

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.

Part I

Section I – 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

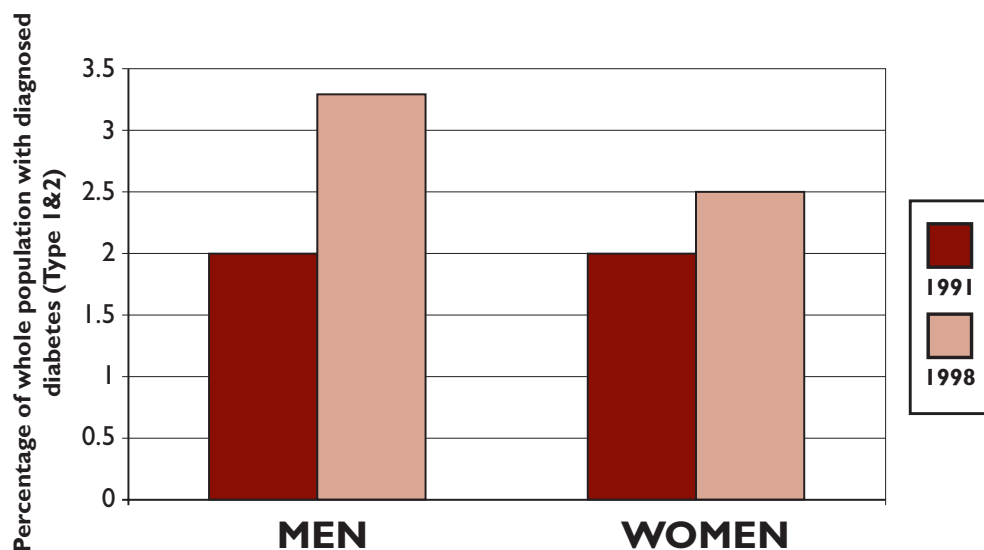
Population studies in the United Kingdom show that the estimated prevalence of Type 1 diabetes is between 0.2 and 0.3% of the population (Evans *et al*, 2000). The prevalence of diagnosed Type 2 diabetes is around 2-3% in the adult general population (Stevens and Raftery, 1994). However, this is not 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.

Figure 1 – Prevalence of diagnosed diabetes in England, 1991 and 1998



Source: Joint Health Surveys Unit (1999)

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.

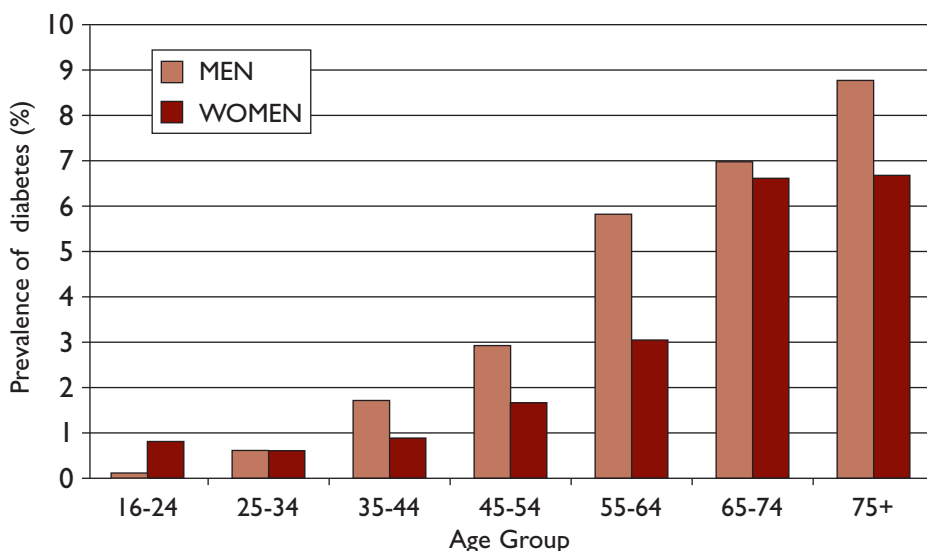
Differences by age and sex

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)

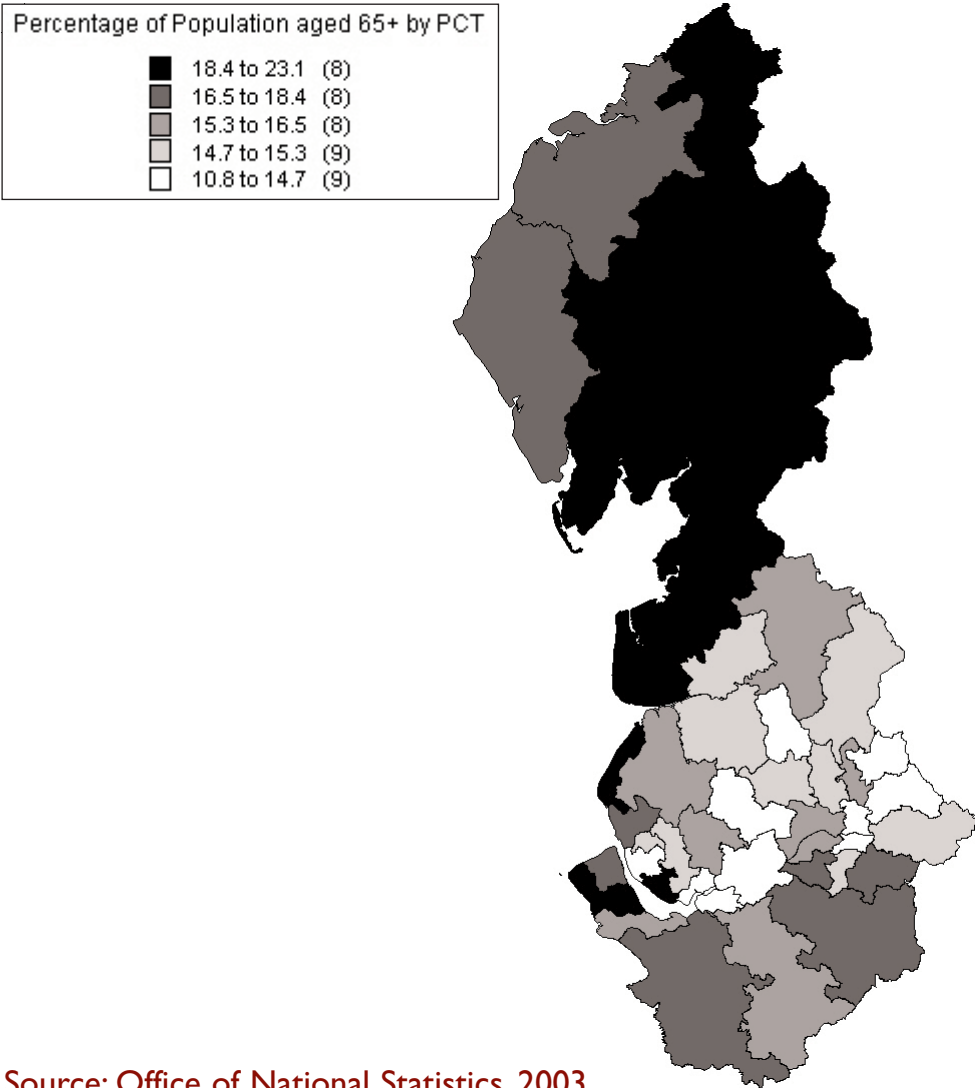
The distribution of older people in different areas such as primary care trusts therefore helps to determine the proportion of people with diabetes in a locality, and the need for specialised health services in that area. Map 1 illustrates the percentage of people aged 65 years and over in primary care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

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



Source: Office of National Statistics, 2003

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

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 I compares the distribution of social classes in the North West Region with the rest of England from the 1991 Census.

