



DIETARY STATUS OF TEENS AND YOUNG ADULTS IN MICRONUTRIENT CRISIS



**Poor diets in teens
and young adults
could impact on
health both now
and later in life.**



FOREWORD

Dr Emma Derbyshire, Dr Pam Mason and Dr Nisa Aslam

Diets of teenagers and young adults have been a cause for concern for several decades. Far too much sugar, saturated fat, sugar sweetened drinks and 'junk' food is consumed by the young. And hidden behind these dietary habits is an issue that lacks the attention it deserves - the crisis of micronutrient status.

Vitamin and mineral intakes are low and falling in 11-18-year olds and young adults over the age of 19. Latest data from the UK National Diet and Nutrition Survey (NDNS)¹ show that 54% of teenage girls have an intake of iron below the Lower Reference Nutrient Intake (LRNI) - a level at which deficiency is extremely likely. Such low iron intakes are a potential cause of tiredness and fatigue, which is not something you want if you are a teenager and want to get on with the business of living. This trend is increasing as the proportion of teenage girls with iron intakes below the LRNI has increased by 25% since the NDNS began in its current format in 2008/9.

As this report shows, this worrying picture is similar for micronutrients and essential fatty acids across the board:

- A significant and growing number of teenagers – both boys and girls – have intakes of micronutrients below the LRNI.
- In the last 12 years, there has been a 62% increase in the proportion of 11-18-year-olds whose vitamin A intake is lower than the LRNI.
- For riboflavin, the proportion whose intake is lower than the LRNI has gone up by 54%; for calcium, by 45%; and for selenium, by 53%.

Whilst the NDNS does not evaluate young adults per se, a secondary analysis of data from years 1-6 of the NDNS by Dr Emma Derbyshire² found that young adults in their twenties had significantly lower ($p < 0.05$) intakes of eight micronutrients; expressed as a percentage of the Reference Nutrient Intake (RNI: an amount considered sufficient for much of the population) compared with adults in their thirties, forties and fifties:

- Vitamin A
- Riboflavin
- Folic acid
- Calcium
- Magnesium
- Potassium
- Iodine
- Copper



There is growing evidence that there is a reality gap between what people say and do. In a new research poll commissioned by the Health and Food Supplements Information Service (HSIS),³ all of the 1015 people, across the UK, thought their own and young people's diets are good, giving them a score of 7-8 out of 10. And this is in a context of around three quarters of participants thinking that nutrition is vital for issues around brain health. A total of 74% think - correctly - that nutrition is important for academic performance and 76% for mood.

Despite some awareness of the importance of nutrients for brain function and mood, micronutrients are a low priority in UK households. Almost seven out of 10 (69%) do not research what nutrients to include in their diets and six out of 10 don't plan meals around nutrients.

Teens and young adults are shifting more towards plant-based diets too. While these diets can be healthy and good for the environment and animal welfare, if the diet is not well planned there is an additional risk of multiple nutrient shortfalls including vitamin A, riboflavin, iron, zinc, selenium and iodine. Intake of all of these is already below recommended intakes in the diets of many young adults and teenagers. Furthermore, almost half of young adults aged 16-29 years in the HSIS omnibus survey do not research the risk of nutrient shortfalls when they shift to a plant-based diet (vegan, vegetarian, flexitarian). And seven out of ten 16-19-year olds do no research after changing their diets.

This situation needs to change – and quickly – as poor diets in teens and young adults could impact on health both now and later in life. Potential problems include:

- poor bone health from shortfalls in calcium
- poor immune health from low levels of vitamin D
- poor cognitive health and risk of neural tube defects in an unborn baby due to low intakes of omega-3s
- reduced fertility from low iron status

Diets must be improved but are unlikely to change quickly enough. In the meantime, a daily multi-vitamin and multi-mineral and fish oil supplement should be recommended for all teenagers and young adults.

SECTION 1:

TEENS AND YOUNG ADULTS: WHAT ARE THE NUTRITIONAL ISSUES?

Dr Emma Derbyshire



Teenagers and young adults experience many physical and lifestyle changes that can impact on their diets. The teenage years are a time of transition between childhood and adulthood, and an important stage of physical, emotional, social and mental development.

Starting secondary school, leaving home for university or starting a first job, for example, means more independence and freedom to choose what you eat and how you spend your spare time. According to findings from the HSIS research poll almost a quarter (24%) of teenagers and young adults eat different meals than the rest of the household, 39% eat modified meals with just over a third (37%) eating the family meal. Almost four out of 10 (37%) 16-29-year-olds do not plan their meals and only 17% cook their meals from scratch each day compared with 30% of those over 60.

Peer group pressure increases during this life stage and can impact on how teenagers and young adults think about their body size and appearance, and the effect of what they eat on these. A large number of other influences can also shape these changes. In the HSIS survey,⁴ resulting data found that:

- 47% identified family as a key influence
- 26% said it is friends that influence them
- 15% identified diet campaigns on TV/social media.⁵

The importance of a healthy diet for teenagers and young adults

A healthy, varied diet is essential to ensure that teenagers receive all the energy and nutrients they need to concentrate well at school, participate in sports and activities and to contribute to good health in these years and into the future.

In the HSIS survey,⁴ almost three quarters (74%) agreed that good nutrition can impact on academic performance. More women (78%) than men (71%) think this. Fewer young adults aged 16-29 (57%) agreed with this statement. High-quality diet is associated with academic performance,⁶ with various nutrients, such as omega-3s, B vitamins, vitamin D and E, all linked with good brain function.⁷

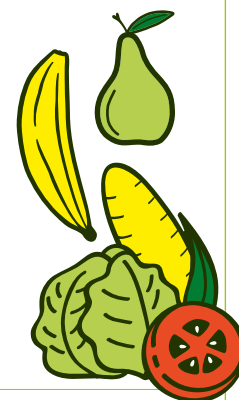
Stress and mood

A healthy diet may help in dealing with times of stress and maintaining positive mood, for example during exams, when moving to a new school or college, starting a new job, or experiencing peer group pressure or stressful family or relationship situations. Omega-3s, for example, are linked with mood.⁸ Amongst the HSIS research poll⁴ participants, 76% believe - correctly - good nutrition can impact on mood. Yet, again, fewer 16-29-year olds (60%) think that good nutrition impacts mood.

Alongside this positive view of the importance of good nutrition, lies the mistaken belief that teenagers and young adults in the household are eating a good diet. Most people in the HSIS survey⁴ rate their youngster's diet highly, giving it a score of 7-8 out of 10. This is reflected across the UK and among men and women of all ages. But the evidence from the UK's National Diet and nutrition Survey (NDNS) shows that this belief is misplaced and that teenagers as well as adults are far from eating a healthy diet.

Fruit and vegetables

The recommendation to eat five portions of fruit and vegetables daily is not widely followed in spite of this message being promoted for almost 20 years. In the HSIS research poll,⁴ just 36% of participants said they or their child followed 5-a-day as a strict rule, 53% said they did sometimes and 10% never.



But more than one fifth (21%) of 16-29 years olds say they do not eat fruit and vegetables at all, with 44% saying they do only when they remember. Perhaps surprisingly, as many as one in six (15%) of vegans and 17% of vegetarian households say they never eat fruit and vegetables.

Amongst the 63% of participants who might change their or their youngster's diet if they thought it would improve immune function, 66% would add more vegetables and 64% more fruit.

Again, young adults (aged 16-29 years) do not appear to have such a strong belief in the value of nutrition. In the HSIS survey,⁴ only 56% of those aged 16-29 years say they would change their diet if they thought it would improve their immune function.

