good sources of iron include meat, fortified cereals, beans, green leafy vegetables, and whole grains.
 - Human milk contains little iron.
 - However, it is generally sufficient for the first 6 months of life
 - After that, the infant diet should include additional sources of iron.
 - If iron deficiency occurs, then a supplement is needed.

Office of Dietary Supplements, NIH, iron

- Iodine
 - Iodine is part of thyroid hormones
 - It is critical to human health and function.
 - Deficiency leads to
 - Goiters (swelling of the thyroid gland).
 - Loss of energy, tiredness, and constipation.
 - Mental function slowing down.
 - Cretinism and permanent mental retardation in the child when severe deficiency occurs during pregnancy and infancy.
 - Sources of dietary iodine are quite variable, depending on the soil in which the food is produced. Seafood is often an excellent source but is also variable. Dairy products are good sources if the cows producing them eat grass and hay with good iodine content or are supplemented.
 - The most reliable dietary source is iodized salt. It is suggested that iodized salt always be used even if it costs more than non-iodized salt.

University of Michigan, iodine deficiency

- Zinc
 - Zinc helps in many chemical reactions in the body.
 - Deficiency leads to
 - Skin rashes, dermatitis, hair loss, diarrhea, poor wound healing, and decreased immune function.
 - Diminished eyesight, taste, smell, and memory.
 - Delayed puberty.
 - 25% of the people in the world are at risk for zinc deficiency, especially populations consuming plant-based diets low in available zinc or with diseases such as chronic diarrhea, which increase zinc losses or interferes with zinc absorption.
 - Meats are a primary source of zinc but other sources include dairy products, beans, nuts, and fortified cereals. Absorption is best in diets that include animal proteins.

Office of Dietary Supplements, NIH, zinc

Vitamins

- Vitamins are organic compounds essential to life and health though present in very small amounts.
- Fat-soluble vitamins (vitamin A, vitamin D, vitamin E, and vitamin K):
 - Can be stored in the body.
 - Can be toxic if consumed in large amounts.
- Water-soluble vitamins (B vitamins, vitamin C, and choline):
 - Can easily be excreted in the urine if consumed in large amounts.
 - Do not generally reach toxic levels.
 - Must be replaced frequently, preferably daily.

VITAMIN TABLE

Vitamin	Name	Sources	Deficiency effects
FAT-SOLUBLE VITAMINS			
Vitamin A	retinol, retinal, retinoic acid	Preformed vitamin A is found only in animals or supplemented foods. It is generally made by converting compounds in yellow and green vegetables.	Impaired vision, night blindness, dry eyes, destruction of the cornea, and total blindness. Other effects include impaired immunity, anemia, thickened cells in breathing passages and urinary bladder, and damaged teeth.
Vitamin D	cholecalciferol, ergocalciferol	Fish, fish oils, and fortified foods. Most is made by converting a compound in the skin when exposed to sunlight.	A deficiency in childhood leads to the bone deformities of rickets. In adulthood, thinning of the bones with muscle weakness is known as osteomalacia. Reduced bone mineral density and fragile bones is called osteoporosis.
Vitamin E	tocopherols, tocotrienols	Almonds, sunflower seeds, sunflower oil, peanuts, hazel nuts, and corn oil.	Deficiency is rare. It usually appears as nerve problems in hands and feet but also as anemia in premature infants.
Vitamin K	phylloquinone, menaquinone	Bacteria in the gut, cabbage, cauliflower, spinach, other green leafy vegetables, cereals, soybeans, and other vegetables.	Impaired blood clotting, poor mineralization of bone.

WATER-SOLUBLE VITAMINS			
Vitamin B ₁	thiamin	Fortified breads, cereals, and pasta; whole grains, lean meats, fish, dried beans, peas, and soybeans. Lesser amounts are found in fruits, vegetables, and dairy products. There is none in unfortified polished rice.	Beriberi: weight loss, emotional disturbances, impaired senses, weakness and pain in arms and legs, irregular heartbeat, and swelling of bodily tissues. Heart failure and death can occur in advanced cases. Chronic deficiency can also cause permanent psychosis with memory loss and confusion.
Vitamin B ₂	riboflavin	Lean meats, eggs, legumes, nuts, green leafy vegetables, dairy products, and fortified breads and cereals.	Cracks in lips (especially mouth corners), high sensitivity to sunlight, inflammation of the tongue, dermatitis (particularly the genitals and mouth), and sore throat and mouth. Growth failure also occurs in children.
Vitamin B ₆	pyridoxine	Cereal grains, legumes, vegetables (carrots, spinach, peas), potatoes, milk, cheese, eggs, fish, liver, meat, and flour.	Anemia, depression, dermatitis, high blood pressure, and water retention.
Vitamin B ₁₂	cobalamin	Eggs, meat, poultry, shellfish, milk, and milk products.	Anemia, neuropathy of hands and feet, and mental deficits. Decreased absorption occurs with gastritis and pernicious anemia. It can also cause symptoms of mania and psychosis. Rarely, paralysis can result.
*	niacin	Dairy products, poultry, fish, lean meats, nuts, and eggs. Legumes and enriched breads and cereals also.	Pellagra: aggression, dermatitis, insomnia, weakness, mental confusion, diarrhea, and eventually dementia and death.
*	pantothenic acid	Eggs, fish, milk and milk products, whole-grain cereals, legumes, yeast, broccoli and other vegetables in the cabbage family, potatoes, and lean beef.	Uncommon but can result in acne, numbness, and tingling.
*	biotin	Eggs, fish, milk and milk products, whole-grain cereals, legumes, yeast, broccoli and other vegetables in the cabbage family, potatoes, and lean beef.	Impaired growth and neurological disorders in infants.
*	folic acid	Beans and legumes, citrus fruits, whole grains, dark green leafy vegetables, poultry, pork, shellfish, and liver.	Anemia and birth defects.
Vitamin C	ascorbic acid	All fruits and vegetables contain some. Highest: green peppers, citrus fruits, strawberries, tomatoes, broccoli, turnip greens and other leafy greens, potatoes, and cantaloupe. Other excellent sources: papaya, mango, watermelon, brussel sprouts, cauliflower, cabbage, winter squash, red peppers, raspberries, blueberries, cranberries, and pineapple.	Scurvy: loss of appetite, diarrhea, shortness of breath, weakness, fatigue, irritability, depression, leg pain, bleeding gums, small hemorrhages from capillaries under the skin, pallor, anemia, poor wound healing, corkscrew body hair, and an impaired immune response.
**	choline	Abundant in egg yolk; added during processing in many foods; lecithin.	Fatty liver and liver damage.