Table I 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 (III(M), 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.

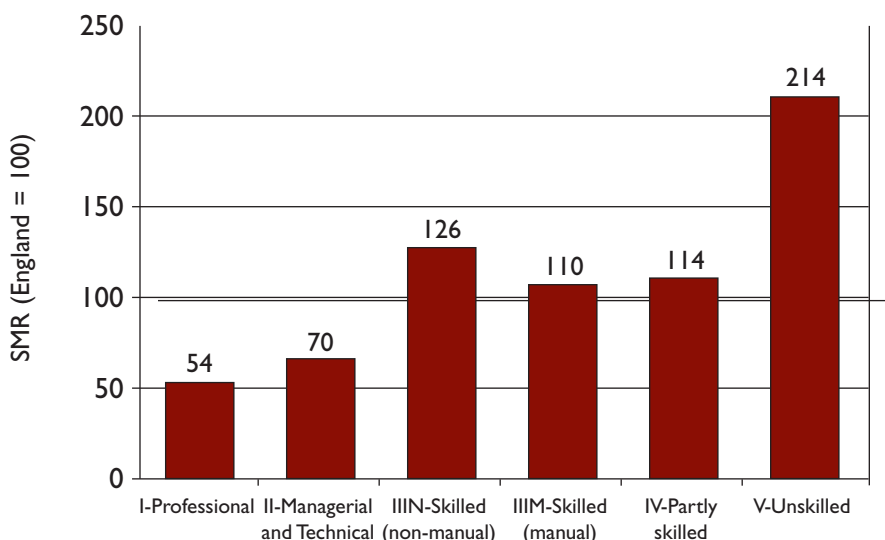
Table I – Social class of men and women based on own occupation, North West compared with England and Wales, 1991

	Men (%)		Women (%)	
	North West Region	England & Wales	North West Region	England & Wales
I - Professional	5.9	6.5	1.4	1.8
II - Managerial and Technical	24.0	26.5	25.5	26.5
III(N) - Skilled (non-manual)	10.5	10.5	36.7	37.6
III(M) - Skilled (manual)	32.1	30.7	7.2	6.8
IV - Partly skilled	15.3	14.5	17.6	16.3
V - Unskilled	5.5	5.0	6.9	6.8
Inadequately described	1.9	2.3	1.3	1.2
Other economically active	4.9	3.9	3.4	2.9
Total economically active	72.0	73.7	49.8	50.5
Total retired	16.7	17.1	21.9	20.2

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.

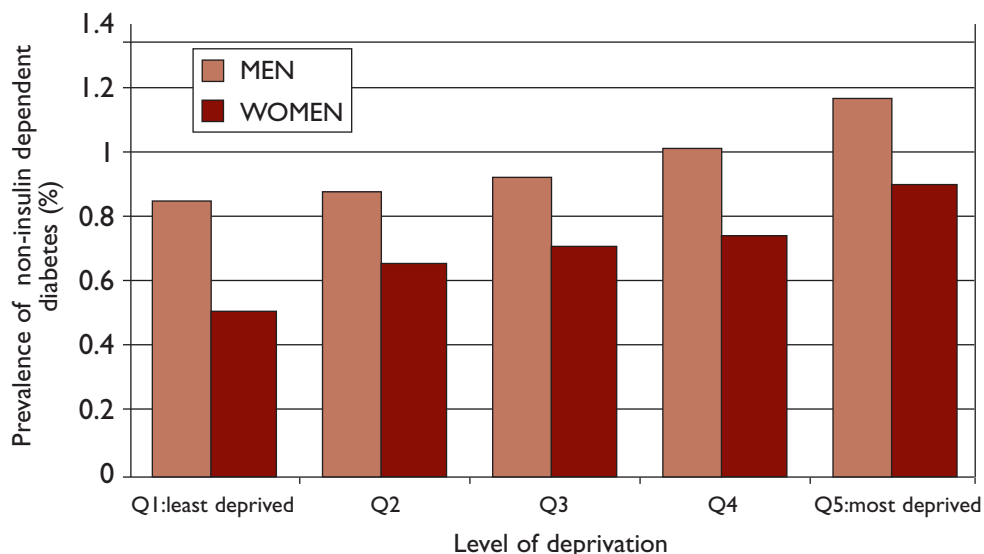
The difference in prevalence and life expectancy is due to a combination of genetic, environmental and lifestyle factors. In particular, risk factors implicated in the development of diabetes (particularly Type 2 diabetes) are also known to be associated with socio-economic status (Joint Health Surveys 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



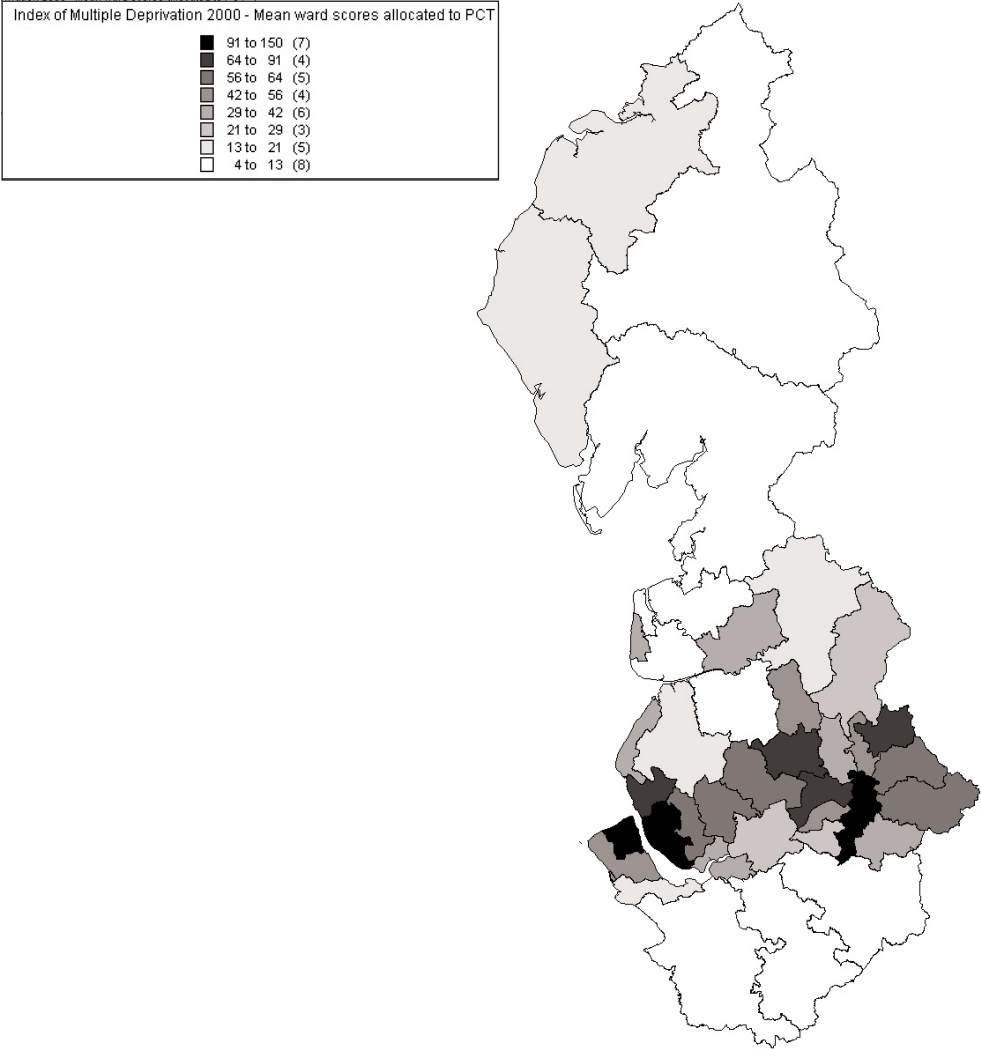
Source: Office of National Statistics, 2000

