The Impact of Diet on Health

Introduction

It is important for workers in health and social care to understand the principles of nutrition, not only to help maintain the nutritional status of the people they care for but also to maintain good nutritional status themselves. The aim of the unit is to help you to develop your knowledge and understanding of nutrition.

How you will be assessed

This is an internally assessed unit. In this unit you will learn about:
- the dietary needs of individuals at different life stages
- the effects of unbalanced diets on the health of individuals
- specific dietary needs of patients/service users
- food safety and hygiene.
Dietary needs of individuals at different life stages

It is important to recognise that people's dietary needs change during their lifespan. A suitable balanced diet for a small child will not be suitable for an adult or older person, so needs must be taken into account when caring for different individuals.

Life stages

Infancy (0–3 years)
At birth, babies rely only on milk to meet their nutritional requirements. Breast milk is the ideal food for newborns because it contains nutrients for all the baby’s needs in the right amounts. Although it is low in iron and copper, the baby has enough of these stored until it starts eating solid foods. In addition, breast milk provides immunity and is clean, readily available and does not have to be prepared. Some mothers are either unable or choose not to breastfeed and use formula milk, which is modified cow's milk. This must be made up to the right concentration to prevent damage to the immature kidneys. The equipment used must be sterilised to prevent infection.

Weaning should not be done before about 4 months of age as doing it early may cause later obesity or allergies. Different foods can be introduced gradually such as cereals, then fruit and vegetables and egg yolk and finely minced meat. By about 12–18 months, the toddler should be eating the same food as the rest of the family, with no extra salt or sugar added. It is usually advised that up until the age of 2 years, children should be given whole milk, but after this they can be given semi-skimmed milk. Skimmed milk should not be given until the age of 5. The amount of milk drunk will decrease as the child eats more and more solid food.

Childhood (4–10 years)
Children aged between 4 and 10 years of age tend to be very active and are growing fast. Although their energy requirements are not as high as adults’, they need almost the same amount of some vitamins and minerals. Some children seem to have big appetites – this is not due to greed but to the fact that they have high nutritional needs. During childhood, children should be encouraged to eat healthy meals consisting of meat, fish or eggs and potatoes, pasta or rice, with plenty of vegetables and fruit. They should not eat too many sweets, crisps, biscuits and fizzy drinks, as these can lead to obesity and tooth decay.

Adolescence (11–18 years)
The nutritional needs of adolescents are greater than for any other age group. This is because they have large appetites and are still growing. It
is important that people in this age group are encouraged to eat sensibly at regular intervals and not to go through phases of overeating or starving themselves in order to lose weight. In addition to encouraging healthy eating, they should be advised to maintain a regular amount of physical activity. Again they should not eat too many sweets, crisps, biscuits and fizzy drinks.

**Over to you**

*Make a list of your favourite foods and drinks. Compare your list with a partner. Do you both enjoy the same kinds of foods? Are there any foods that one of you likes and the other really dislikes? Why do you think this is? Why is it important to enjoy your food?*

**Adulthood (19–65 years)**

During adulthood nutritional needs reduce with age. In general, adults need to eat a healthy diet consisting of complex carbohydrates such as bread, potatoes, rice or pasta, protein such as meat, eggs, cheese or fish, and fruit and vegetables. Fatty and sugary foods should be kept to a minimum and adults should be advised to take physical activity on a regular basis. Alcohol intake should be limited as it contributes extra kilocalories to the diet.

**Pregnancy and breastfeeding**

During pregnancy and breastfeeding a woman’s nutritional needs are increased to provide nutrition for the growing baby and for making breast milk after the baby is born. Although there is a belief that being pregnant means that a woman can ‘eat for two’, only about an extra 200 kilocalories are required in the last three months of the pregnancy, and about 450–570 kilocalories during breastfeeding. This is to give the mother the energy she needs to carry the extra weight of the baby and to make breast milk. Women planning to become pregnant should be advised to eat a diet rich in folic acid to prevent damage to the foetus, particularly spina bifida.

**Old age (65 years +)**

Although, in general, there is not much difference in the energy needs of adults and older adults, as we age we become less mobile and our energy requirements decrease. Appetite also decreases, so it is important that older adults have a diet that provides concentrated sources of protein, vitamins and minerals. Gentle exercise should also be encouraged. Elderly people who live alone often cannot be bothered to cook a hot meal for one person, so they should be encouraged to eat foods that do not require much preparation but are high in nutrients. Taste buds become less efficient in older people so they may require extra flavouring in their food. However, adding salt can raise blood pressure, so herbs and spices can be used.
Concept of balanced diet

Intake and needs

There is not one single food or type of food that provides all the nutrients that the human body needs to function efficiently. A balanced diet will depend on the types of food eaten over a period of time and the nutritional needs of the particular individual. The wider the variety of foods eaten, the more nutrients will be provided by them. It is now known that some health problems are caused by dietary intake, such as too much fat causing heart disease and too much salt contributing to strokes.

---

### Recommended daily amounts of megajoules/kilocalories in males and females

<table>
<thead>
<tr>
<th>Age range</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Megajoules</td>
<td>Kilocalories</td>
</tr>
<tr>
<td>0–3 months (formula fed)</td>
<td>2.28</td>
<td>545</td>
</tr>
<tr>
<td>4–6 months</td>
<td>2.89</td>
<td>690</td>
</tr>
<tr>
<td>7–9 months</td>
<td>3.44</td>
<td>825</td>
</tr>
<tr>
<td>10–12 months</td>
<td>3.85</td>
<td>920</td>
</tr>
<tr>
<td>1–3 years</td>
<td>5.15</td>
<td>1230</td>
</tr>
<tr>
<td>4–6 years</td>
<td>7.16</td>
<td>1715</td>
</tr>
<tr>
<td>7–10 years</td>
<td>8.24</td>
<td>1970</td>
</tr>
<tr>
<td>11–14 years</td>
<td>9.27</td>
<td>2220</td>
</tr>
<tr>
<td>15–18 years</td>
<td>11.51</td>
<td>2755</td>
</tr>
<tr>
<td>19–59 years</td>
<td>10.60</td>
<td>2550</td>
</tr>
<tr>
<td>60–64 years</td>
<td>9.93</td>
<td>2380</td>
</tr>
<tr>
<td>65–74 years</td>
<td>9.71</td>
<td>2330</td>
</tr>
<tr>
<td>75+ years</td>
<td>8.77</td>
<td>2100</td>
</tr>
<tr>
<td>Pregnant</td>
<td>+0.80*</td>
<td>200*</td>
</tr>
<tr>
<td>Lactating:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 month</td>
<td>+1.90</td>
<td>+450</td>
</tr>
<tr>
<td>2 months</td>
<td>+2.20</td>
<td>+530</td>
</tr>
<tr>
<td>3 months</td>
<td>+2.40</td>
<td>+570</td>
</tr>
<tr>
<td>4–6 months</td>
<td>+2.00</td>
<td>+480</td>
</tr>
<tr>
<td>6+ months</td>
<td>+1.00</td>
<td>+240</td>
</tr>
</tbody>
</table>

* = last trimester (three months) only

1 megajoule = 1000 kilojoules; 1 kilojoule = 4.18 kilocalories

Dietary needs will vary for each individual. As you have seen from the information above, dietary needs will differ according to age, but other factors will come into play. Such factors include:

- the level of exercise taken
- the type of job a person does
- religious or cultural decisions
- likes and dislikes
- a person’s health
- availability of food.

These will be discussed further later in the unit.

**Dietary Reference Values**

In 1991, the Committee on Medical Aspects of Food Policy (COMA) published Dietary Reference Values (DRVs), which were designed to provide guidelines by which doctors and nutritionists would be able to assess the adequacy of the diets of different groups of people. From this, three different values were set for most nutrients, as shown in the table below.

<table>
<thead>
<tr>
<th>Dietary Reference Values</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Average Requirement (EAR)</td>
<td>An estimate of the average need for food energy or a nutrient. Most people will need more than this average and many will need less.</td>
</tr>
<tr>
<td>Reference Nutrient Intake (RNI)</td>
<td>The amount of a nutrient that is enough for almost every individual, even those with high needs. The RNI is generally much higher than most people need. The RNI supplies enough of a nutrient for at least 97.5% of the population.</td>
</tr>
<tr>
<td>Lower Reference Nutrient Intake (LRNI)</td>
<td>The amount of a nutrient considered to be sufficient only for the small number of individuals with low nutrient needs (only about 2.5% of the population).</td>
</tr>
</tbody>
</table>
Energy balance

It is important that there is energy balance in the diet. The diet should contain a variety of foods so that energy comes from different sources. As you will see later in the unit, different food groups provide different amounts of energy per gram of the food, and balancing these will help to provide an overall healthy diet.