*Vitamin B numbering is controversial for these vitamins

**Recently recognized essential nutrient

Additional resources:

[Office of Dietary Supplements, NIH, vitamin A](#)
[Office of Dietary Supplements, NIH, vitamin D](#)
[Office of Dietary Supplements, NIH, vitamin E](#)
[NIH Medline Encyclopedia, vitamin K](#)
[NIH Medline Encyclopedia, thiamin](#)
[NIH Medline Encyclopedia, riboflavin](#)

[NIH Medline Drug Information, pyridoxine, vitamin B₆](#)
[NIH Medline Encyclopedia, cobalamin, vitamin B₁₂](#)
[NIH Medline Encyclopedia, niacin](#)
[NIH Medline Encyclopedia, pantothenic acid and biotin](#)
[NIH Medline Encyclopedia, folic acid](#)
[NIH Medline Encyclopedia, vitamin C, Ascorbic acid](#)
[Journal of Nutrition, choline](#)

Water

How much water does the human body need?

- About 60% of the body is water. Virtually all body functions depend on it.
 - An average of 2–2.5 liters (or quarts) is lost on a normal, quiet day at sea level.
 - Water in food replaces about 20% of the water lost.
 - Plain water and other beverages replace 80% of the water lost.
 - The average adult drinks 2.2–3.0 liters (9–12 cups) of fluids each day.
 - This amount in deciliters should equal about one-third the body weight in kilograms.
 - This amount in fluid ounces should equal about one half the body weight in pounds.
- Daily fluid needs can more than double due to higher elevation, higher temperature, lower humidity, more exercise, and wrong clothing.
 - Water losses are still significant even while just sitting in air-conditioned comfort.
 - Caffeine or guarana found in many “power drinks” may cause extra water loss in urine and increase fluid needs.
- The best beverage choice is safe water or, in specific cases when salt losses are high such as with heavy sweating, a high-quality sports beverage.

What happens if a person does not get enough water?

- Dehydration (weight reduction due to net water loss) can cause significant problems.
 - Reduced physical and mental function can begin to occur after only 1%-2% water loss.
 - Other symptoms include headache, dry eyes, irritability, and sleepiness.
 - Muscle cramps and salt loss often occur.
 - Impairment worsens as dehydration increases.
 - Thirst can indicate dehydration but water loss is already significant by the time someone becomes thirsty.
 - It is best to drink enough fluids to avoid these problems.

Additional resources:

[Institute of Medicine, National Academies, Dietary Reference Intakes for Water, ...; Free Resources: PDF Executive Summary](#)

[Institute of Medicine, National Academies, Dietary Reference Intakes for Water, ...; Google Books Result](#)

Infant Nutrition

Why is mother's milk the best food for infants born near term gestation?

- The protein from mother's milk:
 - Is an ideal blend of essential and nonessential amino acids.
 - Generally does not cause allergies.
 - Includes antibodies which may provide some protection against germs found in the environment of the mother and infant.
- The carbohydrates (lactose) from mother's milk:
 - Are readily digestible by virtually all newborn infants.
 - Provide a natural laxative function.
- The fat provides infants with:
 - Essential fatty acids.
 - Energy to meet rapid growth needs.
- Minerals and vitamins are readily digestible and generally sufficient with modest exposure to sunlight to produce some vitamin D.

How should infants be fed?

- Mother's milk should be exclusively fed to an infant for the first 4 to 6 months and should be the foundation of a child's diet for at least 12 months.
- By 4 to 6 months of age, infants tend to “outgrow” their body supply of iron, and other nutrients are needed in addition to mother's milk.
 - New foods are often introduced one at a time for a week or more to determine that the infant tolerates it.
 - Iron-fortified baby cereal (rice or oatmeal) mixed with a little breast milk is generally a good first solid food.
 - This can be followed by pureed fruits, vegetables, and meats.
 - Vegetables should be cooked and thoroughly mashed.
 - Ripe fruits can be sanitized, peeled, and pureed as well.
 - Cooked meats should be chopped and minced to a fine paste.

- If baby cereal is not available, then gruel (made of rice or oatmeal) can be prepared.
- Baby foods should be prepared using purified water and containers which have been sanitized.

How do you feed an infant if the mother's milk is not available, for example, when the mother is missing or very ill?

- A milk substitute may occasionally be used but will not have the advantages of mother's milk and risks of infection may increase. The preferred substitute is an iron-fortified commercial infant formula prepared exactly as instructed on the label. **Caution:** *Do not dilute with extra water.*

- In an emergency, when neither mother's milk nor commercial formula is available, a temporary substitute can be prepared by mixing 19 fl. oz. (600 mL) whole cow milk, 13 fl. oz. (400 mL) water, and 3 tablespoons (45 mL) granulated sugar [or alternatively 10 fl. oz. (300 mL) evaporated milk, 22 fl. oz. (700 mL) water, and 3 tablespoons (45 mL) granulated sugar]. Bring just to a boil and let it cool to room temperature in a sterile container protected from dust and flies. **Caution:** *Condensed milk, honey, molasses, and corn syrup sweetener should not be used, and goat milk requires a folic acid supplement.*

Additional resource:

[American Academy of Pediatrics: infant nutrition](#)

