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The Dairy Council

NutritionFactsheet

Factsheet 5

School children and teenagers

NUTRITIONAL REQUIREMENTS

Young people's diets should sustain growth, promote both current and future health - and be enjoyable. In addition, during adolescence a number of physiological changes occur. These include a marked acceleration in growth (the pubertal growth spurt) and considerable gains in bone and muscle. These changes influence nutritional requirements and consequently demand for both nutrients and energy are high. This makes teenagers particularly vulnerable to deficiency. Anything that increases nutritional needs, such as participation in competitive sport, or interferes with intake, such as dieting, increases the risk of dietary inadequacy.

Current dietary recommendations for children and adolescents are based on the dietary reference values (DRVs) for energy and nutrients, available for children of different ages. The DRVs are published by the Department of Health and are designed to cover the needs of practically all individuals within a specified population group. They are not intended as targets for individual children. Energy requirements, for example, will largely depend on physical activity, which can vary considerably between children.

Table 1 shows the dietary reference values (DRVs) at various stages of adolescence. (See **Factsheet 1** for dietary sources of these nutrients.)

	MALES		**FEMALES**	
	11-14 year olds	**15-18 year olds**	**11-14 year olds**	**15-18 year olds**
Energy, kcal*	2220	2755	1845	2110
Protein, g	42.1	55.2	41.2	45
Thiamin, mg	0.9	1.1	0.7	0.8
Riboflavin, mg	1.2	1.3	1.1	1.1
Niacin, mg	15	18	12	14
Folate, μg	200	200	200	200
Vitamin C, mg	35	40	35	40
Vitamin A, μg	600	700	600	600
Calcium, mg	1000	1000	800	800
Iron, mg	11.3	11.3	14.8	14.8

*Estimated Average Requirement (EAR) is given for energy. Other values are Reference Nutrient Intakes (RNIs) - the amount estimated to be sufficient for 97% of a specified population group.

Calcium and iron are particularly important for adolescents:

Iron
Iron requirements are markedly increased during adolescence. It has been estimated that at the peak of the adolescent growth spurt boys retain 1.1mg of iron per day compared to an average of 0.57mg per day for the period between 10 to 20 years old; the figures for girls are 0.9mg and 0.23mg respectively. For both boys and girls extra iron is needed due to increases in lean body mass, blood volume and haemoglobin. In addition, girls also need to replace the iron lost with menstruation. This, together with low dietary iron intakes, can make teenage girls particularly vulnerable to iron deficiency anaemia (see page 8).

Calcium
During childhood and adolescence there is a once-in-a-lifetime opportunity to build strong bones. About 90% of the total body mineral density is achieved by 17 years of age. At the peak of the growth spurt a large amount of calcium is retained. This amounts to about 200mg of calcium per day in girls and 300mg per day in boys. The current UK RNI for this age group are 800mg/day for girls and 100mg/day for boys. Milk and dairy products are rich and well absorbed sources of dietary calcium. Three portions of dairy foods - for example, a glass of milk (200ml), a small piece of hard cheese (30g), and a pot of yogurt (150g) - provides approximately 700mg of calcium.

The most recent national dietary survey of children and adolescents (see below) reported that one in four older girls (11 to 18 years) had calcium intakes below the RNI. Inadequate intake of calcium during adolescence may result in failure to optimise peak bone mass (the maximum bone mass achieved at skeletal maturity). This, in turn, may increase the risk of developing osteoporosis in later life

Other minerals
Information about requirements for other minerals is based on limited data. However, requirements for magnesium, phosphorus and iodine are known to be high due to muscular and skeletal development that is taking place during adolescence. Zinc is also an essential mineral for growth and sexual development.

Vitamins
Adolescents require quite large amounts of the B vitamins thiamin, riboflavin and niacin, in line with the increased requirement for energy. Folate requirements are also likely to be high at this time because of the involvement of folate in DNA and RNA synthesis in cell growth. There is evidence from the National Diet and Nutrition Survey of Young People (see below) of inadequate folate, riboflavin and thiamin status in older teenage girls (15- to 18-year-olds).

WHAT ARE SCHOOL CHILDREN AND TEENAGERS EATING?

