What is health?

Health matters. Lifestyle choice made on a daily basis have a great impact on health in the future. Health is more than the *absence of disease*.

The WHO includes that health is a state of complete physical, mental and social well-being. Health is seen as a resource to help us reach our goals and to satisfy our needs.

Wellness involves being active in making the correct choices to achieve optimal health. A person who is less well will tend to make poor choices and increase his/her risk of illness, injury and other negative outcomes, including premature death.

The illness-wellness continuum has illness and premature death at one extreme while having high level of wellness at the other extreme. Most people fall somewhere along the line of this wellness continuum.

Dimensions of health and wellness:

- Physical health – Focuses on the functions of the body (i.e. physical activity, eating well, adequate sleep, etc.)
- Intellectual health – Focuses on challenging oneself, learning new ideas and developing skills, being curious, problem solving and critical thinking.
- Psychological health – Responding appropriately to others and things around us, being accepting of oneself, growing and developing as an individual.
- Spiritual health – Focuses on beliefs and values important to us. Good spiritual health helps us find our place in life and helps us strengthen us when challenges are present.
- Social health – Focuses on how we relate to those around us and describes how we help others as well as accepting help in return.
- Environmental health – The quality of where we work, live and play. Included are also the health of the planet (i.e. clean water, use of various chemicals, weather, pollution, etc.)
- Occupational health – Finding fulfillment in whatever you do, either as paid work or your "job" as a student or in athletic endeavours.

Terminology of health:

- Acute illness – Sudden in onset and resolves quickly (can be fatal).
- Chronic illness – Gradual and is long-lasting.
- Morbidity – Illness of any kind, acute or chronic.
- Mortality – Death-related.
  - Infant mortality rate (IMR) counts the number of infants below the age of 1 year who die per 1000 live births. IMR generally relates to a nation's overall health status.
- Sign – An observation (i.e. weight, BP, test results) that may relate to one's state of health (good or bad).
- Symptom – Differs in that it is an experience reported by a patient (i.e. pain, shortness of breath, bleeding, etc.).
- Health promotion – Involves helping people to improve their health, either individually or to groups through mass media.
- Disease prevention – Actions taken to reduce incidence of disease.
  - Prevention can take many forms. Primary prevention seeks to stop problems before they start. Prevention can also target individuals with risk factors to help them avoid potential problems.
  - Protection goes hand-in-hand with prevention as it decreases the risks of our actions.
  - *Prevention* can be looked at as doing everything possible to not have a health-related problem (i.e. not going out in the sun so as to prevent contracting skin cancer – possible but not realistic). *Protection* is understanding the risks of sun exposure, and taking the steps to decrease the risk of getting skin cancer (i.e. using sun screen).
- Causes – More definite, can be related to development of a disease.
- Risk factor – Something that increases likelihood of developing the disease, and is not as directly related to the development of the disease.

Current health challenges in Canada:

Life expectancy is affected (positively or negatively) by nutrition, access to safe drinking water, immunizations, health care, etc. Throughout the lifespan, mortality for males is higher than for females. Poorer Canadians and Inuit communities show lower life expectancy compared to the general population. *Poverty/lack of education* are the overriding influences on health measures, life expectancy and infant mortality rate.

Infant mortality is expressed as the number of deaths of a life-born child below 1 year of age per 1 000 live births. It has declined dramatically in the last century.

In Canada in 2007, the infant mortality rate (IMR) was 5.1/1 000 live births (130/1 000 in 1907). Factors related to IMR include economic development, living conditions, social well-being and the quality of the environment. IMR is an indicator of well-being of a society over time, both within and between countries.

Heart disease and cancer become important causes of death in mid-life and in the older population. Males have higher mortality from *heart disease*, *stroke*, *colorectal* and *lung cancers*. Common behaviours related to the above diseases are:

- Tobacco use
- Excessive alcohol consumption
- Poor nutrition
- Lack of physical activity

Single parents, recent immigrants, disabled persons and Aboriginal people were at greater risk of low income, compared to Canadians in general. Someone at a low income has greater challenges in providing food, shelter and basic necessities.