Nutrient deficiencies and malnutrition

Maintaining good health depends on the consumption of sufficient amounts of nutrients and energy. Malnutrition can describe undernutrition or overnutrition. Undernutrition is the result of not taking in enough energy or nutrients and if this continues over a length of time, starvation and other deficiency disorders will occur. Most particularly, children who suffer from undernutrition can suffer from physical stunting or mental retardation. Overnutrition results from an excessive intake of energy of one or more nutrients and can result in medical problems such as obesity, heart disease or diabetes. Further information on these and other nutrition disorders will be covered in more detail later in the unit.
The balance of good health

The balance of good health is based on the government’s Eight Guidelines for a healthy diet. It forms the basis of the Food Standards Agency nutrition strategy. The guidelines are shown below:

1. Base your meals on starchy foods
2. Eat lots of fruit and veg
3. Eat more fish
4. Cut down on saturated fat and sugar
5. Try to eat less salt – no more than 6g a day
6. Get active and try to be a healthy weight
7. Drink plenty of water
8. Don’t skip breakfast

The balance of good health is set out in pictorial form to show the recommended balance of foods in the diet. If people follow the recommended amounts as shown on the plate and make sure that they choose different foods, they should ensure that they have a balanced diet.
<table>
<thead>
<tr>
<th>Food</th>
<th>What’s included</th>
<th>Main nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bread, other cereals and potatoes</td>
<td>Other cereals means foods such as breakfast cereals, pasta, rice, oats, noodles, maize, millet and cornmeal. This group also includes yams and plantains. Beans and pulses can be eaten as part of this group.</td>
<td>Carbohydrate (starch), fibre, some calcium and iron, B vitamins</td>
</tr>
<tr>
<td>Fruit and vegetables</td>
<td>Fresh, frozen and canned fruit and vegetables and dried fruit. A glass of fruit juice also counts. Beans and pulses can be eaten as part of this group.</td>
<td>Vitamin C, carotenes, folates, fibre and some carbohydrate</td>
</tr>
<tr>
<td>Milk and dairy foods</td>
<td>Milk, cheese, yoghurt and fromage frais. This group does not include butter, eggs and cream.</td>
<td>Calcium, protein, vitamins A, B12 and D</td>
</tr>
<tr>
<td>Meat, fish and alternatives</td>
<td>Meat, poultry, fish, eggs, nuts, beans and pulses. Meat includes bacon and salami and meat products such as sausages, beefburgers and pâté. These are all relatively high-fat choices. Beans, such as canned baked beans and pulses are in this group and they are a good source of protein for vegetarians. Fish includes frozen and canned fish such as sardines and tuna, fishfingers and fishcakes. Aim to eat at least one portion of oily fish such as sardines and salmon each week.</td>
<td>Iron, protein, B vitamins, especially B12, zinc, magnesium</td>
</tr>
<tr>
<td>Foods containing fat</td>
<td>Food containing fat: margarine, butter, other spreading fats and low-fat spreads, cooking oils, oil-based salad dressings, mayonnaise, cream, chocolate, crisps, biscuits, pastries, cakes, puddings, ice cream, rich sauces and gravies</td>
<td>Fat, including some essential fatty acids, but also some vitamins. Some products also contain salt or sugar.</td>
</tr>
<tr>
<td>Foods and drinks containing sugar</td>
<td>Foods and drinks containing sugar: soft drinks, sweets, jam and sugar, as well as foods such as cakes, puddings, biscuits, pastries and ice cream</td>
<td>Sugar, with minerals in some products and fat in others.</td>
</tr>
</tbody>
</table>

Source: Food Standards Agency (2001) *The Balance of Good Health*
<table>
<thead>
<tr>
<th>Message</th>
<th>Recommendations</th>
</tr>
</thead>
</table>
| Eat lots                                                               | Try to eat wholemeal, wholegrain, brown or high fibre versions where possible. Try to avoid:  
  ■ having them fried too often  
  ■ adding too much fat  
    (e.g. thickly spread butter, margarine or low-fat spread on bread)  
  ■ adding rich sauces and dressings  
    (e.g. cream or cheese sauce on pasta)  

| Eat lots – at least 5 portions a day.  
Fruit juice counts as only one portion however much you drink in a day,  
Beans and pulses count as only one portion however much you eat in a day. | Eat a wide variety of fruit and vegetables. Try to avoid:  
  ■ adding fat or rich sauces to vegetables  
    (e.g. carrots glazed with butter or parsnips roasted in a lot of fat)  
  ■ adding sugar or syrupy dressings to fruit  
    (e.g. stewed apple with sugar or chocolate sauce on banana)  

| Eat or drink moderate amounts and choose lower fat versions whenever you can. | Lower fat versions means semi-skimmed or skimmed milk, low-fat (0.1% fat) yoghurts or fromage frais, and lower fat cheeses (e.g. Edam, half-fat cheese and Camembert). Check the amount of fat by looking at the nutrient information on the labels. Compare similar products and choose the lowest, e.g. 8% fromage frais may be labelled ‘low fat’, but it is not actually the lowest available.  

| Eat moderate amounts and choose lower fat versions whenever you can. | Lower fat versions means things like meat with the fat cut off, poultry without the skin and fish without batter. Cook these foods without added fat. Beans and pulses are good alternatives to meat as they are naturally very low in fat.  

| Eat foods containing fat sparingly and look out for the low-fat alternatives. | Some foods containing fat will be eaten every day, but should be kept to small amounts, e.g. margarine and butter, other spreading fats (including low-fat spreads), cooking oils, oil-based salad dressings and mayonnaise.  

| Foods and drinks containing sugar should not be eaten too often as they can contribute to tooth decay. | Foods containing fat such as cakes, biscuits, pastries and ice cream should be limited and low-fat alternatives chosen where available. All foods and drinks containing sugar should be eaten mainly at mealtimes to reduce the risk of tooth decay. |
Although the main components of the diet should be healthy, people can still eat less healthy foods, but in smaller quantities. This is sometimes known as the 80/20 rule – 80% of the time people should eat healthily and they can then eat less healthily 20% of the time. It does not necessarily mean that people have to vary their diet daily – as long as they can achieve a good balance over a week or two-week period. Another pictorial representation is sometimes shown as a pyramid.

Components of a healthy diet

Nutrients

A balanced diet is made up of proteins, carbohydrates, fats, vitamins, minerals, fibre and water. Carbohydrates, proteins and fats are known as macro nutrients because they are required in the body in large amounts. Vitamins and minerals are known as micro nutrients because they are needed in relatively small amounts.

Carbohydrates

Carbohydrates (CHO) are made up of carbon, hydrogen and oxygen. There are three main groups of carbohydrates in foods. These are sugars, starches and cellulose and related products (fibre). They provide the main source of energy in the diet. Foods high in carbohydrates include grains, pulses, fruit and vegetables, and should make up about 55 per cent of the diet.

Sugars are referred to as simple carbohydrates. There are many different types of sugars. Glucose is found naturally in fruit and plants and in the blood. As carbohydrates in food are broken down, the final result is glucose, the molecules of which are small enough to pass from the blood into the cells to provide energy. Glucose syrups are used in the manufacture of cakes, sweets and jams. Fructose is found in some fruit and vegetables and honey. It is the sweetest sugar known. Glucose and fructose are known as monosaccharides or simple sugars.
Sucrose is commonly known as table sugar. It occurs naturally in sugar cane and sugar beet and in some fruits and root vegetables such as carrots. Lactose occurs in milk and is less sweet than glucose or sucrose. Sucrose and lactose linked together both consist of two single sugar units (monosaccharides) to form a disaccharide.

Starches are known as polysaccharides, which means that they are made up of many monosaccharide sugars linked together. Most common forms of starch are cereals such as oats, wheat, barley, rye and rice and potatoes. Pasta and bread are made mainly of wheat. One gram of starch provides approximately four kilocalories of energy.

Non-starch polysaccharides are also known as cellulose or fibre. This is found in the fibrous structure of plant material such as cereals, fruit and vegetables. It is classed as a carbohydrate, but it cannot be digested and absorbed by humans. It is a very important part of the diet as it has a role in the maintenance of good health. It has the following functions:

- It encourages chewing.
- It adds bulk to the diet and helps with digestion.
- It helps to prevent constipation.
- It helps to prevent bowel disorders.

Proteins

Proteins are made up of carbon, hydrogen, nitrogen and oxygen. Most also contain sulphur and some contain phosphorus. Proteins are essential components of all cells and they have two main functions – to regulate body processes or to provide structure in the body. They also help to make antibodies and enzymes. Protein is needed in the body for growth and repair, but any excess taken in will be used to provide energy. Proteins are made up of chains of amino acids. About 20 amino acids are needed in the body and of these, eight are said to be essential. This does not mean that they are more necessary than the others, but that they cannot be made in the body so have to be obtained from the food eaten. Protein should make up about 15 per cent of the diet.

