Diabetes and inequalities in the North West of England

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Introduction

The rapidly increasing number of people developing diabetes around the world is creating a major public health concern. In particular, concern is growing about the steadily increasing prevalence of diabetes in Western countries, primarily due to changes in lifestyles (Tang et al, 2003) with a heavy burden of the disease falling on people from some ethnic minority groups and those from socially excluded groups (Department of Health, 2001a). The long course of diabetes, the associated complications of diabetes such as blindness, renal failure, and lower limb amputations, and the immense material, social and psychological implications of living with diabetes, place huge pressures on the individuals themselves, their families, their support networks and the healthcare system (Cravey et al, 2001).

There are large inequalities across England & Wales in the experience of chronic disease. It is known that the prevalence of chronic diseases, including diabetes, is strongly associated with the social deprivation of an area. This is of particular importance for the North West because it contains some of the most socially deprived areas in the country.

This report aims to bring together a range of information to illustrate the patterns of diabetes and inequalities across the North West region. It identifies available sources of information and presents an overview of the current patterns of the prevalence, incidence and level of care of diabetes in the North West. There is considerable work being undertaken in the North West to address the limited availability of local statistics data and where possible the report will indicate the availability of these data.

What is diabetes?

Diabetes mellitus is a medical condition in which levels of sugar (glucose) in the blood become too high. Insulin, a hormone produced by the pancreas, helps to control the amount of glucose in the blood.
If either the pancreas fails to produce enough insulin, or the body cannot make use of the insulin available, diabetes can result. Long term high blood glucose levels (hyperglycaemia) are associated with damage, poor function and failure of various organs of the body, the eyes, kidneys, nerves, heart and blood vessels are particularly at risk.

There are two main types of diabetes, Type 1 and Type 2. Type 1 diabetes (also known as insulin dependent diabetes) occurs if the body is unable to produce any insulin. This type of diabetes usually occurs before the age of 40. It is treated by regular insulin injections and by diet. Type 2 diabetes (also known as non-insulin dependent diabetes) is much more common. This occurs when the body can still produce some insulin, but not enough, or when the insulin that is produced is not used properly by the body (insulin resistance). Type 2 diabetes usually occurs in people over the age of 40, although it can occur in younger people, especially in some ethnic groups. It is usually treated by diet alone or by diet and tablets. Occasionally it is treated with insulin injections.

Diabetes can be diagnosed by finding very high glucose levels in the blood or the urine. If blood glucose levels are only mildly raised, a glucose tolerance test (in which a high sugar drink is taken, followed by a series of blood tests) can be used to make the diagnosis.
Section 1 – Why focus on diabetes and inequality? The policy context

Saving Lives: Our Healthier Nation

The national public health strategy, Saving Lives: Our Healthier Nation (Department of Health, 1999a) stated that the government pledged to produce a National Service Framework (NSF) for diabetes that would set national standards and define service models for health promotion, disease prevention, diagnosis, treatment and care. The intention was to reduce variations in health care and improve service quality.

The National Service Framework for Diabetes

In April 2001, the National Service Framework for Diabetes (Department of Health, 2001a) was published by the Department of Health. This draws on the principles of the St Vincent Declaration (Department of Health, 2001a) to reduce the impact of diabetes. The main aims of the National Service Framework are therefore to reduce the burden of diabetes and the associated inequalities in health and care. To address these aims it identifies a series of standards and the necessary interventions and actions needed to fulfil these aims (See Section 4).

A second document, the Delivery Strategy (Department of Health, 2002a), sets out the action needed to be taken by local health and social care systems to implement the standards. In line with the organisational changes to the NHS proposed in the Government’s White Paper Shifting the Balance of Power within the NHS (Department of Health, 2001b) and the NHS Plan (Department of Health, 2000; 2002b) it is envisaged that primary care trusts will be the lead organisation in implementing necessary changes to health services. It will be for primary care trusts
to decide the best approach to delivering the diabetes standards, drawing on the approach outlined in the Delivery Strategy whilst reflecting local circumstances and the communities they serve.

While some local services have begun to implement the interventions and the service models recommended in the National Service Framework, others will find it difficult due to limited information on the local context and limited resources available to them. This report presents the current patterns of diabetes and service provision based on available local data for the North West.
Section 2 – Diabetes in the North West

Measuring diabetes in the population

Determining the number of people with diabetes in the population is difficult. Studies have generally relied on self-reports of a diagnosis of diabetes or on extracting data on diagnoses of diabetes from general practitioner (GP) or hospital records. These methods are limited in their accuracy because lay people may not accurately recall a diagnosis correctly, cases of undiagnosed diabetes are not considered, and availability of primary care and hospital data are incomplete and therefore may be unreliable. Until primary care diabetes registers (see Section 6) are fully established, direct measures of diabetes (such as the incidence and prevalence of the condition) will not be available for areas as small as primary care trusts.

Prevalence of diabetes in the United Kingdom

The most widely accepted and used source of data on the prevalence of diagnosed diabetes in England is the Health Survey for England. This survey, while relying on self-reports of a doctor diagnosis of diabetes, is a large study involving a nationally representative sample of adults. This survey estimates that the prevalence of diagnosed Type 1 and Type 2 diabetes among adults (aged 16 and over) is about 3% (Joint Health Surveys Unit, 1999). When children are included the prevalence of diagnosed diabetes for the whole population is about 2.2%.

Based on these prevalence estimates there are likely to be over 154,000 people living in the North West with diagnosed diabetes. Of these over 21,000 (14%) will have Type 1 diabetes and just over 133,000 (86%) will have Type 2 diabetes.

This estimate is based on the England average. The prevalence in the North West will be affected by the population demographics including
ethnic origin, socio-economic class and deprivation, as well as the age and sex structure of the population.

**Prevalence of Type 1 and Type 2 diabetes**

Population studies in the United Kingdom show that the estimated prevalence of Type 1 diabetes is between 0.2 and 0.3% of the population (Evans *et al.*, 2000). The prevalence of diagnosed Type 2 diabetes is around 2-3% in the adult general population (Stevens and Raftery, 1994). However, this is not a very precise estimate because there is evidence to suggest that people with Type 2 diabetes go undiagnosed for many years (Williams *et al.*, 1995; Simmons *et al.*, 1991a). Furthermore, there are large inequalities in the prevalence of Type 2 diabetes that we will see later.

**Trends over time**

Evidence shows that the global burden of diabetes is set to increase in the next two decades. The estimated prevalence in adults worldwide is projected to increase from 4.0% in 1995 to 5.4% by the year 2025 (King *et al.*, 1998). In the UK it is predicted that the number of people with diabetes (diagnosed and undiagnosed) will increase to 3 million by the year 2010 (Audit Commission, 2000). The Health Survey for England estimated that between 1991 and 1998 the prevalence of diagnosed diabetes rose by 65% for men and 25% for women (Figure 1).

Due to the increasing prevalence of diabetes and the changing demography of the population in the North West, the number of people diagnosed with diabetes is predicted to increase to about 300,000 by 2010. This will inevitably increase the demand placed on all health services involved in the care of people with diabetes in the North West.
Mortality from diabetes

Life expectancy is reduced for people with diabetes. Life expectancy can be reduced by 20 years for people with Type 1 diabetes and by 10 years for people with Type 2 diabetes (Department of Health, 2001a). The excess death rate due to diabetes is mainly attributable to heart and circulatory problems (Moss et al, 1991; Raymond et al, 1995; Gu et al, 1998; Vilbergsson et al, 1998; de Marco et al, 1999). Death rates from cardiovascular disease are significantly higher in people with diabetes in all age groups when compared to the non-diabetic population. In a study by Roper and colleagues (2002) the rate of death from cardiovascular disease for men and women aged 40-59 was five and a half times higher for people with diabetes compared with the non-diabetic population.
The number of deaths attributed to diabetes in national mortality statistics is likely to underestimate the actual number of deaths caused by the disease. This is because conditions to which diabetes is a major contributory factor, such as heart and circulatory diseases, are often given as the cause of death for people with diabetes. Various studies have sought to determine the total number of deaths attributable to diabetes. The World Health Organisation’s Global Burden of Disease Project suggests that in the UK there are about five times as many deaths indirectly attributable to diabetes as directly attributable (Murray, 1996).

The pattern of diabetes across society

The prevalence of Type 2 diabetes is higher in men and older people. There are significant socio-economic and ethnic inequalities in the prevalence of diabetes, particularly with regard to Type 2 diabetes. People of South Asian, African, and African-Caribbean descent, for example, have a higher than average risk of developing Type 2 diabetes compared to the UK population as a whole.

Differences by age and sex

There has been a steady rise in the prevalence of diabetes in children and young people in recent decades. The majority of children and young people with diabetes have Type 1 diabetes and the risk of developing Type 1 diabetes before the age of 18 is similar for all ethnic groups: about 1 in 600. However, Type 2 diabetes is also increasingly being diagnosed in young people, particularly in those from minority ethnic groups.

The prevalence of diabetes rises steeply with age: one in twenty people over the age of 65 in the UK has diabetes and this rises to one in five people over the age of 85 years. The prevalence of diabetes is
higher for men than women in all age groups except the 16-24 and 25-34 age groups (Figure 2).

**Figure 2 – Prevalence of diagnosed diabetes (Type 1 and Type 2 combined) in adults aged 16-75+ years: by sex and age, England and Wales, 1998**

Source: Joint Health Survey Unit (1999)

The distribution of older people in different areas such as primary care trusts therefore helps to determine the proportion of people with diabetes in a locality, and the need for specialised health services in that area. Map 1 illustrates the percentage of people aged 65 years and over in primary care trusts in the North West.

As the over-65 population in the UK, including the North West, is projected to increase over the coming decades, the demands on those providing diabetes care is also set to increase.