Student health:

Leading causes of death in college and university students are:

» Unintentional injuries
» Homicide
» Suicide

Chronic disease is not often a factor in deaths within this demographic. Unhealthy habits that can increase chronic disease risk as one ages are common in younger people, although not universal.

Health around the world:

Poverty increases risks for *infectious diseases* that are preventable in richer countries. Illnesses such as *tuberculosis* and *malaria* have become more drug-resistant and of greater concern in poorer countries. Nutritional deficiency diseases are still causing blindness, increased susceptibility to infections that may cause death.

Determinants of health

Social, genetic and environmental aspects influence health:

» Age
» Sex/Gender
» Genetics/family history
» Race/ethnicity
» Health history

The lifestyle behaviours that most influence health are:

» Levels of physical activity
» Food intake
» Smoking/non-smoking
» Alcohol intake

Other influences are:

» One's ability to handle stress
» Sleep habits
» Drug use behaviour
» Available social support
» Healthy sexual decisions
» Personal safety habits
» Socioeconomic status – Being poor means lack of resources to meet daily needs for nutrition, exercise, health and education. Poverty can increase the risk of physical and mental health problems.
» The environment one lives in – Buildings, access to a natural environment, toxic substances or physical hazards can also affect one's ability to maintain health.
» Health services availability – Affects how people take care of their health. Lack of easily accessible care means that health conditions are neglected until that condition is more serious and often more difficult to treat. One's ability to understand disseminated health information is key to making correct health decisions.

Medical terminology

Medical terminology can be confusing to patients. Understanding some of the terminology used by doctors and other healthcare personnel will help a patient better understand what is being discussed about care.

Locational terminology:

Locational terminology gives an idea of location of an injury or problem. Medical terms may indicate organs of the body and tests or procedures to be done.

The body is mostly symmetrical, bilaterally. The left half is essentially equal to the right half. The center line is the median or midline. The *stomach*, *appendix*, *spleen*, *liver* and *heart* are exceptions to the rule of symmetry.

Locations of the body are made with the body in the *anatomical position*, as standard reference:

» Standing erect, facing the observer
» Arms at side
» Palms facing forward
» Feet on the floor

Using this for reference avoids confusion.

The most commonly used anatomical position terms are:

» Anterior – In front of, front
» Posterior – After, behind, following, toward the rear
» Distal – Away from, father from the origin
» Proximal – Near, closer to the origin
» Dorsal – Toward the back
» Ventral – Toward the belly
» Superior – Above, over
» Inferior – Below, under
» Lateral – Toward the side, away from the midline
» Medial – Toward the midline, away from the side

Medical terminology:

The following terms were explained in class:

» Arthroscopy – Examine or treat joints using an endoscope.
» Encephalopathy – Brain disease, damage or malfunction.
» Intracranial – Within the skull.
» Osteosarcoma – Cancer that produces immature bone.
» Otitis media – Inflammatory diseases in the middle ear.

Medical terms always have a *root term* (Greek or Latin words):

» Cardi(o) – Heart
» Gastr(o) – Stomach
» Oste(o) – Bone

Prefixes are small parts added to the *front* of the root word to add precision or more meaning:

» An – Without
» End(o) – Within, inner
» Hyper – Above, over
» Hypo – Under, below
» Micro – Small
» Mono – One
» Pre – Before, in front of
» Sub – Beneath
» Trans - Across

Suffixes are added to the end of the root word:

» Ectomy – Surgical removal
» Emia – Blood condition
» Gram or graph(y) – Record or picture or write
» Itis - Infection
» Oma – Tumour
» Path(y) – Disease, illness or disorder
» Plasty – Forming, molding or surgical repair
» Rrhage or rrhagia or rrhea – Flow or discharge
» Oscope – Instrument for viewing
» Oscopy – Viewing

Medical terms to know

Organ systems:

» Arthr(i/o) – Joints
» My(o) – Muscle, muscle tissue
» Cephal(o) – Head
» Encephal(o) or cerebr(o) – Brain
» Neur(i/o) – Nerve, nerve tissue, nervous system
» Mamm(o) or mast(o) – Breast, breast tissue
» Angi(o) – Blood vessel
» Arter(i/io) – Artery
» Cardi(o) – Heart
» Hem or hemo or hemat(o) – Blood
» Pneum(o) – Air, lung
» Gastr(o) – Stomach
» Hepat(o) – Liver
» Enter – Small intestine
» Col(on) – Colon, large intestine
» Derm(o/at) – Skin
» Cutane – Skin
» Ot(o) – Ear, hearing

Physical fitness

Physical fitness is the ability of the body to respond to routine physical demands, plus enough reserve to meet unexpected challenges. It includes:

» Aerobic/cardiorespiratory endurance
» Muscular strength and endurance
» Flexibility
» Body composition

The components of fitness are:

» Cardiorespiratory fitness – The ability and efficiency of the heart to pump blood throughout the body. It is achieved by aerobic exercise. Exercise level is strenuous enough to increase oxygen need, but not enough to lead to breathlessness.
» Muscular strength – The amount of force one can exert in one contraction of a specific muscle group (1 rep-maximum).
» Muscular endurance – The ability to contract to help you lift, pull or push repeatedly without fatigue.
» Flexibility – The range of motion around each joint. Flexibility is affected by one's age, gender, posture, muscularity and degree of fitness. It increases until adolescence, with gradual loss of flexibility with increasing age.
  ▪ Flexibility exercises help stretch muscles, protect against injury and allow the maximum range of motion for joints.
» Body composition – The relative percentages of fat and lean (muscle, bone, fluid component and organs) tissue. A high body fat percentage is related to increased incidence of heart disease, high blood pressure, diabetes, stroke, some forms of cancer, among other conditions.

Description	Women	Men
Essential fat	10-13%	2-5%
Athletes	14-20%	6-13%
Fitness	21-24%	14-17%
Average	25-31%	18-24%
Obese	32% +	25% +

From the above table, women generally have greater body fat percentage than men. Body fat differs between genders, due to lower muscle mass in women. It is impossible to have a "fat-free body" because essential fat is contained in the brain, nervous system and cell membranes, so fat cannot and should not be attempted to be completely eliminated from the body.

Physical conditioning is the progress that comes with improved cardiorespiratory, muscular strength, muscular endurance, flexibility and body composition.

Functional fitness is related to how efficient one is in performing the everyday activities of living.

Benefits of fitness:

» Physical benefits – Reduction of disease and prolonging life while having a greater stamina.
» Psychological benefits – Lowering of anxiety and stress, moderating depression and improving mood.
» Social benefits – Meet new people, doing activities with friends and family.

Physical activity helps one concentrate better and learn more efficiently, improving intellectual health. Occupational health is helped since fit individuals take less sick days. Spiritual help may be improved as one is more in tune with how the body and mind work together. As one undertakes getting fit, the appreciation of one's surroundings (i.e. clear air, healthy food) is deepened.

The inactivity epidemic:

Being sedentary increases the risk for heart disease, high blood pressure, obesity, osteoporosis, etc. Poverty and less education contribute to lower exercise levels in a society. Time spent watching TV has increased over the years, leading to a greater level of sedentary living. Generally, student exercise levels are low and tend to diminish as one moves through university.

Other health benefits:

» Cardiovascular – Improvement of blood flow, makes heart and lungs more efficient. Increases the number of capillaries (crucial in O_2/CO_2 exchange between blood and tissues). Lowers risk of hypertension, improves levels of various blood fats and cholesterol as well as lowers the risk of heart disease and diabetes.
  ▪ More capillaries create greater blood flow and more oxygen to the muscles which means you're able to exercise longer.
» Lowered risk of metabolic syndrome – This is a combination of high blood pressure, abnormal blood glucose levels, abdominal fat deposition and abnormal blood fats. This increases the risk of type 2 diabetes and heart disease.
» Reduced cancer risk – Especially breast and colorectal cancers.
» Improved immunity – One's susceptibility to disease is reduced with regular exercise. However, those who exercise very intensely (training for marathon) see an increased risk of upper respiratory infections.
» Improved stress management – Endorphins are produced with exercise, stress hormone levels are decreased.
» Improved mental health – Greater self-satisfaction and self-esteem. Improvement of one's appearance may play a part in this effect, since it leads to a better body composition and toning of muscles.