This failure to eat the recommended 5-a-day is reflected also in the latest NDNS data from the NDNS (2015/2016).⁹ Those surveyed aged 11-18 years ate just 2.7 portions of fruit and vegetables each day, a situation that has not improved since 2008/2009 when 11-18-year olds consumed 2.8 portions of fruit and vegetables. The situation is worst amongst boys who are consuming 15% less fruit and vegetables than in 2008/9. Just 8% of 11-18-year olds achieve their five-a-day (9% of girls and 7% of boys). (See Table 1).

Dietary fibre

The NDNS shows that only 4% of 11-18-year olds (6% of boys, 2% of girls) achieve the dietary fibre recommendations (less than (>) 25g/daily for 11-15-year olds and > 30g daily for 15-18-year olds) (see Table 1). The overall adult population fares slightly better, but mean intake is just 19g daily and just 9% (4% women, 13% men) achieve the recommended intake of 30g daily.

This is not surprising, given the relatively low consumption of fruit and vegetables – a key source of dietary fibre. Just under a third of adults overall (31%) and only 8% of teenagers consumed the recommended 5-a-day. On average, teenagers consumed just over half of that amount.

A factor that probably contributes to this poor intake of dietary fibre is the high consumption of ultra-processed foods in both teen and young adult diets. Ultra-processed foods tend to be low in fibre and low in micronutrients and can be high in fat, sugar and salt. Ultra-processed foods are generally understood to refer to food that's gone through multiple food manufacturing processes in order to make it cheap or tasty or both.¹⁰

Taste and food choices

Taste is a significant driver for food choice. In the HSIS poll,⁴ taste was the single biggest driver for food eaten for almost 59% of respondents. Nutrition was important for just over half (51%), energy for 48%, comfort for 36%, and brain fuel for 30%.

Takeaways, which are tasty and convenient, were commonly consumed:

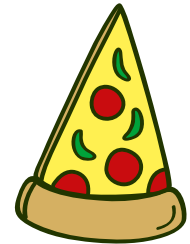
- Over two thirds (68%) of young adults aged 16-29 consume takeaways once a week or more
- Only 28% of households (17% of 16-29-year olds) do not eat takeaways
- A total of 73% of vegans eat a takeaway once or twice a week
- Amongst those following plant-based diets, vegan/vegetarian ready meals are popular, particularly with 16-29-year olds. Of this group, just over two thirds (67%) eat them once a week or more compared with 53% of participants overall.

The growth of ultra-processed food habits

A recent UK study, published in *BMJ Open*,¹¹ confirms teenagers' high consumption of ultra-processed food. The researchers analysed data from the NDNS and found that more than half (57%) of the energy (calories) in UK diets overall is derived from ultra-processed food.¹² This rose to 68% in the diets of 11-18-year-olds. Just over one third of the energy (34%) in the diets of adults over 19, and under a third (27%) in 11-18-year-olds, comes from unprocessed food, minimally-processed food or culinary ingredients.

NB: A full description of the NOVA classification for ultra-processed food used in the BMJ Open study can be found in Appendix 1.

The HSIS survey⁴ found poor awareness and a lack of concern about ultra-processed foods in the diet, making it challenging to tackle their consumption.



In fact, almost three quarters of participants (71% overall; 67% in 16-29-year olds) had not heard of ultra-processed foods.

When asked what they think about ultra-processed foods, almost a quarter (24% overall and 35% of 16-29-year olds) had no concerns about ultra-processed foods.



Fat

In general, saturated fat intake has fallen since 2008/9 but neither teens nor adults aged over 19 years are achieving the recommendations. Intakes remain in excess of 12% of food energy in 11-18-year olds and just under 12% in adults over 19, which compares unfavourably with the target of no more than 11% of energy from saturated fat.



Sugar

Intake of free sugars,¹³ including those from sugar-sweetened beverages, has fallen since 2008/9 but as a percentage of dietary energy it remains significantly above the current UK recommendation of no more than 5%. The vast majority (97%) of 11-18-year olds and 87% of adults overall exceed the 5% of dietary energy from free sugars upper limit.¹⁴ In 11-18-year olds, free sugars comprise 14.1% of dietary energy (13.9% in boys, 14.5% in girls) whilst in adults over 19 years it is lower (11.1%).



Oily fish

Overall, oily fish intake in the teenage and young adult age group has remained the same since 2008/9 with no

improvement. The total consumed averages 14g each week - equivalent to one tenth of the recommended weekly intake of one portion of 140g of oily fish. Girls consume slightly more – 21g each week, but still nowhere near the recommended amount, whilst boys have increased the amount of oily fish, they consume from 7g weekly in 2008/9 to 14g weekly in 2015/16 (see Table 1). Adults over 19 years do a little better but still consume only 56g a week of oily fish (or 40% of the recommended weekly portion)

It can be hard to get teenagers and young adults to consume oily fish. In fact, in the HSIS survey,⁴ amongst those described as fussy eaters, oily fish was the most commonly refused food item (by 34%). Yet oily fish is the only source of long chain omega-3 fatty acids. Omega-3 fatty acids are essential for the health of the:

- Brain
- Immune system
- Cardiovascular system.

Given their importance for health, an omega-3 supplement is a wise policy.

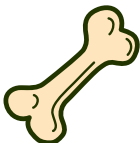


Organic food

Around four out of 10 (41%) buy organic food (43% of 16-29-year olds). Almost half (48%; 47% of 16-29-year olds) buy them because they think they are more nutritious. Differences in the composition between organic and conventional crops exist but are limited, such as a modestly higher content of phenolic antioxidant compounds in organic fruit and vegetables. Organic dairy products, and some organic meats, have a higher content of omega-3 fatty acids compared to conventional products. However, these differences are likely to be of marginal nutritional significance.¹⁵

9 www.gov.uk/government/statistics/ndns-results-from-years-7-and-8-combined 10 www.nhs.uk/news/food-and-diet/does-ultra-processed-food-cause-earlier-death/
11 www.ncbi.nlm.nih.gov/pmc/articles/PMC6830631/ 12 www.ncbi.nlm.nih.gov/pmc/articles/PMC6830631/ 13 Free sugar is any sugar added to a food or drink or the sugar that is already in honey, syrup and fruit juice. These are free because they're not inside the cells of the food we eat. Free sugars do not include the sugars found in fruit, vegetables and milk as they don't seem to have a negative impact on health and are naturally packaged with additional nutrients and fibre. 14 www.ncbi.nlm.nih.gov/pubmed/31662351 15 www.ncbi.nlm.nih.gov/pmc/articles/PMC5658984/

HEALTH ISSUES IN TEENS AND YOUNG ADULTS



Bone health

The teenage and young adult years are a time of rapid growth and development, and the requirements for some nutrients, like calcium and phosphorus, are high. Worryingly, the latest data from the NDNS¹⁶ show more than one in six (16%) of 11-18-year olds (9% of adults over 19) have calcium intakes below the Lower Reference Nutrient Intake (LRNI). For 11-18-year-old girls the figure is more than a fifth (22%). And these figures have worsened over time. In 2008/9 a total of 11% of 11-18-year olds (15% of girls) had a calcium intake below the LRNI. In my secondary analysis of NDNS data (years 1-6)¹⁷ almost one in 10 (9.36%) of 20-29-year olds had a calcium intake below the LRNI.