Dietary Supplements

- Supplements to a well-balanced diet are generally not necessary.
 - Excess amounts of some supplements may create an unhealthy balance of nutrients.
 - However, modest specialized supplements are desirable in special circumstances.
- Vitamin D production by exposure of the skin to the sun is usually adequate.
 - Skin synthesis of vitamin D may not be adequate:
 - With decreased sun exposure beyond 40° latitude.
 - When the skin is covered with sunscreen or clothing or as skin pigmentation increases.
 - In the elderly, who often do not produce enough 7-dehydrocholesterol, which is necessary for vitamin D production.
 - Since human milk levels of vitamin D are very low, if nursing infants are not exposed to sunlight, they may be at risk for developing crooked bones and fractures (rickets). However, too much sun exposure increases the risk of dehydration, sunburn, and eventually skin cancer in later life.
 - In all such circumstances, a vitamin D supplement may be helpful.
- Women are particularly susceptible to developing osteoporosis and bone fractures later in life
 - They should consume adequate calcium, vitamin D, and vitamin K to:
 - Maximize bone mineral deposits during the growth and childbearing years.
 - Maintain bone mineral content thereafter.
- If sufficient amounts are not eaten, then supplements containing them would be prudent.
- Folic acid
 - Birth defects increase if folic acid is low.
 - A folic acid supplement is advisable before and during pregnancy.
 - If not available, a special effort to eat a diet rich in folic acid would be wise (e.g., fortified foods such as grains and cereals, liver, cowpeas, great northern beans, baked beans, spinach, broccoli, asparagus, and green peas).
- Vitamin C
 - Fresh fruits and vegetables may be hard to find in very cold climates for months at a time.
 - In such cases, a vitamin C supplement would be helpful.
- Since absorption of B vitamins decreases with age, the elderly may benefit from a supplement.
- Vitamin B₁₂ is not present in plants. Those eating a strict vegetarian diet may need to receive a supplement.
- Supplements are also useful for treating specifically identified deficiencies.
 - For example, iron deficiency anemia may be treated with an iron supplement.
 - On the other hand, if large doses of zinc, copper, or other nutrients are taken without there being a deficiency, they may interfere with the absorption and utilization of critical nutrients such as iron.

Additional resource:

[Office of Dietary Supplements, NIH; fact sheets on different supplements](#)

Vegetarian diets

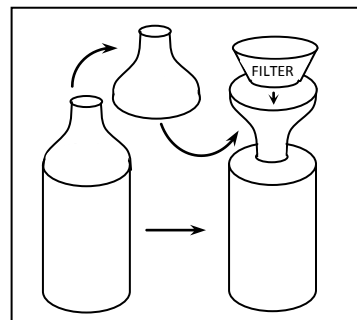
- Vegetarian diets can be quite varied.
 - They can contain low amounts of or no animal products.
 - They are personally chosen, culturally determined, or mandated by scarcity.
 - **Vegans**
 - They are strict vegetarians.
 - They consume no animal sources of food.
 - They are at the highest risk for nutritional problems.
 - **Lacto-vegetarians, ovo-vegetarians, or lacto-ovo-vegetarians** will consume milk, eggs, or milk and eggs, respectively.
 - Some vegetarians will not eat meat or poultry but will eat fish.
 - Other variations of vegetarian diets occur.
- Macronutrients
 - Carbohydrates and fats (oils) are plentiful.
 - Complete proteins may require using:
 - Soy protein (e.g., soy milk and tofu).
 - Simultaneous consumption of combinations of legumes/lentils, nuts/seeds, grains, and/or selected vegetables such as potatoes.
- Intake of several minerals may be limited.
 - Vegetarians not eating dairy products should:
 - Eat enough vegetables containing significant calcium, e.g., spinach, turnip and collard greens, kale, and broccoli.
 - Eat calcium fortified foods such as tofu, soy milk, and fortified fruit juices.
 - Iron and zinc
 - High phytate content of whole grains and legumes may decrease absorption.
- Good vegetable sources of iron include cooked legumes (beans, peas, lentils), enriched cereals, dark leafy green vegetables, whole grain products, and dried fruit.
 - Eating fruits and vegetables with high vitamin C content helps use iron.
- Good vegetable sources of zinc include whole grains, soy products, nuts, and wheat germ.
- Intake of several vitamins may be limited.
 - B vitamins
 - Vitamin B₁₂ is not present in foods from plants.
 - Riboflavin may be deficient if little milk is consumed.
 - Vegetarians can obtain these vitamins from enriched cereals, fortified soy products, or dietary supplements.
 - Adequate intake of vitamin D may be a challenge.
 - Food sources include fortified milk (if consumed), enriched cereals, fortified juice, or supplements.
 - Unblocked sun exposure between the 40-degree latitude parallels provides vitamin D.
 - This exposure is enough year-round for young to middle-aged persons.
 - This exposure may not be enough in older people due to decreased synthesis in the sun. They must rely on supplements.

Note: The following link is not an official Church publication but is provided as additional resource material.
[NIH Medline, vegetarian diets](#)

Water Purification

If your water supply is not known to be safe or has become polluted, it should be purified before use.

- Clarification of cloudy or dirty water by one of two methods is the first step.
 - Filter it through fine cloth or filter paper designed for preparing hot drinks.
 - Allow it to settle, and then draw off clear water.



- Clarified water must be disinfected by one of several methods.
 - Bring it to a rolling boil for 3 to 5 minutes. Caution: prolonged boiling of small quantities of water may concentrate toxic chemical or heavy metal contamination.
 - Alternatively, add 2-4 drops of fresh household chlorine bleach to 1 liter or quart at room temperature, mix, cover, and let stand for 30 minutes. There should be a slight chlorine odor. If not, then repeat the dose of bleach and wait 15 minutes. If the chlorine taste is too strong, pour the water from one clean container to another several times.
- Commercial water filters can effectively clarify, disinfect, and purify water contaminated with microorganisms, toxic chemicals, and heavy metals.
 - Their effectiveness depends on design, condition, and proper use.
 - Water filters produced by Seychelle have been used successfully by Church missionaries for many years. Filters which include silver or iodine (e.g., **Seychelle Advanced** and **Katadyn 0.75L**) more effectively kill micro-organisms.
- See Appendix C for instructions on making a home water filter.