Proteins can be divided into animal and vegetable. Animal proteins are called high biological value proteins because they contain all eight essential amino acids. These include meat, fish, cheese and eggs. Plant proteins are called low biological value proteins because they are usually deficient in one or more of the essential amino acids. When these foods are mixed in the same meal, they will complement each other and become a complete protein. An example of this is baked beans on toast. Bread is deficient in one essential amino acid and beans are deficient in another, so by eating them together you can have a complete protein meal. Low biological value foods include pulses such as beans and peas and soya or tofu. Tofu is the most complete vegetable protein. Food combining is a way that vegetarians and vegans can obtain complete proteins in food. The following diagram shows how this can be done:
In addition to proteins found naturally in animal or plant food, there are alternatives to meat that have been developed by the food industry:

- Texturised vegetable proteins have been developed from plant proteins and are considered suitable for use by vegetarians. These are made from soya beans and are produced as soya mince or chunks. They are fortified with vitamins and minerals.

- Mycoprotein is another acceptable alternative to meat. It is produced from a fungus and one well-known product is Quorn. The fungal microorganism is grown, harvested and processed, and is produced as slices, chunks and mince.

**Fats**

Fats are compounds of carbon, hydrogen and oxygen. Some of the fats consumed by humans are visible, that is, they can be easily seen, such as the fat on meat. Others are invisible and these are generally a component of a food such as milk and nuts. Fats have several important functions in the body:

- Fats provide a concentrated source of energy in the diet.
- They also help to provide insulation against the cold by preventing heat loss.
- They protect body organs such as the kidneys.
- They help to transport and store vitamins A, D, E and K.
- They provide taste to food and make it easier to eat.
The main sources of fat in the western diet come from animal and dairy products. These are called saturated fats and are solid at room temperature. Examples of these are butter and margarine as well as suet and the fat on meat. They are less healthy than fats that come from plants as they can contribute to heart disease because they contain cholesterol. Fats should make up 30 per cent of the diet, but no more than 10 per cent should be saturated fats.

Plant fats are usually liquid at room temperature and examples of these are oils such as olive and sunflower. They are known as unsaturated fats. They are less likely to contribute to heart disease because they do not have the same effect of blocking the blood vessels as animal fats have. Olive oil is particularly identified as an oil that helps to prevent against heart disease.

Essential fatty acids are now known to be very important in the prevention of heart disease. They are the Omega 3 and Omega 6 fatty acids, but those in seeds such as pumpkin seeds, linseed and oily fish such as mackerel, sardines, tuna and salmon are known to be particularly beneficial. Omega 6 fatty acids are found in cereals, eggs, poultry and in evening primrose and borage oils.

**Hydrogenation**

‘Hydrogenation is one of the processes that can be used to turn liquid oil into solid fat. The final product of this process is called hydrogenated vegetable oil, or sometimes hydrogenated fat. It’s used in some biscuits, cakes, pastry, margarine and other processed foods.’

During the process of hydrogenation, trans fats may be formed. This means that foods that contain hydrogenated vegetable oil (always declared in the ingredients list) may also contain trans fats. The trans fats found in food containing hydrogenated vegetable oil are harmful and have no known nutritional benefits. They raise the type of cholesterol in the blood that increases the risk of coronary heart disease. Some evidence suggests that the effects of these trans fats may be worse than saturated fats.

So, as part of a healthy diet we should try to reduce the amount of foods we eat that contain hydrogenated or saturated fats and replace them with unsaturated fats. And it’s also important to reduce the total amount of fat we eat.

Biscuits, cakes, pastries, meat pies, sausages, hard cheese, butter and foods containing coconut or palm oil all tend to be high in saturated fats, so try not to eat too much of these.

Foods that are rich in unsaturated fats include oily fish, avocados, nuts and sunflower, rapeseed and olive oils.

Trans fats are also naturally found at very low levels in foods such as dairy products, beef and lamb.

*Source: www.eatwell.gov.uk*
Vitamins

Until the beginning of the twentieth century, it was believed that the only necessary components of the diet were proteins, carbohydrates and fats. However at this time, it was established that there were other elements that were also essential. Vitamins are very important in the body because they help enzymes to work properly. Vitamins cannot be made by the body and they are essential to life. There are two types of vitamins: water soluble and fat soluble. The water soluble vitamins are the B vitamins and vitamin C. The fat soluble vitamins are A, D, E and K. The table below shows the sources and functions of the vitamins in the diet.

Key point

‘Interestingly, nutritionists are now finding that Omega-6s and Omega-3s will only maintain their status as “good” fats when you get relatively balanced amounts of both. Unfortunately, most western diets today are heavy on Omega-6s, often at the expense of Omega-3s. This means that, except as an adjunct to certain health conditions, Omega-6 supplements are probably not necessary.’

Source: wholehealthmd.com

### Sources and functions of vitamins

<table>
<thead>
<tr>
<th>Vitamin</th>
<th>Chemistry</th>
<th>Principal sources in diet</th>
<th>Function</th>
<th>Effect of shortage</th>
<th>Practical notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A – Retinol</td>
<td>Organic compound, soluble in fat and oil</td>
<td>Fish oil, liver, butter, cheese, eggs, milk, fruit and veg</td>
<td>Night vision, keeps skin and epithelial linings healthy</td>
<td>Night blindness, itching, thickening of horny layer, dry skin</td>
<td>Stored in liver, excess can be harmful</td>
</tr>
<tr>
<td>B₁ – Thiamin</td>
<td>Organic compound, soluble in water</td>
<td>Bread, nuts, cereals, flour, meat, eggs, potatoes, poultry, milk</td>
<td>Release of energy from carbohydrates (CHO), digestion, correct functioning of nerves, building of blood, growth</td>
<td>Beri beri, apathy, poor appetite, pins and needles in legs, depression</td>
<td>Some may be lost in cooking, cannot be stored</td>
</tr>
<tr>
<td>B₂ – Riboflavin</td>
<td>Organic compound, soluble in water</td>
<td>Milk, liver, kidney, cereal, yeast, meat extracts, eggs, cheese</td>
<td>Release of energy from CHO</td>
<td>Cracking at corner of mouth, soreness of tongue, light sensitivity</td>
<td>Susceptibility to sunlight – bottles of milk on doorstep</td>
</tr>
<tr>
<td>B₃ – Niacin</td>
<td>Organic compound, soluble in water</td>
<td>Meat extract, yeast extract, wholemeal bread, eggs, liver, cereals</td>
<td>Release of energy from CHO, healthy skin and nervous system, cell metabolism</td>
<td>Pellagra, redness of skin, exfoliation of hands and face, diarrhoea, memory loss, irritability, insomnia</td>
<td>Depleted by physical and mental stress</td>
</tr>
<tr>
<td>Vitamin</td>
<td>Chemistry</td>
<td>Principal sources in diet</td>
<td>Function</td>
<td>Effect of shortage</td>
<td>Practical notes</td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------</td>
<td>---------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>B₅ – Pantothenic acid</td>
<td>Organic compound, soluble in water</td>
<td>Animal products, cereals, legumes</td>
<td>Releases energy from fat and CHO, healthy immune system</td>
<td>Weakness, depression, resistance to infection</td>
<td>Microorganisms in small intestine can make this.</td>
</tr>
<tr>
<td>B₆ – Pyridoxine</td>
<td>Organic compound, soluble in water</td>
<td>Meat, green veg, bran, wholemeal flour, eggs, bananas</td>
<td>Protein metabolism, converts tryptophan to niacin, formation of haemoglobin</td>
<td>Fatigue, nerve dysfunction</td>
<td></td>
</tr>
<tr>
<td>B₁₂ – Cyanocobalamin</td>
<td>Organic compound, soluble in water</td>
<td>Widely distributed in animal foods</td>
<td>Involved in manufacture of red blood cells in bone marrow, healthy nervous system</td>
<td>Pernicious anaemia, red sore tongues, degeneration of nerve cells</td>
<td></td>
</tr>
<tr>
<td>C – Ascorbic acid</td>
<td>Organic compound, soluble in water</td>
<td>Blackcurrants, citrus fruits, green veg, peppers, tomatoes</td>
<td>Formation of bones and teeth, essential in blood, wound healing, immune system, skin and gums</td>
<td>Scurvy, incomplete cell repair, bruise easily, physical and mental stress</td>
<td>Not stored in body, lost in cooking, possibly carcinogenic in large doses</td>
</tr>
<tr>
<td>D</td>
<td>Organic compound, soluble in fat and oil</td>
<td>Fish liver, oily fish, eggs, milk, margarine, sunlight</td>
<td>Absorption of calcium in intestine, regulates calcium and magnesium in bone tissue</td>
<td>Rickets, osteomalacia, spontaneous fractures</td>
<td>Produced in skin by sun, stored in liver, excess can be harmful, good for nails</td>
</tr>
<tr>
<td>E</td>
<td>Organic compound, soluble in fat and oil</td>
<td>Eggs, cereal oils, veg oils, nuts, seeds</td>
<td>Maintains healthy muscular system, anti-oxidant, protects cell membranes</td>
<td>Poor muscle, circulatory and nerve performance</td>
<td>Babies fed low E content formula can have low stores, some people cannot absorb or utilise</td>
</tr>
<tr>
<td>K</td>
<td>Organic compound, soluble in fat and oil</td>
<td>Green veg, fish liver oils, alfalfa tablets, molasses, yoghurt</td>
<td>Blood clotting</td>
<td>Rare – babies may need supplement at birth, diarrhoea</td>
<td>Can be made by intestinal bacteria.</td>
</tr>
<tr>
<td>Folic acid</td>
<td>Yeast, leafy green veg, meat, avocado, bananas</td>
<td>Produce red blood cells and tissue cells, normal growth, healthy gastrointestinal tract</td>
<td>Megaloblastic anaemia, neural tube defects</td>
<td>Can result from poor diet, decreased absorption in gastrointestinal disease</td>
<td></td>
</tr>
</tbody>
</table>

