



Preventing Diabetes



The number of people in the UK with diabetes is projected to rise from 3.1 million to 3.8 million by 2020. Managing the condition and treating its complications is estimated to cost the NHS £3.9 billion a year.¹ This POSTnote describes the causes of diabetes and the known risk factors, and examines policy options for diabetes prevention.

What is Diabetes?

Diabetes occurs when the body doesn't respond correctly to the hormone insulin. Insulin is produced by the pancreas, and affects the way glucose and fat are metabolised. Some people with diabetes don't produce any insulin, others don't produce enough, or the insulin produced does not work properly (insulin resistance). Insulin plays a vital role in maintaining blood glucose levels. If this regulation fails it can lead to serious complications, including blindness, kidney failure, nerve damage and cardio-vascular disease.

Types of diabetes

In type 1 diabetes (T1D) the cells that produce insulin are damaged by the body's immune system. It usually manifests before the age of 40, and is managed with insulin injections. It is not currently possible to prevent T1D. Rarer forms of diabetes are caused by defects in a single gene. They are also not preventable, although if diagnosed correctly they can be managed with drugs. Together these forms account for around 10% of people with diabetes.

Type 2 diabetes (T2D) accounts for most of the remaining 90% of cases. It occurs when the body cannot produce enough insulin, and/or the insulin produced does not work effectively. T2D is treated through diet and exercise, although drugs and insulin replacement are often needed. It is T2D that is responsible for the increases in the number of cases both globally and in the UK.

Overview

- Type 2 diabetes (T2D) is increasing in the UK. To prevent costs spiralling, many see a need for greater focus on prevention, particularly among the 7 million people at highest risk.
- Obesity is a major risk factor in T2D. Increasing obesity rates mean that more people are being diagnosed, and at a younger age.
- There are two approaches to preventing T2D: identifying and managing people at high risk through NHS health checks, and reducing risk in the whole population as part of the government's obesity strategy.
- It may be necessary to use a combination of some or all of the measures discussed to reverse the trends in obesity and T2D.

T2D is more common in older people, but its prevalence is increasing in young people:

- 3.9% of all English cases are in people aged 16-34
- cases of T2D in children were first reported in the UK in 2000, but by 2009 accounted for 1.5% of all cases.²

The number of people with diabetes in Europe is predicted to increase by 20% by 2030, but the biggest increase is predicted to occur in Asia and the Middle East, mostly due to rising levels of obesity in these regions (see below).

Risk Factors

T2D is caused by a combination of genes, environment and lifestyle (Box 1).³ The more risk factors someone has, the more likely they are to develop T2D. However, if someone reduces their risk factors they may be able to prevent or delay the disease. The majority of type 2 cases are preventable, or can be significantly delayed.

Obesity is the greatest modifiable risk factor for T2D. Rising obesity is thought to account both for the global increase in T2D and the decreasing age of onset. Weight loss can drastically reduce an individual's risk of T2D. There is also evidence that weight loss can reverse T2D in some individuals.

Box 1. Risk Factors for T2D

- **Obesity:** In general, the more over-weight someone is, the greater their risk⁴. Carrying more fat around the waist and upper body is also associated with greater risk, as fat is stored around internal organs such as the liver and pancreas. This fat can enter cells and directly impair insulin action, and release signals which affect metabolism and can eventually cause diabetes.
- **Low levels of physical activity:** Low levels of physical activity and a sedentary lifestyle are associated with a greater risk of T2D. People who achieve at least 150 minutes a week of moderate intensity physical activity can halve their chances of getting T2D.
- **Family history:** People are three times more likely to get T2D if a close family relative also has it, so family history is an important way of identifying people at increased risk of T2D. Some regions of the human genome have been associated with an increased risk of T2D, although it is not currently possible to use genetic tests to accurately predict an individual's risk.
- **Age:** The prevalence of T2D increases with age: half of those with diabetes in England are over 65.
- **Ethnicity:** Certain ethnic groups are at greater risk of developing T2D. Life time risk of T2D is 50% higher in South Asians than white Europeans, and diabetes often develops at a younger age and in people with lower levels of obesity. This is thought to be mostly due to inherited differences in body composition, and diet and physical activity levels in these communities in the UK.
- **Deprivation:** the most deprived people in the UK are 2.5 times more likely than average to have diabetes at any given age, mostly because deprivation is also strongly associated with higher levels of obesity and physical inactivity.
- **Mental illness:** The risk of diabetes among people with mental illness is 2-3 times higher than those without. This is thought to be due to differences in diet and activity, and side effects of drugs which include weight gain and affects on glucose metabolism.
- **Vascular disease:** People with a history of vascular diseases and high blood pressure are also more at risk from developing T2D.
- **Other risk factors** include previous diabetes during pregnancy, a history of poly-cystic ovary syndrome and being born over- or under-weight