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%

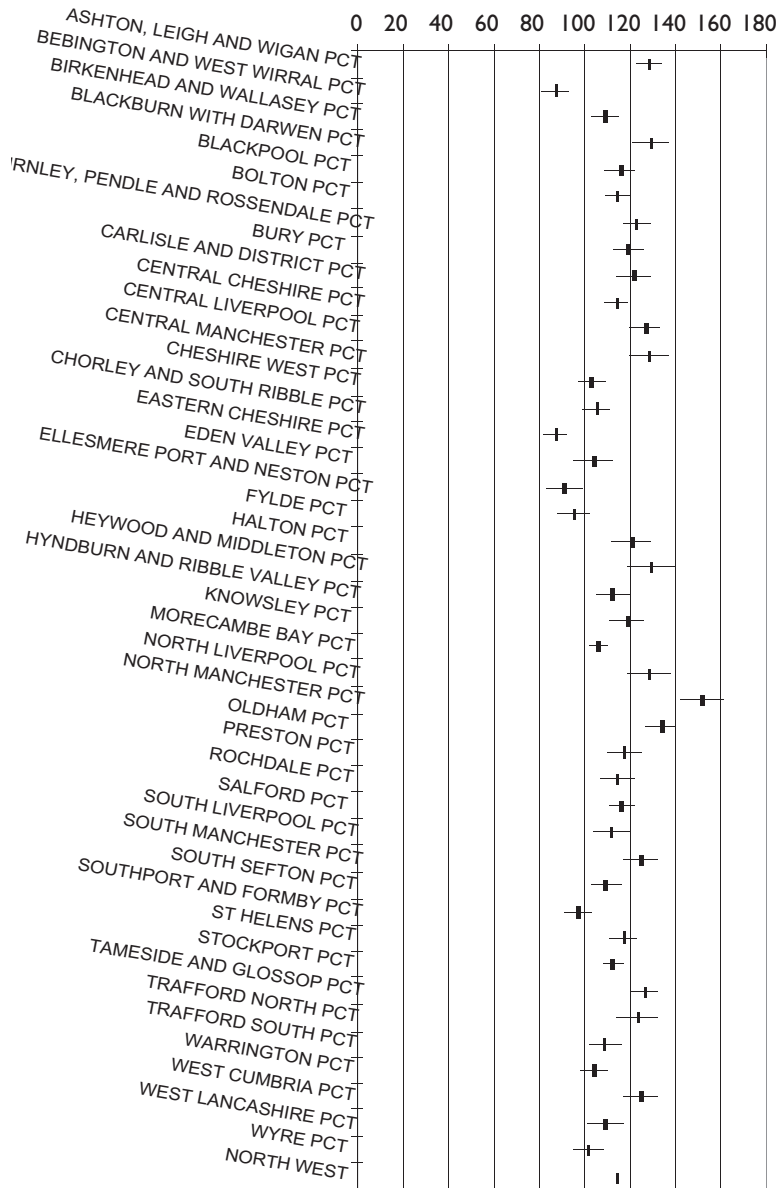
Map 2 – Index of Multiple Deprivation 2000 in the North West primary care trusts



Source: North West Public Health Observatory, 2003

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]

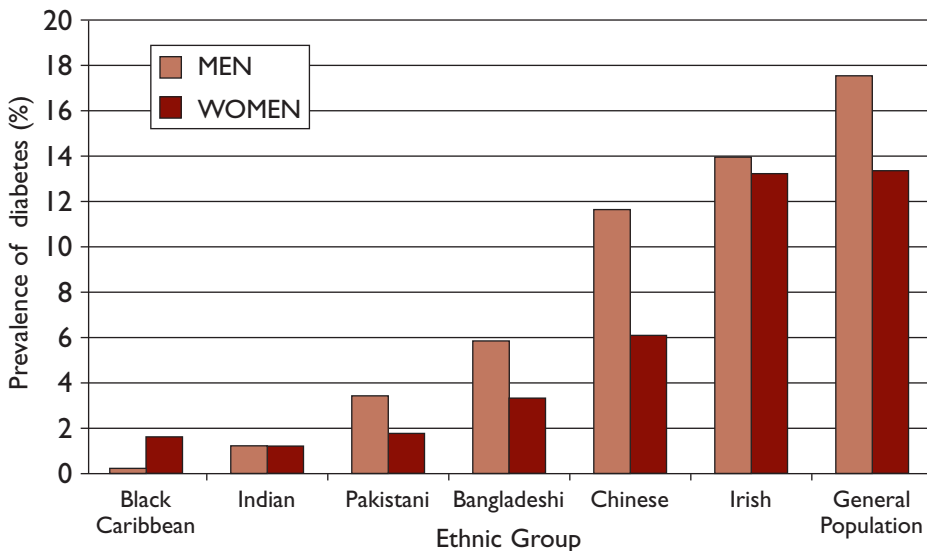
2000 (30% higher than in England). There was also a positive correlation between social deprivation (measured by the Index of Multiple Deprivation 2000) and mortality from diabetes in primary care trusts (PCT) in the North West ($R= +0.51$). That is, mortality from diabetes was higher in the more deprived 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

Ethnic Origin	Relative Prevalence of diabetes
White	1
Black Caribbean	3.1
Black African	3.1
Black other	3.1
Indian	3.6
Pakistani	5.2
Bangladeshi	5.2
Chinese	1.8
Other Asian	1
Other	1

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

	Total population		Total population	
	England		North West	
	Count	%	Count	%
White	54153898	92.1	6354916	94.4
Asian or Asian British				
Indian	1053411	1.8	67998	1.1
Pakistani	747285	1.3	110576	1.7
Bangladeshi	283063	0.5	24784	0.4
Other Asian	247664	0.4	13981	0.2
Black or Black British				
Black Caribbean	565876	1.0	19065	0.3
Black African	485277	0.8	15252	0.2
Black Other	97585	0.2	5084	0.1
Chinese	247403	0.4	25420	0.4
Other	230615	0.4	12710	0.2
Other (not elsewhere classified)	677117	1.2	59736	0.9
All minority ethnic population	4635296	7.9	354604	5.6
All population	58789194	100	6709520	100