**Minerals**

Minerals are elements that are found in the earth and the sea. About 15 of them are essential to normal health and some are needed in quite large quantities while others are trace minerals and are only needed in very small quantities. The tables below show the sources and functions of both.
<table>
<thead>
<tr>
<th>Mineral</th>
<th>Function</th>
<th>Food sources</th>
<th>Deficiency symptoms</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>Builds strong bones and hard teeth. Essential for blood clotting. Helps muscles and nerves to work. Activates certain enzymes</td>
<td>Milk, cheese, bread, flour and green vegetables. For some the bones in canned fish are important</td>
<td>Rickets, osteomalacia, muscle cramps</td>
<td>Blood level controlled by parathyroid glands. Requires vitamin D for absorption</td>
</tr>
<tr>
<td>Iron</td>
<td>Needed by all cells. Needed to form haemoglobin in red blood cells. Needed to form myoglobin in muscles</td>
<td>Meat (offal), bread, flour, cereal products, potatoes and vegetables</td>
<td>Anaemia, fatigue, brittle fingernails</td>
<td>Absorbed by body relative to need. Vitamin C increases absorption of iron</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>Helps build bone and teeth. Needed by nerve fibres. All cells need it. Concerned in release of energy from food</td>
<td>Present in nearly all foods</td>
<td>Continuous thirst, dry skin, general weakness, weak reflexes, muscle spasm (tetany)</td>
<td></td>
</tr>
<tr>
<td>Magnesium</td>
<td>Essential constituent of all cells. Needed for enzymes involved in energy utilisation, healthy heart arteries, protein production and nerve function</td>
<td>Wholegrains, seafood, green vegetables</td>
<td>Growth failure, leg cramps, nervousness, confusion, anger easily</td>
<td>Deficiency likely from diarrhoea. Extra needed during lactation</td>
</tr>
<tr>
<td>Sodium chloride</td>
<td>Maintains balance of body fluid (sodium works with potassium). Maintains blood pressure, aids muscle contraction and nerve transmission</td>
<td>Naturally in eggs, meat, vegetables, milk. Added to many processed foods</td>
<td>Muscle cramps</td>
<td>Salt lost by body in diarrhoea. Control regulated by adrenal gland. Salt lost in sweat. Restriction needed in renal disease</td>
</tr>
<tr>
<td>Potassium</td>
<td>Balance of fluids in body (with sodium). Needed for muscle and nerve function. Controls pH of blood</td>
<td>Potatoes, fruit (especially bananas), vegetables and juices</td>
<td>Irregular heart beat, muscle weakness</td>
<td>Most is absorbed. Excess is excreted by kidneys. Excess can cause heart failure</td>
</tr>
<tr>
<td>Mineral</td>
<td>Chief functions in body</td>
<td>Significant sources</td>
<td>Deficiency symptoms</td>
<td>Toxicity symptoms</td>
</tr>
<tr>
<td>---------</td>
<td>----------------------------------------------------------------------------------------</td>
<td>------------------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>Cobalt</td>
<td>Part of vitamin B&lt;sub&gt;12&lt;/sub&gt;, nerve cell function, blood formation</td>
<td>Vitamin B&lt;sub&gt;12&lt;/sub&gt; containing foods – meat, milk and milk products</td>
<td>Only as Vitamin B&lt;sub&gt;12&lt;/sub&gt; deficiency in humans</td>
<td>Unknown nutritionally, occasional exposure damages skin and red blood cells</td>
</tr>
<tr>
<td>Copper</td>
<td>Necessary for absorption and use of iron in forming haemoglobin. Part of several enzymes. Helps to form protective covering of nerves</td>
<td>Meat, drinking water</td>
<td>Anaemia, bone changes (rare in humans)</td>
<td>Vomiting, diarrhoea</td>
</tr>
<tr>
<td>Chromium</td>
<td>Associated with insulin and required for release of energy from glucose</td>
<td>Meat, unrefined foods, fats, veg oils</td>
<td>Diabetes-like condition – inability to use glucose normally. Associated with coronary artery disease</td>
<td>Unknown as nutritional disorder. Occupational exposure damages skin and kidneys</td>
</tr>
<tr>
<td>Fluorine</td>
<td>Involved in formation of teeth and bones. Helps make teeth resistant to decay</td>
<td>Drinking water, tea, seafood</td>
<td>Tooth decay</td>
<td>Discoloration of teeth, nausea, diarrhoea, itching, chest pain, vomiting</td>
</tr>
<tr>
<td>Iodine</td>
<td>Component of thyroxine which helps to regulate growth, development and metabolic rate</td>
<td>Iodised salt, seafood, plants grown in most parts of the country and animals who eat the plants</td>
<td>Enlargement of thyroid gland (goitre), weight gain, mental and physical retardation of infants</td>
<td>Enlargement of thyroid gland, depressed thyroid activity</td>
</tr>
<tr>
<td>Manganese</td>
<td>Facilitator with enzymes of many cell processes</td>
<td>Widely distributed in foods</td>
<td>(in animals) poor growth, nervous system disorders, reproductive abnormalities</td>
<td>Nervous system disorders</td>
</tr>
<tr>
<td>Selenium</td>
<td>Part of an enzyme that works with vitamin E to protect body compounds from oxidation</td>
<td>Seafood, meat, grains</td>
<td>Anaemia (rare), heart disease</td>
<td>Digestive system disorders. Loss of hair and nails, skin lesions, nervous system disorders, tooth damage</td>
</tr>
<tr>
<td>Zinc</td>
<td>Part of many enzymes. Associated with insulin. Involved in making genetic materials and proteins, immune reactions. Transport of vitamin A. Taste perception, wound healing. Making sperm, normal development of foetus</td>
<td>Protein containing foods – meats, fish, poultry grains, vegetables</td>
<td>Tendency to atherosclerosis, raised ammonia levels, reduced insulin concentration. Growth retardation, abnormal collagen synthesis, decreased DNA synthesis. Impaired cell division and protein synthesis. Diarrhoea, vomiting. Reduced copper absorption, night blindness. Delayed onset of puberty, small gonads in males. Reduced synthesis and release of testosterone, abnormal glucose tolerance, reduced synthesis of adrenocortical hormones. Altered thyroid function</td>
<td></td>
</tr>
</tbody>
</table>
Water

Although people can live for many days without food, they cannot live for more than a few days without water. Water makes up about 55–60 per cent of the body’s weight and is an essential part of all body cells, also helping in many chemical reactions in the body. It helps to carry nutrients to the cells and waste away from them. It helps to regulate body temperature, digest food and lubricate joints. Excess water leaves the body via urine, faeces, sweat and breathing. The kidneys regulate water levels in the body and hormones control the amount of water excreted by monitoring the concentration of the blood.

Nearly all foods contain water, particularly apples, pears, melons, cucumbers, cabbage and tomatoes. Water is also present in cottage cheese, white fish and boiled rice.

People who live in temperate climates such as Britain should have at least a litre of water a day. If they eat good quantities of foods that are high in water content, they can easily do this. People who live in hot climates or who take a lot of exercise must make sure that they drink more than this.

**Diet variation during life stage development**

**Babies**

Breast and bottle feeding have already been mentioned earlier in the unit, but at about four months, babies start to need more nutrients than can be supplied by milk alone. Weaning is the term used to describe the introduction of solid food to babies. It should not be started before four months of age because the baby’s kidneys are not mature enough to cope with solid food before this.

### The process of weaning

<table>
<thead>
<tr>
<th>Stage</th>
<th>Weaning process</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 months</td>
<td>Start with spoonfuls of baby rice, mashed potato or puréed vegetables such as carrot, peas or parsnips. When the baby is used to the spoon, lots of tastes can be introduced, such as puréed meat, pulses and fruit. By 6 months, all infants should have started on some solid food.</td>
</tr>
<tr>
<td>6 months</td>
<td>Introduce food with soft lumps. Do not give nuts as infants may choke or be allergic to them.</td>
</tr>
<tr>
<td>9 months</td>
<td>Minced or finely chopped food can be given. Infants at this age need to be given different textures to get them used to them.</td>
</tr>
<tr>
<td>12 months</td>
<td>A good mixed diet should be given by this stage, including three meals and two to three healthy snacks in between each day.</td>
</tr>
</tbody>
</table>
Babies should be encouraged to start drinking from a cup at about 6 months of age and, ideally, should not be given bottles after the age of 12 months. Prepared baby foods are available in shops or they can be home made. It is important not to add salt to homemade food and it is also advisable not to add sugar, unless there is a need for it in small amounts in puréed fruit, which may be sharp for babies.