Safe Food Preparation and Storage

- Eating contaminated food is a common source of illness.
 - It may carry disease-causing bacteria or parasites.
 - A relatively safe guide regarding food is:

COOK IT, PEEL IT, BOIL IT, OR FORGET IT!
- Certain fresh fruits and vegetables that are not peeled can be sanitized.
 - Wash free of obvious dirt.
 - Soak for at least 30 seconds in sanitizing solution.
 - Rinse in purified water.
 - These suggestions may not be enough for foods formed in heads (lettuce, cauliflower, cabbage, etc.) or with an irregular surface such as spinach, broccoli, or most berries. Due to the agricultural practices in some countries, leafy vegetables such as lettuce and spinach may actually integrate parasites in such a way that they cannot be sanitized without cooking.

- Prepared food is an excellent place for disease-producing bacteria to grow and multiply enough at room temperature to make a person very ill.
 - Illness-producing growth does not generally occur in the first two hours.
 - All prepared food should be eaten or put into a refrigerator (<4°C or <40°F) within two hours.
 - An exception would be carefully prepared sandwiches that are usually safe for five to six hours.
 - Bacteria growth and spoilage can occur in the refrigerator as well but is slowed.
 - Prepared food should be cleaned out of the refrigerator and discarded at least weekly. If frozen, prepared food can be kept for up to a year or more.

Typical Bacterial Growth in Food

Temperature	Time to Double
90°F (32°C)	½ hour
70°F (21°C)	1 hour
60°F (16°C)	2 hours
50°F (10°C)	3 hours
40°F (4°C)	6 hours
32°F (0°C)	20 hours
28°F (-2°C)	60 hours

SANITIZING SOLUTION
 2 teaspoons (10 mL) fresh liquid bleach
 1 quart (or liter) of water

- Surfaces which come into contact with uncooked meat (especially poultry) should not be exposed to other foods until cleaned and sanitized again.

Additional resources:
[U.S. Department of Agriculture, Basics for Handling Food Safely](#)
[U.S. Department of Agriculture, Safe Food Handling Fact Sheets](#)
[University of Tennessee, Guide to Safe Food Handling](#)

Eating Disorders

What are eating disorders?

- Eating disorders are serious eating behaviors, which can be fatal if left untreated.
- They include anorexia nervosa, bulimia nervosa, and binge eating.
 - Anorexia nervosa is characterized as becoming too thin (see [malnutrition](#)) when persons do not eat enough because they think they are fat.
 - Bulimia nervosa involves periods of overeating followed by purging, sometimes through self-induced vomiting or using laxatives.
 - Binge eating is out-of-control eating, often to the point of being uncomfortable. It is similar to bulimia but without purging.
- Compulsive overeating has been classified as a separate eating disorder by some and included with binge eating by others. It has been called an addiction to food. Persons with compulsive overeating use food to cope with their feelings, which leads to obesity. Like those who suffer from binge eating, compulsive overeaters are at risk of heart attack, high blood-pressure, high

cholesterol, kidney disease and/or failure, arthritis and bone deterioration, and stroke.

Who gets eating disorders?

- Women are more likely than men to have eating disorders.
- They usually start in the teenage years and often occur along with depression, anxiety disorders, and substance abuse.

How are eating disorders managed?

- A qualified health professional should assist with diagnosis and management.
- Eating disorders can cause heart and kidney problems and even death. Getting help early is important.
- Treatment involves monitoring, mental health therapy, nutritional counseling, and sometimes medicines.

Additional resources:

[National Library of Medicine, NIH; eating disorders](#)
[National Institute of Mental Health, NIH; eating disorders](#)
[National Eating Disorders Association](#)
[Something Fishy - website on eating disorders](#)

Obesity

Why is it not good to be overweight?

- Excess weight interferes with health, well-being, and the ability to perform normal daily activities.
 - Some immediate problems of excess weight include decreased mobility, fatigue, tiredness, shortness of breath with exercise, increased sweating, back pain, and lower limb problems with feet, ankles, knees, and/or hips.
 - Longer-term excess weight includes increased susceptibility to type 2 diabetes mellitus, hypertension, and cardiovascular disease.
 - The normal body mass index (BMI) is between 18.5 and 25, although up to 28 is acceptable for persons over age 50. See [Nutrition Calculations, BMI](#) to calculate your body mass index.
 - Waist size measured at the navel line has also been shown to be an indicator of health risks due to obesity, regardless of actual weight. Risks are increased in adult women with a waist size greater than 35 inches (89 cm) and in adult men with a waist size greater than 40 inches (102 cm).
 - It is best to begin early to control a tendency to be overweight.

- Obesity
 - Body mass index is between 30 and 40.
 - Normal body function is compromised because of excess weight.
 - Obesity should be treated vigorously when evident.
- Morbid obesity
 - Body mass index is 40 or more.
 - Both body functions and health are impaired.
 - Aggressive action may be required to correct it.
 - Weight loss surgery may be necessary if life is in jeopardy.

What causes obesity?

- Most commonly, obesity is due to eating more calories (energy) than used for activity and maintenance.
- Occasionally, hormonal imbalances such as hypothyroidism or excessive hydrocortisone can help cause obesity.

How can weight be managed?

- At least 30 minutes of daily exercise for six days each week is normally recommended.
 - An additional 30 minutes of daily activity would be wise.
 - A good goal is to walk or run five miles a day.
- A carefully selected diet is important to successfully manage excessive weight.
 - A diet low in animal fat will help.
 - The diet should be modified to maintain appropriate nutrition while decreasing calorie intake.
 - A daily multiple vitamin and mineral supplement is recommended.
- Design a weight-reduction diet such as the following:
 - Determine the estimated number of calories estimated to be needed to maintain weight based on gender, age, height, weight, and activity level. See [Nutrition Calculations, Estimate Daily Calories](#).
 - Choose an intake of 500-1000 calories LESS than the one estimated to maintain your

current weight (but not less than a total of 1000 calories per day).