» Better bone mass – Weight-bearing exercises prevent osteoporosis, which becomes more common with increasing age and is more prevalent in older women than older men.
» Improved weight management – Expending calories causes the body to expend energy. Metabolic rate increases with exercise and can reduce body fat while increasing lean muscle mass. Body composition will also improve.
  ▪ *Diet* is effective for weight loss.
  ▪ *Exercise* is effective for maintenance.
» Efficient sexual functioning – Increased stamina.
» More active old age and loner life span – Exercise counters the loss of muscle mass and increased body fat that generally comes with increased age. Improved longevity is seen in those who continue exercising into old age.

Exercise guidelines

Recommendations for exercise:
» Moderate intense cardiorespiratory exercise 30 min/day for 5 days.
» Intense exercise 20 min/day for 3 days.
» Strength training 2x/week.

The overload principle:
Overload: When exercising, the aim is to stress or challenge the body to do more than it is used to doing. This is a gradual and progressive process because too much overload can lead to injury and fatigue.

The FITT principle:
» Frequency – Exercise must be done regularly.
  ▪ 3-5x/week for cardiovascular exercise.
  ▪ 2-3x/week for muscular fitness and flexibility.
» Intensity – Determines the benefits and improvements one obtains.
  ▪ Cardiovascular exercise requires increasing your heart rate to a level called the target heart rate (THR).
  ▪ Muscular strength means increasing the amount of resistance.
  ▪ Flexibility requires stretching muscles beyond their normal reach.
» Time – Similar benefits can be obtained from several shorter sessions as in one longer session.
  ▪ *High intensity* gives benefits for shorter duration.
  ▪ *Low intensity* needs to be done for a longer duration.
» Type – Certain forms of exercise will benefit the cardiovascular system, but not necessarily improve muscular fitness or flexibility. All forms of exercise (cardiovascular, muscular and flexibility) are necessary.

The benefits of exercise can and will be lost if one ceases exercising. It is best to reduce frequency or duration but continue with the exercise if you find yourself stressed for time to exercise.

Cardorespiratory fitness:
The heart, lungs and blood vessels need to carry more oxygen to all of the body's cells. This type of activity is also called aerobic activity because the body uses as much (or slightly more) O_2 than it usually takes in. In anaerobic exercise, the body needs more O_2 than it can take in, so exercise intensity can be high but exercise duration will be short.

Target heart rate (THR) is used to assess whether the cardiovascular exercise is strenuous enough to challenge the heart and lungs. Use the THR chart, which shows heart rates for diffing levels of heart rates relating to exercise intensity as well as age. Take the *carotid pulse*, which should be taken during or immediately after exercise to determine the level at which you have been exercising.

THR is based on exercising at a percentage of average maximum heart rate for each sex and age group. Exercising at 40-60% of max HR is moderate activity. If weight loss is the goal, aim for 60-70%. At 70-80% of max heart rate, one is able to improve aerobic endurance and strengthen the heart. The resting heart rate (RHR) is taken when not exercising. After exercise, the faster your heart rate returns to RHR, the better your cardiovascular fitness.

Muscular strength and endurance:
Strength is related to the muscles being able to work efficiently and reliably. Strength conditioning leads to firmed muscles that will be able to contract more vigorously, with less effort and lower risk of injury.

Strength training increases the size of the muscle fibres and strengthens the connective tissue around the muscle. It also increases the effectiveness of blood flow to the muscles so nutrients, O_2 and CO_2 will transfer more efficiently. Strength training leading to increase in muscle tissue increases the use of body fat during exercise.

Inactivity leads to gradual loss of muscle size (atrophy) and lowered strength. Increasing use of a muscle leads to the muscle growing stronger. The muscle is trained by overloading (increasing the work demand of the muscle over the usual).

