Food, mood and mental health

There appears to be no respite in the pace or impact of the growing burden of mental ill health on individuals and the nation as a whole. One in four people are likely to experience a mental illness at some point in their life, and mental ill health is now the leading cause of disability among working age adults (as measured by incapacity benefit claimants). The costs of mental ill health to the UK economy are now approaching £100 billion a year.

Mental health problems are believed to be the result of a combination of factors, including age, genetics and environmental factors. One of the most obvious yet under-recognised factors in the development of major trends in mental health is the role of nutrition. But the body of evidence linking diet and mental health is growing at a rapid pace. As well as its impact on short and long-term mental health, the evidence indicates that food could play an important contributing role in the development, management and prevention of specific mental health problems such as depression, schizophrenia, attention deficit hyperactivity disorder and Alzheimer’s disease.

The increasing burden of mental health problems mirrors changes in food production and consumption in the UK. The evidence suggests that this is a contributory part of the picture. As farming becomes more intensive and the nutritional composition of some of the nation’s best loved foods deteriorates, stress-related illnesses are becoming more common and the general mood of the nation appears to be declining. Although some nutritionists and many in the mental health field have long been aware of the importance of diet within a holistic approach to improving mental health, shifts in policy and practice have been slower to materialise.

For this reason, the Mental Health Foundation in partnership with Sustain, the national alliance for better food and farming, commissioned a comprehensive review of the evidence on the links between diet, mental well-being and specific mental disorders. The two resulting reports, the Mental Health Foundation’s Feeding Minds and Sustain’s Changing Diets, Changing Minds: how food affects mental health and well-being, argue that policy makers and industry, as well as health practitioners, service users and the public generally, need to recognise the potential contribution of diet to easing the growing health, economic and social burden of mental ill health. The evidence gathered in the review supports the call for action to improve the nutritional content of the nation’s diet. This article summarises some of the key findings from the review.

A healthy brain

While most of us readily associate nausea with ‘something we ate’, for some reason we don’t always apply this intuition to the brain. Like the heart or the stomach or the liver, the brain is acutely sensitive to what we consume in our daily lives: to remain healthy, it needs different amounts of complex carbohydrates, essential fatty acids (EFAs), amino acids, vitamins and minerals and water.

Our diet has the potential to affect our mental health and well-being at every stage of life. Conception, pregnancy and the first three years of an infant’s life are critical stages in the development of the brain. Babies born at full term and at a healthy weight (i.e., those whose brains at birth are fully and healthily developed) have physical and cognitive advantages over pre-term or low-weight babies, with differences recorded in IQ, language and reading ability. Infants with low birth weights are known to be less co-operative, less active, less alert and less happy than normal weight infants. There is growing evidence that birth weight is heavily influenced by the mother’s diet.
The trend continues throughout infancy. Many studies have found that babies who are breastfed have a neurophysiological advantage over babies fed with formula milk, and explanations for these findings point to the increased levels of essential fatty acids (EFAs) in breast milk.

Diet and nutrition continue to have a contributory influence on mental health as the child grows. Much of the research exploring the connection between diet and mental health in childhood and adolescence focuses on attention deficit hyperactivity disorder (ADHD) and the rising levels of depression in the young. However research also shows that good nutritional intake is linked to a child’s academic performance. Schools that have introduced breakfast clubs (see box p26) to feed hungry children also report improved behaviour in the classroom. Diet has also been found to influence the behaviour of young people. One study conducted in a young offenders’ unit found that supplementing their diets with vitamins, minerals and essential fatty acids resulted in a 35% reduction in anti-social behaviour.

There is also growing recognition of the protective effect of diet on the ageing brain. Several organisations promote healthy diets as a preventive measure against age-related cognitive decline (for example, the Alzheimer's Society's Mind Your Head campaign and the Alzheimer’s Association’s Maintain Your Brain campaign), and an increasing number of studies show that a diet high in essential fatty acids and low in saturated fats slows the progression of memory loss and other cognitive problems.

**Diet and mental illness**

There is also growing evidence that diet plays an important contributory role in specific mental health problems and diagnosed mental illnesses, including ADHD, depression and schizophrenia.

ADHD is prevalent in approximately four per cent of the population: most commonly in childhood or adolescence and more often in boys than girls. Alongside behavioural management strategies, one widely used treatment for ADHD is medication, usually in the form of methylphenidate (Ritalin). However, concerns about the long-term impact of this and other drugs have encouraged support groups to look at alternative approaches, including dietary changes. Two food groups have been implicated through clinical research: essential fatty acids and minerals. A number of controlled trials have compared the levels of EFAs in children with ADHD to those without and found that levels of some EFAs were significantly lower in the hyperactive children. One trial found this particularly associated with deficiencies of total omega-3 fatty acids.