In 2000 the Government published the National Diet and Nutrition Survey of Young People, which reported on the eating habits of 4- to 18-year-olds in the UK (Gregory *et al.*, 2000). The survey revealed:

- The most commonly eaten foods were white bread, savoury snacks, biscuits, potatoes (including chips) and chocolate confectionery.
- Fizzy drinks were the most popular drink.
- Most young people drank milk, but the proportion not drinking milk increased with age.
- Chicken and turkey were the most commonly eaten meats
- On average, children ate less than half the recommended 5 portions of fruit and vegetables per day.
- One in five children ate no fruit at all during the week of the study.
- One in five young people took vitamin and mineral supplements.
- 10% of older girls (15 to 18 year olds) said they were vegetarian.
- 16% of the older girls were on a diet (compared to only 3% of 15- to 18-year-old boys).
- The majority of children could be classed as inactive: 40% of boys and 60% of girls do less than 1 hour of moderate physical activity per day.

The survey indicated that the majority of children had adequate intakes of most nutrients and that there was no evidence of widespread malnourishment. However, in older age groups (15 to 18 years) intakes of some minerals were lower than recommended. Zinc, potassium, magnesium, calcium, iron, iodine and copper were all low in older girls. A low intake of milk and red meat is likely to contribute to the poor intake of many of these nutrients. Analysis of blood samples found poor nutritional status with regard to iron and some B vitamins (folate, riboflavin and thiamin). A large number of children also had low blood levels of vitamin D, which is important for calcium absorption and therefore bone health. In addition, the intake of saturated fats, non-milk extrinsic sugars (NMES) and salt were all higher than recommended, and fibre intake was well below the adult recommendation.

- Total fat intake was close to the recommended 35% of energy but the intake of saturates was too high (14% rather than 11% recommended).
- Intakes non-milk extrinsic sugars (NMES) exceeded recommendations (over 16% of energy compared to the recommended 11%).
- Salt intakes were high, often twice the recommended levels.
- Average intakes of vitamins (except vitamin A) were well above reference nutrient intake (RNIs).
- One fifth of older girls had vitamin A intakes below the lower reference nutrient intake (LRNIs).

- Average intakes of a number of minerals were below the RNI in the 15-18 year old age groups, including zinc, potassium, magnesium and calcium for older boys and girls, and iron for older girls.
- About 50% of the older girls had iron intakes that were below the LRNI, and 27% had low serum ferritin levels which may indicate low iron stores.
- 13% of 11 to 18 year olds had poor vitamin D status. The proportion with low vitamin status was greater in the winter months.

The survey also demonstrated social and regional inequalities. Children (especially boys) from households receiving benefits had a lower energy intake and poorer quality diet than children from other households. Intakes of most vitamins and minerals tended to be lower in Scotland, and to a lesser extent, in the North of England, than elsewhere.

HEALTHY EATING IN CHILDHOOD AND ADOLESCENCE

Good eating habits are generally acquired when young and persist throughout life. Eating foods in the proportions illustrated in the Balance of Good Health (see **Factsheet 1**) will help ensure children and teenagers obtain all the nutrients they require. A healthy diet should also be based on as wide a variety of foods as possible, with the emphasis on foods of high nutrient density rather than those providing mainly energy and few nutrients e.g. confectionery, biscuits, crisps and fizzy drinks. Table 2 shows the recommended number of servings per day from each of the five food groups, the size of which will vary depending on appetite.

Table 2: Suggested daily eating pattern

Food Group	Suggested number of servings
• Bread, other cereals and potatoes	• Foods from this group should form the basis of each meal
• Fruit and vegetables	• At least 5
• Milk and dairy foods, e.g. cheese and yogurt	• At least 3
• Meat, poultry, fish and alternatives e.g. eggs, pulses, and nuts	• 2
• Foods containing fat, foods containing sugar, e.g. crisps, confectionery, biscuits	• Foods from this group should be eaten only occasionally, and in small amounts

A sensible diet for school children

The general principles of a healthy diet, including a reduction in fat intake and increase in fibre, are aimed at all children over 5 years of age (see **Factsheet 2**). However, these guidelines should not be applied too rigorously in the early primary school years as some young children may be unable to eat enough to satisfy energy and nutrient needs i.e. a fibre-rich diet can be very filling. Children require nutrient-dense foods from the four main food groups in order to meet their needs for growth and development.

Three main meals a day should be encouraged with between-meal snacks as needed. These should consist of the healthier choices such as sandwiches or toast (preferably wholemeal), yogurt, fresh fruit and milk. (See **Factsheet 13 -** Healthy snacks and light meals for school children.) Skipping meals can lead to reduced nutrient intakes particularly if snacks that are high in fat and sugar but lack essential nutrients are taken instead. Foods such as chocolate, sweets, biscuits, cakes, crisps and sugary drinks should be consumed in moderation to help prevent obesity and tooth decay (see below).