Strategies to Reduce Risk

Prevention strategies aim to help people reduce their risk as much as they can, while accepting that some risk factors can't be modified. There is good evidence that weight loss can significantly reduce people's risk, and most strategies focus on increasing physical activity and weight reduction. There are two main approaches to preventing diabetes:

- interventions targeted at those at highest risk;
- wider measures to reduce risk in the general population.

The National Institute for Health and Clinical Excellence (NICE) has published guidelines on each approach^{5,6}. Interventions targeting those at high risk are carried out by the Department of Health through the NHS health checks programme. This programme is commissioned locally and aims to assess people's risk of heart disease, stroke, kidney disease and diabetes, as well as giving advice on risk reduction. There is no specific strategy for reducing diabetes risk in the wider population. Instead measures are carried out through the government's obesity strategy which is carried out by the Department of Health.

Interventions for High-risk Individuals**Tests to identify high risk individuals**

The NHS Health Checks programme is a systematic programme. It aims to assess 15 million eligible people

between the ages of 40 and 74 for their risk of vascular diseases such as heart attacks, stroke and diabetes. Body mass index (BMI, a measure of obesity) and blood pressure are measured to initially assess diabetes risk. Those at high or medium risk of developing a vascular disease are then referred to an appropriate lifestyle programme or receive medical intervention, while those at low risk are offered lifestyle advice to reduce or maintain their level of risk. NHS Health Checks have been welcomed by diabetes charities and health professionals. However, the take up of checks has varied widely between primary care trusts, and there have been calls from charities such as Diabetes UK to ensure they are implemented more consistently.

A second way to identify those at risk of developing T2D is to use risk profiles, which may be self-assessment questionnaires, or to use data which are routinely collected in general practice. This may be followed up with a simple blood test to assess a long term measure of average blood glucose levels (HbA1c). People's ability to regulate glucose can start to decline years before they are diagnosed with T2D, so those with blood glucose above a certain level are at increased risk of developing T2D.

NICE recommends risk assessments and lifestyle intervention programmes should be made available to those not eligible for the NHS Health Check programme. It also recommends using specific diabetes risk profiles to assess T2D risk in these people, rather than BMI and blood pressure. Such scores take ethnicity and family background into account, and identify those at greater risk at a younger age and/or lower BMI. Opportunistic testing by GPs and practice nurses of those with risk factors for T2D may also be beneficial.

Settings for Tests

The NHS and NICE recommend that risk assessment programmes are offered in a variety of settings, such as GP surgeries, pharmacies and community centres, to encourage uptake in hard to reach groups. Diabetes UK and others stress the need for effective communication between GPs and other providers in these cases. Offering screening in a variety of settings helps to ensure that the screening programme does not increase health inequalities. This is a particular concern for diabetes, as vulnerable and minority groups are all at increased risk but may be among the least likely to access health checks or screening programs.

Interventions

Clinical trials in high risk individuals show that losing 5-7% body weight reduces diabetes risk by up to 58%.⁷ These studies used intensive education programmes to promote healthy eating and physical activity. Less is known about how effective these measures are in the long term, although this research is ongoing. Drugs used to treat T2D also reduce risk, although they are not as effective as lifestyle changes and only work while the drug is being taken. Other measures which reduce obesity, such as anti-obesity drugs and weight loss surgery, also reduce T2D. NICE currently

recommends that drugs and surgery should only be used in certain cases.

Cost-effectiveness Considerations

Health check programmes are effective only if the lifestyle interventions offered prevent or delay T2D. Currently the interventions offered to people identified as high-risk by NHS Health Checks vary between PCTs. NICE recommends that all those at high risk should be offered specially designed, quality assured programmes. It also recommends more research into the efficacy and cost effectiveness of different types of lifestyle-change programmes. This is because although very intensive lifestyle interventions are effective, they are also expensive.