**Children and adolescents**

Schoolchildren grow very fast and are very active. This results in them having large appetites. Children should be encouraged to eat meals that are not too heavy but have concentrated sources of vitamins and minerals and protein to help with growth and development. Obesity can be a problem in children that will remain a problem in adulthood. Some studies in the USA seem to point to the fact that 80 per cent of obese children become obese adults. On this basis, children should be encouraged to eat plenty of fruit and vegetables along with protein and carbohydrate, and discouraged from eating too much fatty and sweet foods. Sugar only provides calories and has no nutritional benefit. Training young palates to enjoy healthy foods is more likely to encourage healthy eating for life. Publicity about the food provided in schools and the television series ‘Jamie’s School Dinners’, resulted in changes being announced in September 2005 by the Secretary of State for Education about what food should be provided in school canteens and what should be banned.

**Over to you**

The School Meals Review Panel is an expert advisory group on school meal standards. It first met in May 2005. It was set up by the government in response to a campaign by TV chef Jamie Oliver to improve the quality of school meals. It has announced detailed nutritional standards for school meals.

*Carry out some research to find out what the nutritional standards are. Do you think that such standards will work? If so, why? If not, why not?*

Adolescents probably have the highest needs of any other group of people. They generally have big appetites and should be advised to eat as healthily as possible. There is perhaps less parental influence over what adolescents eat, and this can lead to snacking on high fat and sugar food and drinks. When adolescent obesity occurs it is often as a result of a poor diet and lack of exercise. It is important to encourage regular healthy eating rather than periods of dieting which can be dangerous and lead to nutritional deficiency.
**Adults**

In developed countries, adults are more likely to suffer from overnutrition than undernutrition. Food is plentiful and readily available and there is a lot of hidden sugar and salt in ready-made meals. Heart disease is the commonest cause of death in Britain and one of the causes of this is eating food high in saturated fat. A high salt intake contributes to strokes and adults should be advised not to cook with salt and not to add salt at the table.

A healthy well-balanced diet for adults is one that is high in complex carbohydrates such as bread, potatoes, pasta and rice, moderate amounts of meat or alternatives (oily fish about three times a week will help to prevent heart disease) and plenty of fruit and vegetables. Alcohol should be limited to 28 units per week for men and 21 units per week for women. Alcohol provides 7 calories per gram, 3 calories per gram more than proteins and carbohydrates and only 2 calories per gram less than fats.

During pregnancy and breastfeeding, a woman’s diet should contain sufficient energy, protein, iron, calcium, folate and vitamins C and D. This is to ensure the normal growth and development of the foetus. Insufficient intake will mean that the foetus will use the mother’s stores and she may become undernourished. Pregnant women should be advised to avoid certain foods and alcohol. Birth defects can occur from eating foods high in vitamin A and so liver should be avoided. Soft cheeses and pâtés should also be avoided because of the risk of them being contaminated with listeria, a bacterium that can be harmful.

There is some debate over whether women should drink any alcohol during pregnancy. The UK government advises that pregnant women should not drink more than one or two units per week. Alcohol consumption during pregnancy can result in Foetal Alcohol Syndrome (FAS).

---

**Key point**

The current government recommendation for salt intake in adults is no more than 6 grams, which is about one teaspoonful per day.

---

**Key point**

Children with FAS may have the following characteristics or exhibit the following behaviours:

- small for gestational age or small in stature in relation to peers
- facial abnormalities such as small eye openings
- poor coordination
- hyperactive behaviour
- learning disabilities
- developmental disabilities (e.g. speech and language delays)
- mental retardation or low IQ
- problems with daily living
- poor reasoning and judgement skills
- sleep and sucking disturbances in infancy.
As people age, their nutritional needs decline. This is because body weight decreases as does energy expenditure. People tend to eat less and so they may become deficient in certain vitamins or minerals. Older people should be encouraged to eat little and often and to make sure that the food they choose contains concentrated amounts of the necessary nutrients. As with any age group, older people should be advised not to eat too many foods that contain saturated fat, to help prevent heart disease. Gentle exercise should also be encouraged.

People who are very active at work or take a lot of exercise will have higher needs than those who do not exercise much and have sedentary jobs. They are more likely to burn off any excess energy that they take in and their blood pressure is likely to be lower than those who do not take exercise. Keeping weight within normal limits by eating a well-balanced diet will help to prevent nutrition-related conditions.

Practice for Assessment

Carrying out this activity will provide evidence for P1, M1 and D1.

What are the differences between the components of a balanced diet for people in different age groups? (P1)

How do these components contribute to people’s health at different life stages? (M1)

Why do the components of a healthy diet vary according to a person’s life stage? (D1)

You should cover the following life stages in your work: infancy, childhood, adolescence, adulthood (including pregnancy and breastfeeding), and old age.

Factors influencing the diet of individuals

Religion/culture

Religion and culture will play a large part in the food that people eat. Various foods are forbidden in certain religions. In general, Jews and Muslims do not eat pork, Hindus do not eat beef and Buddhists are vegetarian. (See the table on page 32 which shows the general food rules for six different religions.)

Asian groups, particularly teenage girls, may be deficient in vitamin D, which is known as the sunshine vitamin. Because their religion requires them to cover most of their body, they do not get the opportunity to expose their skin to the sunlight. This can result in conditions known as rickets and osteomalacia. The most common sign of this is bowed legs. They should ensure that they eat a diet that is high in vitamin D. They may also be more at risk of becoming anaemic as a traditional Asian diet may not provide enough iron.
Social class

There is some evidence to suggest that differences in social class will play a part in influencing dietary choices. In general, people from Social Classes I and II tend to eat more healthy food, and poorer people eat fewer fruit and vegetables and more high-fat, high-sugar foods (Scottish Health Survey – Eating Habits, 1998). Women (not men) in the lower social classes are more likely to be obese than women in the upper social classes. (For more information on social classes, see Unit 4 Cultural Diversity in Health and Social Care, page 151.)

People in lower social classes generally earn less money than those in the higher social classes and because of this are more likely to substitute cheap, processed food for fresh food.

Personal preference

Personal preference plays a part in the choices an individual makes about food. This may not just be linked to likes and dislikes but other factors, for example people who choose not to eat meat because of the implications of killing animals for food. Personal preference is also influenced by taste, texture, cultural and social habits.

Peer pressure

Peer pressure can have an effect on the food choices that are made, especially by children and teenagers. Many young people develop a stereotyped view of people who eat healthy and unhealthy food and may choose less healthy options such as fast food to fit in with what their friends eat because they do not want to seem different.
The media
Information publicised in the media can be another factor that influences food choice. Food scares can often be caused by reporting of facts in the press and in news bulletins. Two examples of this were the egg scare in 1988 and ‘mad cow disease’ in 1995. In 1988, a junior health minister, Edwina Curry, said that the majority of eggs in the UK were contaminated with salmonella. This had a huge impact on the sale of eggs – 400 million eggs and 4 million chickens were destroyed. In 1996, beef exports to Europe were banned when a link between eating beef and a brain disease, Creutzfeld Jacob Disease, was established. Again, this had a huge impact on beef sales and consumption of beef, and beef was banned from school menus.

Position in family
There is little evidence available to suggest that there is a difference in food choice depending on the position you hold in the family, but it is known that mothers will often give more protein or fruit and vegetables or larger quantities to their husband/partner or children. They will then fill up on lower quality food and their nutritional status may suffer as a result. Choice may also be related to who in the family does the shopping and cooking. If you do most of the family shopping and do not like a particular food, even if others in the family do like it you are less likely to buy it.

Geographic location
Where you live will have an effect on the diet you have. Although there is enough food in the world, it is not evenly distributed. More wealthy countries can afford to buy food and so have a greater variety than countries that are poor. Food that is grown in poor soil will contain fewer minerals and so the quality of the diet will be poorer.

Availability of food
Many developing countries suffer from poor soil conditions, flooding and drought, which result in repeated years of lost harvests. People have access to restricted diets that are high in carbohydrates and not so rich in protein and fats. This can lead to undernutrition.

In developed countries, people have access to a good variety of food. Much of it is home grown and the increase in air travel means that most foods are available all year round. As a result, the population of developed countries is more likely to suffer from overnutrition.

Other factors influenced by geographical location will be where people live and how easily they can get food. Greater variety is available in large supermarkets generally situated on the outskirts of large towns. Small corner shops in rural areas tend to have less variety and less fresh fruit and vegetables.
Financial resources

The ability to afford food is linked to social class (see above). People who are in the higher social classes have more money to spend on food and tend to buy better quality food and eat out more. People who have low incomes are more likely to buy food that is high in salt, fat and sugar and provide concentrated sources of energy.