It is particularly important for children to have breakfast. Studies have shown that children who eat breakfast have a better intake of vitamins and minerals than those who do not. In addition, breakfast improves children's ability to concentrate in class and means they are less likely to snack on high-fat/ high-sugar foods later in the morning. A cooked breakfast is not essential; a bowl of wholegrain breakfast cereal with milk, and/or toast, and a glass of fruit juice is perfectly adequate. Recent studies have reported that around one in ten primary school children skip breakfast. However, this number increases as children get older, particularly among girls (see page 7).

School lunchtime can also be an area of nutritional concern. Prior to 1980, a school meal was expected to provide one-third of the child's daily requirement of protein, energy and some vitamins and minerals. After more than twenty years without guidelines, compulsory nutritional standards for school lunches were again introduced by the Government in 2001. Now, however, rather than expecting the school meal to contribute a certain proportion of a child's nutritional needs, the new standards are based on the provision of foods according to the Balance of Good Health food groups. For example, in primary schools, a food from the milk and dairy food group must be available every day, a type of vegetable should also be available each day and so on.
If a child takes packed lunches suitable contents might include wholemeal bread sandwiches with lean meat, cheese, fish or egg filling and salad; fruit; yogurt; nuts and raisins; low-fat crisps; fruit juice and milk. (Also see **Factsheet 13**.) Foods high in sugar and/or fat such as biscuits, cakes, confectionery, crisps and sausage rolls should be kept to a minimum.

It is important for parents to be aware of the nutritional content of their child's lunch in order to plan nutritionally adequate evening meals, particularly if the child is given lunch money to buy whatever he or she likes. Parents should be encouraged to implement the guidelines for a balanced and healthy diet (see **Factsheet 1**). Programmes to improve the diets of school children need to be directed at the parents and the child, as well as school meals and tuck shop provisions.

It is also important that children drink enough during the school day as dehydration can cause headaches, tiredness and poor concentration. Dentists consider that milk and water are the only safe drinks for teeth between meals (see Dental health, below). Every primary school child in the UK aged from 5 to 11 years is eligible for up to 250ml of EU subsidised milk at school each day.

Teenage eating habits

There are many factors that affect eating behaviour in adolescence. These include:

- Physiological needs and characteristics
- Health
- Family unit and family characteristics
- Peer pressure
- Social and cultural norms and values
- Media influences such as advertising
- Available income
- Personal values and beliefs
- Nutrition knowledge
- Body image

Adolescence is a time of increasing independence. Changing lifestyles, social values and spending power have contributed to an increased reliance on snacks and 'fast foods' in teenagers. Regular meals are often replaced by 'grazing' throughout the day. While the grazing pattern of eating can be healthy provided it is part of a balanced diet (as outlined above), in practice it often results in a diet that is too high in fat and sugar but low in other essential nutrients. For example, a recent study in the United States found that teenagers who frequently use fast food outlets have higher energy and fat intakes and lower intakes of calcium, fibre, vitamin A, vitamin C and carotene than those who ate fast food less often. The lower fat options for 'fast foods' such as wholemeal bread sandwiches, jacket potato and filling and grilled burgers should usually be chosen in preference to chips and fried fish or burgers. Choosing thick cut chips rather than French fries can also reduce the fat content of a fast food meal and the addition of salad will improve the overall balance.

Skipping meals, particularly breakfast, also becomes increasingly common as children get older. Studies have shown that as many as one in five teenage girls miss breakfast, with consequences for both nutritional intake and cognition (see above).

Changes that can lead to a healthier diet for adolescents include:

- Eating more fruit and vegetables.
- Replacing crisps, cakes, pastries, confectionery and biscuits with more bread (preferably wholemeal) and bread products such as teacakes, fruit buns, crumpets, plain muffins and bread sticks.
- Reducing consumption of soft drinks such as fizzy drinks and squash, which are high in sugar.
- Drinking more milk.
- Using leaner meat, reduced fat sausages and burgers to replace fatty meat and meat products.
- Eating less fried food. Fat provided by chips can be reduced by using thicker cut chips; oven-chips may also provide less fat.
- Eating more foods rich in iron.

POTENTIAL PROBLEMS LINKED TO NUTRTION IN SCHOOL CHILDREN AND TEENAGERS

Overweight

It is estimated that about 22% of all boys and girls aged seven to 11 years in the UK can be classified as overweight, while the prevalence of obesity is around 12% in boys and 11% in girls. As with adult obesity, these levels are thought to be increasing.