Intake of recommended calcium levels during the teenage and young adult years is crucial as the bones are developing and strengthening, a process which continues to the end of the third decade. At least 90% of peak bone mass is acquired by the end of the teenage years, which makes youth the best time to “invest” in bone health. Calcium contributes to achievement of optimal peak bone mass¹⁸ and shortfalls in intake at this life stage can increase the risk of bone disease in later life.



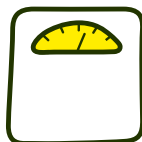
Brain health

The teenage and young adult years can be a time of academic pressure and exams, the results of which impact on future life prospects, including college/

university entrance and jobs in adult life. Poor adolescent diets may influence brain health and behaviour in adulthood.¹⁹ Almost three quarters (74%) of those surveyed⁴ for HSIS agreed that nutrition can impact on school performance and almost two thirds (63%) believe specific nutrients aid young learning (74% of 30-44-year olds). Young adults (16-29-year olds) seemed to be more sceptical with 57% and 54% thinking that specific nutrients can impact on academic performance and learning respectively.

A total of 70% (but only 60% of 16-29-year olds) believe that specific nutrients may improve a young person’s mood. But teenage and young adults’ diets are lacking in these nutrients.

Foods high in long chain omega-3 fatty acids may support brain function²⁰ and can influence mood and mental health.²¹ Yet oily fish consumption, the key source of long chain omega-3 fatty acids in the diet, is just one tenth of the recommended intake in 11-18 year-olds and 40% of the recommended intake in adults overall.



Weight and shape

Concern with weight and shape is extremely common amongst teenagers and young adults. This age group can feel dissatisfied with their body image and feel pressurised to be thinner than is healthy. A survey of 1,035 posted social media tweets typically used by young adults found that 67.2% related to body image, eating disorders, fitness, food or dieting.²² The pressure can lead some adolescents and young adults to exercise excessively, skip meals and follow unnecessary weight loss diets, which in extreme cases can lead to eating disorders such as bulimia and anorexia nervosa.

¹⁶ www.gov.uk/government/statistics/ndns-results-from-years-7-and-8-combined ¹⁷ Derbyshire E (2018) Micronutrient Intakes of British Adults Across Mid-Life: A Secondary Analysis of the UK National Diet and Nutrition Survey. *Front. Nutr.* 5:55. doi: 10.3389/fnut.2018.00055 ¹⁸ www.ncbi.nlm.nih.gov/pubmed/26856587 ¹⁹ www.sciencedaily.com/releases/2017/06/170619170619134058.htm ²⁰ www.ncbi.nlm.nih.gov/pmc/articles/PMC2805706/ ²¹ www.ncbi.nlm.nih.gov/pmc/articles/PMC6087749/ ²² pubmed.ncbi.nlm.nih.gov/29300696/



Poor adolescent diets may influence brain health and behaviour in adulthood.



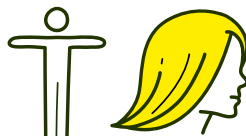
Crash Diets & Meal Skipping

Adolescents and young adults worried about their weight and shape may be tempted to follow a crash or fad diet, seriously limiting food intake or eliminating whole food groups. That means that they may not be getting all the vitamins and minerals they need, and this can lead to tiredness, irritability and feeling unwell. While it can be tempting to follow the latest celebrity-endorsed diet which can help to lose weight quickly, results may be difficult to maintain and the weight regained quickly.

Though not necessarily following fad diets, almost a third (31%) of respondents, and almost half of participants in the HSIS poll⁴ described their children as ‘fussy eaters’, with 19% being ‘fussy’ sometimes. Amongst fussy eaters:

- 34% refuse oily fish
- 32% do not eat green vegetables
- 31% steer clear of stews and casseroles
- 28% shun most vegetables
- More than a fifth (22%) of household meal providers hide vegetables in food or create meals where vegetables aren't obvious.

These dietary patterns contribute to the poor micronutrient intakes described in Section 2.



Nutrients and skin, hair and nails

Teenagers and young adults are often concerned by their appearance and want to be sure that their skin, nails and hair are at their very best. Many micronutrients (vitamins and minerals) can influence the condition of the skin (e.g. biotin, copper, iodine, niacin, riboflavin, vitamin A, vitamin C and zinc), nails (e.g. selenium and zinc) and hair (e.g. biotin, copper, selenium and zinc), intakes of which often fall short in teenagers' diets.

Micronutrient intakes

Section 2 looks at micronutrient intakes in the diets of teenagers and young adults. These fall well below recommended levels, with a worsening situation since 2008/9 when the current NDNS first came into being.

SECTION 2:

MICRONUTRIENT ISSUES IN TEENS AND YOUNG ADULTS

Dr Gill Jenkins



Despite the findings from the HSIS survey⁴ that a majority of households rated their diets as healthy, evidence from the NDNS shows that the majority of teenagers in the UK are not eating a healthy diet with significant impacts on vitamin and mineral intake. A secondary analysis of NDNS data (years 1-6)²³ also shows that a significant proportion of 20-29-year olds have much poorer micronutrient intakes than overall.

Less than one in 10 (8%) of 11-18-year olds and less than one third (31%) of adults overall are eating their 5-a-day. Dietary fibre intakes are well below recommended levels, partly a reflection of such low fruit and vegetable intakes, with just 4% of 11-18-year olds and 9% of adults overall consuming the UK recommended fibre intake.

Oily fish intake has not improved since 2008/9 and equates to 10% and 40% respectively for 11-18-year olds and adults overall of the recommended 140g portion each week. High intakes of ultra-processed foods also impact micronutrient intake.

Micronutrient (vitamin and mineral) intakes in younger people has been of significant concern over the past two decades²⁴ and the most recent data from the NDNS for the intake of many micronutrients show a worsening situation since the 2008/9 NDNS survey began in its current format. In fact, 11-18-year olds fare worse than young adults aged 20-29 and adults overall across almost all measures of micronutrient intake.

The data from the NDNS for 11-18 year olds (for both boys and girls and the total) for each of the four time periods studied in the survey since 2008/2009 can be found in Tables 1, 2, 3 and 4. (Data at this level of detail are not available for young adults aged 20-29 as the NDNS evaluates the age range 19-64)

- Table 1 (p25) shows intakes of macronutrients including sugars and fats and also some foods, including fruit and vegetables, red and processed meats and oily fish. Findings from Table 1 are discussed in Section 1 of this report.
- Table 2 (p26) shows intakes of all 11 micronutrients and

the percentage change for each one between 2008/9 and 2015/16. Most of the changes in vitamin and mineral intake are in the downwards direction.

- Table 3 (p27) shows the percentage of teenagers and young adults with intakes of each micronutrient below the LRNI, an intake at which deficiency is extremely likely. Table 3 also shows that the percentage of teenagers and young adults with intakes below the LRNI for almost all micronutrients has increased since 2008/9 – i.e. repeating the finding that the trend in intakes is downwards.
- Table 4 (p28) shows the actual micronutrient status (analysed in the blood) for measures of vitamin B12, folate, vitamin B2, iron and iodine. Again, many of these measures are low and show a downward trend since 2008/9.

Here's a summary spotlight on what vital nutrients are missing from teen and young adults' diets and why they need them to fuel their bodies:

Vitamin A

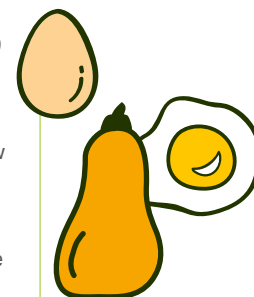
Vitamin A is found in two types of substances:

- Retinoids which are present in animal sources (egg, egg yolk, cheese, liver).
- Beta-carotene which is present in plant sources (carrots, squash, red potatoes).