A similar inverse relationship has been found between levels of iron in children and symptoms of ADHD, and deficiencies in magnesium and zinc have also been noted. Findings have consistently shown significant improvements with zinc when compared with placebo, taken alongside normal medication or as a stand-alone treatment. Similar results have been recorded with magnesium supplementation.

Two issues with research in this area are the difficulty in establishing cause and effect and the lack of studies examining the collective contribution of combined nutritional supplementation (individual nutrients are usually examined in isolation). Further research is required to disentangle the complex interplay of factors that are described above.

Depression is the most common mental health problem in the UK, and a number of cross-country and population-based studies have linked the intake of certain foods or nutrients with its reported prevalence. Several studies have looked at the intake of essential fatty acids, measuring intake by the amount of fish or seafood consumed. Correlations between low intakes of fish by a country and high levels of depression among its citizens – and the reverse – has been shown for major depression, post-natal depression (PND), seasonal affective disorder and bipolar affective disorder. Epidemiological research has also been conducted with specific populations. A study looking at the changing diets of peoples living in the Arctic and sub-arctic regions found that levels of depression were rising at the same time that traditional diets, which were high in EFAs, were being abandoned for more processed foods.

A number of case studies have been published, some of which show dramatic effects of omega-3 supplementation on depressive symptoms. Similar results have been found in controlled trials of EPA for bipolar depression and chronic clinical depression.

A particular focus of research in recent years is the need for balance between levels of omega-3 and omega-6 in our diet. Because there has been an increase in the consumption of refined vegetable oils, which are high in omega-6, at the same time that levels of fish consumption (fish are high in omega-3) have been falling, it has been suggested that most western diets contain too much omega-6 and not enough omega-3. Some research has linked the imbalance to depressive and schizophrenic symptoms. There is a general consensus that intake of omega-6 in the UK should be reduced and intake of omega-3 increased, but further research is required to establish the ways through which these processes operate.

Other research has focused on the role of vitamins and minerals and their association with depressive symptoms. Studies have found links between low dietary intake of folate (folic acid), zinc and vitamins B1, B2 and C and depression. Supplementation of people’s diets with these vitamins and minerals alongside standard
treatment has been found to improve outcomes more significantly than standard treatment alone.

One of the characteristics of depression is a reduction in the amount of the neurotransmitter serotonin in the brain. There is evidence showing that consuming tryptophan (found in eggs, lean meat, free-range poultry and beans) leads to an increase in brain serotonin, and removing it from the diet reduces serotonin. However, the results of trials using it to treat depression have been inconsistent.

Schizophrenia
Schizophrenia occurs in approximately one in every 100 people and, although incidence rates are similar around the globe, there are differences in outcomes between countries. Generally, people with schizophrenia in poorer countries fare better than those in richer, industrialised countries. This suggests that environmental factors may have some role in determining the duration and severity of the symptoms. One avenue of research has focused on the role of diet in the outcome of schizophrenia.

A Danish study has found significant correlations between low intakes of fat from birds and land animals (i.e., saturated fats) and lower rates of schizophrenia. Correspondingly, a higher intake of fat from vegetables, fish and seafood was also correlated with reduced rates of schizophrenia. People with a diagnosis of schizophrenia have also been found to have lower levels of polyunsaturated fatty acids (PUFAs) in their bodies than those without. As with depression and ADHD, one of the primary suspects in the association is the omega-3 fatty acid EPA, with a number of studies showing reductions in symptoms with higher intakes of this fatty acid.

Antioxidant enzymes are also lower in the brains of people with schizophrenia, suggesting that their cells are more vulnerable to oxidation. In light of this, one study compared 18 people with schizophrenia with 15 others, measuring the levels of antioxidants known as superoxides. Those with schizophrenia showed a significantly higher level of superoxides when compared with the control group and there was a linear relationship between the level of superoxides and the level of negative symptoms. That said, trials testing the efficacy of treating schizophrenia with antioxidants and vitamins have proved inconclusive.

Research over the past decade has also established possible links between schizophrenia and Alzheimer's disease, implicating the SH match receptor 2A as a priority in both of these mental illnesses. Further research is warranted to identify the specific mechanisms through which diet can work alongside other care options to alleviate the symptoms of schizophrenia in different populations. Any progress made in such research could also inform the evidence exploring the link between Alzheimer's and diet.

Alzheimer's disease
High blood pressure – associated with high salt intake – is known to increase the likelihood of vascular dementia. To compound the issue, some medications prescribed to lower blood pressure are also linked to increased dementia in older adults. This evidence suggests that one of the preventive measures a person can take against developing dementia, alongside regular exercise and intellectual stimulation, is to limit their salt intake and consume a healthy diet.