Practice for Assessment

Carrying out this activity will give you evidence for P2. Read about Sarah and Benita and then answer the questions below.

Sarah is 84 years old and lives in a small rural village with only one shop. Her family all live more than three hours away and she does not see them very often. She has good neighbours, but most of them work full time and the village is very quiet on weekdays. She no longer drives and the local bus service only comes through the village every two hours. The bus journey to the nearest town with a large supermarket takes one-and-a-half hours. Sarah has arthritis and a heart condition and cannot carry heavy things. She is on a very low income as she only has her state pension to live on. She spends a lot of her time watching daytime television.

Benita is 75 years old and lives in a luxury flat in a town centre. She was widowed seven years ago. Her husband was the managing director of a large company. As well as her state pension, she also receives a substantial pension from her husband’s firm. Benita is very active and still drives her car. Most of her family live within 30 minutes’ drive of her home. Her town has very good services and there are three large supermarkets within 15 minutes’ drive of her flat. There is also a farmers’ market in the town centre every Tuesday. Benita has a lively social life and is often out and about meeting friends and family.

Identify five socio-economic influences from the two case studies above. What influence could they have on Sarah’s and Benita’s diets?

Over to you

Below is a list of fruit and vegetables which grow in the UK. See if you can find out which month each is ‘in season’:

- Parsnips
- Spinach
- Strawberries
- Rhubarb
- Apples
- Carrots
- Brussels sprouts
- Pears
Effects of unbalanced diets on the health of individuals

### Medical conditions related to unbalanced diets

#### Malnutrition

A balanced diet is based on the consumption of appropriate amounts of nutrients and energy. Malnutrition can result from people eating too much or too little of some nutrients over a period of time. Insufficient intake can result in undernutrition or starvation and excessive intake can result in overnutrition and obesity.

#### Overnutrition

There are some conditions that are related to eating too much of a certain nutrient. Coronary heart disease occurs as a result of eating too many foods such as animal proteins that are high in saturated fats. Fatty deposits build up in the coronary arteries in the heart and this can lead to the formation of a clot that will stop the supply of blood to part of the heart muscle which then dies. This is known as a heart attack. Symptoms of a heart attack can include shortness of breath and pain in the chest, jaw and left arm.

Obesity results from eating too much food. Any food that is eaten in excess will ultimately be converted to fat and stored in the body, which leads to overweight and obesity.

Type 2 diabetes, also known as late or adult onset diabetes, is today seen in children as young as 9 years old. It is caused by eating too much fat and sugar in the diet. The pancreas is either unable to produce enough insulin to allow the cells to absorb glucose from the blood or the body becomes resistant to the insulin that is produced. Symptoms of Type 2 diabetes include thirst, excessive urination and extreme tiredness.

#### Undernutrition

Undernutrition can result from a general lack of nutrients, particularly protein and energy, or from a lack of a particular nutrient. Two conditions that are seen in underdeveloped countries and that particularly affect children are kwashiorkor and marasmus. The differences between them can be seen in the table below.
### Differences between marasmus and kwashiorkor

#### Birth and breastfeeding

<table>
<thead>
<tr>
<th>Nutritional marasmus</th>
<th>Kwashiorkor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starts as early as 5 months</td>
<td>Starts at about 12 months</td>
</tr>
<tr>
<td>Early abrupt weaning onto formula or breast milk substitute</td>
<td>Late gradual weaning and stopping breastfeeding</td>
</tr>
<tr>
<td>Dirty dilute formula</td>
<td>Starchy family diet with insufficient protein</td>
</tr>
<tr>
<td>Repeated infections especially of the digestive tract</td>
<td>Acute infections</td>
</tr>
<tr>
<td>Starvation therapy</td>
<td></td>
</tr>
</tbody>
</table>

**Signs and symptoms:**

- **Nutritional marasmus:**
  - Commonest severe form of protein energy malnutrition
  - Diet very low in protein and calories often due to early weaning
  - Usually occurs at less than one year
  - Growth very retarded and weight very low
  - Muscles and fat wasted giving an ‘old man look’
  - Vitamin deficiency
  - Dehydration

- **Kwashiorkor:**
  - Protein energy malnutrition. Occurs between ages 1 and 3 years in children from poor rural areas displaced from the breast by the next child and given a low-protein porridge diet (cassava and plantain)
  - Growth failure, low weight, oedema (swelling) of feet, legs, face and hands
  - Wasted muscles but still have fat
  - Misery and apathy
  - Hair turns orangeish, straightens and pulls out easily
  - Skin becomes lighter on the face
  - Stools are loose
  - Anaemia
  - Flaky skin on legs and buttocks, pain and ulcers, may lead to gangrene
  - Liver large and fatty
  - Deficient in vitamins A and B, zinc, potassium and magnesium

---

![A child suffering from nutritional marasmus](image-url)
Specific nutrient deficiencies

Anaemia
Anaemia is caused by iron deficiency. Iron is used for making red blood cells and in the body’s use of oxygen. Symptoms include:

- fatigue/lack of energy
- weakness
- brittle fingernails.

Tooth decay
Tooth decay or dental caries cannot be strictly be described as undernutrition, as it is caused by an excess of sugar in the diet. Sticky deposits called plaque are deposited on the teeth. Plaque is acid and over time it will dissolve the enamel on teeth, causing cavities. If they remain untreated, they can kill the tooth’s nerve and blood supply and eventually the whole tooth will die. It is important that sugary foods and drinks are kept to a minimum and good dental hygiene is observed.

Rickets
Rickets is caused by vitamin D deficiency, which controls calcium metabolism. The elderly, adolescents and women who have repeated pregnancies may suffer from osteomalacia (the adult form of rickets) because they absorb too little calcium from a low calcium diet. There is also some ethnic evidence of a difference in vitamin D metabolism.

In children, long bones are not calcified enough and their legs bend, and they tend to have very tiny chests. The four main plates of the skull are not ossified – this is known as the hot-cross bun sign in newborn babies.
Night blindness
Night blindness is caused by a lack of vitamin A. It is also known as xerophthalmia or dry eye. In its early stages, it can be cured by providing sufferers with vitamin A supplements such as palm oil or other foods high in vitamin A. However, in its later stages it is incurable and leads to complete blindness and in some cases death.

Beri beri
Beri beri is vitamin B₁ or thiamin deficiency – this vitamin is needed to metabolise carbohydrates. Symptoms of beri beri include some or all of the following:

- neuritis
- headache
- fatigue
- poor memory
- diarrhoea
- anxiety
- insomnia
- depression
- irritability
- eczema
- dermatitis
- acne
- enlarged heart muscle weakness
- wrist and ankle drop – no strength to keep them up
- tenderness in calf muscle.

Scurvy
Scurvy is known as vitamin C deficiency and only occurs when fresh food, especially citrus fruits, are not available. Symptoms include swelling of gums and teeth falling out, bleeding and slow wound healing.
Real Life Care

Dan is 16 and has been having trouble with his teeth. He is a bit embarrassed because, when he cleans them, his gums bleed. He thinks that might mean bad breath, but he does not know who to ask. He is also annoyed that he has had a cold for about a month which will not go away. His nose is red and runny all the time. He lives with his parents, but he hardly ever eats at home. He is always out and only seems to grab a can of cola and some chocolate when he is hungry. Sometimes he has a bit of fish or a burger from the burger van in the town square when he can be bothered. His skin is a bit spotty, too. In fact, he has decided he looks a bit grey – he will have to do something about his appearance because he wants to ask Jodie out this weekend.

1. Why do you think that Dan is having the kind of health problems that he describes?
2. What would you suggest he does?
3. What might be the long-term effects on his health if he does not follow your advice?

Practice for Assessment

This activity will provide evidence for P3 and M2.

Choose two medical conditions related to unbalanced diets to research in detail. Find out the signs and symptoms of the two conditions and state how they are related to unbalanced diets. (P3)

Once you have completed your research, explain how unbalanced diets could have resulted in the two conditions that you have identified. (M2)
Specific dietary needs of patients/service users

Conditions with specific dietary requirements

Coronary heart disease
People who suffer from coronary heart disease should modify their diet in order to prevent further damage to the heart. Sufferers should be advised to make the following changes to their diet:

- Eat at least five portions of fruit and vegetables a day.
- Reduce the total amount of fat in the diet and substitute saturated fats for poly- and mono-unsaturated fats such as vegetable and olive oils.
- Eat oily fish such as mackerel, sardines, herring, tuna, salmon two to three times a week.
- Introduce nuts and seeds into the diet.
- Maintain a healthy weight.
- Reduce the amount of salt in the diet to a maximum of 6 grams per day.
- Drink alcohol in moderation – 1–2 units per day.
- Take exercise – a minimum of 30 minutes three times a week.