**Differences by socio-economic status**

The prevalence of diabetes also varies according to socio-economic
status. The exact nature of this relationship can, however, be difficult to determine, as there are several different ways to measure socio-economic status. Some measures apply directly to individuals (e.g. social class). These measure a person’s position in society as

Map 1 – Percentage of people aged 65 years and over in North West primary care trusts

determined by their type of occupation, level of income or level of education. Other measures apply to the area in which a person lives (e.g. indices of area deprivation). These measure the degree of deprivation in the area where a person lives, and are based on factors such as the state of housing, the local labour market, access to services and the degree of poverty in the area. This report contains an example of the differences in diabetes prevalence by socioeconomic status based on a measure of social class (from the 1991 Census), and two examples based on measures of deprivation in area of residence (the Townsend Material Deprivation Score (Townsend et al 1998) and the Index of Multiple Deprivation 2000 (Department of the Environment, Transport and the Regions, 2000)).

There is little evidence for a relationship between socio-economic status and Type 1 diabetes (Connolly et al, 2000; Evans et al, 2000; Office of National Statistics, 2000) but strong evidence of an association with Type 2 diabetes in developed countries. Several studies have found a higher prevalence of Type 2 diabetes among people who were less well educated, of a lower income, or unemployed (Drury et al, 1995; Hjelm et al, 1996; Connolly et al, 2000). James et al (1997) found that both men and women who earned less had a higher prevalence of diabetes. Unwin et al (1995) found a strong relationship between glucose intolerance and manual social class in women, independent of age, body mass index, and waist-hip ratio (see Section 3). The relationship was not significant in men.

a) Socio-economic class

In the 1991 Census, social class was determined by occupation, on a scale that ranged from professional occupations (class I) to unskilled manual occupations (class V). Table 1 compares the distribution of social classes in the North West Region with the rest of England from the 1991 Census.
Table 1 shows that compared with England and Wales, in 1991 the North West had a slightly lower percentage of men and women in social classes I and II, but a higher proportion in the manual classes (IIIM, IV and V).

There are clear variations in mortality by social class for all diabetes in men. Figure 3 illustrates this, using data from the 1991 census.

**Table 1 – Social class of men and women based on own occupation, North West compared with England and Wales, 1991**

<table>
<thead>
<tr>
<th></th>
<th>Men (%)</th>
<th>Women (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>North West Region</td>
<td>England &amp; Wales</td>
</tr>
<tr>
<td>I - Professional</td>
<td>5.9</td>
<td>6.5</td>
</tr>
<tr>
<td>II - Managerial and</td>
<td>24.0</td>
<td>26.5</td>
</tr>
<tr>
<td>Technical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III(N) - Skilled</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>(non-manual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III(M) - Skilled</td>
<td>32.1</td>
<td>30.7</td>
</tr>
<tr>
<td>(manual)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV - Partly skilled</td>
<td>15.3</td>
<td>14.5</td>
</tr>
<tr>
<td>V - Unskilled</td>
<td>5.5</td>
<td>5.0</td>
</tr>
<tr>
<td>Inadequately described</td>
<td>1.9</td>
<td>2.3</td>
</tr>
<tr>
<td>Other economically active</td>
<td>4.9</td>
<td>3.9</td>
</tr>
<tr>
<td>Total economically active</td>
<td>72.0</td>
<td>73.7</td>
</tr>
<tr>
<td>Total retired</td>
<td>16.7</td>
<td>17.1</td>
</tr>
</tbody>
</table>

Source: Office of Population Censuses and Surveys, 1993
Mortality from diabetes in male unskilled manual workers (Social class V) was more than four times that of professionals (Social class I). Unskilled manual workers had over twice the level of mortality from diabetes compared with the England and Wales population as a whole. In contrast professional men had half the mortality from diabetes when compared with the England and Wales population as whole.

**Figure 3 – Standardised mortality ratio (SMR) for diabetes by social class, men aged 20-64 years, England and Wales, 1991-1993**

Source: Drever and Whitehead, 1997  
(SMR = 100 for England and Wales. An explanation of how a Standardised Mortality Ratio is calculated is given in Part 2, Section 5)

Evidence has shown that mortality risk, principally for cardiovascular disease, increases as socio-economic class declines in people with diabetes (Charturverdi et al, 1998; Roper et al, 2001). Charturverdi et al (1998) showed that the mortality rate in diabetic populations in partly skilled and unskilled manual workers was twice the mortality in professional groups.
The difference in prevalence and life expectancy is due to a combination of genetic, environmental and lifestyle factors. In particular, risk factors implicated in the development of diabetes (particularly Type 2 diabetes) are also known to be associated with socio-economic status (Joint Health Surveys Unit, 1999).

b) Deprivation of area of residence

There is a strong association between deprivation of area of residence and Type 2 diabetes, with a higher prevalence in more deprived areas (Meadows, 1995; Ismail et al, 1999; Office of National Statistics 2000; Riste et al, 2001). General practices located in deprived areas also tend to have a higher prevalence of type 2 diabetes among their practice population (Office of National Statistics, 2000). Figure 4 illustrates the prevalence of diabetes for general practice populations in England & Wales. The practices were divided into five groups, or quintiles, according to the level of deprivation of the ward in which the practice is located. Quintile 1 (Q1) consists of the practices located in the least deprived fifth of wards and quintile 5 (Q5) consists of the practices located in the most deprived fifth of wards. Deprivation was measured by the Townsend Material Deprivation Score (Townsend et al, 1998). For men the prevalence of type 2 diabetes was 1.2% for practices in the most deprived areas (quintile 5) compared with 0.86% in the least deprived areas (quintile 1). For women, the prevalence for practices in the most deprived areas was 0.9% compared with 0.5% for practices in the least deprived areas.

Evidence from other studies confirms the strong relationship between diabetes prevalence and social deprivation (Connolly et al, 2000; Evans et al, 2000). Evans and colleagues showed that the prevalence of diabetes in the most deprived areas was 1.6 times higher than the prevalence in the least deprived areas, a statistically significant difference. Over the age of 70 years the association
Figure 4 – Age standardised prevalence of Type 2 diabetes by deprivation of the ward in which the general practice is located, England and Wales, 1998

![Prevalence of non-insulin dependent diabetes (%)](chart)

**Source:** Office of National Statistics, 2000

between deprivation and diabetes prevalence becomes weaker (Connolly *et al*, 2000). This could be due to higher premature death rates for diabetics from lower socio-economic groups (Charturvedi *et al*, 1998).

Map 2 shows deprivation scores for primary care trusts in the North West and electoral wards in Greater Manchester and Merseyside, based on the Index of Multiple Deprivation 2000. The areas with the highest deprivation scores are contained in the major urban areas of Manchester and Liverpool. These cities have some of the highest levels of deprivation in the country. However, within these areas, deprivation is not evenly spread. Generally, deprived primary care trusts and local authorities may contain a number of less deprived wards. Similarly, more affluent areas, such as South Cheshire, may contain several ‘hot spots’ of deprivation within their boundaries.

In 1998-2000 the mortality from diabetes in the North West was 14%
higher than that in England as a whole. There are large geographical variations in the death rate from diabetes in the North West. The population covered by Greater Manchester Strategic Health Authority had the highest death rate from diabetes in the North West in 1998-
Figure 5 – Standardised mortality ratio (SMR) for diabetes for primary care trusts in the North West, 1998-2000

Source: Composite Indicator: Office of National Statistics 1998-00, Annual Deaths 1998-00 and North West Public Health Observatory PCT Population Estimates (North West Public Health Observatory). [Vertical bar above and below the point estimate represents the 95% confidence interval]
2000 (30% higher than in England). There was also a positive correlation between social deprivation (measured by the Index of Multiple Deprivation 2000) and mortality from diabetes in primary care trusts (PCT) in the North West (R = +0.51). That is, mortality from diabetes was higher in the more deprived areas (Figure 5).

**Ethnic inequalities in diabetes**

Evidence suggests that there is little difference in the prevalence of Type 1 diabetes between different ethnic populations, but there are large differences in the prevalence of Type 2 diabetes.

Compared with the general adult population (16 and over) in England, diabetes is much higher amongst some ethnic minority populations. The Health Survey for England in 1999 reported that for Pakistani and Bangladeshi men and women the prevalence of diagnosed diabetes

**Figure 6 – Prevalence of type 1 and type 2 diabetes in England: by ethnic group and sex, 1999**

Source: Joint Health Surveys Unit, 2000
was over five times the average for the population as a whole (Joint Health Surveys Unit, 2000). For Black Caribbean men it was two and a half times as high and for Black Caribbean women it was four times as high (Figure 6).

In a study of ethnicity and health in 1993/94 (Nazroo, 1997), the adult diabetes prevalence in Pakistani and Bangladeshi populations was over five times and Indian populations over three times that in the white population. The prevalence in the black population (Caribbean, African and other) was over three times the white population (Table 2).

**Table 2 – Relative prevalence of diabetes by ethnic group, 1993/94**

<table>
<thead>
<tr>
<th>Ethnic Origin</th>
<th>Relative Prevalence of diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>1</td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>3.1</td>
</tr>
<tr>
<td>Black African</td>
<td>3.1</td>
</tr>
<tr>
<td>Black other</td>
<td>3.1</td>
</tr>
<tr>
<td>Indian</td>
<td>3.6</td>
</tr>
<tr>
<td>Pakistani</td>
<td>5.2</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>5.2</td>
</tr>
<tr>
<td>Chinese</td>
<td>1.8</td>
</tr>
<tr>
<td>Other Asian</td>
<td>1</td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
</tr>
</tbody>
</table>

*Source: Nazroo, 1997*

The differences in the prevalence of Type 2 diabetes in minority ethnic populations are also due to a combination of environmental, genetic and lifestyle factors. In particular, certain minority ethnic populations may be more vulnerable to the detrimental effects of an increased fat
mass, which leads to Type 2 diabetes and cardiovascular disease, than the white population (See Section 3).

The ethnic diversity in the North West is illustrated in data from the 2001 Census. This reported that all ethnic minority groups made up approximately 5.6% of the North West population, compared with 7.9% for England as a whole. The Pakistani population was the only ethnic minority group that made up a higher proportion of the total population in the North West than for the rest of England (Table 3).