Source: Office of National Statistics, 2003

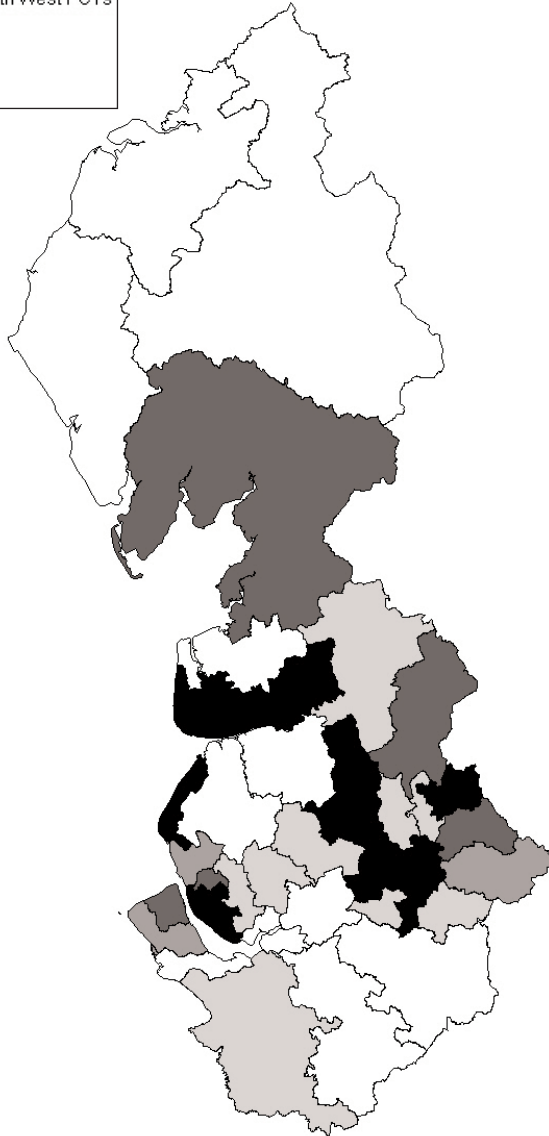
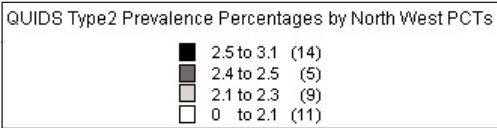
The distribution of people from different ethnic minorities in the North West is not evenly spread across the region. For example, Pendle Local Authority in Greater Manchester has a resident Pakistan population of 13.42% compared with 0.02% resident in Eden Local Authority in Cumbria. The raised prevalence 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

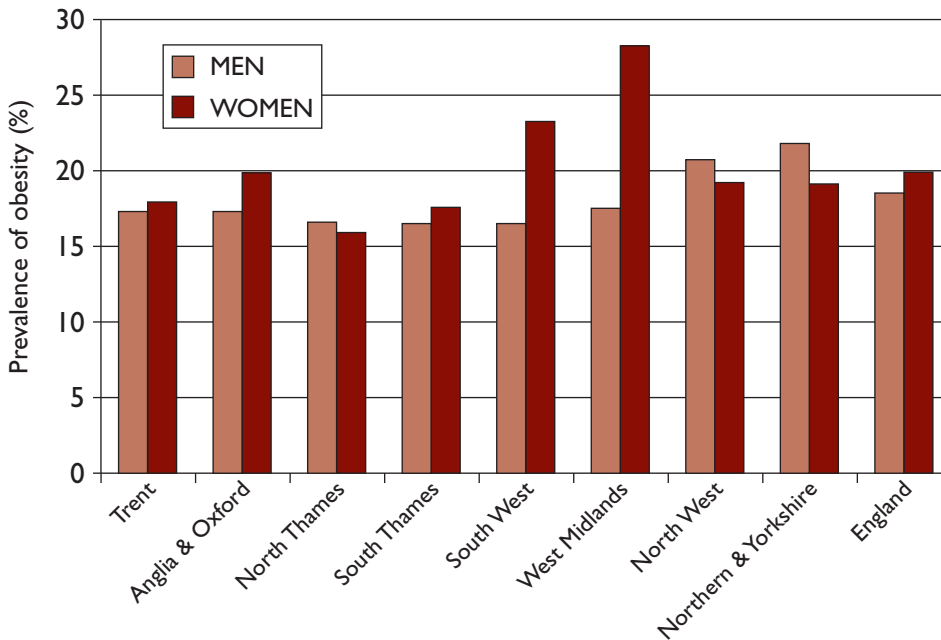
In order to define overweight or obesity, a measurement is used which allows for differences in weight due to height. The most commonly used measure is the Body Mass Index (BMI), which is derived by dividing a person's weight (in kilograms) by the square of their height (in metres). Overweight is classified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



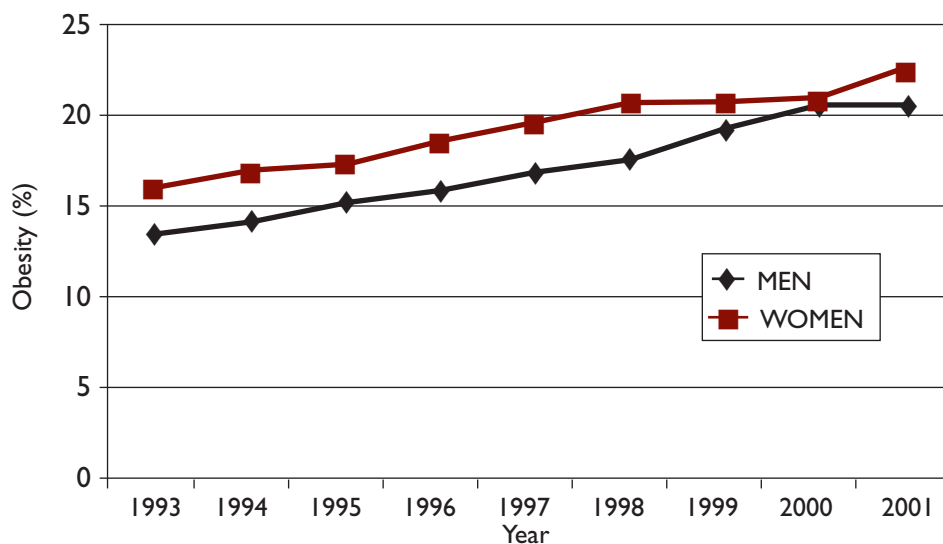
Source: Joint Health Surveys Unit, 2000

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



Source: Office of Population Censuses and Surveys 1994; Joint Health Surveys Unit 1995-2002

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.

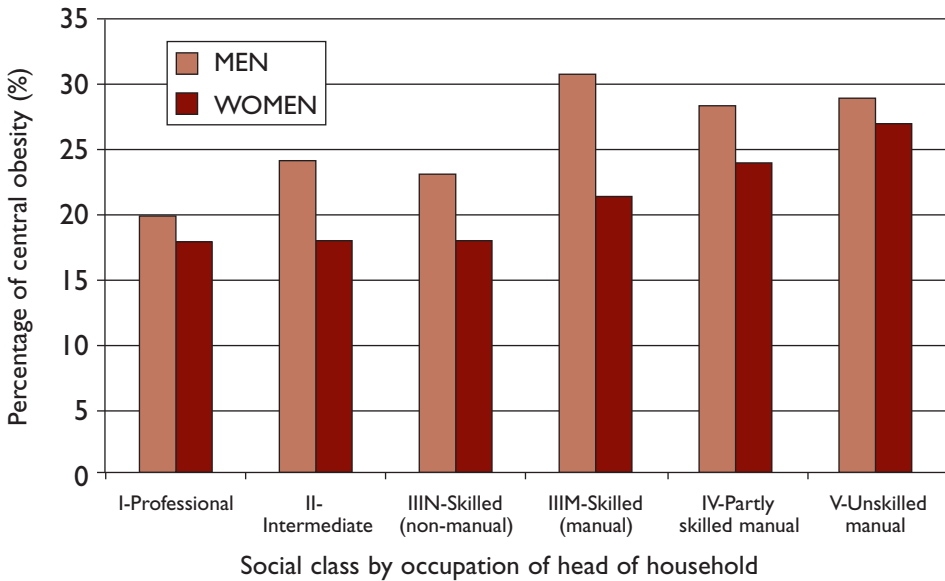
Differences in obesity by social class

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 4 – Prevalence of general obesity by ethnic origin, England, 1999