Flexibility:
Flexibility refers to the range of motion that is possible without injuring a joint or group of joints. Flexibility increases until adolescence after which flexibility tends to decrease over the rest of the lifespan, leading to greater stiffness of the joints. Benefits are:
» Prevention of injury
» Relief of muscle strain
» Relaxation
» Relief or soreness after exercise
» Improved posture

Nutrients

Nutrients are needed for:

» Energy
» Building/repair of tissues
» Regulating body functions

Essential nutrients are often supplied by food:

» *Macronutrients* – Over a few g/day. The first 3 provide energy measured in C (kCal).
  - Protein – 10 to 35% of kCal.
  - Fat – 20 to 35% of kCal.
  - Carbohydrates – 45 to 65% of kCal.
  - Water – Has no caloric value but is required for maintaining temperature, carrying nutrients and wastes via the blood and aids in digestion. The average adult should consume about 2 to 2.8L of fluids per day.
» *Micronutrients* – Less than 1 g/day.
  - Vitamins
  - Minerals

Anthocyanins are pigments that are responsible for bright oranges and blue-violet colours in fruits and vegetables.

Nutrient density:

Nutrient density is the amount of a nutrient contained in a given amount of food in relation to the calories in that amount of food. Foods we eat should be *nutrient dense*. From low to high nutrient density:

» Red meat, refined grains, full-fat dairy/cheese, refined oils/sweets
» Fish, fat-free dairy, wild meats and fowl, egg
» Cooked starchy veggies, whole grains, raw nuts, seeds and avocado
» Green/all-raw/non-starchy cooked vegies, beans, legumes and fruits

Caloric requirements depend on:

» Gender, life stage, weight and health
» Basal metabolic rate (BMR)
» Activity level

Excess calories are stored as fat

Macronutrients:

» Proteins – 4 Calories/g
  - Protein requirement = 0.8 × weight in kg
  - Amino acids are the building blocks of proteins.
  - Of the 20 amino acids, 9 are *essential*.
  - Animal proteins supply all the amino acids.
  - Plant proteins supply some of the amino acids.
» Carbohydrates – 4 Calories/g
  - When broken down to glucose, they provide energy.
  - Required for majority of body function, especially the brain.
  - *Simple carbohydrates* are sugars and sugar-containing foods like honey, brown sugar, fruits and vegetables.
  - *Complex carbohydrates* are in whole grains, beans and lentils.
  - Low-carbohydrate foods are consumed in an effort to lose weight. Reduced carbohydrate foods may be higher in fat than the foods they replace. Weight loss with a low-carb diet may be rapid in the short term, but long-term weight loss is difficult to achieve with this diet.
  - *Dietary fibre* is a non-digestible form of carbohydrate naturally found in plant foods. *Functional fibre* is fibre that may be added to foods by manufacturers. Fibre slows stomach emptying, enhances feeling of fullness when eating. Fibre is necessary to promote elimination and may decrease risk of developing heart disease and diabetes.
» Fats (lipids) – 9 Calories/g
  - Aid in the absorption of fat-soluble vitamins and functions as cushioning for the abdominal organs. They also help regulate temperature.
  - They are part of the cell membrane and lining of nerve cells.
  - *Saturated fats* are straight and solid at room temperature. Vegetable oils are processed to produce partially hydrogenated fats.
  - *Unsaturated fats* are bend and liquid at room temperature. They can either be monounsaturated or polyunsaturated. Unsaturated fats are recommended as a way to decrease the incidence of heart disease. Omega-3 found in fish are also highly recommended.
  - *Trans fat* are unsaturated but tend to be straight and encourage development of heart disease. They increase cholesterol levels and are produced during the hydrogenation process.
  - It is recommended to use soybean, canola, corn, olive, safflower or sunflower oils. Saturated fats should be consumed as little as possible. Two 3-oz servings of fatty fish are recommended per week to provide omega-3 fatty acids (salmon, tuna, and sardines).
» Vitamins and minerals – Most vitamins and minerals regulate the body's growth and metabolism. They do not provide calories but some work as antioxidants.
  - Most vitamins need to be provided in the diet. Some are fat soluble (A, D, E, and K). Vitamin D can be produced in sufficient quantities by the body, depending on exposure to the sun.
  - Water-soluble vitamins (if taken in larger quantities than needed) will be lost in the urine. All B vitamins, including folic acid, as well as vitamin C, are water soluble.
  - *Folic acid* (folate) is important. Insufficient levels of folic acid in pregnant women increases risk of development of neural tube defects in the baby. With spina bifida, the spinal cord develops abnormally. The baby is born with the defect and may have some difficulties with walking and bladder/bowel control.