Vitamin A is essential for normal iron metabolism, the maintenance of normal mucous membranes (for example in the nose, mouth and rest of the respiratory tract), skin and vision. It is also essential for immune function and has a role in the process of cell specialisation.

- More than one in five (21%) of 11-18-year olds (19% of boys, 24% of girls) have intakes of vitamin A below the LRNI (see Table 3).
- A total of 13.3% of 20-29-year old adults have below LRNI intakes for vitamin A. For comparison, 13% of adults also have a vitamin A intake below the LRNI.

There has been a downward trend in both teens and adults overall. The proportion of 11-18-year olds with vitamin A intakes below the LRNI has increased by 62%



(58% increase in boys, 71% increase in girls) over the same time period (see Table 3). Absolute intakes of vitamin A (see Table 2) have fallen overall in this age group by 19% (16% in boys, 22% in girls) since 2008/9.

Riboflavin

Riboflavin is found in cheese, eggs, milk and yoghurt. This vitamin contributes to normal energy metabolism, metabolism of iron, functioning of the nervous system, maintenance of normal mucous membranes and red blood cells and protection of cells from oxidative stress. Riboflavin, like vitamin C, also helps iron absorption.²⁵

- A fifth (20%) of 11-18-year olds (13% of boys, 26% of girls) have intakes of riboflavin below the LRNI (see Table 3).
- A total of 10.1% of 20-29-year-old adults have below LRNI intakes for riboflavin. For comparison, below-LRNI intakes occur in 10% of adults overall (14% of women, 6% of men).

As for vitamin A, this is a worsening picture in 11-18-year olds and adults over 19, with a slightly downward trend in intakes since 2008/9. The proportion of 11-18-year olds with intakes below the LRNI has increased by 54% (63% increase in boys, 44% increase in girls). Absolute intakes of riboflavin have fallen overall in 11-18-year olds by 2% (0.6% in boys, 5.5% in girls) since 2008/9 (see Table 2).

The NDNS also evaluated riboflavin status using the erythrocyte glutathione reductase activation coefficient (EGRAC). An EGRAC level of 1.3 or less indicates adequate riboflavin status in all population groups.²⁶ The NDNS data shows that 74% of 11-18 year olds (71% of boys, 78% of girls) have an EGRAC above 1.3 (see Table 4; 54% of adults over 19, 61% of women, 54% of men) which is an indication of poor riboflavin status. These figures have improved very slightly since 2008/9 (with approximately 10% fewer teenagers (both boys and girls), and 11% of adults over 19 having an EGRAC above 1.3).

Folate

Folate is found in asparagus, broccoli, orange juice and spinach, while folic acid is in fortified cereals and grains.

Folate contributes to:

- Maternal tissue growth during pregnancy
- Normal blood formation
- Homocysteine metabolism
- Psychological function
- Immune function
- Reduced tiredness and fatigue.

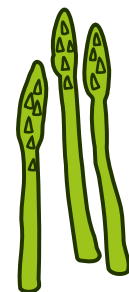
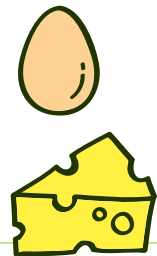
Almost one in 10 (9%) of 11-18-year olds (3% of boys, 15% of girls) have intakes of folate below the LRNI (see Table 3). A total of 3.25% of 20-29-year-old adults have below-LRNI intakes for folate. For comparison, 5% of adults over 19 (6% of women, 3% of men) have below LRNI intakes.

Again, this is a worsening picture with a downward trend in intakes since 2008/9.

- The proportion of 11-18-year olds with folate intakes below the LRNI has increased by 125% (it remained the same in boys with a 150% increase in girls).
- Absolute intakes of folate have fallen overall in this age group by 10.2% (11.4% in boys, 8.9% in girls) since 2008/9 (see Table 2).

These figures are serious for both boys and girls but such low folate status in teenage girls and young women is extremely worrying should they become pregnant, as folate is essential for the development of the neural tube in the unborn child.

Of significant concern is a 2014 paper published in PLOS One which found that two thirds of women in the UK are not taking a folic acid supplement before pregnancy.²⁷ The proportion of women taking folic acid supplements before pregnancy declined from 35% in 1999–2001 to 31% in 2011–2012. Just 6% of women aged under 20 took folic acid supplements before pregnancy, compared with 40% of women aged between 35 and 39.



The NDNS also evaluated folate status using two separate measures:

- 1 Red blood cell folate. The NDNS data show that 21% of 11-18-year olds (15% of boys, 28% of girls) have a red blood cell folate level below the clinical threshold. For adults aged over 19, the respective figures are 7%, 11% and 3%.
- 2 Serum folate. A total of 60% overall have a serum folate level below the clinical threshold of 13nmol/litre (49% of boys, 73% of girls) (see Table 4). For adults over 19, the respective figures are 46%, 46% and 45%.

These figures have worsened considerably since 2008/9, with approximately 2.5 times and almost half (46%) more teenagers respectively having red blood cell folate levels and serum folate levels below the clinical thresholds. Amongst adults over 19, 75% and 59% more had levels of red blood cell folate and serum folate levels respectively below the clinical threshold.

Vitamin B12

Vitamin B12 is found naturally in animal sources including cheese, eggs, milk and meat. It is also added to fortified breakfast cereals. Vitamin B12 contributes to normal energy metabolism, functioning of the nervous system, homocysteine metabolism, normal red blood cell formation, immune function, cell division and reduction of tiredness and fatigue. Low vitamin B12 levels have also been linked to poor cognitive function.²⁸

The only indicators for vitamin B12 in the NDNS are status levels rather than intakes. Two measures of status levels are included:

- 1 Vitamin B12 below 150 pmol/litre. A total of 5% of 11-18-year olds (4% of boys, 6% of girls) have vitamin B12 levels below the threshold. These levels have stayed approximately the same overall and in girls but with a third more boys having a level below the threshold since 2008/9. Amongst adults over 19, 3% overall, 4% of women and 3% of men had similarly low B12 levels.
- 2 Holotranscobalamin below 32 pmmol/litre. A total of 11% of 11-18-year olds (6% of boys, 16% of girls) have a level below the threshold. These levels have worsened considerably in both girls and boys

since 2012/13-2013/2014 (years 5-6 of the survey). Twice as many boys and 16 times as many girls have a Holotranscobalamin level below the identified threshold since 2012/13-2013/2014. A total of 7% of adults over 19 (8% of women, 5% of men) have below 32 pmmol/litre levels of Holotranscobalamin.

HSIS FACT: Holotranscobalamin (holo-TC) is a transcobalamin-vitamin B12 complex currently being investigated as a diagnostic test for vitamin B12 deficiency in symptomatic and at-risk populations

Vitamin D

Most of our vitamin D is obtained by the action of sunlight on the skin. Vitamin D is found in only a few foods, which include oily fish, fortified margarine, milk or cereals. Hence the UK government recommends that everyone consider taking a vitamin D supplement of 10 micrograms daily in the autumn and winter months.

Vitamin D contributes to normal absorption/utilisation of calcium and phosphorus and blood calcium levels, the maintenance of normal bones, teeth, muscle and immune function.