- Use your chosen daily calorie intake to determine the servings in each food group. See [Nutrition Calculations, balanced diet servings](#).
- Distribute these servings over 5 to 6 meals throughout waking hours.
- Use low-calorie snacks to stave off hunger, such as yogurt (80-100 calories) plus a glass of water.
- Strictly maintain the size and number of servings each day.
- Consider and treat edema and hormonal imbalances, if present. These are uncommon and most persons with excess weight can benefit from calorie management.

Additional resources:

[National Institutes of Health \(NIH\), Medline: weight control](#)
[National Institute of Diabetes and Digestive and Kidney Diseases, NIH: weight-control information network](#)
[National Heart, Lung, and Blood Institute, NIH: Body mass index](#)
[Body mass index, formulas and interpretation](#)
[National Heart, Lung, and Blood Institute, NIH: Aim for a healthy weight and waist size](#)

Malnutrition

What's wrong with being underweight?

- Moderate nutritional deficiency appears as general weight loss; muscle loss; muscle weakness; sensation of coldness; thin, boney appearance; listlessness; fatigue; apathy; anxiety; decreased social responsiveness; and frequent infections.
- Severe nutritional deficiency results in fatty liver; edema (swollen limbs and face, which can mask weight loss); thin, easily broken fissured nails; poor wound healing; "flaky paint" rash; skin ulcerations; brittle, depigmented hair; and wrinkled, baggy skin (loss of subcutaneous fat).
- It can become a life-threatening condition if not resolved promptly.
- Malnutrition is a risk when body mass index is less than 18 and clearly present when less than 17. See [Nutrition Calculations, BMI](#).

Additional resources:

[Facts on carbohydrates, proteins, fats and fiber and amounts in common foods](#)
[USDA. Food sources of protein beginning with the highest concentration](#)
[USDA. Food sources of calories beginning with the highest concentration](#)
[USDA. Food sources of protein listed alphabetically](#)
[USDA. Food sources of calories listed alphabetically](#)

What causes malnutrition?

- Malnutrition is the result of an inadequate intake and retention of nutrients.
- This condition can be caused by lack of food, lack of a particular food group, failure to consume enough food or a particular food group, vomiting, diarrhea, parasitic infection, or chronic mental or physical disease.

How is malnutrition managed?

- It is critical that underlying infections and physical and emotional diseases be treated while attempting to restore a normal body weight.
- Feeding a malnourished person is best done under the direction of a competent health care professional to avoid severe reactions to the wrong foods being fed too rapidly.

Nutrition Calculations

What is the Body Mass Index (BMI) and how is it calculated?

- The body mass index is calculated using weight and height in the calculator on the right or the chart in Appendix A.
- A higher number means more fat and a lower means less fat.
- The range for good health is between 18.5 and 25; up to 28 is acceptable if over age 50.
- Obesity is from 30 to 40 and morbid obesity is over 40.
- Severe malnutrition is 17.5 and lower.

What impacts daily calorie needs and how are they estimated?

- In addition to weight and height, the calories needed to maintain that weight depend upon gender, age, and activity.
- Activity is estimated from the number of minutes spent exercising each day, including walking.
- The estimator on the right or in Appendix B applies only to persons age 3 and older.
- You can also use the estimator as a guide to lose or gain weight.
 - Use your target weight to estimate your target calories needed.
 - To lose weight, choose a level below or equal to your target calories but no less than 1000 calories per day unless otherwise directed by your physician.
 - To gain weight, choose a level above or equal to your target calories.

How is the number of servings in each food group determined for a balanced diet at a particular calorie intake?

- A balanced diet includes servings from each food group during each day.
- Use the calculator on the right or the table below to convert any calorie goal between 1000 and 9800 into the number of servings needed from each food group each day.
- The number of calories entered will be rounded to the nearest 200 to generate the list of servings.
- Whole grains should make up half of the servings of grains.
- A variety of fruits and vegetables of different bright colors will provide needed vitamins and minerals.
- Oil should include vegetable oils containing essential fatty acids to be used in food dressings and cooking.
- If meat is not lean and/or dairy is not reduced fat, then the servings of extra calories should be reduced.
- **The size of each serving is critical in determining the total number of calories consumed each day.** See the following table that shows the relatively modest size of the servings compared to what may be customary.

Category	Serving Sizes	Examples
Grains	1 oz or 30 g	1 slice bread, ½ cup or 125 mL cooked rice
Vegetables	½ cup or 120 mL	tennis ball -sized serving
Fruits	½ cup or 120 mL	tennis ball -sized serving or medium-sized piece of fruit (apple, orange, peach) or ½ cup of juice
Dairy (milk group)	1 cup or 240 mL 2 oz or 60 g	1 cup low-fat milk or yogurt 2 dominoes -sized pieces of cheese
Meat & beans	3 oz or 90 g	card deck -sized piece of lean meat, ½ cup beans, checkbook -sized piece of fish
Vegetable oil	1 tablespoon or 15 mL	in cooking, gravies, or dressings
Extra calories	120 calories	small piece of cake, ½ candy bar, 2 golf ball -sized scoops of ice cream

SUGGESTED SERVINGS FOR DIFFERENT TOTAL DAILY CALORIES

To estimate servings for higher intakes, multiply 3200 calorie column numbers by chosen calorie factor (e.g., 3500/3200)

TOTAL CALORIES	1000	1200	1400	1600	1800	2000	2200	2400	2600	2800	3000	3200
Grains	3	4	5	5	6	6	7	8	9	10	10	10
Vegetables	2	3	3	4	5	5	6	6	7	7	8	8
Fruits	2	2	3	3	3	4	4	4	4	5	5	5
Dairy	2	2	2	3	3	3	3	3	3	3	3	3
Meat & beans	1	1	1.5	1.5	2	2	2	2	2.5	2.5	2.5	2.5
Vegetable Oil	1	1	1	1.5	1.5	2	2	2	2	2	3	3
Extra Calories	1	1	1	1	1.5	2	2.5	3	3.5	4	4.5	5

Additional resources:

[U.S. Department of Agriculture; Food Pyramid](#)

[U.S. Department of Agriculture; Dietary Guidelines](#)

[California State University; Composition of common foods](#)

[U.S. Department of Agriculture; Comprehensive source of food composition](#)

[American Heart Association; food portion control](#)

[American Cancer Society; food portion control](#)

Appendix A

Body Mass Index (BMI)

The BMI has been used as a measure of the appropriateness of a person's weight for a given height. It is calculated as...

$$\text{BMI} = \frac{\text{Weight}}{\text{Height}^2},$$

with weight in kg and height in meters.

