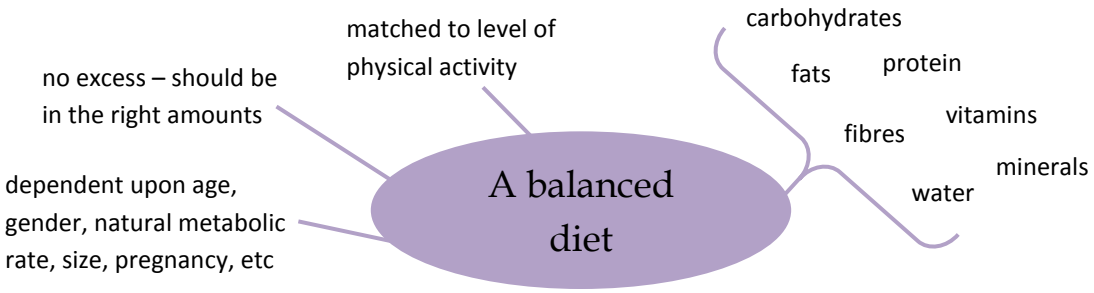
4.1 Food and Health
A Balanced Diet

Components of a balanced diet and risks of consumption of an unbalanced diet

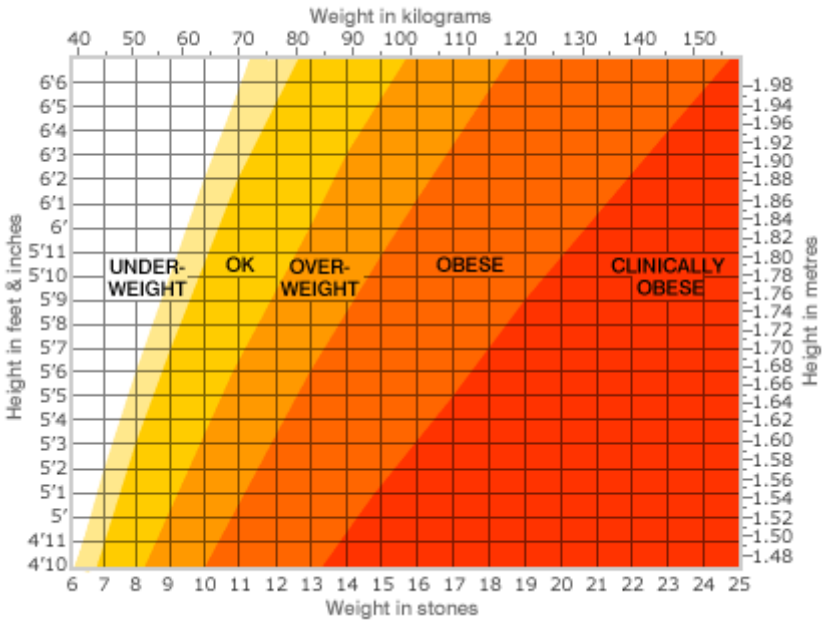
What is **nutrition**? It is **nourishment**. This is the nutrients and energy needed for growth and health. A **balanced diet** is a diet which contains all the nutrients required for health, in appropriate proportions.



What are the components of a balanced diet?

A balanced diet must provide the building blocks for growth and repair, and sufficient energy. There are seven components to a balanced diet:

- **carbohydrates** – the majority of energy intake should come from these molecules, which provide an energy source – these can be divided into *sugars* and *starches*
- **proteins** – needed for growth and repair, and are a minor energy source (55% of energy should come from carbohydrates, 35% from fats and only 10% from protein), due to it being a less efficient energy source
- **fats** – major energy reserve/resource, used for insulation and cell membranes, hormones and cholesterol
- **fibres** – technically a carbohydrate but we don't have the enzyme to break it down so it is indigestible, but is an essential part of the diet for ensuring a functioning digestive system – fibre aids the passage of food through the alimentary canal (also the breakdown by bacteria of fibres can help provide certain trace vitamins)
- **water** – an important transport medium, water is essential for the body to function, and it is involved directly in some metabolic reactions
- **vitamins** – these play an important roles in the chemical processes taking place inside cells – some vitamins are water-soluble and others are fat-soluble
- **minerals** – these are the inorganic elements occurring in the body that are essential to its normal functions