**Table 3 – Population of ethnic minority groups living in the North West, 2001**

<table>
<thead>
<tr>
<th>Total population</th>
<th>Total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>%</td>
</tr>
<tr>
<td>White</td>
<td>54153898</td>
</tr>
<tr>
<td>Asian or Asian British</td>
<td></td>
</tr>
<tr>
<td>Indian</td>
<td>1053411</td>
</tr>
<tr>
<td>Pakistani</td>
<td>747285</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>283063</td>
</tr>
<tr>
<td>Other Asian</td>
<td>247664</td>
</tr>
<tr>
<td>Black or Black British</td>
<td></td>
</tr>
<tr>
<td>Black Caribbean</td>
<td>565876</td>
</tr>
<tr>
<td>Black African</td>
<td>485277</td>
</tr>
<tr>
<td>Black Other</td>
<td>97585</td>
</tr>
<tr>
<td>Chinese</td>
<td>247403</td>
</tr>
<tr>
<td>Other</td>
<td>230615</td>
</tr>
<tr>
<td>Other (not elsewhere classified)</td>
<td>677117</td>
</tr>
<tr>
<td>All minority ethnic population</td>
<td>4635296</td>
</tr>
<tr>
<td>All population</td>
<td>58789194</td>
</tr>
</tbody>
</table>

The distribution of people from different ethnic minorities in the North West is not evenly spread across the region. For example, Pendle Local Authority in Greater Manchester has a resident Pakistan population of 13.42% compared with 0.02% resident in Eden Local Authority in Cumbria. The raised prevalence of Type 2 diabetes in these population groups is of vital importance for planning current and future provision of diabetes care in differing localities. Primary care trusts need to recognise the particular health needs of ethnic minority communities.

**Diabetes in primary care trusts across the North West**

Given the variation in the prevalence of diabetes by age, sex, socio-economic status and ethnic group, the number of people with diabetes living in the North West's primary care trusts will depend on each trust's demographic and social composition. The report “Quality Indicators from Diabetes Services” (QUIDS, 2004) calculates the predicted prevalence of diagnosed diabetes in each primary care trust, based on the age structure, level of deprivation and ethnic mix of the locality (Map 3).

The predicted prevalence of diagnosed diabetes in the North West region is 14% higher than expected from national prevalence rates in 1999 (Joint Health Surveys Unit, 2000). This is probably due to the differing socio-demographic structure that exists in the North West when compared to the England population as a whole. These measures help to illustrate the inequalities that exist in the prevalence of diabetes in and across the North West of England. Within the North West, prevalence varies from 2.4% in areas such as Halton or Warrington, to 3.6% in Central Manchester.
Map 3 – Diabetes prevalence by primary care trust in the North West, 2001

Sources: Quality Indicators from Diabetes Services, 2001: Number of cases of diabetes (Adil, 2003a)
Section 3 – Key determinants of diabetes in the North West

Standard 1 of the National Service Framework for Diabetes aims to reduce the number of people developing Type 2 diabetes. There is increasing evidence to suggest that it is possible to prevent Type 2 diabetes – or at least delay its onset – by reducing the number of people overweight or obese and by promoting physical activity (Tuomilehto, 2001).

The increase in the prevalence of Type 2 diabetes is partly a consequence of features of present day living, such as changing eating habits, dietary content of food, and decreasing levels of physical activity, all of which can lead to excessive weight gain and insulin resistance (Department of Health, 2001a). The United States Behaviour Risk Factor Surveillance System Survey has shown that, in the US, the prevalence of obesity and the prevalence of Type 2 diabetes have been increasing in parallel (Mokdad et al, 2000). The risk of developing Type 2 diabetes increases as body weight increases – diabetes is approximately three times more common in people who have gained around 10kg in weight during adulthood than in those who maintain their weight (Jung, 1997).

Overweight and Obesity

In order to define overweight or obesity, a measurement is used which allows for differences in weight due to height. The most commonly used measure is the Body Mass Index (BMI), which is derived by dividing a person’s weight (in kilograms) by the square of their height (in metres). Overweight is classified as a BMI of greater than 25, obesity by a BMI of greater than 30.

The adverse effect of weight is more pronounced when the fat is concentrated mainly in the abdomen. This known as central obesity.
and can be identified by measuring the waist to hip ratio. A waist to hip ratio of greater than 0.9 in men and greater than 0.8 in women indicates central obesity.

Data from the Health Survey for England 1999 (Joint Health Survey Unit, 2000) showed that the proportion of adults in the North West who were obese was 21% for men and 19% for women compared to 18% for men and 20% for women in England as a whole (Figure 7).

Figure 7 – Prevalence of obesity by region, 16-64 years, England, 1999

The prevalence of overweight and obesity in England is increasing. Since 1980, the number of obese adults has more than trebled. It is estimated that if the current trends continue, over a quarter of adults would be obese by 2010 (National Audit Office, 2001).

The data from the Health Survey for England between 1993 and 2001 shows the changing trend in the proportion of people who were
obese. In men the proportion increased from 13% to 21%, and in women from 16% to 24% (Figure 8).

**Figure 8 – Trends in obesity in men and women over 16 years age, England, 1993-2001**

The prevalence of obesity is increasing in children and young people. Analyses of the National Diet and Nutrition Survey data on children found that 10% of six year olds could be classified as being obese (Reilly and Dorosty, 1999). Being overweight in childhood increases the risk of obesity in adulthood. As a result an increasing number of children and young people are at risk of developing Type 2 diabetes. The prevalence of obesity increases with age for both men and women, up to the age of 65.

**Differences in obesity by social class**

There are differences in the prevalence of obesity between social groups, particularly in women: in 1998 the Health Survey for England
estimated that 14% of women in social class I were generally obese compared to 28% in social class V. For men, 12% of men in social class I were obese compared to 18% for social class V (Joint Health Surveys Unit, 1999).

The prevalence of central obesity is different for men and women compared with general obesity. Men have a higher prevalence of central obesity than women in all social classes, but the social class gradient is more evident in women (Figure 9).

**Figure 9 – Prevalence of central obesity by sex and social class, England, 1998**

Source: Joint Health Surveys Unit, 1999

**Differences in obesity by ethnic group**

The prevalence of general obesity varies for different ethnic groups (Table 4). The Health Survey for England 1999 (Joint Health Surveys Unit, 2000) showed that, among men, the age-adjusted prevalence of
<table>
<thead>
<tr>
<th>Ethnic Origin</th>
<th>Observed % Men</th>
<th>Standardised risk ratio</th>
<th>Observed % Women</th>
<th>Standardised risk ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>General population</td>
<td>18.9</td>
<td>1.00</td>
<td>20.9</td>
<td>1.00</td>
</tr>
<tr>
<td>Black</td>
<td>18.3</td>
<td>1.02</td>
<td>31.9</td>
<td>1.60</td>
</tr>
<tr>
<td>Caribbean Indian</td>
<td>11.9</td>
<td>0.66</td>
<td>19.6</td>
<td>1.02</td>
</tr>
<tr>
<td>Caribbean Indian</td>
<td>12.6</td>
<td>0.74</td>
<td>25.6</td>
<td>1.61</td>
</tr>
<tr>
<td>Pakistani</td>
<td>5.4</td>
<td>0.32</td>
<td>9.5</td>
<td>0.63</td>
</tr>
<tr>
<td>Bangladeshi</td>
<td>6.2</td>
<td>0.38</td>
<td>4.5</td>
<td>0.20</td>
</tr>
<tr>
<td>Chinese</td>
<td>20.4</td>
<td>1.04</td>
<td>21.2</td>
<td>1.03</td>
</tr>
<tr>
<td>Chinese</td>
<td>20.9</td>
<td>1.00</td>
<td>20.9</td>
<td>1.03</td>
</tr>
</tbody>
</table>

- Prevalence significantly greater than general population
- Prevalence significantly less than general population

Source: Joint Health Surveys Unit, 2000
obesity for Bangladeshis was 5%, about half the prevalence among the other South Asian groups. Chinese men also had a low prevalence of obesity (6%). The highest prevalence of obesity was among Irish men, 20% of who were obese.

Compared with women in the general population as a whole, Black Caribbean and Pakistani women were over 50% more likely to be generally obese, while Bangladeshi and Chinese women were much less likely to be obese: Bangladeshi women were 37% less likely as the general population to be obese, and Chinese women were 80% less likely.

Despite the relatively low levels of general obesity, Pakistani, Indian and Bangladeshi men have relatively high levels of central obesity, with 41% of Indian men classified as centrally obese compared to 28% of men in the general population (Joint Health Surveys Unit, 2000).

For women, all ethnic minority populations have a higher prevalence of central obesity than the general population. Black Caribbean and Pakistani women are twice as likely, and Bangladeshi women over three times as likely to have central obesity as women in the general population as a whole.

**Physical Activity**

The risk of developing Type 2 diabetes is 30-40% higher in sedentary people, compared with people who take regular physical activity. This increased risk is independent of body mass index, therefore everyone, regardless of their level of obesity, can potentially reduce their risk of diabetes through physical activity. (Helmrich et al, 1991; Manson et al, 1991; Kriska and Bennett, 1992).

Physical activity rates are low across the entire population – about 60% of men and 70% of women are not regularly physically active.
Rates of physical inactivity are higher among older people, people from minority ethnic groups and among people who live in rented accommodation (Health Education Authority, 1995).

**Differences in physical activity by social class**

The Health Survey for England 1998 (Joint Health Surveys Unit, 1999) showed that there is a social class gradient in the proportion of people walking and taking part in sport and exercise in leisure time (Table 5). In social class I 44% of men and 30% of women reported walking at a ‘fairly brisk’ or ‘Fast’ pace compared with 32% of men and 18% of women from social class V. In social class I 52% of men and 43% of women reported taking part in sport and exercise compared with 43% of men and 27% of women from social class V. Although men from manual occupations have lower participation rates in leisure time physical activity, they tend to be more physically active as part of their work.