OR

$$\text{BMI} = \frac{703 \times \text{Weight}}{\text{Height}^2},$$

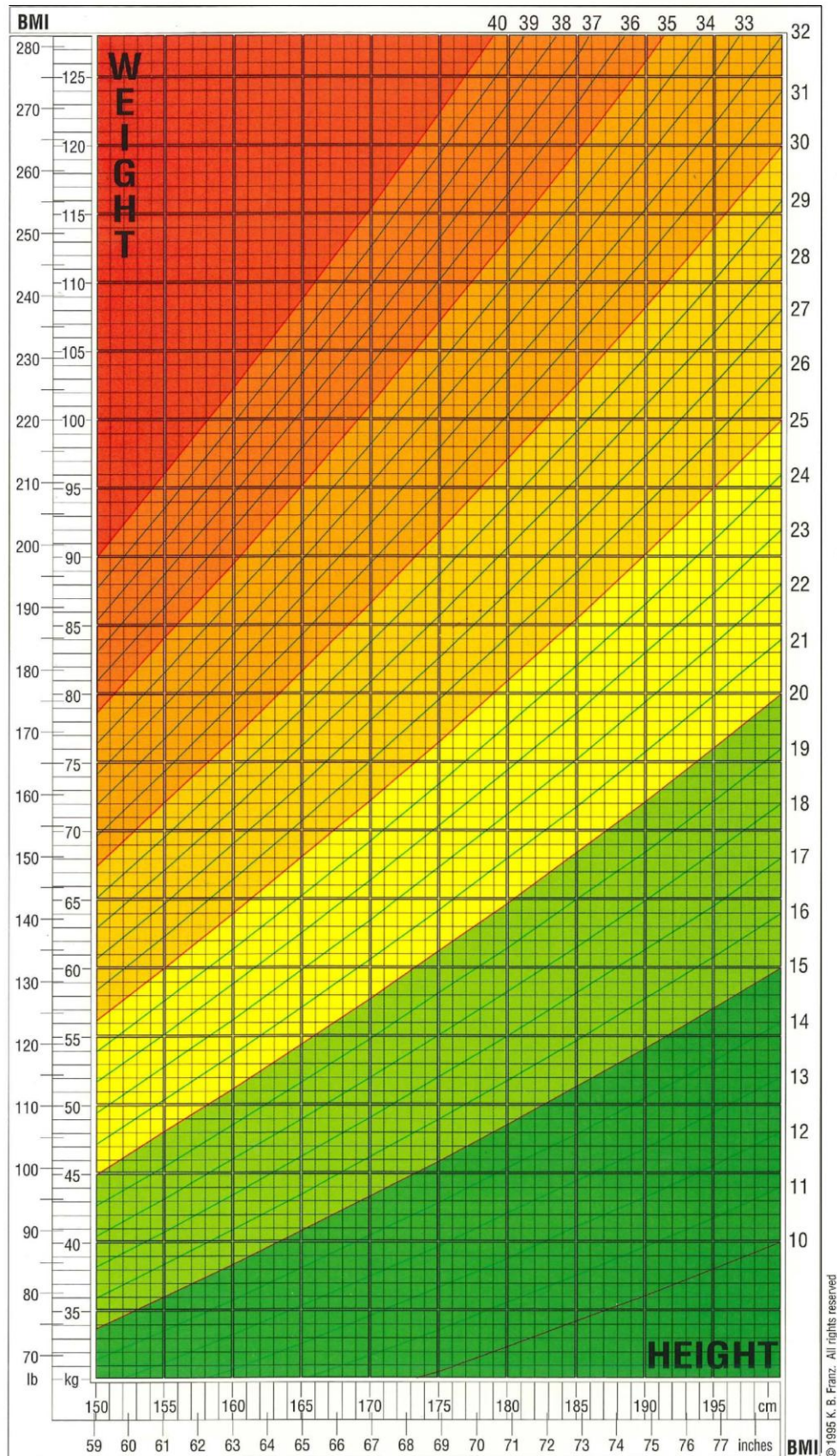
with weight in lbs and height in inches.

The normal BMI is between 18.5 and 25, although for persons over 50 years, up to 28 is acceptable. If this number is less than 17.5, then the person is severely underweight and there is a good chance he or she has protein-energy malnutrition.

COMPUTATION CHART

1. Find weight in pounds on leftmost scale or weight in kg on scale next to it.
2. Find height in inches on bottom scale or height in cm on scale just above it.
3. Locate the intersection of these two coordinates on the black square grid.
4. Read BMI (kg/cm^2) on the curved green lines with values on right and above ranging from 10 to 40.

For example, 70 kg (155 lbs) intersects with 175 cm (69 in) at the green BMI curve labeled $23 \text{ kg}/\text{cm}^2$ on the right.



Body Mass Index

Appendix B

ENERGY (CALORIE) NEEDS

The first step in defining a balanced diet is to determine the estimated daily calorie requirement for an individual. Important factors to consider are gender, weight (pounds or kilograms), height (inches or meters), level of activity, and age (years). If a change in weight is desired, consider using the desired weight instead of actual weight. The factor for the level of activity should be determined from the table below considering the number of minutes spent walking or exercising each day.