Obesity
The best way to combat obesity is to maintain a diet low in fat and sugar and high in complex carbohydrates and fruit and vegetables. Regular exercise will also help to burn up any excess energy intake.
Type 2 diabetes
People who suffer from Type 2 diabetes can do a lot to help the levels of blood glucose by maintaining a diet low in fat and sugar. Complex carbohydrates should form a part of the diet, as low carbohydrate diets can be high in fat. There is a relatively high incidence of coronary heart disease in diabetics sufferers in the UK.

Lactose intolerance
Lactose intolerance is an inability to digest lactose, the sugar found in milk and milk products. It is particularly common in people of African and Asian origin and can lead to digestive disturbance such as cramps, diarrhoea and wind. Milk should be avoided in the diet, but often sufferers can tolerate yoghurt and cheese because the lactose is converted to lactic acid during manufacture.

Food allergies
Allergic reactions to food vary in intensity, and similar symptoms and illnesses can be triggered by different allergens as well as the same allergens causing very different reactions in different people. Symptoms can include eczema, asthma, urticaria (hives) and other health problems. Anaphylaxis is an extreme reaction which must be treated by adrenaline injections. Failure to treat this promptly can result in death. Avoidance of food that causes allergies is the only way to prevent the onset of symptoms.

Genetic disorders
Certain genetic disorders can cause problems that can be relieved by diet. Cystic fibrosis is a disorder that causes thick, sticky mucous to coat the pancreatic duct. Pancreatic enzymes needed to digest food cannot pass into the small intestine and sufferers are given these enzymes in powdered form sprinkled onto their food.

Phenylketonuria is a rare inherited condition in which there is a build up of phenylalanine in the body. Phenylalanine is an amino acid – a
building block of protein. A low-protein diet is essential for sufferers and has to be supplemented with artificial protein that does not contain phenylalanine. If this diet is not followed, learning difficulties can result.

Religion/culture

The table below shows the main dietary rules for some world religions.

<table>
<thead>
<tr>
<th>Foods</th>
<th>Roman Catholic</th>
<th>Jewish</th>
<th>Sikh</th>
<th>Muslim</th>
<th>Hindu</th>
<th>Buddhist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eggs</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Milk/yoghurt</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>Not with rennet</td>
<td>Not with rennet</td>
<td>✓</td>
</tr>
<tr>
<td>Cheese</td>
<td>✓</td>
<td></td>
<td>Some</td>
<td>Some</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Chicken</td>
<td>Some people do not eat meat during Lent</td>
<td>Kosher</td>
<td>Some</td>
<td>Halal</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Lamb</td>
<td>Kosher</td>
<td></td>
<td>✓</td>
<td>Halal</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Beef</td>
<td>Kosher</td>
<td></td>
<td>✓</td>
<td>Halal</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pork</td>
<td></td>
<td>Rarely</td>
<td>✓</td>
<td>Rarely</td>
<td>Some</td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td>✓</td>
<td></td>
<td>Some</td>
<td>Halal</td>
<td>Must have scales and fins</td>
<td>✓</td>
</tr>
<tr>
<td>Shellfish</td>
<td>✓</td>
<td></td>
<td>Some</td>
<td>Halal</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Animal fats</td>
<td>✓</td>
<td>Kosher</td>
<td>Some</td>
<td>Some halal</td>
<td>Some</td>
<td>✓</td>
</tr>
<tr>
<td>Alcohol</td>
<td>✓</td>
<td></td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Cocoa/tea/coffee</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Nuts</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Pulses</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fruit</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Vegetables</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Fasting</td>
<td></td>
<td></td>
<td>Yom Kippur</td>
<td>Ramadan</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Some people choose not to eat meat and become vegetarian or vegan. Vegetarians do not usually eat meat, poultry, game or fish. However, most will eat eggs and dairy products. Vegetarians will be healthy as long as they eat a varied diet and combine plant proteins, as shown in the diagram on page 12.

Vegans eat no animal foods at all and have to be careful about the plant proteins they eat to ensure that they have a balanced diet. There is a possibility that they may suffer from vitamin B₁₂ deficiency as this is mainly found in animal products, although yeast extract is a good source.
Two-day plan

Sometimes it is necessary for people who have been newly diagnosed with a nutrition-related disorder to be given advice about how they should change their diet to suit their needs. Creating a two-day plan that will give them ideas about the foods they should be eating with suggestions for possible suitable alternatives will help them to adjust to a new way of eating.

Over to you

This will help you to prepare for P4 of your assessment opportunity. Keep a food diary for two days of all the food and drink that you have consumed, making sure that you do not cheat! Swap your diary with a partner and make a table of all the foods consumed according to the five food-group headings. Analyse what has been eaten and drunk over the 48-hour period.

Make recommendations to your partner about what changes they could make to their diet. Do they eat five portions of fruit and vegetables a day? Do they eat a lot of high-fat/sugar/salt snacks? Do they drink eight glasses of water a day?

Devise a two-day healthy eating plan for your partner to follow. After the two days, find out the following information:

- How easy was it to follow the plan?
- What did they enjoy?
- What did they not enjoy?
- Could you make any changes to the plan to include any of your partner’s preferences?

Practice for Assessment

Carrying out this activity will provide evidence for P4, M3 and D2.

Now that you have practised analysing your two-day plan on each other, you can practise further by devising a two-day plan for two different service users who have specific dietary needs. You can make up a small case study for each of the service users, or you can ask two people you know who suffer from the conditions to keep a two-day food diary for you that you can use to devise the two-day plan.

Devise a two-day food plan for two different service users suffering from two different dietary conditions. (P4)

Describe why the identified specific dietary needs require dietary adjustment for the two service users. (M3)

Explain how the two-day diet plan meets the dietary needs of the service users. (D2)
Food safety and hygiene

Safe practices

Hygiene control

Control of hygiene when working with food is essential. This is because food must be kept safe. This is done by:

- protecting food from contamination by harmful bacteria
- preventing bacteria from multiplying to dangerous levels
- destroying harmful bacteria in or on food by thorough cooking
- disposing of harmful food safely.

The basic rules of food hygiene are outlined below:

- Always wash your hands before touching food, particularly after visiting the toilet, after touching animals, your own skin and hair, and after touching raw food.
- Always cover any break in the skin of your hands, or sores or spots, with a waterproof adhesive dressing (preferably a highly coloured one so you notice it if it comes off).
- No smoking during the preparation of food.
- Avoid preparing food if you have any illness (particularly skin, nose or throat infections and sickness and diarrhoea).
- Do not allow animals into the food preparation area.
- Cover food to protect it from flies and other insects.
- Wrap all food waste and dispose of it in a covered waste bin.
- Clean as you go. Wash surfaces with hot water and detergent.
- Wipe spills up immediately with kitchen tissue and place this in a covered bin.
- Serve food as soon as possible after preparing it.
- Never allow raw food to come in contact with cooked food; common ways in which cooked food is contaminated from raw food are through the hands, knives and working surfaces.
- Wear clean clothing and be clean yourself.
- Do not cough or sneeze over food.

The basic rules of food hygiene
Temperature control

Control of temperature is very important in the cooking and storage of food. The Food Safety (Temperature Control) Regulations 1995 sets out the safe temperatures for the storage, heating and chilling of food, as shown in the table below.

<table>
<thead>
<tr>
<th>Method</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freezer</td>
<td>–18°C to –22°C</td>
</tr>
<tr>
<td>Refrigerator</td>
<td>Legal requirement 8°C; good practice 5–6°C</td>
</tr>
<tr>
<td>Hot holding food</td>
<td>Hot food must be maintained at a temperature of 63°C</td>
</tr>
<tr>
<td>Reheating commercially manufactured food that has been cooked once during manufacture</td>
<td>Temperature of reheated food must reach a minimum of 82°C</td>
</tr>
</tbody>
</table>

Temperature of boiling water

Temperature of refrigerator

Temperature of freezer

Body temperature

Room temperature

Refrigerator temperature

Z Z Z Z

Let’s start a family

I feel very ill

Is this what they mean by global warming?

The cemetery for me
Pest control
A food pest is any animal that can live on or in food, causing damage or contamination. The main types of pests are:

- insects such as flies, cockroaches and weevils
- birds
- rodents such as rats and mice.

Flies land on food and carry bacteria on their bodies. In addition, they defecate on food and regurgitate half-digested food from a previous meal onto the food. They can also lay eggs and their dead bodies can be found in food.

Cockroaches can deposit faeces on food and spread bacteria, and small insects such as weevils live in stored foods and food products such as flour and cereals.

Rodents such as mice and rats carry bacteria and pass these on by either walking on the food or on work surfaces. Mice particularly have a tendency to urinate on food.

Some birds can also carry bacteria. Food can be contaminated by droppings and feathers and by insects that they carry on their bodies. Some birds will contaminate milk by pecking through the foil tops of bottles left on the doorstep.

Protecting premises where food is stored or manufactured is the most important way of preventing possible infection of or damage to food. The owner of the premises must ensure that the building is kept in good repair with no obvious points of entry for pests. Food pests tend to like warm, dark, damp undisturbed places, so it is important for food storage and preparation areas to be cool, clean and dry.