- *Antioxidants* protect the body from damage caused by pollution, sun exposure, poor eating habits, stress, etc. This damage can lead to changes in the cell membrane, harm to DNA, increased risk of cancer and heart disease. Vitamins *C, E and A* are precursors and act as antioxidants that reduce damage from oxidative processes of the body's metabolism.
- We consume vitamins from natural sources in foods rather than in supplement form. Those consuming a diet high in antioxidants have a lower risk of lung, colon and stomach cancer.
- *Minerals* are important for building bones and teeth, enzyme functions, nerve and muscle function. *Iron* and *calcium* are the most likely minerals to be deficient in the diet.
- To prevent the development of osteoporosis, one must ensure adequate calcium intake throughout life, as well as weight-bearing exercise (i.e. walking, jogging, cross country skiing, aerobic dancing, skipping, etc.). Most of the calcium in the body is in bones and teeth. The body must build up peak bone mass by young adulthood to prevent osteoporosis in later life. Osteoporosis leads to increased risk of wrist and hip fracture in later life.
- High sodium is a factor in the development of high blood pressure. Sodium intake should be kept to 2.4 g/day (about 1 tsp of salt). The sources of salt are naturally occurring, added during cooking, added at the table or from processed foods.

Canada's Food Guide

Canada's Good Guide is the guide that gives the dietary guidelines to be followed by all Canadians above the age of 2 years.

Following the food guide is one of the steps towards better health, maintaining a healthy body weight and avoiding overweight and obesity. It decreases the risk of chronic diseases such as heart disease, diabetes and certain cancers.

There are 50 nutrients that the human body needs and the food guide is broken down into *4 main groups*, with another small group also mentioned (oils and fats). One should strive to eat the recommended amount of food each day. Choosing a variety of foods is important to meet all nutrient needs. Certain foods should be limited such as those high in calories, fat, sugar and salt.

Limiting intake:

Foods consumed should be:

» Low in fat (saturated and trans-fat).
  - Polyunsaturated fat is *ok*
» Lean meats (poultry and fish), peas, beans and lentils should be primary protein sources.
» Low or moderate amount of alcohol.

4 main food groups:

» Fruits and vegetables – Very emphasized, especially dark green and orange vegetables. These are rich sources of vitamins and minerals (i.e. potassium) as well as fibre.
» Grain products – Healthy source of complex carbohydrates.
» Milk and alternatives – High calcium content. Choose low-fat items from this food groups. In the case of *lactose intolerance*, lactose-free milks or non-dairy enriched milks can be used.
» Meat and alternatives – Includes dried beans, peas, lentils, nuts, seeds and eggs. Major source of protein. Choose low-fat meats and smaller serving. Processed meat can be high in fat.
» Oils and fats – A small amount of unsaturated fat is recommended as a healthy source of omega-3 and omega-6 fats which are essential.

Other:

Also included are recommendations for physical activity. An adult should accumulate at least 2½ hours of moderate to vigorous physical activity per week.

Nutrition labels

The nutrition label states specifically the size of serving for which the nutrition information is given. They are designed to give nutrition information that can be used to compare one food to a reference intake.

The daily value (DV) is the reference intake for each nutrient listed. It is based on the nutrients supplied by a standardized balanced 2 000 Calorie diet. The DV listed for each nutrient gives consumers a point of reference on which he/she can compare on food to another. It is important to try to attain 100% of one's DV for most nutrients. For some nutrients such as total fat, saturated and trans-fats, cholesterol as well as sodium, one should *not* exceed the DV intake.