There is little evidence about what makes an effective programme in the “real world” although there are examples of individual projects which appear to be effective (Box 2). Developers stress the need to support behaviour change and encourage people to take ownership of their condition, as well as providing information. Courses may include practical elements such as exercise or cooking classes, as well as group or telephone based support. Programmes may need to be tailored to different cultures and communities. Advocates of this approach state that it can be cost effective over the long term, but it is still expensive in the short term because of the large number of people who are at high risk. It is therefore also important to prevent people becoming high risk in the first place.

Box2. The Walking Away from Diabetes Programme.⁸

This is a course being developed by a research collaboration which also runs education programmes for people who have diabetes. The aim is to reduce people’s risk of developing T2D by promoting behaviour changes and increasing physical activity. It is cheaper than the more intensive interventions used in clinical trials. The course:

- consists of 3 hours of structured education in small groups
- is delivered by trained educators in the community
- focuses on encouraging people to take responsibility for their health
- provides information about diabetes and the effects of being at high risk
- helps participants to understand their risk factors and ways to reduce them through diet and exercise
- explores the thoughts and feeling of the participants
- encourages participants to set goals and plans for the future.

Participants are given a pedometer to measure their activity levels and set goals to increase them. The course has been successful in reducing people’s risk after 12 months, and is being trialled in several areas of the UK.

Interventions at a Population Level

Reducing diabetes risk in the general population also has a beneficial effect on other diseases, as many share the same risk factors of obesity and physical inactivity. There are many policy options that could be used to reduce obesity. However, it can be hard to assess the impact of individual policies, as most interventions act over a long period of time, there are many confounding factors and few policies undergo robust evaluations.

National Strategies

In 2011 the government published “Healthy Lives, Healthy People: a call to action on obesity in England”⁹. This set out a strategy to achieve a downward trend in overweight and obesity by 2020, and reduce the population’s calorie intake by 5 billion a day. The Department of Health has two major programmes to tackle obesity and inactivity.

- Change4life is a social marketing programme. Started in 2009 it aims to encouraging healthy eating and physical activity.
- The Public Health Responsibility Deal was introduced in 2011. It sets out a series of voluntary pledges between government, industry and some charities. Many food businesses have committed to calorie labelling on menus and action on calorie reduction. However, the deals have been criticised by many charities, including Diabetes UK, who are concerned that those involved have conflicts of interest, and that there is not currently enough evidence that such voluntary pledges are effective.

Education Campaigns

Information campaigns such as Change4Life are the most common strategies used in EU countries to tackle obesity. They are important in explaining the need to eat healthily and be more active, but there is evidence that they have only a small effect on behaviour. For instance, research found after that the UK 5-a-day information campaign increased fruit and vegetable consumption by an average of 0.3 portions a day (after controlling for changes in prices)¹⁰.

Changing Eating Behaviour

The Foresight report on “Tackling Obesities” stated that obesity was an inevitable consequence of the UKs ‘obesogenic’ environment.¹¹ Simply encouraging people to choose a healthier lifestyle would therefore be ineffective in reducing obesity. This is because people’s behaviour is influenced as much by emotional, economic, habitual and psychological factors as conscious decisions. As a result, it suggested that other strategies are required. Some of these are discussed below.

Restricting Advertising

Advertising is known to influence purchasing behaviour in adults. There are no restrictions on advertising foods to adults. There is a UK ban on advertising food which is high in fat, salt and sugar to children on television. The ban has reduced the number of such adverts seen by children, but demonstrating its effect on actual eating habits is more difficult. The British Heart Foundation and Children’s Food Campaign have expressed concern over advertising which targets children online, and the effects of marketing through social media, which are harder to police.

Better Nutritional Labelling

There is debate around the best way to use food labelling to provide more information for consumers¹². The food industry favours a percentage guideline daily allowance scheme, whereas most charities would like to see a “traffic light” system. Under a new EU Regulation on food labelling, front

of pack nutrition labelling will remain voluntary, but governments are allowed to recommend which scheme to use. The government is currently consulting on this.

Regulating Portion Sizes

Portion size is known to affect how much people eat, so reducing portions might help reduce over-eating. This is the theory behind a proposed ban on the sale of very large soft drinks in New York. There have been calls for similar actions in the UK. The Food and Drink Federation (FDF), which represents the UK food and drink industry, suggests it is important to provide customers with a range of portion sizes to enable them to choose what is appropriate for them.