- Mean vitamin D intakes from food in 11-18-year olds are 2.1µg/day (2.3µg/day in boys and 1.9µg/day in girls), representing only a fifth to a quarter of the UK government recommendation of 10µg/day. These intakes have not changed since 2008/9 (see Table 2). Comparable intakes in adults over 19 are 2.7 µg/day (2.5µg/day in women, 2.9 µg/day in men).
- The UK threshold serum level for vitamin D (25-hydroxyvitamin D; 25-OH D) is 25nmol/litre. More than a quarter (26%) of 11-18-year olds have a 25-OH D level below this; this includes 15% of boys and 39% of girls (see Table 4; 11% of adults over 19, 16% of women, 19% of men).

These figures have worsened since 2008/9. A total of 73% more overall (116% more girls and 25% more boys) have 25-OH D levels below 25nmol/litre. The picture is little better in adults with 17% of those over 19 (16% of women, 19% of men) having below 25nmol/litre vitamin D levels.



²⁸ www.ncbi.nlm.nih.gov/pubmed/22221769

Iron

Iron is found in black liquorice, eggs, red meat, fortified grains and bread. It contributes to normal energy metabolism, cognitive function, formation of red blood cells and haemoglobin, oxygen transport in the body and the reduction of tiredness and fatigue.

- Almost one third (32%) of 11-18-year olds (12% of boys, 54% of girls) have intakes of iron below the LRNI (see Table 3).
- A total of 16.6% of 20-29-year-old adults, including 33% of women in this age group, have below LRNI intakes for iron. For comparison, a total of 15% of adults overall (27% of women, 2% of men) also have below LRNI intakes of iron.

Again, this is a concerning picture with a downward trend in intakes since 2008/9.

- For 11-18-year olds, the proportion with iron intakes below the LRNI has increased by one third (50% increase in boys, 25% increase in girls).
- Absolute intakes of iron have fallen slightly overall in this age group by 5.2% (4.7% in boys, 3.5% in girls) since 2008/9 (see Table 2).

The NDNS also measures haemoglobin and ferritin (a measure of iron stores).

- Amongst 11-18-year olds, 5% have haemoglobin and 12% have ferritin below the clinical threshold (9% and 24% respectively in girls 11-18, 8% and 12% respectively in women over 19).

Calcium

Food sources of calcium include cheese, milk, sardines, salmon, tofu and yoghurt. Calcium contributes to energy metabolism, normal blood clotting, muscle function, neurotransmission and maintenance of normal bones and teeth.

- More than one in six (16%) of 11-18-year olds (11% of boys, 22% of girls) have intakes of calcium below the LRNI (see Table 3).
- A total of 9.3% of 20-29-year-old adults have below LRNI intakes for calcium. Again, this is a worsening picture with a downward trend in intakes since 2008/9.
- The proportion of 11-18-year olds with calcium intakes below the LRNI has increased by almost half (45%)

(38% increase in boys, 47% increase in girls). This is a worrying scenario in that increase in bone density (which requires calcium) occurs at a rapid rate during the teenage years.

- Absolute intakes of calcium have fallen slightly overall in this age group by 3.3% (0.6% in boys, 4.0% in girls) since 2008/9 (see Table 2).

Magnesium

Magnesium is found in cashews, green vegetables, milk, and sunflower seeds. It contributes to electrolyte balance, normal muscle function and protein synthesis, functioning of the nervous system and the maintenance of normal teeth and bones.

- Almost four in ten (38%) of 11-18-year olds (27% of boys, 50% of girls) have intakes of magnesium below the LRNI (see Table 3).
- One in five (18.5%) of 20-29-year-old adults (21.9% of men) have below LRNI intakes for magnesium (for comparison, 13% of adults overall, 11% of women, 11% of men).

The proportion of 11-18-year olds with magnesium intakes below the LRNI has not improved. Absolute intakes of magnesium have also not improved in teens since 2008/9 (see Table 2).

Potassium

Potassium is found in grains, legumes, meat, milk and potatoes. Potatoes are a valuable dietary source of potassium and Western diets with lower intakes of fruit and vegetables have been linked to declining potassium intakes.²⁹ It contributes to normal functioning of the nervous system, muscle function and maintenance of normal blood pressure.

- More than a quarter (28%) of 11-18-year olds (18% of boys, 38% of girls) have intakes of potassium below the LRNI (see Table 3).
- A total of 15.6% of 20-29-year-old adults (34% of women) have below LRNI intakes for potassium (for comparison 17% of adults over 19, 23% of women, 11% of men).



²⁹ www.ncbi.nlm.nih.gov/pubmed/23674806



Again, this is a worsening picture with a downward trend in intakes since 2008/9.

- The proportion of 11-18-year olds with potassium intakes below the LRNI has increased by around a fifth (20% increase in boys, 19% increase in girls).
- Absolute intakes of potassium in teenagers have fallen overall in this age group by 3.9% (0.3% in boys, 3.9% in girls) since 2008/9 (see Table 2).

Iodine

Iodine is found in iodised salt and seafood. It contributes to normal energy metabolism, cognitive function, function of the immune system, maintenance of normal skin, normal production of thyroid hormones and thyroid function. Lack of iodine is particularly important during pregnancy as it may be associated with impairments in cognition and school performance in the offspring.³⁰

- Exactly one fifth (20%) of 11-18-year olds (14% of boys, 27% of girls) have intakes of iodine below the LRNI (see Table 3).
- A total of 14.7% of 20-29-year-old adults (17% of women, 15% of men) have below LRNI intakes for iodine.

Again, this is a worsening picture with a downward trend in intakes since 2008/9. The proportion of 11-18-year olds with iodine intakes below the LRNI has increased by more than half (54%; 100% increase in boys, 35% increase in girls).

Absolute intakes of iodine have fallen slightly overall in this age group by 4% (0.7% in boys, 8.2% in girls) since 2008/9 (see Table 2).

The NDNS measured urinary iodine levels to get an indication of iodine status. More than a third (35%) overall (32% of boys, 38% of girls; 46% of adults over 19) have a urinary iodine concentration below the threshold of 100µg/litre.

Selenium

Selenium is found in seafood and walnuts. This essential mineral contributes to normal spermatogenesis, hair, nails, thyroid function, function of the immune system and protection of cells from oxidative stress.

- 38% of 11-18-year olds (26% of boys, 45% of girls) have intakes of selenium below the LRNI (see Table 3).
- A total of 39% of 20-29-year-old adults (29% of men, 50% of women) have below LRNI intakes for selenium



Low selenium status has been associated with increased risk of mortality, poor immune function, and cognitive decline.³¹

A recent study published in the *American Journal of Clinical Nutrition*³² indicates a link between severity of COVID-19 disease and poor selenium status.

Zinc

Foods containing zinc include fortified cereals, nuts, oysters, poultry and red meat. Zinc is an important part of many enzymes, some of which have key roles in the formation of new proteins – one of the processes involved in tissue growth. Zinc is required to aid growth of the immune cells and to maintain hair, skin and nails. Superoxide dismutase (a powerful antioxidant enzyme that neutralises potentially-damaging free radicals) requires zinc. Zinc is also essential for reproduction.

- One in five (22%) of 11-18-year olds (18% of boys, 27% of girls) have intakes of zinc below the LRNI (see Table 3).
- Almost one in 10 (8.6%) of 20-30-year olds have below LRNI intakes for zinc (8% of adults over 19, 8% of women, 7% of men)

Again, this is a worsening picture with a downward trend in intakes since 2008/9 particularly for teenagers. **The proportion of 11-18-year olds with zinc intakes below the LRNI has increased by 37% (50% increase in boys, 35% increase in girls).**

Absolute intakes of zinc have fallen slightly overall in this age group by 2.7% (3.6% in boys, 3.1% in girls) since 2008/9 (see Table 2).