BMI

The term **malnutrition** is often used to refer to people who are **underweight**. But malnutrition also includes those who are **overweight**, as the term just describes a health condition caused by an unbalanced diet. **Obesity** is caused by consuming too much energy. This is a condition where excessive fat deposits impair health, and is usually defined by having a **body mass index** (BMI) of 30 or more. This indicates a weight of 20% over the recommended for your height. BMI can be calculated using the following formula:

$$\text{BMI} = \frac{\text{mass (kg)}}{\text{height (m)}^2}$$

Severe obesity can increase the chance of **mortality** (death), which is why severe obesity is often known by the names *clinical obesity* or *morbid obesity*. As much as 30,000 deaths a year in the UK are considered obesity-related. Obesity is believed to be the most important dietary factor in:

- **cancer**,
- **cardiovascular disease**, and
- **type 2 diabetes**

and is also linked to:

- gallstones,
- osteoarthritis, and
- hypertension (high blood pressure)

It is important that overall energy intake is matched to energy usage to prevent being overweight or underweight. But there are other areas of the diet which can cause bad health. This course focuses on factors which contribute towards **coronary heart disease** (**CHD**). This is the result of the deposition of fatty substances of the coronary arteries. This deposition (called *atherosclerosis*) is covered in detail in 4.3 Smoking and Health.

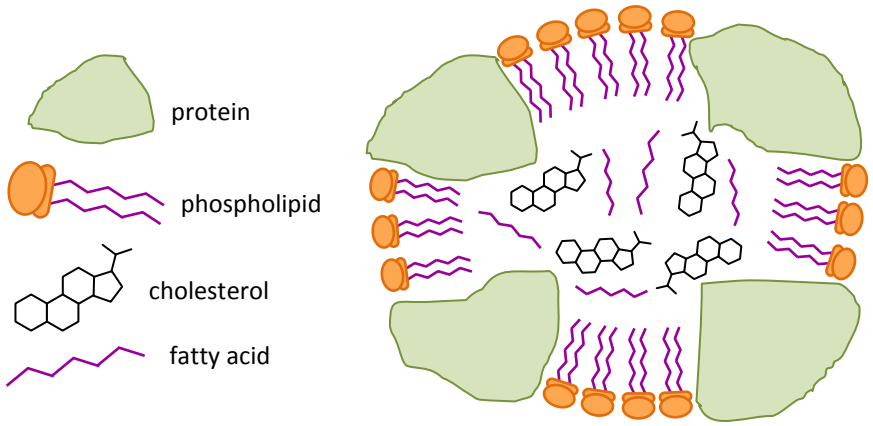
There are some elements of the diet which can help to *prevent* CHD, such as eating oily fish, drinking alcohol in moderation and dietary fibre. However, some of the components which increase the risk of CHD are covered below:

- ***salt**:* having excess salt in the diet will increase the water potential of your blood, resulting in more water being held in the blood and therefore blood pressure increasing, leading to **hypertension** (high blood pressure), a condition which can lead to damage of the inner lining of the arteries, which is one of the early steps in atherosclerosis
- ***fats** (lipids):* you will have noticed on food labels that *saturated* and *unsaturated* fats exist – animal fats tend to be saturated and plant oils are normally unsaturated – saturated fats are generally more harmful to your health, and some unsaturated fats, like those found in olive oil are actually beneficial to your health
- ***cholesterol**:* not quite a triglyceride but is associated with many saturated fats and oils, and too much of it in the blood is harmful – high blood cholesterol concentrations have been linked to almost 50% of deaths due to CHD

Lipoproteins

A **lipoprotein** is used to transport lipids around the bloodstream. The outside of lipoproteins (composed of phosphate heads – from phospholipids – and proteins) are hydrophilic and can therefore dissolve in water. The diagram below shows a typical lipoprotein.

There are two types of lipoprotein. A **high density lipoprotein** (HDL) tends to carry cholesterol from body tissue back to the liver (cholesterol is made in the liver from saturated fats). The liver cells have receptor sites which allow the HDLs to bind to the cells' surface membranes. In the liver, the cholesterol is used in metabolic processes (e.g. to make bile) or is broken down.



Therefore, HDLs are associated with reducing cholesterol levels in the blood. This is why they are often given the nickname "**good cholesterol**".

A **low density lipoprotein** (LDL) carries cholesterol from the liver to the body tissue. Body tissues have the receptor sites which allow LDLs to bind to their cells and deposit cholesterol. Having too much saturated fat in the diet causes the concentration of LDLs in the blood to rise, which means more cholesterol is deposited on arteriole walls, leading to atherosclerosis and in turn, CHD. Because LDLs are associated with increasing the blood cholesterol levels, they are given the nickname "**bad cholesterol**".