Reformulating Foods

Reformulation of food to reduce fat, salt and sugar content has been done on a voluntary basis in the UK for many years. This has resulted in a fall in salt consumption by 15%, and artificial trans fats¹³ by a third since 2000/1. In England, the Responsibility Deal also includes pledges for manufacturers to remove artificial trans fats, and reduce salt and calories in foods.

Introducing Food Taxes

In theory taxation could be used to make certain foods less attractive to consumers. Denmark taxed foods high in saturated fat in 2010, and Finland re-introduced a tax on sweets in 2011. Several American states tax soft drinks, as has France since 2012. It is too early to assess the impact of these. There is considerable debate over whether pricing should be used to change eating behaviours. It can be difficult to predict how people will react to changes in price. Some models suggest that people's responses to changes in food prices are quite small, and consumers might substitute the taxed food for equally 'unhealthy' but untaxed food. Proponents argue that only small changes may be needed to have a large overall effect on population health. Other concerns are that taxation may affect poorer people more as they spend more of their income on food, although they may also see the greatest health benefits.

Increasing Physical Activity

Being active reduces people's risk of T2D even if they are still overweight. Physical activity is also important in aiding and maintaining weight loss, although this has historically been under-estimated. Levels of physical activity have decreased over the last 50 years, as small increases in leisure activity have not compensated for reductions in transport, occupational and domestic activity. As a result around two thirds of adults do not meet the Chief Medical Officer's recommended weekly level of 150 minutes of moderate intensity activity. The government's 'Call to action on obesity' identified three priorities for increasing activity:

- Promoting active travel (e.g. walking and cycling).
- Creating a healthier built environment (e.g. designing buildings to encourage people to take the stairs rather than lifts).
- Ensuring the widest possible access to opportunities to be physically active.

Encouraging active travel may be particularly effective in increasing activity levels, as it can easily be built into a daily routine. Activity levels are affected by many social factors, including where people live, what access they have to leisure facilities and whether they can afford a car. For this reason, interventions to encourage physical activity may need to be tailored to individuals or communities.

Targeting Approaches to Local Communities

NICE recommends that effective policies are tailored to local communities as they will have different needs and barriers to behaviour change. This may involve using local media and community resources to publicise messages, and using local people as well as health professionals. For example, Diabetes UK has 'community champions': trained members of the community who can provide information and advice about how to reduce diabetes risk. NICE also recommends that health programmes are culturally appropriate. For example, it suggests that cooking classes should be tailored to what people from different cultures eat at home.

Reducing Diabetes Risk from Childhood

Many people highlight the need to encourage healthy behaviours from childhood, as habits and behaviours can be formed early in life. 30% of UK children are overweight or obese, putting them at high risk of developing diabetes in the future. Interventions may need to start before a child is born, as both low and high birth weight increase the risk of diabetes later in life. However, much of the policy around child obesity has focused on schools. The Department for Education publishes standards on school food, which set out what types of food should be provided and how often. Campaigners such as The School Food Trust are concerned that some schools are not following the guidelines as well as they could. There are also calls for better teaching of nutrition and cooking skills to encourage healthy behaviours that continue into adulthood.

Only 32% of boys and 24% of girls (aged 2-15 years) in England achieve the recommended 60 minutes of moderate intensity activity a day. Physical activity also decreases with age, and girls in particular are much less physically active after they enter secondary school. There have been calls to improve children's participation in sport through providing different types of activities. There are strategies to encourage sport through the Olympic legacy programme, and initiatives through the Public Health Responsibility Deal.

Endnotes

- 1 NAO, 2012; *The management of adult diabetes services in the NHS*
- 2 DiabetesUK, 2012 *Diabetes in the UK 2012*
- 3 Chen *et al.* 2012 *Nat. Rev. Endocrinol.* 8 228-236
- 4 Library Standard Note SN03724
- 5 NICE 2012, *Preventing T2D - risk identification and interventions for individuals at high risk.*
- 6 NICE 2011, *Preventing T2D - population and community interventions*
- 7 DPP research group 2002 *N Engl J Med* 346:393-403
- 8 www.desmond-project.org.uk/walkingaway-280.html
- 9 DH, 2011, *Healthy Lives, Health People: a call to action on obesity*
- 10 Capacci and Mazzocchi 2011; *J Health Econ* 30(1):87-98
- 11 www.idea.gov.uk/idk/core/page.do?pagelid=8267926
- 12 www.publications.parliament.uk/pa/ld201012/ldselect/ldsctech/179/179.pdf
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