Conclusion

Data on micronutrient intakes in teenagers and adults aged 20–29 years make for grim reading. This is particularly the case for 11–18-year olds who fare worse in terms of micronutrient intakes among these two age groups. **Significant proportions of 11–18-year olds have intakes below the LRNI for all 11 vitamins and minerals evaluated in the NDNS. But intakes in adults over 19 are not without concern.**

Girls and women fare worse than boys and men across the board.

- More than half of girls have intakes of iron and magnesium below the LRNI.
- Almost half have intakes of selenium below the LRNI whilst four out of ten have a potassium intake below the LRNI.
- Around a quarter to a third have below LRNI intakes of vitamin A, riboflavin, iodine and zinc whilst over one fifth have similarly worrying intakes of calcium.

But young adults in their twenties do not fare well either.

- 40% of adults in their twenties had selenium intakes below the LRNI.
- A third of young women aged 20–29 years (33%) had iron intakes below the LRNI.
- A quarter (24.7%) had potassium intakes below lower recommended nutrient thresholds.
- Overall, more than one in 10 young adults (aged 20–29 years) had four micronutrients below the LRNI (vitamin A, iron, magnesium, and iron).

Amongst males:

- Just under one-third (29%) aged 20–29 years had selenium intakes below the LRNI (Figure 3).
- One in five males in this age category had magnesium intakes below the LRNI and 17% had vitamin A intakes below the lower reference nutrient standard. Statistical analysis in Dr Derbyshire's paper³³ showed that a significantly higher proportion of males in their twenties had vitamin A intakes below the LRNI compared to those in their thirties and fifties ($p < 0.05$).

A significantly higher proportion of females aged 20–29 years had magnesium, potassium and iodine intakes

below the LRNI ($p < 0.05$) compared to those in their thirties, forties and fifties.³⁴

Blood levels also show significant shortfalls:

- Almost a quarter of girls aged 11–18 and 12% of adult women overall have low ferritin (a marker of iron storage) levels, while around three quarters have indicators of poor folate and riboflavin status.
- Four out of ten girls, 16% of adult women overall, one in six boys and 19% of adult men have low vitamin D levels.
- Four out of ten girls and a third of boys show evidence of poor iodine status.
- More than one in 10 (11%; 16% of girls) have a low Holotranscobalamin level (which is a measure of vitamin B12 status).

Worse still, these figures are not improving.

In fact, for most micronutrients, absolute intakes as well as the proportions of teenagers and adults overall with below-LRNI intakes and poor blood levels have largely become worse since 2008/9.

This is a serious situation. Whilst it is not possible from the overall NDNS data and Dr Derbyshire's secondary analysis to tease out the same detailed data for 20–29-year olds as for 11–18-year olds, diets of our adolescent and young adults, as reflected in the micronutrient intakes reported here, give huge cause for concern.

Yet the HSIS research poll⁴ shows that householders think their diets and those of teenagers and young adults are good. They also show limited awareness of nutrition and the importance of micronutrients for health. This very worrying situation must be addressed without delay.

³³ Derbyshire E (2018) Micronutrient Intakes of British Adults Across Mid-Life: A Secondary Analysis of the UK National Diet and Nutrition Survey. *Front. Nutr.* 5:55. doi: 10.3389/fnut.2018.00055 ³⁴ *ibid*

SECTION 3:

THE IMPORTANCE OF SUPPLEMENTATION

Dr Emma Derbyshire



Micronutrient intakes in teenagers and young adults – both males and females – need to be addressed without delay. Micronutrient status at this life stage impacts health prospects throughout adulthood and later in life:

- **Calcium and vitamin D for bone health**
- **Omega-3 fatty acids for brain and cardiovascular health**
- **Vitamin A, C, D, E, iron, zinc, iodine and selenium for immune function.**

These shortfalls in vitamins, minerals and omega-3 fatty acids are a reflection of bad diets in terms of poor fruit and vegetable intakes, plus a lack of fibre and oily fish intakes. There is widespread higher-than-recommended consumption of free sugars, which are often found in ultra-processed foods of low micronutrient density. Teenagers fare the worst for poor micronutrient intakes.

Unprocessed or minimally-processed foods, which make up just 27% and 34% of the calories³⁵ in teenagers' and young adults' diets respectively, include fresh, dry or frozen fruits or vegetables; grains, flours and pasta; pasteurised or powdered plain milk, plain yoghurt, fresh or frozen meat, fresh or frozen fish. These foods tend to have a higher micronutrient density than ultra-processed foods which provide more than two thirds (68%) of the calories in teenagers' diets and more than half of the calories (57%) in adults' diets.

Urgent need to shift behaviour habits

Ideally, diets in adolescents and young adults should be rapidly improved but behavioural change takes time – particularly in a context of teenage independence, busy household lifestyles and the desire for speed and convenience. Perhaps more important though, is the lack of understanding and knowledge of poor-quality diets. In the HSIS survey,⁴ the majority of households across the UK gave their household's diets a score of 7-8 out of 10.

Yet there is significant belief that nutrition overall can:

- impact academic performance (as noted by 74% of those surveyed by HSIS).
- Impact mood (78% of those polled by HSIS).

Of concern is that 16-29-year olds appear to have a poorer understanding of nutrition and the importance of nutrients which could be attributed to misinformation. Just over half (57%) think that specific nutrients impact learning, while a similar proportion (59%) think that specific nutrients influence mood. These are lower proportions than in participants overall (63% and 70% respectively). Only 47% of 16-29-year olds think that nutrition affects immune function compared with 56% overall. However, research shows that several nutrients including vitamin C, D, zinc, selenium and iodine are essential for immune function.³⁶

Worryingly, seven out of 10 (69%) parents do not research nutrients important in their children and teenagers' diet. Adults aged 16-29 do a little better, with 38% researching dietary nutrients – but 62% do not.

Overall, micronutrients seem to be a low priority in UK households:

- Six out of 10 (60%) households do not plan meals around nutrients
- Among 16-29-year-olds, 55% don't plan meals around nutrients while 27% do.

Why are dietary habits so poor?

Part of the reason for this state of affairs is that for several decades, dietary advice and misinformation³⁷ has focused on reducing fat, sugar and salt. Although this is important for good health, it has often seemingly been at the expense of micronutrients.

Micronutrients get forgotten or their intakes are perceived as sufficient. In fact, 69% of respondents (65% of 16-29-year olds) in the HSIS survey⁴ seemed comfortable with what they know about nutrients and said they did not need information about nutrients and supplements.

Yet the NDNS data shows that micronutrient intakes are not adequate in teenagers and young adults. While the micronutrient density of diets needs to be improved, this is unlikely to happen fast. Supplementation with a multi-vitamin and multi-mineral will help to make good this huge dietary gap in the teenage years.



However, fewer than four in 10 (38%) of adults in the households surveyed⁴ for HSIS take supplements. Almost half (48%) don't and 14% do sometimes. Amongst 16-29-year olds, just over one third (35%) take supplements.