	Black Caribbean	Indian	Pakistani	Bangladeshi	Chinese	Irish	General population
Men							
Observed %	18.3	11.9	12.6	5.4	6.2	20.4	18.9
Standardised risk ratio	1.02	0.66 ↓	0.74 ↓	0.32 ↓	0.38 ↓	1.04	1.00
Women							
Observed %	31.9	19.6	25.6	9.5	4.5	21.2	20.9
Standardised risk ratio	1.60 ↑	1.02	1.61 ↑	0.63 ↓	0.20 ↓	1.03	1.00

↑ - 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 37% 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

	Social class of head of household					
	I	II	IIINM	IIIM	IV	V
Walking						
Men	44	39	37	27	29	32
Women	30	28	26	22	20	18
Sport & Exercise						
Men	52	52	45	39	40	37
Women	43	43	36	32	28	27

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).

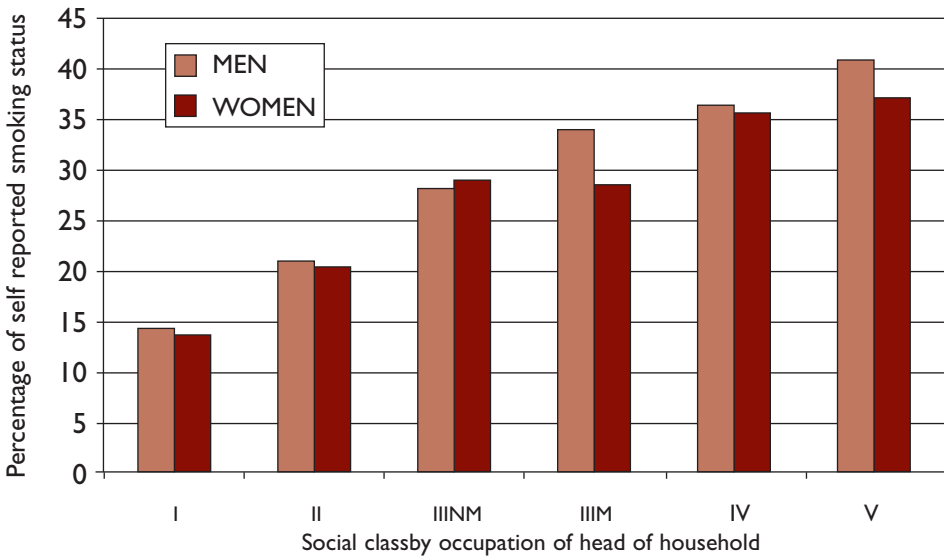
Table 6 – Mean percentage of cigarette smoking by health authority in the North West (age standardised), 1994-1996

Health Authority area	Mean %	95% Confidence Intervals	
		Lower	Upper
Manchester	38.5	32.3	44.7
West Pennine	38.1	30.5	45.7
Bury & Rochdale	36.6	31.2	42.0
Liverpool	34.1	29.0	39.1
Sefton	32.1	24.9	39.3
Wigan & Bolton	32.1	27.4	36.8
East Lancashire	31.7	25.4	37.9
St Helens & Knowsley	31.5	25.5	37.5
North West Lancashire	29.6	22.6	36.5
Salford & Trafford	29.3	24.8	33.8
South Lancashire	29.0	22.3	35.6
Morecambe Bay	28.1	22.9	33.3
Wirral	27.0	19.4	34.5
South Cheshire	26.8	22.6	31.0
Stockport	23.6	18.8	28.4
North Cheshire	21.2	14.8	27.6
All England	28.8	28.2	29.3

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 – 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)

Standard 1: Prevention of Type 2 diabetes

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.

Standard 2: Identification of people with diabetes

The NHS will develop, implement and monitor strategies to identify people who do not know they have diabetes.

Standard 3: Empowering people with diabetes

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.

Standard 4: Clinical care of adults with diabetes

Adults with diabetes will receive quality care and support to optimise the control of risk factors for developing the complications of the condition.

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

10. People with diabetes will receive regular surveillance for the long-term complications of diabetes.

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

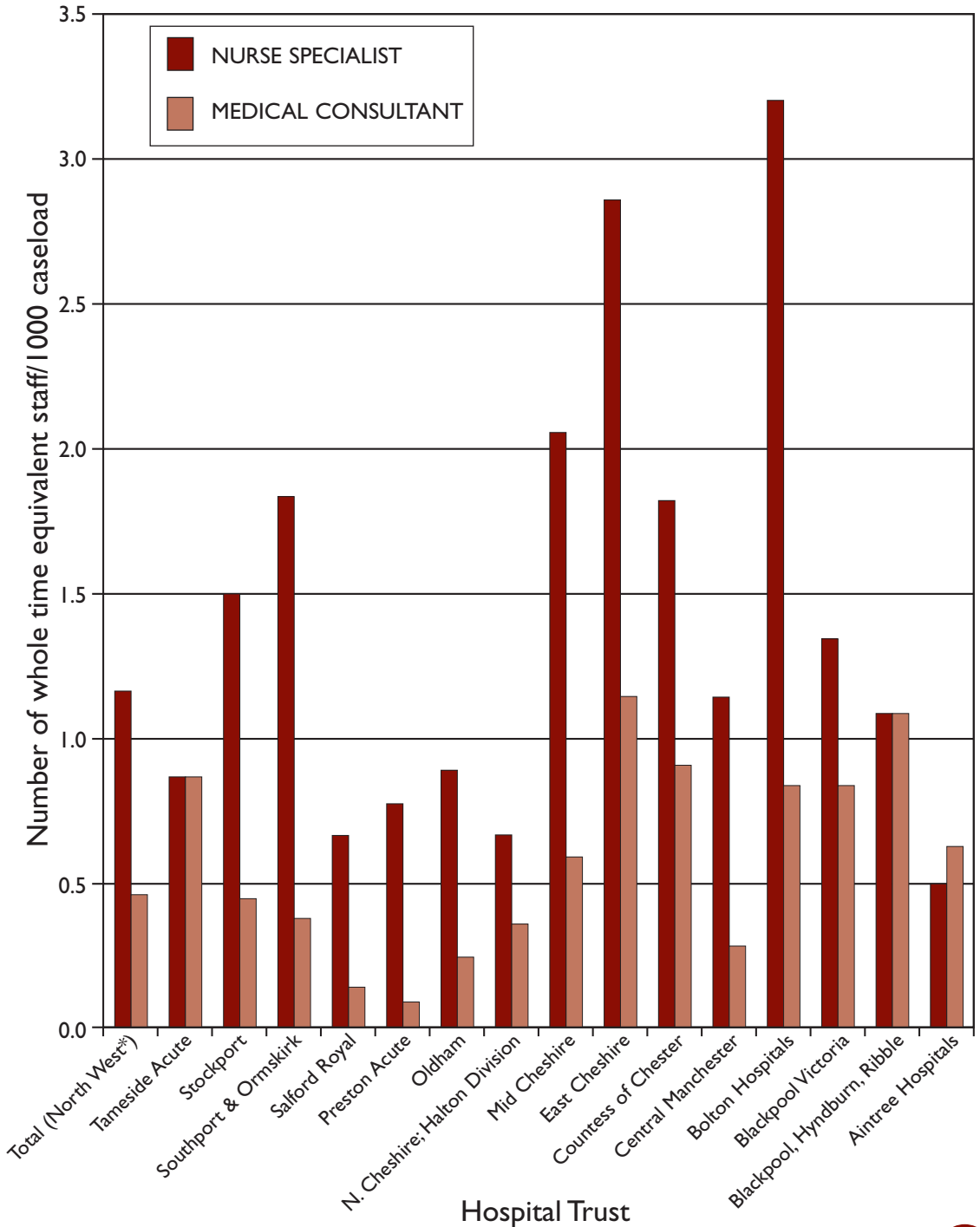
The National Service Framework recognises there is a need to increase the number of staff involved in diabetes care. Most hospital trusts in the North West have a dedicated specialist diabetes service to care for people with the condition. The staff involved in diabetes care include medical, nursing, 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