**Table 5 – Physical activity by social class of head of household and sex, England, 1998**

<table>
<thead>
<tr>
<th>Social class of head of household</th>
<th>I</th>
<th>II</th>
<th>IIINM</th>
<th>III M</th>
<th>IV</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>44</td>
<td>39</td>
<td>37</td>
<td>27</td>
<td>29</td>
<td>32</td>
</tr>
<tr>
<td>Women</td>
<td>30</td>
<td>28</td>
<td>26</td>
<td>22</td>
<td>20</td>
<td>18</td>
</tr>
<tr>
<td>Sport &amp; Exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>52</td>
<td>52</td>
<td>45</td>
<td>39</td>
<td>40</td>
<td>37</td>
</tr>
<tr>
<td>Women</td>
<td>43</td>
<td>43</td>
<td>36</td>
<td>32</td>
<td>28</td>
<td>27</td>
</tr>
</tbody>
</table>

Source: Joint Health Surveys Unit, 1999
Differences in physical activity by ethnic group

Compared with the general population, South Asian and Chinese men and women are less likely to participate in physical activity, with the lowest levels found in the Bangladeshi community. Only 18% of Bangladeshi women meet the current recommended physical activity levels (30 minutes activity on 5 or more days a week). Black Caribbean men and women are the most likely to be physically active at the recommended level (Joint Health Surveys Unit, 2000).

Smoking

Several studies suggest that smoking is associated with the development of Type 2 diabetes (Rimm et al, 1993; Rimm et al, 1995; Kawakami et al, 1997; Targher et al, 1997). Rimm and colleagues (1993,1995) showed that the risk of Type 2 diabetes was 42% higher among women and 94% higher among men who smoked compared to non-smokers. The younger someone is when they start smoking and the more cigarettes they smoke the more likely they are to develop Type 2 diabetes.

An estimate of the national prevalence of cigarette smoking comes from the General Household Survey of 1998 which shows that the prevalence of cigarette smoking in England at that time was 27% (28% for men and 26% for women), and that the prevalence of smoking in the North West was slightly higher than the national average for men (29%) and much higher for women (32%) (Bridgwood et al, 2000).

The most recent local data for the North West comes from pooled data from the Health Surveys for England 1994-1996, which showed that within the North West there were large variations in smoking prevalence between different health authorities (Table 6) (Department of Health, 1999b).
Table 6 – Mean percentage of cigarette smoking by health authority in the North West (age standardised), 1994-1996

<table>
<thead>
<tr>
<th>Health Authority area</th>
<th>Mean %</th>
<th>Lower</th>
<th>Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manchester</td>
<td>38.5</td>
<td>32.3</td>
<td>44.7</td>
</tr>
<tr>
<td>West Pennine</td>
<td>38.1</td>
<td>30.5</td>
<td>45.7</td>
</tr>
<tr>
<td>Bury &amp; Rochdale</td>
<td>36.6</td>
<td>31.2</td>
<td>42.0</td>
</tr>
<tr>
<td>Liverpool</td>
<td>34.1</td>
<td>29.0</td>
<td>39.1</td>
</tr>
<tr>
<td>Sefton</td>
<td>32.1</td>
<td>24.9</td>
<td>39.3</td>
</tr>
<tr>
<td>Wigan &amp; Bolton</td>
<td>32.1</td>
<td>27.4</td>
<td>36.8</td>
</tr>
<tr>
<td>East Lancashire</td>
<td>31.7</td>
<td>25.4</td>
<td>37.9</td>
</tr>
<tr>
<td>St Helens &amp; Knowsley</td>
<td>31.5</td>
<td>25.5</td>
<td>37.5</td>
</tr>
<tr>
<td>North West Lancashire</td>
<td>29.6</td>
<td>22.6</td>
<td>36.5</td>
</tr>
<tr>
<td>Salford &amp; Trafford</td>
<td>29.3</td>
<td>24.8</td>
<td>33.8</td>
</tr>
<tr>
<td>South Lancashire</td>
<td>29.0</td>
<td>22.3</td>
<td>35.6</td>
</tr>
<tr>
<td>Morecambe Bay</td>
<td>28.1</td>
<td>22.9</td>
<td>33.3</td>
</tr>
<tr>
<td>Wirral</td>
<td>27.0</td>
<td>19.4</td>
<td>34.5</td>
</tr>
<tr>
<td>South Cheshire</td>
<td>26.8</td>
<td>22.6</td>
<td>31.0</td>
</tr>
<tr>
<td>Stockport</td>
<td>23.6</td>
<td>18.8</td>
<td>28.4</td>
</tr>
<tr>
<td>North Cheshire</td>
<td>21.2</td>
<td>14.8</td>
<td>27.6</td>
</tr>
<tr>
<td>All England</td>
<td>28.8</td>
<td>28.2</td>
<td>29.3</td>
</tr>
</tbody>
</table>

Source: Department of Health, 1999b
Figure 10 shows a clear graduation of smoking, rising from 15% of professional men to 42% of unskilled manual men. In women a similar rise from 14% to 32% is seen (Joint Health Surveys Unit, 1999)

**Figure 10 – Self-reported cigarette smoking status (age standardised), by social class of head of household and sex, England, 1998**

Source: Joint Health Surveys Unit, 1999
Section 4 – Diabetes services in the North West

Implementing the NSF for diabetes

The National Service Framework for Diabetes (Department of Health, 2001a) set 12 standards aimed at improving care for people with and most at risk of diabetes (Box 1). The Delivery Strategy published in 2002 (Department of Health, 2002a) aims to guide the NHS to the achievement of these standards. Box 2 illustrates the key elements proposed in the Delivery Strategy for the NSF for diabetes.

Box 1 – Standards designed to reduce the burden of diabetes and the associated inequalities in health and care (adapted from National Service Framework for Diabetes, 2001)

<table>
<thead>
<tr>
<th>Standard 1: Prevention of Type 2 diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The NHS will develop, implement and monitor strategies to reduce both the risk of developing Type 2 diabetes in the population and inequalities in risk.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard 2: Identification of people with diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>The NHS will develop, implement and monitor strategies to identify people who do not know they have diabetes.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard 3: Empowering people with diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>All people with diabetes will receive a service which encourages partnership in decision-making, and support them to manage their diabetes and maintain a healthy lifestyle. Agreed and shared care plans and engagement of parents and carers will be required.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard 4: Clinical care of adults with diabetes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adults with diabetes will receive quality care and support to optimise the control of risk factors for developing the complications of the condition.</td>
</tr>
</tbody>
</table>
Standard 5 & 6: Clinical care of children and young people with diabetes

5. Children and young people with diabetes will receive high-quality care and will be supported to optimise the control of their blood glucose and their physical, psychological, intellectual, educational and social development.

6. Young people with diabetes will experience a smooth transition of care from paediatric to adult diabetes services, which will be organised in partnership with each individual and at an age appropriate to and agreed with them.

Standard 7: Management of diabetic emergencies

The NHS will develop, implement and monitor agreed protocols for the treatment of diabetic emergencies by health care professionals, including the management of acute complications and procedures to minimise recurrence.

Standard 8: Care of people with diabetes during admission to hospital

Children, young people and adults with diabetes admitted to hospital will receive effective care of their diabetes. Wherever possible, they will continue to be involved in decisions concerning the management of their diabetes.

Standard 9: Diabetes and pregnancy

The NHS will develop, implement and monitor policies for women with pre-existing or gestational diabetes to optimise the outcomes of their pregnancy.

Standard 10, 11 & 12: Detection and management of long-term complications

11. The NHS will develop, implement and monitor agreed protocols for people who develop long-term complications of diabetes, to receive investigation and treatment to reduce their risk of disability and premature death.

12. People with diabetes requiring multi-agency support will receive integrated health and social care.

Box 2 – Key elements proposed in the Delivery Strategy for the National Service Framework for Diabetes

- Setting up a local diabetes network, or similarly robust mechanism, which involves identifying local leaders and appointing and resourcing network managers, clinical champions and people with diabetes to champion the views of local people
- Reviewing the local baseline assessment, and establishing and promulgating local implementation arrangements to reach the standards
- Participating in comparative local and national audit
- Undertaking a local workforce skills profile of staff involved in the care of people with diabetes and developing education and training programmes with the local Workforce Development Confederation

The Delivery Strategy also reflects targets set in the Department of Health’s Priorities and Planning Framework: ‘Improvement, Expansion and Reform’ (Department of Health, 2003c). By 2006 these targets are:

- To ensure that there are systematic eye-screening programmes that meet national standards.
- To put in place registers, education and advice, to support systematic treatment regimens for diabetes.
Local baseline assessments in primary care trusts

NHS performance indicators for 2002/2003 (Commission for Health Improvement, 2004) have presented information on the number of primary care trusts that completed a review of the local baseline assessment for diabetes. This showed that 83% of primary care trusts in the North West completed the review of the baseline assessment, including 12 out of 14 in Greater Manchester Strategic Health Authority area, 13 out of 15 in Cheshire and Merseyside Strategic Health Authority, and 10 out of 13 in Cumbria and Lancashire Strategic Health Authority.

Development of a workforce skills profile

One of the main aims of the National Service Framework for Diabetes is workforce development. This includes:

- Improving education and training for staff involved in the care of people with diabetes
- Developing the roles of staff (especially in primary care)
- Increasing the numbers of staff involved in diabetes care

The National Service Framework recognises there is a need to increase the number of staff involved in diabetes care. Most hospital trusts in the North West have a dedicated specialist diabetes service to care for people with the condition. The staff involved in diabetes care include medical, nursing, allied health professionals (e.g. podiatry and dietetics), and administration and clerical staff.

The North West Regional Office conducted a survey of hospital trust staff from November 2001 to February 2002 (Adil, 2003b). The survey showed that in the North West of England there were the following staff working in diabetes services (expressed as whole time equivalent staff):

- 40 medical consultants
Figure 11 – Whole time equivalent diabetic nurse specialists and medical consultants per 1000 registered patients with diabetes in each hospital trust in the North West, 2001-2002.

*N.B. Not all hospital trusts provided staff and caseload information. Source: Adil, 2003b
- 110 diabetes nurse specialists
- 22 dieticians
- 34 podiatrists working with diabetics

In addition, many more clinical and administrative staff are employed by diabetes services in the North West.

Figure 11 illustrates the proportion of medical consultants and diabetic specialist nurses in each hospital trust in relation to the number of patients with diabetes recorded in the diabetes register. Clearly, there are large variations in the proportion of staff in different locations, which requires further investigation. This may be due to the configuration of services or the needs of the patients in each hospital trust.