What you consume may be more or less than the serving size stated on the label. The label includes:

» Serving size
» Calories
» Protein
» Fat content – Broken into saturated and/or trans-fats
» Carbohydrates – Broken into sugars and fibre
» Cholesterol
» Sodium
» Daily values (%)

When looking at fibre, look for a minimum of 4 grams of fibre per serving. Look for whole wheat grains in the first 3 ingredients. If it does not say this but says wheat flour, you are eating refined flours that have no fibre.

The obesity trend

Obesity rates have soared in North America and around the world. 2 out of 3 Canadians is overweight or obese. Childhood obesity rates have also risen dramatically.

Being obese increases the risk of type 2 diabetes, heart disease, stroke, high blood pressure, high blood sugar, insulin resistance and premature death. Obesity levels also contribute to loss of economic output and greater medical costs to society (between 4.6 and 7.1 billion per year as direct health costs and lost productivity due to not being able to find employment).

Factors contributing to overweight and obesity:

» Genetics – The *thrifty gene theory* proposes that those humans who survived in adverse food environments may pass on the susceptibility to store fat more efficiently and be less able to lose body fat as they burn fewer calories.
  - Raised as a factor but studies show that one's food environment plays a greater role.
  - Genetics and environmental factors determine one's BMR.
  - Basal metabolic rate (BMR) is the lowest rate of energy expenditure in the body other than sleeping.
  - Resting metabolic rate (RMR) is BMR plus calories used in daily but sedimentary activities (sitting, standing, digesting food) and without any exercise.
  - Exercise metabolic rate (EMR) is the rest of daily caloric expenditures which covers the calories used for activity, exercise and sport.
  - BMR (and RMR which is *slightly* larger) changes over the lifespan. The younger you are, the faster your BMR and RMR, due to growth requirements. As one ages, BMR and RMR tend to decrease in line with loss of muscle mass.

» Region in the hypothalamus – Monitors blood nutrient levels and subsequently controls appetite and eating behaviour. It is theorized that the monitoring in obese people is not efficient. Thin people are thought to be able to burn off calories by increasing metabolic rate to compensate for ingesting excess calories.
  - Set point theory – The suggestion is that our body adapts to keeping our weight within narrow range and adjusts metabolic rate to maintain this body weight. Our body would fight to hold on to stored calories during any weight reduction diet to maintain this body weight as a form of protection against starving.
  - Yoyo dieting – Some dieters lose weight, then regain or even increase their overall weight. Their BMR was adjusted lower during the dieting phase and once the dieter resumes eating normally, weight gain is easier.

» Hormones – Includes ghrelin and leptin. Those who are at a more normal weight have a better signalling of the feeling of satiety (fullness) and will discontinue eating.
  - Ghrelin – Hormone produced by the stomach that signals hunger and stimulates appetite.
  - Leptin – Produced by fat cells and works to keep fat stores stable, once they have been established.

» Fat cells – During periods of growth in late childhood and early puberty, the number of fat cells increase. During periods of excess intake, fat cell size increases. When fact cells have reached their maximum size, the cell number increases. Even with fat loss, the cells may shrink but not the number.
  - Some obese individuals may have many more fat cells than thinner individuals. Fat cell numbers increase by a process called *hyperplasia* during fetal life, infancy and puberty. These cells can increase in size (*hypertrophy*) so that those with excess number of fat cells can go on to store greater amounts of fat overall.

A variety of factors come into play in the increase of obesity and overweight in Western society:

» Less activity requires to perform various jobs
» TV, video and technology
» Food marketing
» Larger portion sizes and more food eaten away from home
» Consuming calorie-dense foods and doing less activity
» Suburban living
» Stress, fast pace of life
» Prenatal factors may be malnutrition during pregnancy, prenatal diabetes and maternal obesity
» Food used as a reward
» Poverty may cause the ingestion of less healthy but cheaper foods

Assessing body weight and body composition

Essential fat is fat that is necessary for the body to function normally (i.e. fat surrounding the nerves) and accounts for 3-7% of body weight in men and 10-12% in women. Storage fat refers to all the other fat in the body. Storage fat in women is higher than in men due to greater fat deposits in the hips, thighs and breasts.