Alzheimer's disease (AD) has become more common in the past 50 years and is believed to be the result of a combination of factors, including age, genetics and environmental factors. Growing epidemiological evidence suggests that diet may be one of those environmental factors. Specific connections have been found between the occurrence of AD and the amount of saturated fat and vitamins and minerals in the diet. In addition, poor methylation and high levels of homocysteine (methylation is the process our
Brain fodder

Magic Breakfast
Magic Breakfast is a London-based charity founded in 2003 that aims to ensure that no child starts a school day feeling hungry and therefore unable to concentrate or learn. It delivers breakfast (protein-enriched bagels and cereals) to 13 inner city primary schools in London. Approximately 40 children per school receive the service.

Teachers have reported that children concentrate better and are more able to settle down in the classroom and their ability to socialise with other children has also improved.

'It is noticeable that the children who are eating bagels before school or at playtime are more focused during the following lesson and find it easier to follow school rules.'
(Headteacher, Kingsmead Primary School, Hackney)

The Food and Mood Project
The Food and Mood Project (www.foodandmood.org) is a web-based, user-led, self-help service that aims to help individuals explore the relationship between diet, nutrition and emotional and mental health. It also facilitates the sharing of experience by enabling people to run workshops, and through email discussion groups.

Since 2003 the project has been an internet service providing self-help resources.

'I started feeling the benefits of reducing caffeine, alcohol and sugar and eating meals on a regular basis... My paranoia decreased, my anxiety reduced, my depression almost disappeared and my sleep pattern went back to normal. I have not been working for the past ten years due to my mental health problems and I am now feeling well enough to return to some form of paid or voluntary work.'
(Service user)

Early intervention
Established in May 2005, Rotherham early intervention team, in Doncaster and South Humber NHS Trust, works with young people who are experiencing their first episode of psychosis. The project is supported by a nutritionalist and by the trust’s physiotherapy department. All new service users have a full nutritional assessment and analysis. Nutritional deficiencies in the diet are initially increased by using supplements (omega-3 fatty acids, multivitamin and mineral preparations) and service users who have an excess of poor nutrients are advised to reduce their intake of saturated fat and sugar. Continuing nutritional feedback is given with the aim of achieving optimum nutrition from a balanced diet, without the need for continuing supplements.

A physical activity assessment is also carried out by the physiotherapist and a programme of activities is devised to suit the service user, using local facilities in the community (gym, swimming etc) and supported by community sports staff.

The team has found this approach to be very well received by service users. Many people are reluctant to take anti-psychotic medication but are willing to stay in contact with the service when they are offered lifestyle approaches. The team has found that modifying nutrition is much easier in this group than in service users with a longer history of mental health problems. The service has not been established for sufficiently long to evaluate the long-term effects on physical and mental health, although short-term benefits have been recorded.

Brain depends on to create, maintain and repair brain cells and neurotransmitters; the amino acid homocysteine determines how effectively methylation occurs have been shown to be strongly associated with an increased risk of AD. Although there has not been a wealth of controlled clinical trials testing the efficacy of nutrients for the treatment of AD, the evidence that does exist points a role in the prevention of AD (as opposed to its treatment).

Many studies have shown a positive association between higher levels of saturated fat (SFA) intake and increased incidence of dementia, while also showing an inverse relationship between its incidence and polyunsaturated fatty acid (PUFA) intake. It has also been observed that older Japanese people, known for their high fish consumption, have very low levels of AD and this finding has been supported by cohort studies with other older populations. Similarly, the Mediterranean diet, characterised by high intake of mono-unsaturated fatty acids, has been linked to low rates of dementia in Italy, while high intakes of cereals and fish appear to decrease risk in North American and northern European countries. One controlled trial in this field looked at the effect of a mixed PUFA supplement on 100 older adults with Alzheimer’s over a period of four weeks. Of the 60 that received the supplement, 49 were reported to show improvement in mood, co-operation and short-term memory.

Another study has found that meat and fish eaters are more than twice as likely as their vegetarian counterparts to develop AD. It is unclear whether this outcome could be the result of higher fat consumption by the meat eaters or of higher vegetable consumption by the vegetarians. High intakes of vitamins C and E have also been linked to a lower risk of AD, particularly among smokers.

Conclusion
The body of evidence linking diet with mental health is growing at a rapid pace. As well as its impact on mood and general well-being, the evidence demonstrates the important contributory role of diet in the prevention and treatment of specific mental health problems such as ADHD, depression, schizophrenia and Alzheimer’s disease. The implications are far-reaching, both in scope and depth, for a wide range of stakeholders. As policymakers choose to incorporate the evidence into health and education guidelines, practitioners become more equipped to offer therapeutic treatments that take account of the complexities of mental health problems. Nutritional influences can be considered among a range of care options offered to those seeking to improve their mental health. Most importantly, perhaps, individuals can become more aware of the association between their diet and their mental health, enabling them to incorporate dietary changes alongside their other care options.

Feeding Minds: the impact of food on mental health and Changing Diets, Changing Minds: how food affects mental well-being and behaviour are free and available to download from www.sustainweb.org and www.mentalhealth.org.uk/feedingminds