Interventions to improve patient care

Through its standards, the National Service Framework recommended a number of key interventions and service priorities to reduce the occurrence of, and improve the care of people with diabetes (Box 3).

Box 3 – Key interventions and service priorities to reduce the occurrence of, and improve the care of, people with diabetes (adapted from the Delivery Strategy for Diabetes)

- Prevention of Type 2 diabetes and identification of diabetes (Standards 1 and 2)
- Management and treatment of diabetes (Standards 4 and 5) - blood glucose, blood pressure, and cardiovascular risk (heart disease and stroke)
- Support through times of greater need (Standards 6 to 9) - diagnosis; treatment escalation; ill health and hospitalisation; childhood, adolescence and young adulthood; pre-conception and throughout pregnancy
Identification of people with diabetes

The National Service Framework for Diabetes has set identification of people with diabetes as a priority. People who are undiagnosed run a greater risk of complications such as eye disease (retinopathy), kidney disease (nephropathy) and cardiovascular disease because their diabetes is not being treated.

The rapid onset of Type 1 diabetes means that few people remain undiagnosed for any length of time. Type 2 diabetes, however, can remain undiagnosed for several years, which increases the risk of future complications. It has been estimated that a third to a half of people with Type 2 diabetes in England are undiagnosed (Williams et al, 1995, Simmons et al, 1991). This means that there could be approximately 45,000 to 67,000 people currently living in the North West with undiagnosed Type 2 diabetes. At the time of diagnosis, nearly half already have complications, such as diabetic retinopathy, nephropathy or cardiovascular disease (UK Prospective Diabetes Study Group, 1991).

Ethnic minority groups, with higher rates of diabetes than the general population, also have higher rates of undiagnosed diabetes (McKeigue et al, 1988; Simmons et al, 1989; Cruickshank et al, 1991). The prevalence of undiagnosed diabetes may also be higher in lower socio-economic groups. It is known that people from manual social classes and areas of higher social deprivation are less likely to attend routine health checks (Waller et al, 1990; Imperial Cancer Fund OXCHECK Group, 1994) at which urine and/or blood glucose are measured. This means that the association between Type 2 diabetes, socio-economic status and social deprivation may be even stronger than previously.
Table 7 – Prevalence of actual and predicted diagnosed diabetes in North West health authorities, 2001

<table>
<thead>
<tr>
<th>Health Authority</th>
<th>Type 1</th>
<th>Total</th>
<th>Type 2</th>
<th>Total</th>
<th>Type unspecified</th>
<th>Total</th>
<th>Percentage Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bury &amp; Rochdale</td>
<td>1738</td>
<td>10491</td>
<td>1975</td>
<td>8870</td>
<td>10383</td>
<td>9256</td>
<td>-8.5</td>
</tr>
<tr>
<td>Liverpool</td>
<td>2142</td>
<td>11464</td>
<td>1975</td>
<td>8870</td>
<td>10383</td>
<td>9256</td>
<td>-8.5</td>
</tr>
<tr>
<td>Manchester</td>
<td>1923</td>
<td>11459</td>
<td>1975</td>
<td>8870</td>
<td>10383</td>
<td>9256</td>
<td>-8.5</td>
</tr>
<tr>
<td>North Cheshire</td>
<td>1379</td>
<td>6001</td>
<td>1149</td>
<td>4127</td>
<td>11434</td>
<td>7210</td>
<td>-22.2</td>
</tr>
<tr>
<td>Salford</td>
<td>1378</td>
<td>7029</td>
<td>1087</td>
<td>5456</td>
<td>5543</td>
<td>6543</td>
<td>-10.8</td>
</tr>
<tr>
<td>St Helens &amp; Knowsley</td>
<td>1516</td>
<td>7079</td>
<td>1241</td>
<td>6999</td>
<td>1088</td>
<td>9328</td>
<td>-2.3</td>
</tr>
<tr>
<td>West Pennine</td>
<td>1957</td>
<td>10312</td>
<td>12269</td>
<td>9232</td>
<td>10404</td>
<td>9773</td>
<td>-15.2</td>
</tr>
<tr>
<td>Wirral</td>
<td>1538</td>
<td>7694</td>
<td>1131</td>
<td>7762</td>
<td>3161</td>
<td>880</td>
<td>5.9</td>
</tr>
<tr>
<td>Total</td>
<td>13571</td>
<td>69791</td>
<td>83362</td>
<td>56678</td>
<td>76317</td>
<td>9256</td>
<td>-8.5</td>
</tr>
</tbody>
</table>

Source: Adil, 2003a
indicated. Undiagnosed diabetes is also higher in older population groups (Simmons and Williams, 1992). Furthermore, elderly people in care homes have a higher prevalence (27%) than in the comparable general population (Sinclair et al, 2001).

Table 7 compares the predicted prevalence of diagnosed diabetes with the actual diagnosed prevalence recorded in diabetes registers for the health authorities in the North West which supplied information (Adil 2003a). Comparing the two measures, it is estimated the diabetic registers in each health authority have not captured just over 7000 (8.5%) of the total number of people with diabetes. The prevalence of diabetes estimated from Health Authority Diabetes Registers ranged from 29.7% apparently undiagnosed in Liverpool Health Authority to 8.5% diagnosed over the predicted prevalence in St Helens & Knowsley Health Authority. These observed differences might reflect the number of patients treated for their diabetes in primary care, and at present systems are not in place to clarify this. At the time of reporting (November 2001 to February 2002) South Cheshire and Stockport Health Authorities were unable to provide up to date register information. East Lancashire, Morecombe Bay, North West Lancashire, South Lancashire and Wigan and Bolton Health Authorities were not holding registers and Salford and Trafford Health Authority did not respond.

The National Service Framework has set targets aimed at introducing diabetes registers in all general practices by 2006. The introduction of such registers (in addition to increasing awareness of diabetes symptoms) aims to reduce the number of cases going undiagnosed.

**Management of diabetes**

Once diabetes has been diagnosed, an individual’s risk of developing serious complications can be significantly reduced by the effective
treatment of high blood glucose levels. Early identification of complications such as high blood sugar and diabetic eye disease allows early treatment to limit further deterioration. Early complications are frequently asymptomatic and therefore require detection through regular clinical review (UK Prospective Diabetes Study Group, 1998a; UK Prospective Diabetes Study Group, 1998b). Up to 70% of adults with Type 2 diabetes have raised blood pressure and more than 70% have raised cholesterol levels (Department of Health, 2001a).

There is considerable evidence from other conditions, particularly cardiovascular disease, that access to services is related to relative affluence or deprivation (Payne and Saul, 1997; Chapple and Gatrell, 1998). There is evidence that socio-economic factors influence access to care in many different populations and within different health services (Whitehead & Hanratty 2004). The evidence for inequalities in access to health care in the UK has been reviewed (Goddard and Smith, 1998). In studies of diabetic clinic populations it has been shown that morbidity is related to socio-economic factors (Kelly et al, 1993; Connolly and Kesson, 1996) and that deprivation is related to poorer diabetic control and incorrect insulin use (Kelly et al, 1994; Chaturvedi et al, 1996). However, it is likely that these cohorts are not representative of all individuals with diabetes since they consist of people already attending clinics. It is therefore important also to study populations which include individuals with diabetes who do not attend hospital clinics and those who do not have a regular clinical review. These patients are difficult to identify and have not been studied nearly as extensively as those who do attend diabetes clinics.

Many patients with diabetes receive support for their condition through primary care services. Studies have reported many factors influencing the quality of care provided (Dunn and Bough, 1996; Khunti et al, 1999). One cohort study has illustrated that diabetics from areas of deprivation were less likely to have general practice reviews (Goyder and Botha, 2000). It is suggested that this may be due
to a lack of services at the primary care level in deprived areas. This is supported by evidence that shows that general practices in areas of high deprivation still lag behind practices in areas with less deprivation in terms of access to members of a diabetes team (e.g. chiropodist and dieticians) (Khunti et al, 2001). Furthermore, people from more deprived communities are less likely to use preventive care services (Baker and Klein, 1991; Heath, 1995; Campbell et al, 2001).

**Patient knowledge about diabetes**

Patient knowledge about diabetes is a key component of diabetes care (Beaser et al, 1994). In order to manage diabetes individuals must know how to monitor their blood glucose levels, understand their medication and diet, and know how to modify them according to their daily activities and concurrent health (Coates and Boore, 1996). The extent to which diabetes is managed however, varies widely, and overall management is not as thorough as might be desired (Most et al, 1986). One reason why people do not manage their diabetes properly may be lack of knowledge (Coates and Boore, 1996).

As part of its review of diabetes services, the Audit Commission conducted a postal survey to get a better understanding of the views of people with diabetes (Audit Commission, 2000). One area analysed was patients’ knowledge of key elements of their diabetes care. The information collected was analysed by age, type of diabetes, duration of having the condition, and ethnicity. A summary “knowledge score” was constructed for each respondent, and respondents were then divided into those who were “more knowledgeable” or “less knowledgeable” based on the median knowledge score. Figure 12 shows the percentage of respondents “less knowledgeable” by key characteristics.

In summary, knowledge scores were statistically significantly lower among:

- People over 40 years of age compared with those under 40
• People with type 2 diabetes compared with people with type 1 diabetes
• People over 40 years of age compared with those under 40
• People with type 2 diabetes compared with people with type 1 diabetes
• People diagnosed at over 40 years of age compared with those diagnosed at a younger age
• Those with a duration of diabetes of under 10 years compared with those with a longer duration
• Ethnic minorities compared with white populations.

**Figure 12 – Prevalence of a low knowledge score by age, type of diabetes, duration of diabetes and ethnicity, England, 2001**

Source: Audit Commission (2000)

People with lower knowledge scores were found to feel they needed better written and verbal information and more consistent advice. They were less likely to think that good control of their diabetes was worthwhile and be less confident that good diabetic control would prevent them from developing long term complications. This group
also reported receiving less eye and foot care, blood pressure monitoring and blood testing in the last year than those with higher knowledge scores. People with lower knowledge scores were also more likely to go the general practice surgery for their annual diabetes check-up than to the hospital clinic.