-
- Detection and management of long-term complications (Standards 10 to 12) - feet, eyes, kidneys and cardiovascular disease.

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

Health Authority	Predicted Prevalence (Prevalence Model)			Diabetes Prevalence (Caseload from each HA)					Percentage Difference
	Type 1	Type 2	Total	Type 1	Type 2	Type Unspecified	Total		
Bury & Rochdale	1738	8753	10491	487	8870		9357	-10.8	
Liverpool	2142	11464	13606	1975	7593		9568	-29.7	
Manchester	1923	11459	13382	1149	8858	4127	14134	5.6	
North Cheshire	1379	6001	7380	1974	5236		7210	-2.3	
Sefton	1378	7029	8407	1087	5456		6543	-22.2	
St Helens & Knowsley	1516	7079	8595	1241	6999	1088	9328	8.5	
West Pennine	1957	10312	12269	1339	5904	3161	10404	-15.2	
Wirral	1538	7694	9232	1131	7762	880	9773	5.9	
Total	13571	69791	83362	10383	56678	9256	76317	-8.5	

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).

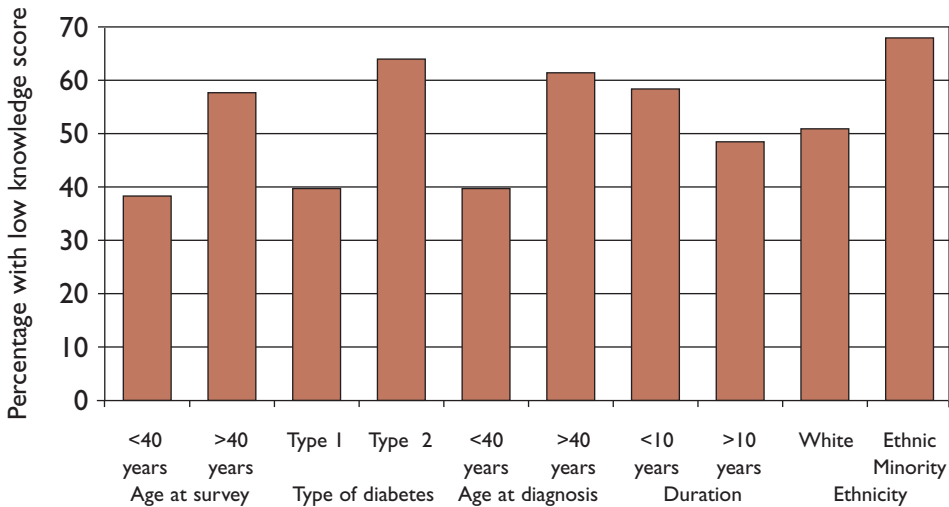
As part of its review of diabetes services, the Audit Commission conducted a postal survey to get a better understanding of the views of people with diabetes (Audit Commission, 2000). One area analysed was patients' knowledge of key elements of their diabetes care. The information collected was analysed 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.

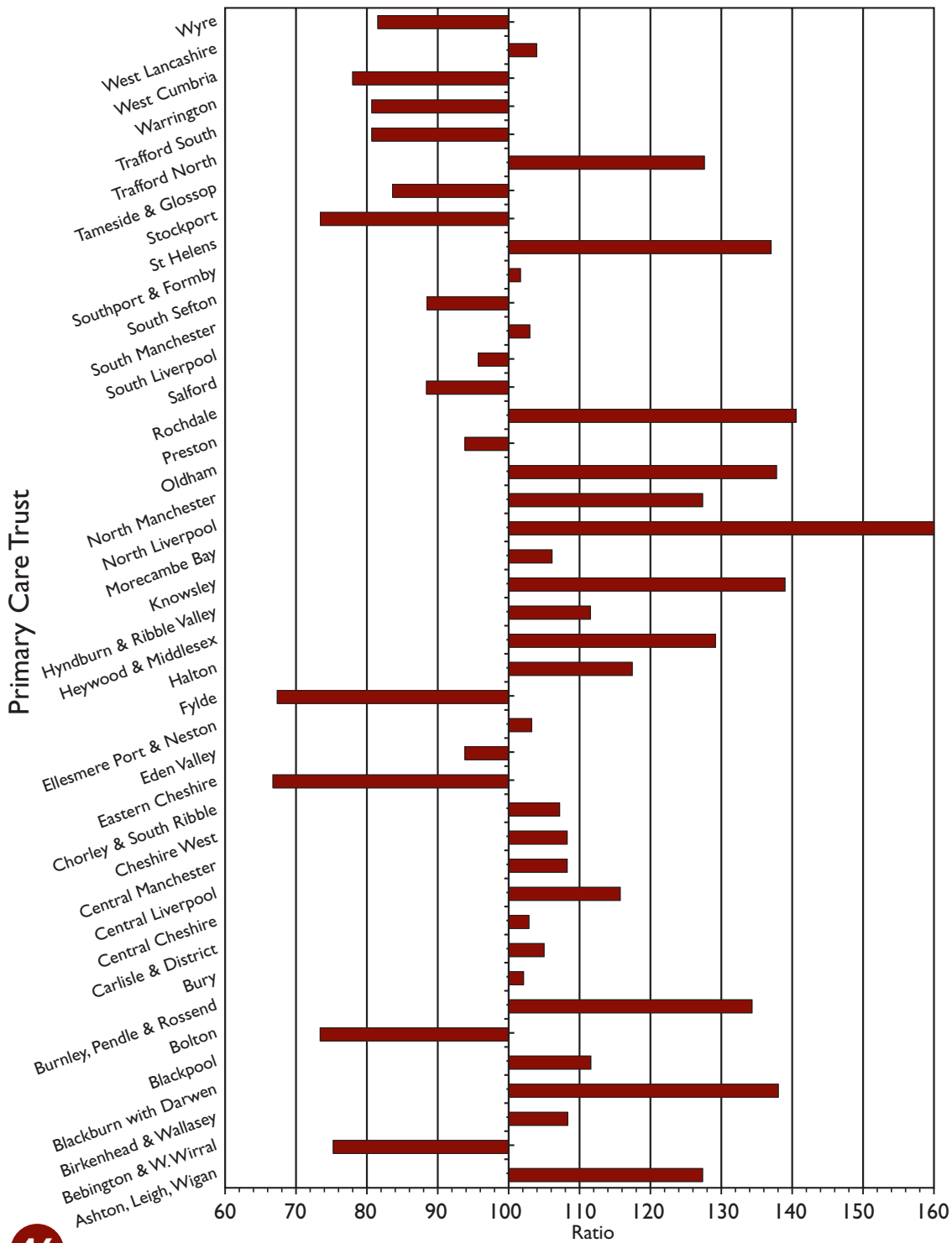
Knowledge about diabetes and its management has been found to be low in the UK population of Pakistani Muslim patients (Hawthorne and Tomlinson, 1999). In this study poorer glycaemic control and poorer knowledge of self-monitoring management and diabetes complications was found in Pakistani women. This 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