In the appropriate gender column in the estimation table, fill in the weight (pounds in top chart or kilograms in bottom chart) on line 2, height (inches in top chart or meters in bottom chart) on line 5, activity factor on line 8, and age (years) on line 13. Then fill in the lines of that column from top to bottom according to the instructions in the first column.

ACTIVITY FACTOR (PA)

Activity Level	Boys (3-18)	Girls (3-18)	Men (>19)	Women (>19)
Sedentary	1.0	1.0	1.0	1.0
< 30 minutes	1.13	1.16	1.11	1.12
30-60 minutes	1.26	1.31	1.25	1.27
> 60 minutes	1.42	1.56	1.48	1.45

Adapted from Dietary Reference Intakes for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein, and Amino Acids (Macronutrients), 2005, National Academy of Sciences, Institute of Medicine, Food and Nutrition Board, pp. 159 (in Chapter 5) and 1200 (in Appendix I).

http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=4&tax_subject=256&topic_id=1342&level3_id=5141&level4_id=10588

The equation for Total Energy Expenditure rearranged from page 159 is:

$$TEE = ((D \times \text{weight} + E \times \text{height}) \times PA) + A - (B \times \text{age})$$

The coefficients (A, B, D, and E) and the activity factors (PA in table above) for the equation are from page 1200.

ESTIMATED ENERGY REQUIREMENT – LBS./INCHES
 (Make entries on lines 2, 5, 8, and 13 then fill in others)

INSTRUCTIONS		MEN	WOMEN
	1	7.22	4.25
Enter target weight in pounds on line 2	2		
Multiply line 1 by line 2 and enter product on line 3	3		
	4	13.71	18.44
Enter height in inches on line 5	5		
Multiply line 4 by line 5 and enter product on line 6	6		
Add line 3 to line 6 and enter sum on line 7	7		
Enter activity factor from table above on line 8	8		
Multiply line 7 by line 8 and enter product on line 9	9		
	10	662	354
Add line 9 to line 10 and enter sum on line 11	11		
	12	9.53	6.91
Enter age in years on line 13	13		
Multiply line 12 by line 13 and enter product on line 14	14		
Subtract line 14 from line 11 and enter difference on line 15 = Estimated Daily Maintenance Calories	15		

ESTIMATED ENERGY REQUIREMENT – LBS./INCHES
 (Make entries on lines 2, 5, 8, and 13 then fill in others)

INSTRUCTIONS		BOYS	GIRLS
	1	12.12	4.54
Enter target weight in pounds on line 2	2		
Multiply line 1 by line 2 and enter product on line 3	3		
	4	22.94	23.72
Enter height in inches on line 5	5		
Multiply line 4 by line 5 and enter product on line 6	6		
Add line 3 to line 6 and enter sum on line 7	7		
Enter activity factor from table above on line 8	8		
Multiply line 7 by line 8 and enter product on line 9	9		
	10	88.5	135.3
Add line 9 to line 10 and enter sum on line 11	11		
	12	61.9	30.8
Enter age in years on line 13	13		
Multiply line 12 by line 13 and enter product on line 14	14		
Subtract line 14 from line 11 and enter difference on line 15 = Estimated Daily Maintenance Calories	15		

ESTIMATED ENERGY REQUIREMENT – KG./METERS
 (Make entries on lines 2, 5, 8, and 13 then fill in others)

INSTRUCTIONS		MEN	WOMEN
	1	15.91	9.36
Enter target weight in kilograms on line 2	2		
Multiply line 1 by line 2 and enter product on line 3	3		
	4	540	726
Enter height in meters on line 5	5		
Multiply line 4 by line 5 and enter product on line 6	6		
Add line 3 to line 6 and enter sum on line 7	7		
Enter activity factor from table above on line 8	8		
Multiply line 7 by line 8 and enter product on line 9	9		
	10	662	354
Add line 9 to line 10 and enter sum on line 11	11		
	12	9.53	6.91
Enter age in years on line 13	13		
Multiply line 12 by line 13 and enter product on line 14	14		
Subtract line 14 from line 11 and enter difference on line 15 = Estimated Daily Maintenance Calories	15		

ESTIMATED ENERGY REQUIREMENT – KG./METERS
 (Make entries on lines 2, 5, 8, and 13 then fill in others)

INSTRUCTIONS		BOYS	GIRLS
	1	26.7	10.0
Enter target weight in kilograms on line 2	2		
Multiply line 1 by line 2 and enter product on line 3	3		
	4	903	934
Enter height in meters on line 5	5		
Multiply line 4 by line 5 and enter product on line 6	6		
Add line 3 to line 6 and enter sum on line 7	7		
Enter activity factor from table above on line 8	8		
Multiply line 7 by line 8 and enter product on line 9	9		
	10	88.5	135.3
Add line 9 to line 10 and enter sum on line 11	11		
	12	61.9	30.8
Enter age in years on line 13	13		
Multiply line 12 by line 13 and enter product on line 14	14		
Subtract line 14 from line 11 and enter difference on line 15 = Estimated Daily Maintenance Calories	15		

Appendix C

Filtering water with homemade filters will not remove germs or parasite eggs. But it will make the water clear before you purify it. Filtering also makes the water taste better. Algae and other particles are removed by passing the water through fine sand. Flavors and colors are removed by passing the water through crushed charcoal. Eventually, the fine sand will get clogged, and the charcoal will not filter well. Both will need to be replaced. Usually, a filter like the one shown in the diagram will work well for two months. It will filter 40 liters of water a day. When the water starts flowing too slowly, replace the top layer of fine sand. If the water still has an odor, color, or taste after it has been filtered, replace the charcoal.

Building a Home Water Filter

This simple filter is made of two clean plastic containers such as buckets or trash cans. One should be smaller so that it will fit inside the larger container with at least 2½ centimeters of space around the outer edge.

1. Study the picture of the filter.
2. Punch or drill holes in the bottom of the smaller container. They should be at least ½ centimeter in diameter so that the water can flow freely from the inner to the outer container.