Knowledge about diabetes and its management has been found to be low in the UK population of Pakistani Muslim patients (Hawthorne and Tomlinson, 1999). In this study poorer glycaemic control and poorer knowledge of self-monitoring management and diabetes complications was found in Pakistani women. This may have been due to lack of education in the past and their ability to read or speak English. They form a ‘hard to reach’ segment of the population for health care workers, who cannot speak their language and are not familiar with their culture. Similar findings have been obtained from the Indian community in Nottingham (Hawthorne, 1990; Simmons et al., 1991b).

Evidence suggests that people from lower social classes are less likely to monitor and control their symptoms than people from higher social classes (Chaturvedi et al, 1996; Kelly et al, 1994).

**Management of diabetic emergencies**

Emergency admissions for diabetes can be the result of poor management by healthcare services or by the diabetic patient themselves. Diabetic ketoacidosis is an avoidable, potentially life-threatening, complication of diabetes which can lead to drowsiness and coma. It is characterised by very high blood glucose levels resulting from a severe lack of insulin. People who develop diabetic ketoacidosis require urgent hospital treatment, and the condition is a prominent cause of death in people with diabetes, particularly children and young people (Department of Health, 2001a). The risk and
Figure 13 – Standardised emergency hospital admission ratios for diabetes, North West primary care trusts 1999/2000-2001/2002

Source: Department of Health, 2003b
severity of diabetic ketoacidosis can be reduced by the provision of guidance and advice to people with diabetes on how to manage changes in blood glucose control that occur during other illnesses.

The emergency admission rate for people with diabetic emergencies in the North West from 1999-2002 was 5% higher than the England population as a whole, with large variations across the North West. In particular, emergency admissions in North Liverpool Primary Care Trust were 60% higher than for the England population as a whole, whereas emergency admissions in East Cheshire and Fylde Primary Care Trusts were over 30% less than in the national average (Figure 13).

The variation in rates could be due to differences in the way diabetics are managed by healthcare services, differences in referral rates from primary care trusts or differences in the age and ethnic make-up of

**Figure 14 – Age-standardised rates of hospital episodes for diabetic ketoacidosis and coma across the North West, 2001/2002**

[Source: Lakhani et al, 2003]

[Vertical bars represent 95% confidence intervals]
the primary care trust population. All possible reasons need to be investigated.

There were 2177 hospital episodes of diabetic ketoacidosis in all persons in the North West in the financial year 2001/02. The rate of episodes was 33 per 100,000 of the whole population, significantly greater than for England as a whole (Figure 14). The rate of hospital episodes for diabetic ketoacidosis was significantly greater in Cheshire and Merseyside Health Authority than Greater Manchester and Cumbria and Lancashire Health Authorities.

**Figure 15 – Age-standardised rates of hospital episodes for diabetic ketoacidosis and coma by health authority in the North West, 2001/2002**

Source: Lakhani et al, 2003

[Vertical bars represent 95% of confidence intervals]

Figure 15 compares the hospital episodes for diabetic ketoacidosis for the former Health Authority areas in the North West in 2001/2002.
The episode rate was significantly higher in Liverpool, St. Helens and Knowsley and Wirral Health Authorities than in the North West population as a whole. These Health Authorities were the main contributors to the higher episode rate in Cheshire and Merseyside Health Authority.

**Management of complications of diabetes**

Diabetes can cause severe morbidity. Complications of diabetes can be divided into three categories:

- Changes in blood glucose levels, resulting in levels becoming too low (hypoglycaemia) or too high (hyperglycaemia). Both can lead to diabetic coma and death.

- Damage to small blood vessels (microvascular disease) resulting in damage to organs such as the retina (retinopathy), kidney (nephropathy) or nerves (neuropathy).

- Damage to the larger blood vessels (macrovascular disease) resulting in complications such as strokes, coronary artery disease and other circulatory problems.

The UK Prospective Diabetes Study found that nearly half of people with diabetes recruited to the trial had one or more micro or macrovascular complication (UK Prospective Diabetes Study Group, 1991), with about a quarter already having cardiovascular disease (Table 8).

Data are presented on diabetic retinopathy and diabetic complications affecting the lower limb. Specific regional level data are unavailable for other significant complications such as diabetic renal disease, and cardiovascular complications.

**Retinopathy**

Diabetic retinopathy results from damage to the blood capillaries
supplying the retina of the eye. The capillaries may proliferate and become fragile, bleeding easily. Untreated, significant visual loss and blindness can result.

Diabetic retinopathy is the commonest complication of diabetes. Surveys show that at any one time, up to 10% of people with diabetes will have retinopathy requiring follow up or treatment by an eye specialist (MacLeod et al, 1988).

It has been estimated that if an effective, high-quality screening programme were introduced across England, there would be a 40% reduction in the number of cases of new blindness due to retinopathy
within five years (Bachman and Nelson, 1998). Recent surveys of diabetic retinopathy screening services in the UK have demonstrated that there are wide variations in policies and practice, and in the quality of the screening provided. Some services have no central organisation or systematic recording of service outcomes (Bagga et al, 1998). The proportion of people with diagnosed diabetes that have been screened in the previous year ranges from 38% to 85% across districts, and from 14% to 97% across GP practices (Grimshaw et al, 1999).

The serious disability caused by diabetic retinopathy led the National Service Framework to set the following short-term target:

By 2006, a minimum of 80% of people with diabetes are to be offered screening for the early detection (and treatment if needed) of diabetic retinopathy as part of a systematic programme that meets national standards, rising to 100% coverage of those at risk of retinopathy by end 2007.

A survey by the North West Regional Office conducted from November 2001 to February 2002 collected data relating to the provision of diabetic retinopathy screening in health authorities in the North West. The survey asked ‘What proportion of the population is covered by an effective eye screening programme?’ The results of the survey are presented in Table 9 which shows that 4 out of 13 health authorities did not know what proportion of the target population was offered screening in their area, and more than half (7 out of 13) had no information on uptake. South Lancashire, St. Helens and Knowsley and Wirral Health Authorities did not supply survey results.

**Lower limb complications**

Lower limb complications, such as foot ulceration, poor blood supply and reduced sensation, are common in people with diabetes.
Table 9 – Availability and uptake of retinopathy screening in North West health authorities, 2001/2002

<table>
<thead>
<tr>
<th>Health Authority</th>
<th>Screening reported to be offered (%)</th>
<th>Reported uptake of screening (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salford &amp; Trafford</td>
<td>100</td>
<td>Unknown</td>
</tr>
<tr>
<td>Liverpool</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>West Pennine</td>
<td>Unknown</td>
<td>Unknown</td>
</tr>
<tr>
<td>North Cheshire</td>
<td>100</td>
<td>Unknown</td>
</tr>
<tr>
<td>Wigan &amp; Bolton</td>
<td>Not all population</td>
<td>Unknown</td>
</tr>
<tr>
<td>Stockport</td>
<td>100</td>
<td>80</td>
</tr>
<tr>
<td>Sefton</td>
<td>Unknown</td>
<td>45</td>
</tr>
<tr>
<td>N. West Lancashire</td>
<td>100</td>
<td>Unknown</td>
</tr>
<tr>
<td>Bury &amp; Rochdale</td>
<td>Unknown</td>
<td>50</td>
</tr>
<tr>
<td>Morcombe Bay</td>
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<td>60</td>
</tr>
<tr>
<td>Manchester</td>
<td>80</td>
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</tr>
<tr>
<td>South Cheshire</td>
<td>100</td>
<td>Unknown</td>
</tr>
<tr>
<td>East Lancashire</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>

Source: Adil, 2003b

Approximately 25% of people with diabetes have evidence of nerve damage, 20% have poor blood flow and 5% have an active ulcer (Neil et al, 1989; Walters et al, 1992; Kumar et al, 1994). These complications can result in the need to amputate part of the lower limb. The annual incidence of foot ulcers in people with diabetes is between 2% and 10%, while the annual incidence of lower limb amputation is between 0.2% and 2.0%. The cost to the NHS is high, with more occupied hospital bed days attributable to diabetic foot disease than any other diabetes-specific condition. There were 249 lower limb amputations in patients with diabetes in the North West in the financial year 2001-2002. The rate of amputation was similar to that for England as a whole (Figure 16).
Figure 16 – Age-standardised rates of lower limb amputations in diabetic patients: All ages, financial year 2001/2002

Source: Lakhani et al, 2003
[Vertical bars indicate 95% confidence intervals]
Section 5 – Sources of information about diabetes

This section describes currently available sources of information about diabetes and examines how different sources may be used to look at social differences in diabetes. The information sources are divided into three types:

- Mortality and morbidity data
- Population data on prevalence and risk factors
- Hospital data

Mortality and morbidity data

Mortality data

Information about deaths from diabetes is collected as part of the process for registering a death and is analysed by the Office of National Statistics (ONS). When a person dies, the Registrar of Births and Deaths in the district where the death occurred records information about the causes of death, together with a set of personal information about the deceased. This information is sent electronically to the Office of National Statistics where it is coded and compiled into a national database for further analysis. Extracts from this database are made available for use by local primary care trusts.

The information collected through this process includes:

- Name and surname of the deceased
- Date and place of birth and death
- Usual address
- Occupation
- Underlying and contributing causes of death (Coded to International Classification of Diseases, Edition 10)
Mortality statistics are expressed as indirectly standardised mortality ratios and directly standardised mortality rates. Both methods aim to standardise for the different age structures in different populations, so that mortality experiences can be compared.

For indirectly standardised mortality ratios (SMR), the death rates experienced by each age group in England & Wales as a whole are applied to the population of the same age group in the study area. This shows how many people would have died in each age group in the study area if the national death rates had prevailed. These expected deaths for each age group are totalled to give an expected number of deaths for the study area. The actual number of deaths for the area is then divided by the expected number of deaths. The result is expressed as a standardised mortality ratio, where the ratio for England and Wales as a whole is 100. An area with a standardised mortality ratio greater than 100 has a higher death rate than England & Wales, whilst an area with a standardised mortality ratio less than 100 has a lower death rate.