Amongst those who take supplements, multivitamins remain the most popular:

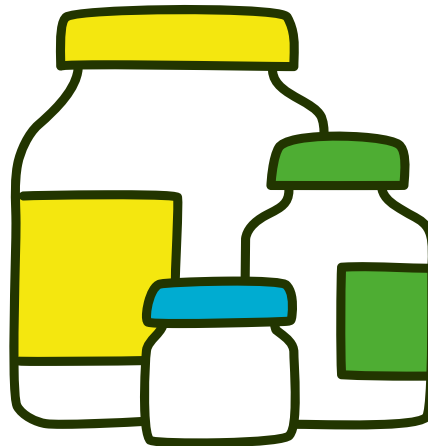
- A total of 42% of supplement-users take a multivitamin and 18% a multi-mineral but only 22% and 13% respectively take these daily.
- Fewer than a third (30%) follow the UK government's recommendation to take a vitamin D supplement and of those who do take it, only 18% take it daily.
- A total of 22% take iron.
- 20% take vitamin B12 and an omega-3 supplement. Only 13% take these each day.
- A total of 14% take calcium (11% take it daily), 10% consume zinc (9% daily) and 4% supplement with iodine (5% daily).
- A fifth (20%) gave a multivitamin to their child, 13% gave vitamin D and 10% iron, a multi-mineral and/or omega-3.

The medical importance of micronutrients appears to get forgotten too:

- Only a fifth (21%; 25% of 16-29-year olds) of those consumers surveyed⁴ for HSIS say a healthcare professional has advised them to take vitamins

Conclusion

Overall, awareness and knowledge of micronutrient needs is low amongst households, families, parents and healthcare professionals. Given that intakes of vitamins, minerals and omega-3s in teenagers and young adults are worryingly low, especially among those large proportions of 11-18-year olds who have intakes of micronutrients below the LRNI and with intakes continuing to fall, knowledge of micronutrients - including the importance of supplementation - needs to be improved.



Micronutrient intakes of teenagers and young adults will improve if an all-round multivitamin and multi-mineral supplement is taken daily.



LAST WORD

This latest report from HSIS indicates that the UK is setting the stage for poor health in future generations. Teenage and young adult diets are low in fruit and vegetables, fibre and oily fish and high in micronutrient-poor, ultra-processed foods - which are also high in fat and sugar - are increasing the risk for chronic disease in the future.

While the links between high intakes of saturated fat, sugar and salt and obesity, type 2 diabetes and cardiovascular disease are frequently made and highlighted, there is all too often complete silence about poor intakes of vitamins and minerals which also risk the health of our future adults both now and in years to come.

Low intakes of omega-3 fatty acids have been linked with poor cognitive health and could be increasing the risk for brain health issues in older age. Low calcium intakes, poor magnesium intakes and limited vitamin D levels pose a risk to bone health. Low intakes of vitamin A, vitamin D, folate, iron, zinc, iodine and selenium pose a risk for immune function, while low folate in a pregnant teenager or young woman could prejudice the health of an unborn child. Low iron can also lead to tiredness and lack of riboflavin can reduce absorption of iron.

Understanding and knowledge about micronutrients is very limited and where knowledge exists this does not seem to result in dietary change. Most meals are not planned around nutrients; indeed, many are not planned at all, and takeaways are common.

Most worryingly, micronutrient intakes show no sign of improving; rather they are getting worse with time, with trends in micronutrient status following the same troubling journey. Yet fewer than four out of 10 take supplements and amongst those who do, many take them sporadically, therefore not gaining full health and wellness benefits.

The diets of all teenagers and young adults should meet micronutrient recommendations. Diets must be improved but it seems very unlikely that this will happen quickly, given the lack of knowledge and sometimes lack of household motivation to change and plan meals around nutrients. It is understandable that many households are extremely time poor and teenagers and young adults want to eat what they like. We can only conclude that the way to bridge very disturbing dietary gaps is for every teenager and young adult to take a multivitamin and multi-mineral supplement in recommended amounts. If that happened, no-one in this age group should have an intake of micronutrients low enough to risk deficiency.

For further information or to arrange an interview with an HSIS spokesperson, please contact the HSIS press office HSIS@junglecatsolutions.com or call 020 3600 0228. Out of hours please call 07867 513 361.



APPENDIX 1

The NOVA classification of ultra-processed foods³⁸:

- 1 Unprocessed or minimally processed foods (egg, fresh, dry or frozen fruits or vegetables; grains, flours and pasta; pasteurised or powdered plain milk, plain yoghurt, fresh or frozen meat)
- 2 Processed culinary ingredients (egg, table sugar, oils, butter and salt)
- 3 Processed foods (egg, vegetables in brine, cheese, simple breads, fruits in syrup, canned fish)
- 4 Ultra-processed foods (egg, soft drinks, sweet or savoury packaged snacks, confectionery; packaged breads and buns; reconstituted meat products and pre-prepared frozen or shelf-stable dishes)

APPENDIX 2

Top healthy eating tips for teens:

- **Take a multivitamin, multimineral and fish oil supplement.**
- **Don't skip breakfast.** Some teenagers and young adults may think that not eating breakfast will help them to lose weight, but this meal is important to boost energy levels for the day. Try:
 - A bowl of cereal (low in fat, salt and sugars) with low-fat milk (e.g. 'green' semi-skimmed milk, 'orange' 1% milk or 'red' skimmed milk), and an apple or banana
 - Porridge with chopped banana and a handful of blueberries or dried fruit
 - Wholegrain toast with low-fat spread, a glass of orange juice and plain yoghurt
 - Boiled egg with toast and a fruit smoothie.
- Eat three meals a day; breakfast, lunch and dinner. Make sure each meal includes at least one portion of fruit or vegetables and plenty of wholegrains such as whole wheat pasta or wholemeal bread or alternatively, potatoes with their skins.
- Eat at least five portions of fruit and vegetables every day (fresh, frozen, canned and dried all count). Examples of what counts as one portion include two or more small fruits (e.g. plums, satsumas); one piece of medium fruit (e.g. a banana or apple) and one heaped tablespoon of dried fruit.
- Drink plenty of fluids, especially when taking part in exercise and physical activity, as the body loses water as sweat.
 - Aim for about six to eight glasses each day. The best sources of fluid include water and low-fat milk. Unsweetened fruit juice should be limited to a small 150ml glass a day. Try to avoid too many sugary drinks and energy drinks, especially between meals, as they could harm your teeth.
- Limit fast food intake and ultra-processed food. These foods can be high in saturated fat, salt and/or sugars, and low in fibre which can be bad for health when eaten in large amounts.
- Snack sensibly. If hungry, healthier snack choices include:
 - Fruit (fresh or dried)
 - Small handful of unsalted mixed nuts and/or seeds
 - Plain yoghurts
 - Wholemeal pitta bread with lower-fat dips e.g. reduced-fat houmous or salsa.

TABLE 1:
ABSOLUTE INTAKES AND CHANGE IN INTAKES OF SELECTED FOODS AND
MACRONUTRIENTS IN 11-18-YEAR OLDS FROM 2008/9 TO 2015/2016