3. You may want to use a faucet or spigot to draw off the filtered water. If you do, drill or punch a hole in the side of the outer container. The hole should be a little above where the sand and charcoal will be. Install the faucet with rubber or plastic washers or plastic gasket cement.

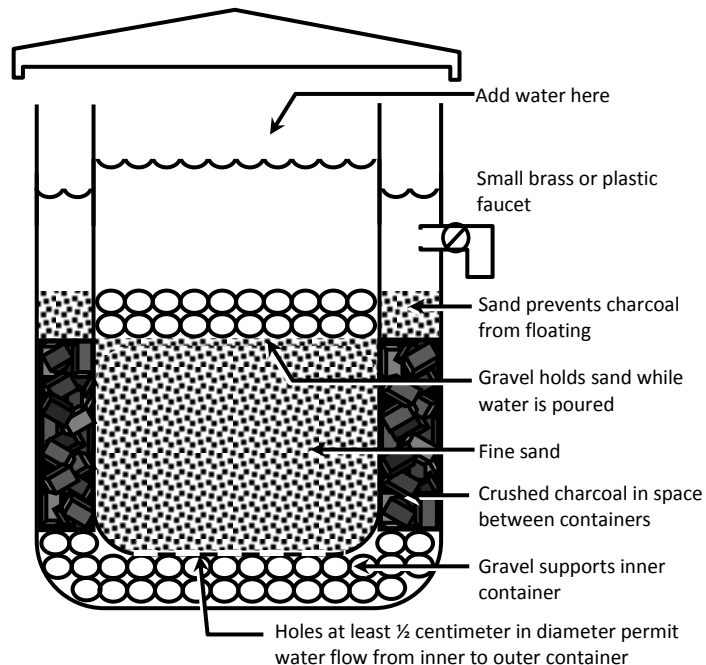
4. Place gravel in the bottom of the large container. Put in enough so that the top of the inner container will be even with the top of the larger container.

5. Put the smaller container on the gravel. Fill it about half full with fine sand. Cover the sand with about five centimeters of gravel to hold the sand in place when you pour water into the filter.

6. Fill the lower portion of the space between the containers with crushed charcoal. Cover it with about five centimeters of sand to keep charcoal particles from floating to the surface.

Using the Water Filter

Clean the filter before you use it. Pour water into the smaller container and draw it off with the faucet until the water comes out clear. Then run eight liters of water that has two teaspoons of chlorine bleach in it through the filter. Then run eight liters of water without chlorine bleach through the filter. The filter is now ready for regular use.



Recommended Dietary Allowances/Adequate Intake levels (RDA/AI) and Tolerable Upper Intake Levels (TUIL) of Nutrients for Missionaries

From US Department of Agriculture Dietary Guidance DRI table last modified September 13, 2011

http://fnic.nal.usda.gov/nal_display/index.php?info_center=4&tax_level=3&tax_subject=256&topic_id=1342&level3_id=5140

ELEMENTS	MALES						FEMALES					
	19-30 years		51-70 years		>70 years		19-30 years		51-70 years		>70 years	
	RDA/AI	TUIL	RDA/AI	TUIL	RDA/AI	TUIL	RDA/AI	TUIL	RDA/AI	TUIL	RDA/AI	TUIL
Calcium, mg	1000	2500	1000	2000	1200	2000	1000	2500	1200	2000	1200	2000
Chromium, µg	35		30		30		25		20		20	
Copper, mg	0.9	10	0.9	10	0.9	10	0.9	10	0.9	10	0.9	10
Fluoride, mg	4	10	4	10	4	10	3	10	3	10	3	10
Iodine, µg	150	1100	150	1100	150	1100	150	1100	150	1100	150	1100
Iron, mg	8	45	8	45	8	45	18	45	8	45	8	45
Magnesium, mg	400	350§	420	350§	420	350§	310	350§	320	350§	320	350§
Manganese, mg	2.3	11	2.3	11	2.3	11	1.8	11	1.8	11	1.8	11
Molybdenum, µg	45	2000	45	2000	45	2000	45	2000	45	2000	45	2000
Phosphorus, mg	700	4000	700	4000	700	3000	700	4000	700	4000	700	3000
Selenium, µg	55	400	55	400	55	400	55	400	55	400	55	400
Zinc, mg	11	40	11	40	11	40	8	40	8	40	8	40
Potassium, mg	4700		4700		4700		4700		4700		4700	
Sodium, mg	1500	2300	1300	2300	1200	2300	1500	2300	1300	2300	1200	2300
Chloride, mg	2300	3600	2000	3600	1800	3600	2300	3600	2000	3600	1800	3600
VITAMINS												
A, µg *	900	3000	900	3000	900	3000	700	3000	700	3000	700	3000
C, mg	90	2000	90	2000	90	2000	75	2000	75	2000	75	2000
D, µg **	15	100	15	100	20	100	15	100	15	100	20	100
E, mg	15	1000	15	1000	15	1000	15	1000	15	1000	15	1000
K, µg	120		120		120		90		90		90	
Thiamin, mg	1.2		1.2		1.2		1.1		1.1		1.1	
Riboflavin, mg	1.2		1.2		1.2		1.1		1.1		1.1	
Niacin, mg	16	35	16	35	16	35	14	35	14	35	14	35
B6, mg	1.3	100	1.7	100	1.7	100	1.3	100	1.5	100	1.5	100
Folate, µg	400	1000	400	1000	400	1000	400	1000	400	1000	400	1000
B12, µg	2.4		2.4		2.4		2.4		2.4		2.4	
Pantothenic acid, mg	5		5		5		5		5		5	
Biotin, µg	30		30		30		30		30		30	
Choline, mg	550	3500	550	3500	550	3500	425	3500	425	3500	425	3500

§ Tolerable Upper Intake Level for Magnesium is for non-food sources used as supplements not for total dietary intake.

*If vitamin A source is retinol, then 1 µg = 3.3 IU (International Units)

** For vitamin D, 1 µg = 40 IU (International Units)