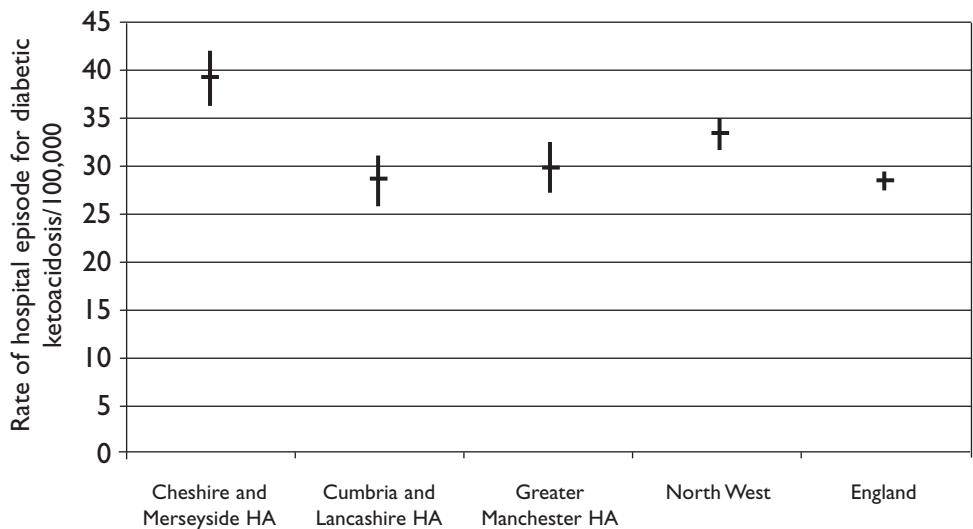


severity of diabetic ketoacidosis can be reduced by the provision of guidance and advice to people with diabetes on how to manage changes in blood glucose control that occur during other illnesses.

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



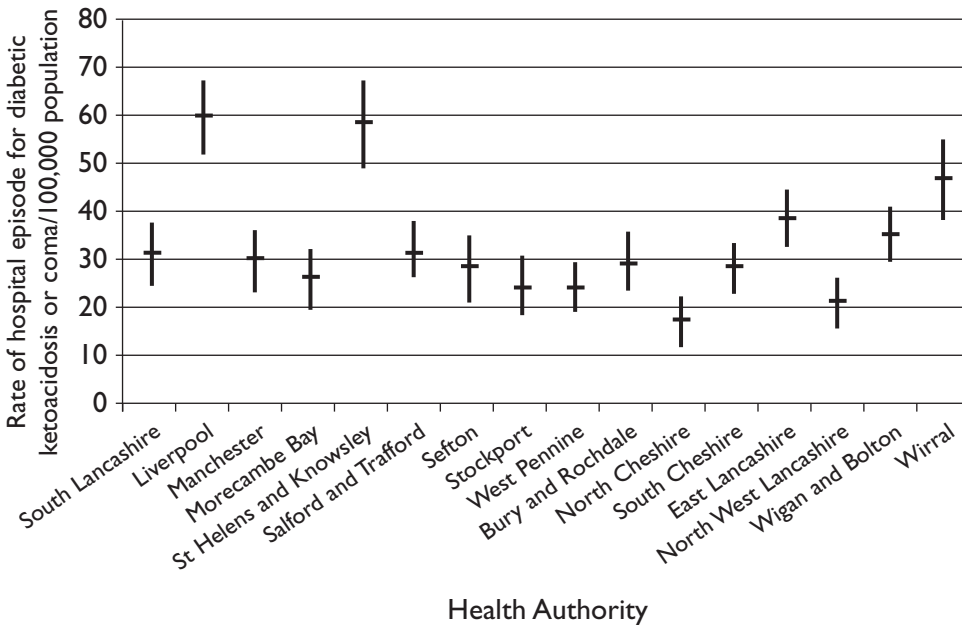
Source: Lakhani *et al*, 2003

[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

Table 8 – Prevalence of complications of diabetes amongst people with newly diagnosed diabetes, United Kingdom, 1977-1991

Complications	%
Retinopathy	21
Abnormal electro-cardiogram	18
Myocardial infarction	2
Angina	3
Intermittent claudication	3
Stroke/transient ischaemic attack	1
Absent foot pulses/ischaemic feet	14
Impaired reflexes/decreased sense of vibration	7
Number of patients	4,072

Source: UK Prospective Diabetes Study Group, 1991

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.

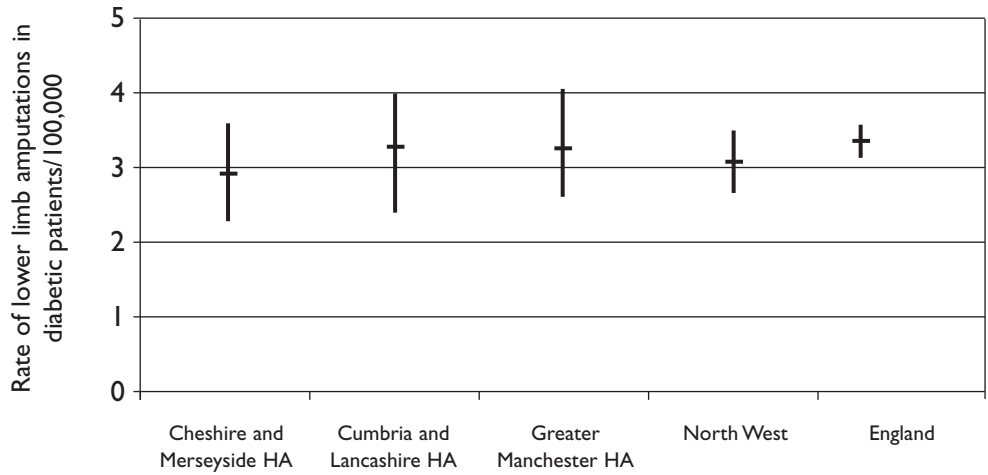
Table 9 – Availability and uptake of retinopathy screening in North West health authorities, 2001/2002

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

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]

Part 2

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/

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

See <http://www.nhsia.nhs.uk/phsmi/pages/ncasp.asp?om=ml> for more details of core dataset developments.

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:

	Kilometres	Miles
Easy/casual	< 3.2	< 2
Normal/average	3.2 – 4.8	2 – 3
Brisk	4.8 – 6.2	3 – 3.9
Run	> 6.2	> 3.9

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.

References

Adil, M. 2003a Quality Indicators from Diabetes Services, 2001. North West Regional Office.

Adil, M. 2003b Diabetes Baseline Assessment 2001-2002. North West Regional Office.