There are many factors which can contribute to obesity in children such as hormonal causes (although very rare), hereditary tendency, emotional factors, feeding habits in infancy, lack of physical activity, and high consumption of foods rich in fat and/or sugar. On a population basis, a decrease in physical activity over recent years coupled with an abundance of energy-dense food is considered to be particularly important in explaining the increasing number of overweight children. In the National Diet and Nutrition Survey of Young People, the majority of children could be classed as inactive: 40% of boys and 60% of girls do less than one hour of moderate physical activity per day.

An increase in young people's levels of physical activity is not only desirable to help control body weight but also to improve health generally, including bone health and self-esteem.

Dramatic weight loss is not desirable while children are still growing and the aim should be to maintain rather than lose weight whilst height continues to increase. Thus, height effectively ‘catches up’ with weight. A healthy, varied diet should be advocated which might well mean the whole family modifying their eating habits. Weight reduction must be supervised by a dietitian. (Also see **Factsheet 8** - Weight reduction).

Teenage dieters

Numerous studies have reported that many teenagers, especially girls, are dissatisfied with their weight, have a low self-esteem and a distorted view of their body image. Studies have shown that up to 70% of teenage girls have attempted to lose weight – sometimes starting as young as nine years old. In the National Diet and Nutrition Survey of Young People (2000), 16% of the girls in the 15- to 18-year-old age group were currently 'on a diet'. Such a high percentage suggests that discontent with body weight is by no means confined to overweight teenagers. For example, a recent study of teenage girls in Dublin reported that the majority were dissatisfied with their weight and 60% wanted to be lighter. Only 23% of this group of 15-year-olds could be classified as overweight yet 45% perceived themselves to be. It is suggested that current social pressure to conform to an ‘ultra-slim’ image may contribute to teenagers' dissatisfaction with their weight.

The fear of being overweight and the inappropriate eating behaviours that go along with it (for example, fasting, skipping meals and fad diets) are often associated with low intakes of important nutrients, such as iron and calcium (see below). In extreme cases, more serious eating disorders such as anorexia nervosa and bulimia nervosa can develop, which are extremely damaging to health.

Iron deficiency anaemia

Adolescents are vulnerable to iron deficiency because of high physiological needs. This is especially true for teenage girls, who, in addition to the high requirements of growth, must also replace iron lost with menstruation. Moreover, changes in diet sometimes adopted at

this age, such as vegetarianism or unhealthy slimming practices, can significantly reduce iron intake.

The National Diet and Nutrition Survey of Young People (2000) found that many teenage girls had a low intake of iron; 45% of 11- to 14-year-olds and 50% of 15- to 18-year-olds had intakes below the lower reference nutrient intake (LRNI), suggesting that they were wholly inadequate. Moreover, 1% of boys and 9% of girls aged 15 to 18 years were classified as anaemic. Other studies of teenagers have found anaemia to be three times more common in vegetarians compared to meat eaters, and in girls who had recently tried to lose weight.

Anaemia is known to compromise all work performance, both physical and mental, but recent studies have suggested that even low iron stores without anaemia can negatively affect cognitive function.

Foods rich in iron should be encouraged, for example, red meat, liver, pulses (peas, beans and lentils), iron-enriched breakfast cereals, green leafy vegetables and dried fruit. The absorption of iron from non-meat sources can be improved by eating these foods along with others that provide vitamin C. For example, having a glass of orange juice with an iron-fortified breakfast cereal.

Dental health

Despite improvements in the prevalence of dental caries over recent decades, the oral health part of the National Diet and Nutrition Survey (NDNS) of Young People (Walker *et al*., 2000) revealed that tooth decay still occurs in over 50% of school children. It is well established that the frequent consumption of non-milk extrinsic sugars (NMES; i.e. those not found within milk or within the cell structure of fruit and vegetables) can contribute to the development of dental caries (see **Factsheet 2**). The National Diet and Nutrition Survey found that 15- to 18-year-olds with high intakes of NMES were more likely to have dental caries than those with lower intakes. Young people who reported eating sugared confectionery at least once a day were also more likely to have dental decay, as were those who consumed a sugared drink at night. In general, intake of NMES was higher than recommended, contributing 16% of dietary energy, rather than the national target of 11% (see **Factsheet 2**).

Certain foods have been shown to have a particularly low potential to cause decay and may even have a protective effect on the teeth. These include hard cheese, unsweetened yogurt, and peanuts.

In addition to dental caries, the NDNS of young people reported that over 60% of school children had erosion to their teeth (wearing away of the tooth enamel). The frequent consumption of acidic drinks such as fruit juice, squashes and carbonated drinks (including 'diet' versions) is suggested to have contributed to the high incidence.