	Years 1-2 2008/9-2009/10			Years 3-4 2010/11-2011/12			Years 5-6 2012/13-2013/14			Years 7-8 2014/15-2015/16			Percent change since 2008		
	M	F	All	M	F	All	M	F	All	M	F	All	M	F	All
Energy intake (kcal/day)	1996	1623	1816	1947	1515	1735	1933	1617	1779	1868	1555	1716	-6.4	-5.5	-5.5
Protein intake (g/day)	73.3	57.0	65.4	74.6	55.7	65.3	75.0	58.7	67.1	72.5	57.9	65.4	-1.1	0	0
Fat intake (g/day) % food energy	75.2 33.8	62.3 34.2	69.0 34.0	72.4 33.0	57.4 33.6	65.1 33.5	71.4 33.0	61.2 33.9	66.5 33.4	70.0 33.7	58.5 33.7	64.9 33.7	-6.9 -0.3	-5.9 -14.6	-5.9 -0.9
Saturated fat intake (g/day) % food energy	28.2 12.6	22.5 12.5	25.4 12.5	27.3 12.5	20.9 12.3	24.2 12.4	27.1 12.5	23.0 12.7	25.1 12.5	26.7 12.5	21.4 12.3	24.2 12.4	-5.3 -0.8	-4.8 -1.6	-4.7 -0.8
Free sugars (g/day) % food energy	87.6 16.2	68.5 15.8	78.4 15.9	85.1 16.3	63.0 15.4	74.3 15.8	83.9 16.0	68.3 15.6	76.3 15.8	71.6 13.9	62.4 14.5	67.1 14.1	-18.3 -14.2	-14.4 -8.2	-14.4 -11.3
Sugar sweetened soft drinks (g/day)	311	236	275	307	179	244	229	193	212	198	183	191	-36.0	-22.5	-30.5
AOAC fibre (g/day)	17.3	14.8	16.1	17.0	14.0	15.5	16.7	15.0	15.9	16.5	14.1	15.3	-4.6	-4.9	-4.9
AOAC fibre % meeting recommended intake	6	1	4	6	1	4	6	2	4	6	2	4	0	+100	0
Fruit & vegetables (portions/day)	3.0	2.7	2.8	2.7	2.6	2.6	2.8	2.8	2.8	2.6	2.8	2.7	-15.4	0	0
Fruit & vegetables % achieving 5-a-day	12	7	10	7	6	6	8	9	8	7	9	8	-41	+28.6	-20
Red & processed meat (g/day)	78	48	64	70	43	57	69	49	59	62	44	53	-20.5	-8.3	-17.2
Oily fish (g/week)	7	21	14	14	14	14	35	21	28	14	21	14	+100	0	0

AOAC fibre recommendations: 11-15 years: > 25g daily; 15-18 years > 30g daily

TABLE 2:
**ABSOLUTE INTAKES AND CHANGE IN INTAKES OF MICRONUTRIENTS IN 11-
 18-YEAR OLDS FROM 2008/9 TO 2015/16**

	Years 1-2 2008/9-2009/10			Years 3-4 2010/11-2011/12			Years 5-6 2012/13-2013/14			Years 7-8 2014/15-2015/16			Percent change since 2008		
	M	F	All	M	F	All	M	F	All	M	F	All	M	F	All
Vitamin A (µg/day)	720	638	680	729	554	643	673	575	626	598	497	549	-16	-22	-19
Riboflavin (mg/day)	1.56	1.26	1.41	1.68	1.18	1.43	1.68	1.26	1.48	1.57	1.19	1.38	-0.6	-5.5	-2.0
Folate (µg/day)	237	191	215	237	181	206	226	189	208	210	174	193	-11.3	-8.9	-10.2
Vitamin D (µg/day)	2.3	1.9	2.1	2.4	1.8	2.1	2.6	2.1	2.4	2.3	1.9	2.1	0	0	0
Iron (mg/day)	10.6	8.6	9.7	10.7	8.2	9.5	10.6	8.6	9.6	10.1	8.3	9.2	-4.7	-3.5	-5.2
Calcium (mg/day)	859	692	778	919	648	786	889	706	800	854	664	762	-0.6	-4.0	-3.3
Magnesium (mg/day)	230	186	209	231	181	207	235	194	215	226	187	207	-1.7	+0.5	-0.9
Potassium (mg/day)	2554	2112	2341	2517	2018	2272	2553	2153	2358	2546	2029	2249	-0.3	-3.9	-3.9
Iodine (µg/day)	138	110	124	145	108	127	140	111	126	137	101	119	-0.7	-8.2	-4.0
Selenium (µg/day)	44	35	40	45	35	40	46	37	42	45	36	41	+2.3	+2.9	+2.5
Zinc (mg/day)	8.3	6.5	7.4	8.4	6.2	7.3	8.3	6.6	7.5	8.0	6.3	7.2	-3.6	-3.1	-2.7

TABLE 3:
MICRONUTRIENT INTAKE CHANGES IN 11-18-YEAR OLDS FROM 2008/9 TO 2015/16
(by % age of teenagers and young adults having intakes below the LRNI)

	Years 1-2 2008/9-2009/10			Years 3-4 2010/11-2011/12			Years 5-6 2012/13-2013/14			Years 7-8 2014/15-2015/16			Trend in intakes		
	M	F	All	M	F	All	M	F	All	M	F	All	M	F	All
Vitamin A (µg/day)	12	14	13	10	15	13	14	18	16	19	24	21	↓	↓	↓
Riboflavin (mg/day)	8	18	13	9	25	17	8	20	13	13	26	20	↓	↓	↓
Folate (µg/day)	2	6	4	5	8	7	5	7	6	2	15	9	↓	↓	↓
Iron (mg/day)	6	43	24	9	49	29	9	48	28	12	54	32	↓	↓	↓
Calcium (mg/day)	8	15	11	9	23	16	12	19	15	11	22	16	↓	↓	↓
Magnesium (mg/day)	26	51	38	30	54	41	27	48	37	27	50	38	↓	↔	↔
Potassium (mg/day)	15	32	23	18	34	26	15	33	24	18	38	28	↓	↓	↓
Iodine (µg/day)	7	20	13	11	26	18	16	26	21	14	27	20	↓	↓	↓
Selenium (µg/day)	21	49	15	23	42	32	23	44	33	26	45	38	↓	↑	↓
Zinc (mg/day)	12	20	16	11	25	17	17	22	19	18	27	22	↓	↓	↓

Data is from food sources only. ↓ Intakes have gone down. ↔ Intakes show no distinct trend; much the same. ↑ Intakes have improved.

TABLE 4:
MICRONUTRIENT STATUS (BLOOD MEASUREMENTS) AND TRENDS IN
MICRONUTRIENT STATUS IN 11-18-YEAR OLDS SINCE 2008/9

	Years 1-2 2008/9-2009/10			Years 3-4 2010/11-2011/12			Years 5-6 2012/13-2013/14			Years 7-8 2014/15-2015/16			Percent change since 2008		
	M	F	All	M	F	All	M	F	All	M	F	All	M	F	All
Haemoglobin% below threshold	0	7	3	4	8	6	0	9	5	1	9	5	↓	↓	↓
Ferritin% below threshold	7	20	13	6	33	20	6	22	14	2	24	12	↑	↓	↑
Vitamin B12% below 150pmol/litre	3	6	5	1	3	2	0	3	2	4	6	5	↓	↔	↔
Holo Trans Cobalamin% below 32 pmol/litre	-	-	-	-	-	-	3	1	2	6	16	11	↓	↓	↓
EGRAC% above 1.3	79	86	82	78	90	84	72	67	70	71	78	74	↑	↑	↑
Red Blood Cell Folate% below clinical threshold	2	10	6	8	15	12	9	8	9	15	28	21	↓	↓	↓
Serum folate% below clinical threshold of 13nmol/litre	44	38	41	43	38	40	34	44	39	49	73	60	↓	↓	↓
25-hydroxyvitamin D% below 25nmol/litre	12	18	15	16	16	16	17	15	16	15	39	26	↓	↓	↓
Iodine% below 100µg/litre	-	-	-	-	-	-	31	40	35	32	38	35	↓	↑	↔

Data is from food sources only. ↓ Intakes have gone down. ↔ Intakes show no distinct trend; much the same. ↑ Intakes have improved.



ABOUT HSIS

HSIS (the Health and Food Supplements Information Service) is a communication service providing accurate and balanced information on vitamins, minerals and other food supplements to the media and to health professionals working in the field of diet and nutrition. Find out more at www.hsis.org.



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