Effects of unsafe practices

Food can be contaminated in a variety of ways – both physical and chemical. Physical contaminants include bones, shells or pips and stalks from food, food packaging, nuts or bolts from equipment, jewellery, hair, fingernails, plasters, dust and dirt, and insects and their droppings and eggs.

Chemical contamination can be caused by cleaning chemicals, if they are not kept separate from food and food preparation areas, and agricultural chemicals, for example on fruit and vegetables if they have been sprayed. They must be cleaned thoroughly or peeled before eating.

Leftover food or drink from metal containers should always be transferred to a non-metallic container and stored covered in a refrigerator. Acidic and salty food can attack the metal once a can is opened, which then affects the food.

Biological contamination is contamination by bacteria or viruses where they multiply on the food to dangerous levels, or by moulds which cause
Food safety legislation requires that establishments preparing and serving food ensure that food is safe to eat. Three of the main laws and regulations are:

### Food poisoning

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Source</th>
<th>Symptoms</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmonella</td>
<td>Raw poultry, eggs, raw meat, milk, animals, insects and sewage</td>
<td>Abdominal pain, vomiting, diarrhoea, fever</td>
<td>12–36 hours</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>Unpasteurised milk, people</td>
<td>Abdominal pain or cramp, vomiting, low temperature</td>
<td>1–6 hours</td>
</tr>
<tr>
<td>Clostridium perfringens</td>
<td>Raw meat, animal and human waste, soil, dust, insects</td>
<td>Abdominal pain, diarrhoea</td>
<td>12–18 hours</td>
</tr>
<tr>
<td>Clostridium botulinum</td>
<td>Raw fish and meat, vegetables, smoked fish, canned fish and corned beef</td>
<td>Difficulties in breathing and swallowing, paralysis</td>
<td>12–36 hours</td>
</tr>
<tr>
<td>Bacillus cereus</td>
<td>Cereals, soil and dust</td>
<td>Abdominal pain, diarrhoea and vomiting</td>
<td>1–5 hours or 8–16 hours depending on the form of the food poisoning</td>
</tr>
</tbody>
</table>

**Source:** Chartered Institute of Environmental Health

### Food-borne diseases (illness spread by food or water)

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Source</th>
<th>Symptoms</th>
<th>Incubation period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campylobacter</td>
<td>Raw poultry, raw meat, milk, animals (including pets)</td>
<td>Diarrhoea, often bloody, abdominal pain, nausea, fever</td>
<td>48–60 hours</td>
</tr>
<tr>
<td>E. coli</td>
<td>Human and animal gut, sewage, water and raw meat</td>
<td>Abdominal pain, fever, diarrhoea, vomiting, kidney damage or failure</td>
<td>12–24 hours or longer</td>
</tr>
</tbody>
</table>

**Source:** Chartered Institute of Environmental Health
the Food Safety Act 1990
the Food Safety (General Food Hygiene) Regulations 1995
the Food Safety (Temperature Control) Regulations 1995.

Food Safety Act 1990
The Food Safety Act is the main piece of legislation that governs the safety of food. The Act says that it is illegal to sell or keep for sale food that is unfit for people to eat or causes food to be dangerous to health, or is not of acceptable content or quality, or is labelled or advertised in any way that misleads the consumer. If prosecuted, people who work with food must show that they have taken all reasonable steps to avoid causing any of the above.

Food Safety (General Food Hygiene) Regulations 1995
These regulations cover the basic hygiene principles that businesses must follow and relate to staff, premises and food handling. They affect anyone who owns manages or works in a food business, whether it is a caravan in a lay-by selling tea, coffee and snacks, or a five-star hotel. The regulations cover the following:

- The supply and selling of food in a hygienic way.
- Identification of possible food hazards.
- Control of identified hazards to prevent harm to customers.
- The establishment of effective control and monitoring procedures to ensure that harm does not come to customers.

Food Safety (Temperature Control) Regulations 1995
These regulations cover the following aspects of food hygiene:

- The stages of the food chain that are subject to temperature controls.
- The temperatures at which certain foods must be kept.
- Which foods are exempt from specific temperature controls.
- When the temperature controls allow flexibility.

The safe temperatures are set out in the table above (page 35).

Hazard Analysis Critical Control Point (HACCP)
HACCP is a universal food safety system. It aims to protect food from contamination by:

- identifying critical points in the food handling process that might cause contamination
- putting controls in place to prevent microbiological, chemical and physical contamination of food
- monitoring the critical points to ensure that contamination does not occur.
This means that all potential hazards at each stage of food handling, from delivery of raw products to the serving of fully prepared food, must be identified. The whole process is designed to ensure that any problems can be dealt with before they cause any problems or illness.

The hazard control chart for pre-cooked meat is shown below.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Hazards What can go wrong?</th>
<th>Controls How can I prevent it going wrong?</th>
<th>Monitoring How can I check my control?</th>
<th>Corrective action What do I do if things are not right?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serving</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hazard flow chart for pre-cooked meat

Practice for Assessment

Carrying out this activity will contribute to P5 and M4.

Identify what safe practices should be followed when preparing, cooking and serving food. (P5)

What might be the results of following unsafe practices when preparing, serving and cooking food? (M4)
Check your understanding

1. What does ‘weaning’ mean and approximately when should it be started? Why is it important not to start weaning too early?
2. What factors will influence the dietary needs of individuals?
3. What are the government’s Eight Guidelines for a healthy diet?
4. What are macronutrients and micronutrients and why are these terms used?
5. What are the functions of fibre in the diet?
6. Why are vegetable proteins called ‘low biological value proteins’?
7. Essential fatty acids are considered to be important in the diet. Give examples of foods that contain them.
8. Explain the differences in the food choices of Jews, Muslims and Hindus.
9. Name two conditions that occur through overnutrition. Why do they occur?
10. Explain what rickets is.
11. What aspects of food hygiene do the Food Safety (General Food Hygiene) Regulations 1995 cover.
12. What is HACCP and what are its aims?

Acknowledgements
The authors and publishers are grateful to those who have given permission to reproduce material. Every effort has been made to contact copyright holders of material reproduced in this book. Any errors or omissions will be rectified in subsequent printings if notice is given to the publishers.

Photos
Corbis/ Reuters – page 26
Getty Images/ Photodisc – page 1
Science Photo Library/ Biophoto Associates – pages 22, 28
Still Pictures – page 27
adolescent dietary needs 2–3, 19
adult dietary needs 3, 20
alcohol consumption and pregnancy 20
anaemia 27

babies
dietary needs 2, 18–19
weaning 2, 18
balanced diet 4–6
DRVs 5–6
energy balance 6
intake and needs 4–5
beri beri 28
breast-feeding 2, 3
dietary needs 20
Buddhist diet 21, 32
carbohydrates 8, 10–11
childhood: dietary needs 2, 19
class and diet 22, 24
COMA (Committee on Medical Aspects of Food Policy) 5
contamination of food 36–7
coronary heart disease 30
Creutzfeld Jacob Disease 23
culture and diet 21, 32
cystic fibrosis 31
deficiencies
nutrient 6, 27–8
vitamin 14–15, 21, 22, 27, 28
diabetes (Type 2) 25, 31
diet
and availability of food 23
factors influencing 21–4

and financial resources 24
and geographic location 23
influence of media 23
and peer pressure 22
personal preference 22
and position in family 23
and religion 21
and social class 22, 24
unbalanced 25–8
see also balanced diet
dietary needs 2–4
adolescence 2–3, 19
adults 3, 20
babies 2, 18–19
childhood 2, 19
factors affecting 5
older people 3, 21
specific conditions 30–2
variation in life stages 18–21
Dietary Reference Values 5–6
egg scare 23
Eight Guidelines for healthy diet 7
energy balance 6
essential fatty acids 14
Estimated Average Requirement (EAR) 5
fats 8, 9, 12–14
females: recommended calorific intake 4
fibre 11
Foetal Alcohol Syndrome 20
food allergies 31
food groups: nutritional value 8–9
food poisoning 37
food pyramid 10
Food Safety Act (1990) 38
Food Safety (General Food Hygiene) Regulations (1995) 38
food safety and hygiene 34–9
cooking and storing 35
effect of unsafe practices 36–7
legislation and regulations 37–9
Food Safety (Temperature Control) Regulations (1995) 38
food scares 23
Food Standards Agency Guidelines 7
food storage
pest protection 36
temperatures 35
food-borne diseases 37
genetic disorders and dietary needs 31–2
geographic location and diet 23
good health guidelines 7
Hazard Analysis Critical Control Point 38–9
hazard flow chart 39
healthy diet 7–10
80/20 rule 10
components of 10–18
heart attack 25
Hindu diet 21
Holford, Patrick 12
hydrogenation 14
hygiene control 34
see also food safety
infancy see babies
Jewish diet 21, 32