For directly standardised mortality rates, the death rates for each age group in the study area are applied to the number of people in each age group of a standard population. Usually the European Standard Population is used, which is a theoretical population with a fixed number of people in each age group. Applying death rates in this way gives the number of deaths that would have occurred in the standard population if the death rates from the study area had prevailed. This calculation can be carried out for several study areas, and the resulting standardised death rates can be directly compared.

As previously noted, national mortality statistics are likely to underestimate the number of deaths that are attributable to diabetes, because the conditions to which diabetes is a major contributory factor (such as heart attacks and strokes) tend to be recorded as the cause of death for people with diabetes.
Morbidity data

Morbidity data estimates the number of people with diabetes living in the population at a particular time.

Morbidity data is more difficult to obtain than mortality data because there is currently no accurate or robust central register of people with diabetes in the UK. Because of the limitations of present data, incidence and prevalence studies of diabetes generally rely on self-reports of a diagnosis of diabetes or on extracting data on diagnoses of diabetes from general practitioners records (e.g. the Morbidity Statistics from General Practice, a national survey carried out with a nationally representative sample of general practices) or hospital records (see below).

Population data on prevalence and risk factors

The Health Survey for England is a series of annual surveys about the health and lifestyles of people in England. This information aims to underpin and improve targeting of nationwide health policies (Joint Health Surveys Unit, 1991-2002).

The survey collected prevalence data for diabetes in 1991, 1993, 1994, 1998 and 1999. The survey relies on self-reports of diagnosis. Self-reporting underestimates the true prevalence rate because some people do not know they have been diagnosed with diabetes, whilst others choose not to present their symptoms to a doctor or may have no symptoms and remain to be diagnosed by their doctor.

The availability of risk factor data for diabetes is limited. Data are usually collected by specific local or national surveys, which look at a representative cross section of the population. In addition to the Health Survey for England, the General Household Survey also collects health and lifestyle information and can be used to
demonstrate social, geographical and ethnic minority variations in health-related behaviour. The risk to health from smoking is explored in the report ‘Cancer and Inequalities in the North West’ (Bendel, 2002). Evidence of the risk to health from obesity comes from the following sources:

- The Health Survey for England has recorded information about obesity in the adult population from 1993 until 2001 (Office of Population Censuses and Surveys, 1994; Joint Health Surveys Unit, 1995-2002)

- In 1998 the Health Survey for England carried out a more in depth analysis of obesity across different socio-economic classes which compared the prevalence of diabetes in manual and non-manual groups (Joint Health Surveys Unit, 1999)

- In 1999 the Health Survey for England carried out a more in depth analysis of obesity in people from different ethnic minority groups (Joint Health Surveys Unit, 2000)

These surveys allow the data to be analysed geographically in order to show variations between different parts of the country. However, the number of interviews in the surveys is usually only large enough to allow the information to be analysed at regional level.

It is much more difficult to find information describing the variations in obesity and other types of behaviour at the level of health authorities or primary care trusts. However, the Department of Health combined 3 years of data from the Health Survey for England in 1994-1996 to produce a dataset that allows analysis at this level. These data were used earlier in this report (Table 6). Some health authorities have carried out local population surveys to measure the health needs and patterns of health related behaviour in their area. A full description of the local sources of health information can be found in the ‘Cancer and Inequalities in the North West’ report by the North West Public Health Observatory (Bendel, 2002).
Clearly, the present availability of robust and reliable data for diabetes in the North West, particularly for primary care trusts, is limited. The Diabetes Information Strategy (Department of Health, 2003a) has been published to improve all levels of information provision: from clinical systems to information for the general public and those most at risk of diabetes.

**Hospital data**

**Hospital Episode Statistics (HES)**

Hospital episode statistics comprise information collected on all people who have been admitted to hospital and have been assessed by a doctor. A finished consultant episode is defined as a period of healthcare under one consultant in one hospital provider. During a stay in hospital a person may have more than one finished consultant episode. Information collected in the hospital episode statistics include:

- Age and sex
- Date of admission
- Date of discharge
- Number of finished consultant episodes during admission
- Postcode of usual residence
- Diagnosis on admission (using the International Classification of Diseases - Edition 10).

Hospital episode statistics can therefore be used to analyse diabetic admissions and care in hospital. Further details and summary statistics for England and hospital trusts can be found at the website: [www.HES.co.uk/](http://www.HES.co.uk/)

**Hospital specialist services registers**

At present the only direct source of information about people with
diabetes in the North West is from hospital specialist services registers. These registers generally collect information about patients attending specialist services for diabetes. In addition, some services obtain information from primary and community care about patients they see. Although this is a valuable information source for diabetes data, it has limited availability and reliability.

Most systems still rely on a paper transfer of information from different NHS care providers. There are many people who are never treated for their diabetes in hospital, and unless the primary care services inform the register about this group of people they will not be recorded in the hospital registers. Research has shown that hospital registers often contain fewer patients than would be expected from the demography of the area of residence of their patients. The introduction of the electronic transfer of patient data between different services should improve the quality of data from diabetes registers.
Section 6 – Developments in diabetes information

This section describes some of the developments that are underway to improve existing diabetes information sources or develop new ones.

Diabetes Information Strategy

The Diabetes Information Strategy (Department of Health, 2003a) is intended to provide the information infrastructure, systems and services required to deliver improvements in services proposed by the National Service Framework for Diabetes (Department of Health, 2001a).

The focus of the strategy is in four different areas:

- Information for the general public and particularly those at risk of diabetes
- Information for people with diabetes in managing their condition
- Information for health professionals and others working in partnership with people with diabetes
- Information for quality improvement, performance management, prevention, health improvement and planning

The Diabetes Information Strategy has the following objectives:

- The development of a framework and toolkit to support local information services for the general public, and for people with diabetes, about the risks, complications, treatment and care of diabetes and about services for people with diabetes
- The development of specifications and standards for local implementation This includes objectives to:
  - Provide people with diabetes access to their records
  - Develop virtual diabetes registers within the context of wider integrated care record service development
Develop a common language for diabetes through wider dataset development

Improve access to knowledge about diabetes through the development of the National Electronic Library for Health

Support quality improvement, performance management, public health and planning

The development of a national specification and standards for the Integrated Care Record Service, to support integrated diabetes care.

On a local level, services will need to develop analytical capacity and to take part in national clinical audit. Primary care trusts and strategic health authorities will need to decide the local priorities and pace of implementation within the framework provided through the document: *Improvement, Expansion and Reform (Priorities and Planning Framework 2003-2006)* (Department of Health, 2003c).

**Primary Care Registers**

The first stage in the National Service Framework Delivery Strategy and Diabetes Information Strategy is to introduce practice based registers by the year 2006. These will be virtual registers derived from data already entered in the electronic patient record on the practice information system.

The aim of the registers is to enable practitioners to identify new patients with diabetes and patients with particular risk factors for diabetes: improve the management of current diabetic patients and thereby reduce the complications of diabetes; and to provide a regular call/recall system for retinopathy screening. In addition, the information compiled within the primary care database will supplement and enhance hospital registers, provide epidemiological data to help determine health needs, health service development and developments in preventive interventions.
The National Health Service Information Authority has produced a national core dataset for all practice-based registers, to help provide consistent diagnostic terms and codes. The core dataset will include:

- Demographic information
- Administrative information (e.g. call/recall data)
- Family history
- Lifestyle factors
- Routine tests
- Results of tests and measurements


**Primary Care Information Service (PRIMIS)**

General practice systems must be able to consistently identify people for whom any of the disease terms and codes related to diabetes have been recorded. The ability to search and retrieve against certain criteria will depend on the quality and accuracy of the data recorded in each patient record. For this reason, it is essential that precise diagnostic terms and codes be used wherever possible. Projects such as Primary Care Information Service (PRIMIS) can assist practices and primary care trusts to improve the quality of their data recording and offer free training and support. Launched in April 2000, PRIMIS is funded by the NHS Information Authority and is based in the Division of Primary Care at the University of Nottingham.

PRIMIS works with local information facilitators, employed by primary care trusts to provide GPs and practice staff with:

- Training in information management skills
- Analysis of data quality and key clinical topics
- Feedback and interpretation of analysis results
- Support in developing action plans to improve data quality
PRIMIS is currently undertaking a National Comparative Analysis Service in Diabetes for participating PRIMIS practices with the help of local facilitators. This involves the release of a set of queries (based on the Diabetes National Service Framework) to extract anonymised patient data from clinical systems, and the analysis of this data.

PRIMIS has recently completed an audit across Liverpool Central Primary Care Trust to gather a baseline assessment of primary care diabetes registers in relation to the National Service Framework for Diabetes and the General Medical Service contract. To obtain more information about PRIMIS in your own area you can find more details on the following website http://www.primis.nhs.uk/pages/default.asp.

**Quality Indicators for Diabetes Services (QUIDS)**

Quality Indicators for Diabetes Services (QUIDS) developed an audit methodology to measure the clinical quality of routine diabetes care. The methodology comprised linked systems for locally based data compilation, consistent data extraction, central data aggregation, validation, analysis, benchmarking and web-based feedback.

Data from the pilot implementation of the methodology (32 localities in the North West and 30 elsewhere in England) included 100,000 records from people with diabetes in 2000. Extraction of data allowed a comparison of the registers across the North West whilst producing a predicted prevalence of diabetes for each ward, primary care trust and health authority to help assess needs and demand.