Over-fatness is more of the problem, rather than being overweight, taken as weighing more than the "standard" weight for one's age and gender. Highly muscled individuals may weigh more than expected. One is classified obese if they weight more than 20% above the ideal weight for height. Morbidly obese individuals are 100% or more above their ideal weight for height.

BMI:

The tool used to assess overweight or obesity is called the body mass index (BMI) calculated as the following:

$$\frac{\text{Weight [kg]}}{\text{Height}^2\ [\text{m}^2]}$$

BMI does not take gender into account, nor does it measure body fat amounts or percentages. The guidelines are the following:

» Healthy → 18.5 to 24.9
» Overweight → 25 to 29.9
» Obesity → Over 30
» Morbid obesity → Over 40

Well-muscled individuals may be classified as obese, without actually being over-fat. Older individuals and the majority of shorter individuals may not be correctly classified by BMI.

Waist circumference:

Waist circumference is also used to evaluate health risks of overweight. Waist circumference of over 40" in men and over 35" shows greater health risk. These standards reflect the fact that fat stored around the abdomen is more injurious to health than fat stored in other areas of the body.

We can also evaluate overweight by using the waist-to-hip ratio:

» Safe → 0.8 (women) and 0.9 (men).
» At risk → 1.0 or above

Body fat measurements:

Each of these has a certain error factor:

» Underwater weighing – Most accurate, using water displacement to measure body density.
» Skinfold measurements – Needs skinfold caliper and someone knowledgeable in its correct use.
» Bioelectrical impedance analysis BIA – Measures lean body mass with electrical current. Body fat is the difference after subtraction of lean body mass.
» DEXA – Uses low-level X-rays to differentiate lean tissue from fat tissue.
» Bod pod – Uses air displacement to measure body density.

Managing weight

Long-term eating behaviours have to be healthy. Dieting may be successful in the short-term, but does not necessarily lead to long-term weight loss.

What we can do:

» Improving eating habits – It is helpful to study one's cues for eating, such as time of day, social context, emotions, how much one eats in various situation. After this, a plan for healthier eating can be instituted. Seek help from nutritional professionals if necessary.
» Calories and energy balance – Calories are a unit of measure that tells us how much energy we derive from the foods we eat. Eating 3500 Calories in excess of needs will lead to a gain of 1 lb. of body fat. Expending 3500 extra Calories in physical activity (500 extra calories per day) should lead to about 1 lb. loss per week.
» Including exercise – Physical activity that uses the larger muscles of the body will burn more calories. The more one weighs, the greater the caloric expenditure to move the body over a given distance. Physical activity expends more energy the more time one spends doing the activity.
» Keeping weight in perspective – Weight loss (and weight maintenance) requires ongoing effort. Lifestyle changes are necessary, including healthy eating and exercise.
» Avoid very low Calorie diets – These diets are severely restricted, providing 400 to 700 Calories per day, much below the recommended for sufficient nutrient intake. This type of diet needs strict medical supervision, as the severe lack of Calories can lead to muscle tissue loss, possible dehydration and build-up of ketones in the blood. Some patients have died following this type of diet.
» Avoid drug treatments – One type of medication aims to decrease fat digestion and absorption. The side-effects can lead to oily stool, diarrhea and far soluble vitamin deficiencies. *Stimulants* such as caffeine and amphetamine-like products have been used. The amphetamine-like products have led to patient deaths. Many OTC supplements are bought by patients, with little to no success.
» (Last resort) Surgery – Some techniques reduce the volume of the stomach to cause the patient to feel full after eating a small amount of food. *Gastric bypass surgery* is done both to restrict the size of the stomach and bypass the area of the small intestine where most of the energy-yielding calories are absorbed. The side-effects include infection, vitamin/mineral deficiencies and malnutrition. *Liposuction* involves fat removed from the body under suction. This procedure is most often performed for cosmetic reasons. There are risks here of infection, scarring, skin irregularities and death.