Dietary advise to safeguard dental health in children and teenagers includes restricting the consumption of acidic drinks, and food and drink containing NMES to mealtimes only. Snacks and drinks which are free from NMES such as milk, natural yogurt, bread and fresh fruit should be promoted. Milk and water are the only drinks considered by dentists to be safe to consume between meals.

Vegetarianism
Vegetarianism is becoming more popular among teenagers, in particular among teenage girls. The National Diet and Nutrition Survey of Young People (2000) reported that 10% of 15- to 18-year-old girls classed themselves as vegetarian.

A vegetarian diet can be nutritionally adequate if it is carefully planned. However, problems arise if meat and fish (and eggs and dairy foods in the case of vegans) are not replaced by suitable alternatives. In a typical mixed diet, meat provides important amounts of energy, protein, vitamin B_{12}, zinc, and iron; dairy foods make a significant contribution to calcium, protein, riboflavin (vitamin B_2) and vitamin B_{12} intake. Teenage vegetarians are particularly vulnerable to deficiency because their energy and nutrient requirements are high to support the rapid growth and development of adolescence; teenage vegans even more so because of greater restriction in food choices.

A recent study found that the diets of vegan adolescents were lacking in riboflavin, vitamin B_{12}, vitamin D, calcium, and selenium. Other studies have reported that iron-deficiency anaemia is three times more common in vegetarian teenagers than non-vegetarians teenagers (see above).

Teenagers following vegan diets are advised to take vitamin B_{12} supplements since this vitamin is only found in foods of animal origin such as milk and meat. The high demand for calcium in adolescence may also necessitate calcium supplementation, especially as the calcium from plant sources is relatively poorly absorbed. (Also see **Factsheet 10** – Vegetarian diets.)

Competitive sport
Exercise is considered essential for healthy growth and development and, as discussed above, the majority of children and teenagers in the UK should increase their levels of activity. However, some young people are involved in competitive sport and accompanying intensive training schedules. This sort of exercise adds additional energy and nutritional costs to the already high requirements of adolescence and can therefore increase the risk of dietary inadequacy. Low intakes of energy and nutrients, including calcium and iron, are particularly common in female athletes who are restricting their food intake in order to maintain a low body weight (e.g. gymnasts, long distance runners, and lightweight rowers). Teenagers who participate in sports where the typical body weight is heavier are more likely to have adequate diets. Low calcium intakes, coupled with menstrual abnormalities, can have a deleterious effect on bone health. (See **Factsheet 9** - Nutrition and sport.)

Smoking and alcohol intake
There is evidence that the prevalence of smoking among teenagers and the level of alcohol intake are high, especially in teenage girls. Such behaviour may influence nutritional status and this can be compounded by the fact that many girls are also restricting their food intake in order to stay slim or lose weight.

Pregnancy
Pregnancy during adolescence imposes additional physiological and emotional stresses. The risks of maternal and infant mortality, low birth weight babies and difficult labour are higher in teenagers. Nutritional requirements will be further increased and, unless these are met by appropriate dietary modifications, the teenage mother may be at increased risk of nutritional deficiency. Her nutrient stores are likely to be fairly low to start with,

especially during and after the growth spurt, and this situation can be exacerbated by pregnancy. Special attention should be given to calcium, iron, zinc, vitamins A and C and folic acid intake (see **Factsheet 3 –** Pregnancy and breast-feeding). Nutrient-dense foods such as milk and dairy products, wholegrain cereals, fruit, vegetables, lean meat, poultry, fish and eggs should be encouraged.

FURTHER INFORMATION

The following Dairy Council publications can be ordered from The Dairy Council website (www.milk.co.uk)

For residents of Northern Ireland please contact the Dairy Council for Northern Ireland www.dairycouncil.co.uk

For Health Professionals/Teachers:
Topical Update 11 – Diet and dental health
Topical Update 12 – Milk, soya, nut and rice drinks: a comparison
Topical Update 13 – School Milk
Topical Update 14 – 3-A-Day

For children:
Bob
Chomp
Calcium poster
The Big Book of Health

For parents:
Bump 2 Baby
Baby Nosh
Tiny Teeth
Tiny Tums

For general consumers:
3-A-Day
Calcium leaflet
DASH diet sheets

For teenagers:
Get Healthy Feel Great

FURTHER READING

Gregory, J. *et al*. (2000) National Diet and Nutrition Survey: Young People Aged 4-18 Years. Vol 1. Report of the National Diet and Nutrition Survey. London: The Stationery Office.

Walker, A. *et al*. (2000) National Diet and Nutrition Survey: Young People Aged 4-18 Years. Vol 2. Report of the Oral Health Survey. London: The Stationery Office.