The methodology has become national policy as undertaken by ‘The National Clinical Audit Support Programme’. Further details can be obtained at www.quids.org.uk.
The National Clinical Audit Support Programme

The National Clinical Audit Support Programme is the co-ordinating body for the development and improvement of clinical audit data. It provides the infrastructure to collate local clinical data for analysis and feedback, at every level of the NHS. The National Clinical Audit Support Programme works with clinicians, professional bodies and other interested parties to develop standards for national clinical audit projects and their associated infrastructure that will support clinical priorities, clinical audit, performance management, National Services Frameworks and the NHS plan. National, comparative, risk adjusted audit datasets are to be implemented for diabetes in 2004. Collection of data for national and local clinical audit purposes will also begin in 2004. More details about the National Clinical Audit Support Programme can be obtained from www.nhsia.nhs.uk/ncasp

North West Diabetes Register and Research Group

A local diabetes register and research group has been developed, consisting a wide range of people working in the field of diabetes from the NHS and academia, across the North West. The aim of the group is to identify key areas for future research in basic sciences and genetics, epidemiology and clinical/health services using the existing diabetes registers. Further details can be obtained from Jacqueline Sholtz: email: Jacqueline.R.Scholtz@man.ac.uk; tel: 0161 275 1603.
Section 7 - Where to find further information about diabetes

The emphasis of the report has been to provide information about measuring the current and future health needs, estimating the prevalence of major risk factors and measuring current service provision for diabetes. It is important to note that further information is available from a variety of sources. This section of the report lists a number of useful websites and contacts that provide information for people with diabetes and their families.

National Service Framework for Diabetes

www.dh.gov.uk/PolicyAndGuidance/HealthAndSocialCareTopics/Diabetes/fs/en

Further information about the National Service Framework for Diabetes, both the Standards and Delivery Strategy, can be found via the web page on the Department of Health.

Diabetes UK

http://www.diabetes.org.uk/

Diabetes UK is the leading charity working for people with diabetes. It funds research, campaigns and helps people to live with the condition. Its mission statement ‘is to improve the lives of people with diabetes and to work towards a future without diabetes’. The website has a wealth of information about diabetes and has links to other useful sources of information.

Diabetes Insight

http://www.diabetic.org.uk/

Diabetes Insight was established in April 1996 to provide information for people and families with diabetes in the UK, to help them to
manage their diabetes and lead a normal active life. Diabetes Insight also provides an E-mail support forum, accessed via http://www.diabetes-insight.info/ where people can share support, information and discuss all of the personal and scientific aspects of this disease and how it affects their lives.

Diabetes Insight  
C/O Trefoil Solutions Ltd  
15 Ravenhill Avenue  
Knowle  
Bristol BS3 5DU  
United Kingdom

**British Society for Paediatric Endocrinology and Diabetes**

http://www.bsped.org.uk/

The British Society for Paediatric Endocrinology and Diabetes (BSPED) was formed in 1979 to "advance education in paediatric endocrinology and related subjects by promoting research and disseminating the useful results of such research". The website contains a useful links section to diabetes resources.
**Glossary**

**Age-adjusted/ age-standardised:** Prevalence or incidence rates of disease that have been adjusted to take account of the differences in the age composition of different populations.

**Angina:** Chest pain, caused by a temporary reduction in the amount of oxygen delivered to the heart muscle through narrowed, diseased coronary arteries.

**Body Mass Index (BMI):** BMI describes the relationship between a person’s weight and height, and is associated with the amount of body fat. It is calculated by dividing body weight (in kilograms) by height (in meters) squared. A BMI over 25 is considered to be overweight, and a BMI over 30 is considered to be obese.

**Central obesity:** See Waist to hip ratio.

**Correlation:** The degree to which two variables change together. This can be described mathematically using the r-value.

**Diabetes (Diabetes mellitus):** A medical condition in which levels of glucose in the blood become too high. Glucose levels in the blood are normally controlled by a hormone, insulin, produced in the pancreas. Diabetes occurs if either the body is unable to produce insulin or the body is unable to make use of the insulin available.

**Diabetic ketoacidosis:** An avoidable, potentially life-threatening, complication of diabetes characterised by very high blood glucose levels resulting from a severe lack of insulin.

**Electro-cardiogram:** A graphic record of the electrical activity of the heart, detected by pads placed on the chest. It is used to diagnose damage to the heart muscle.

**Gestational diabetes:** Diabetes that develops during pregnancy. Gestational diabetes usually becomes apparent during the 24th to 28th weeks of pregnancy. The symptoms are usually mild, and blood glucose levels frequently return to normal after delivery.
Glucose: The main sugar that the body derives from carbohydrates and other foods. Glucose is the body’s major source of energy, and is carried to cells in the bloodstream. The cells cannot use glucose without the help of insulin.

Glucose tolerance test: A test that measures the body’s ability to metabolize glucose. The most common glucose tolerance test is the oral glucose tolerance test (OGTT). After an overnight fast, the patient drinks a glucose solution. Their blood glucose is measured before drinking the glucose solution, and again every 30 to 60 minutes after the glucose is consumed, for up to 3 hours.

HbA1c: A test that determines the average blood glucose level over several weeks. It measures the amount of glucose bound to haemoglobin (a protein found in red blood cells), which is directly related to the concentration of glucose in the blood over the previous 60 to 90 days.

Hyperglycaemia: Abnormally high levels of blood sugar, usually associated with diabetes.

Hypoglycaemia: Abnormally low levels of blood sugar, usually resulting from excessive insulin or poor diet.

Incidence: The number of new cases of disease occurring during a given time period in a specified population. The incidence is usually expressed as a rate (e.g. per 100,000 population).

Index of Multiple Deprivation 2000 (IMD): The IMD uses information from 33 indicators to describe the level of deprivation in wards. These 33 indicators come from 6 “domains” of deprivation: income; employment; health deprivation and disability; education, skills and training; housing; and geographical access to services.

Insulin: A hormone produced by the pancreas. Insulin decreases the level of glucose in the blood and regulates the metabolism of glucose,
fats and proteins. Insulin for the use of diabetics is usually produced with the aid of genetically engineered bacteria.

**Intermittent claudication:** A symptom of peripheral arterial disease. It is a potentially disabling condition characterized by attacks of pain or fatigue in the calf, thigh, or buttock. The attacks are brought on by exercise, and are caused by lack of oxygen to the muscles as a result of narrowed or blocked arteries.

**Ischaemia:** Reduced oxygen supply to muscles and other tissues, usually due to obstruction of blood flow in the arteries.

**Ischaemic feet:** Feet that are prone to ischaemia.

**Low-intensity exercise:** Light physical activity that wouldn’t usually result in breathlessness, such as walking for pleasure, gardening, housework and social dancing.

**Moderate-intensity exercise:** Physical activity that would usually result in breathlessness, such as brisk walking, hiking, stair climbing, aerobic dancing, jogging, bicycling, rowing and swimming.

**Myocardial infarction:** A heart attack. Occurs when an area of heart muscle dies or is permanently damaged because of an inadequate supply of oxygen to that area.

**Obesity:** Abnormal body weight, usually defined as more than 20 percent above average for age, height and bone structure. Obesity is a risk factor for several diseases, including diabetes. In practice obesity is usually diagnosed by measuring the **Body Mass Index** and/or the **Waist to hip ratio**.

**Peripheral arterial disease:** Narrowing and hardening of the arteries, especially in the blood vessels of the legs. This causes a decrease in blood flow that can injure nerves and other tissues.
**Prevalence**: The number of people with a disease at a particular time in a given population.

**Rates of walking**: Walking rates are defined according to the distance covered in an hour:

<table>
<thead>
<tr>
<th></th>
<th>Kilometres</th>
<th>Miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Easy/casual</td>
<td>&lt; 3.2</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>Normal/average</td>
<td>3.2 – 4.8</td>
<td>2 – 3</td>
</tr>
<tr>
<td>Brisk</td>
<td>4.8 – 6.2</td>
<td>3 – 3.9</td>
</tr>
<tr>
<td>Run</td>
<td>&gt; 6.2</td>
<td>&gt; 3.9</td>
</tr>
</tbody>
</table>

**Regular physical activity**: A minimum of 30 minutes of moderate-intensity physical activity on most days of the week.

**Retina**: The light-sensitive layer at the back of the eye.

**Retinopathy**: Damage to the retina, resulting from damage to the blood vessels that supply it. Retinopathy is a major cause of blindness in diabetics.

**r value (correlation coefficient)**: A measure of the degree to which two variables have a linear relationship. The r value can vary between +1 and −1. When r= +1 there is a perfect positive linear relationship, that is one variable directly increases as the other increases. When r= -1 there is a perfect negative linear relationship, that is one variable directly decreases as the other increases. When r= 0 there is no linear relationship between the two variables.

**Sedentary**: Being physically inactive.

**Standardised Mortality Ratio (SMR)**: The ratio of the number of deaths observed in a population to the number that would be expected if the population had the same mortality (death) rates as a reference or standard population. The SMR is often used to compare
the mortality rates in particular areas (e.g. Liverpool) or particular groups (e.g. social class V) with national rates.

To interpret the SMR: the standard population always has an SMR of 100. If an area or group has an SMR above 100, then it has higher mortality rates than the standard population. For example: an SMR of 200 indicates that the area has mortality rates twice as high as the standard population. Similarly, if an area or group has an SMR below 100, then it has lower mortality rates than the standard population.

**Townsend Material Deprivation Score:** A measure of the material deprivation in an area. It is based on four variables taken from the Census: unemployment, overcrowding, lack of owner occupied accommodation and lack of car ownership in the given area. The higher the score, the greater the level of deprivation.

**Type 1 diabetes (insulin dependent diabetes mellitus):** The diabetes that occurs if the body is unable to produce any insulin. It usually develops before the age of 40 and is treated by regular injections of insulin and diet.

**Type 2 diabetes (non-insulin dependent diabetes mellitus):** The diabetes that occurs if the body cannot produce enough insulin, or the insulin that is produced is not used properly by the body (insulin resistance). Type 2 diabetes is more common than Type 1 diabetes and usually occurs after the age of 40. It is usually treated by diet alone or by diet and tablets, occasionally it is treated with injections of insulin.

**Waist to hip ratio:** The circumference of the waist divided by the circumference of the hips. The waist is measured at the level of the belly button, and the hips around widest part of hips & buttocks. A waist to hip ratio of greater than 0.9 in men and greater than 0.8 in women indicates **central obesity.**
**Transient ischaemic attack:** Paralysis, numbness or speech difficulty that starts suddenly and recovers within 24 hours. It is caused by the blood flow to the brain being temporarily interrupted.

**Variable:** Any quantity that varies, e.g. height, weight, blood pressure.