Audit Commission (2000) *Testing times: a review of diabetes services in England and Wales: National Report*. <http://www.diabetes.audit-commission.gov.uk/data.htm> (accessed May 2004).

Bachmann, M and Nelson, S. (1998). Impact of diabetic retinopathy screening on a British district population: case detection and blindness prevention in an evidence based model, *Journal of Epidemiology in Community Health*, 52, 45-52.

Bagga, P., et al (1998). Survey of Diabetic Retinopathy Screening Services in England and Wales, *Diabetes Medicine*, 15,780-782.

Baker, D. and Klein, R., (1991). Explaining outputs of primary care: population and practice factors. *British Medical Journal*, 303, 225-9.

Beaser, R., Richardson, D., and Hollerworth, H., (1994). Education in the treatment of diabetes. In: C. Kahn and G. Weir, eds. *Joslin diabetes mellitus* Philadelphia: Lea and Febiger, pp404-414.

Bendel, N. (2002). *Cancer and inequalities in the North West of England*. Report from the North West Public Health Observatory, Merseyside and Cheshire Zone.

Bridgwood, A., Lilly, R., Thomas, M., Bacon, J., Sykes, W., and Morris, S. (2000). *Living in Britain: Results from the 1998 General Household Survey*. London: The Stationery Office.

Campbell, S., et al (2001). Identification predictors of high quality care in English general practice: observational study. *British Medical Journal*, 323, 1-6.

Chapple, A., and Gatrell, A., (1998). Variations in the use of cardiac services in England: perceptions of general practitioners, general physicians and cardiologists. *Journal of Health Service Research Policy*, 3,153-8.

Chaturvedi, N., Stephenson, J., and Fuller, J., (1996). EURODIAB IDDM Complications Study Group. The relationship between socio-economic status and diabetes control and complications in the EURODIAB IDDM Complications Study. *Diabetes Care*, 19, 423-30.

Charturvedi, N., Jarrett, J., Shipley, M., and Fuller, J., (1998). Socio-economic gradient in morbidity and mortality in people with diabetes: cohort study findings from the Whitehall study and WHO multinational study of vascular disease in diabetes. *British Medical Journal*, 316, 100-6.

Christensen, N., et al (1983). Quantitative assessment of dietary adherence in patients with insulin dependent diabetes mellitus. *Diabetes Care*, 6, 245-250.

Coates, V., and Boore, J., (1996). Knowledge and diabetes self-management. *Patient Education and Counselling*, 29, 99-108.

Commission for Health Improvement (CHI): <http://www.chi.nhs.uk/> (accessed June 2004).

Connolly, V., and Kesson, C., (1996). Socioeconomic status and clustering of cardiovascular disease risk in diabetic patients. *Diabetes Care*, 19, 419-22.

Connolly, V., et al., (2000). Diabetes prevalence and socio-economic status: a population based study showing increased prevalence of type 2 diabetes mellitus in deprived areas. *Journal of Epidemiology and Community Health*, 54,175-177.

Cravey, A., et al., (2001). Developing socio-spatial knowledge networks:

a qualitative methodology for chronic disease prevention. *Social Science and Medicine*, 52, 1763-1775.

Cruickshank, J., et al., (1991). Ethnic differences in fasting plasma C-peptide and insulin in relation to glucose tolerance and blood pressure. *Lancet*, 338, 842-847.

Department of the Environment, Transport and the Regions (2000). Indices of Deprivation 2000. Regeneration Research Summary. Number 31. London: DETR.

Department of Health (1999a). Saving lives: our healthier nation. Cm4386. London: The Stationery Office.

Department of Health (1999b). Geographical Variation in Health Indicators by Health Authority, 1994-96. London: Department of Health.

Department of Health, (2000). *The NHS Plan. A Plan for Investment: A Plan for Reform*. Cm 4818. London: The Stationery Office.

Department of Health (2001a). *National Service Framework for Diabetes*. London: The Stationary Office.

Department of Health (2001b). *Shifting the balance of power within the NHS: Securing delivery*. London: The Stationary Office.

Department of Health (2002a). *National Service Framework for Diabetes: Delivery Strategy*. London: The Stationary Office.

Department of Health (2002b). *Delivering the NHS Plan*. London: The Stationary Office.

Department of Health (2003a). *Diabetes Information Strategy*. London: The Stationary Office.

Department of Health (2003b). *Hospital Episode Statistics, 1999-2002*. London: The Stationary Office.

Department of Health (2003c). *Improvement, Expansion and Reform (Priorities and Planning Framework 2003-2006)*. London: The Stationary Office.

Drever, F. and Whitehead, M., (eds) (1997). *Health inequalities: decennial supplement. DS Series No. 15, Office for National Statistics*. London: The Stationary Office.

Drury, T., Danchik, K., and Harris, M., (1995). Sociodemographic characteristics of adult diabetes. In Tang et al., eds. Gender related differences in the association between socio-economic status and self-reported diabetes. *International Journal of Epidemiology*, 2003, 32, 381-385.

Dunn, N., and Bough, P., (1996). Standards of care of diabetic patients in a typical English community. *British Journal of General Practice*, 306, 630-634.

Evans, J., et al., (2000). Socio-economic status, obesity and prevalence of type 1 and type 2 diabetes mellitus. *Diabetes Medicine*, 17, 478-480.

Goddard, M., and Smith, P., (1998). Equity of access to health care. In E. Goyder et al., (2000) *Inequalities in access to diabetes care: evidence from a historical cohort study*. *Quality Health Care*, 9, 85-89.

Goyder, E., and Botha, J., (2000). Inequalities in access to diabetes care: evidence from a historical cohort study. *Quality in Health Care*, 9, 85-89.

Grimshaw, G.M., et al., (1999). *Report of the Inter-College Audit of Diabetic Retinopathy Screening*. Leicester Clinical Governance research and Development Unit: University of Leicester.

Gu, K., Cowie, C., and Harris, M., (1998). Mortality in adults with and without diabetes in a national cohort of the US population 1971-1993. *Diabetes Care*, 21, 1138-1145.

Hawthorne, K., (1990). Asian diabetics attending a British hospital clinic: a pilot study to evaluate their care. *British Journal of General Practice*, 40, 243-247.

Hawthorne, K., and Tomlinson, S., (1999). Pakistani Moslems with Type 2 diabetes mellitus: effect of sex, literacy skills, known diabetic complications and place of care on diabetic knowledge, reported self-monitoring management and glycaemic control. *Diabetic Medicine*, 16, 591-597.

Health Education Authority (1995). *Physical Activity Update*, London, HEA.

Heath, I. (1995). The mystery of general practice. In S. Campbell, et al., Identification predictors of high quality care in English general practice: observational study. *British Medical Journal*, 323, 1-6.

Helmrich, S., et al., (1991). Physical activity and reduced occurrence of non-insulin dependent diabetes mellitus. *New England Journal of Medicine*, 325, 147-152.

Hjelm, K., et al., (1996). Foreign and Swedish born diabetic patients – a population based study of prevalence, glycaemic control and social position. *Scandinavian Journal of Social Medicine*, 24, 234-52.

Imperial Cancer Fund OXCHECK Group, (1994). Effectiveness of health checks conducted by nurses in primary care: results of the OXCHECK study after the first year. *British Medical Journal*, 308, 308-12.

Ismail, A., et al., (1999). Capture-recapture-adjusted prevalence rates of type 2 diabetes are related to social deprivation. *Quarterly Journal of Medicine*, 92, 707-710.

James, R., et al., (1997). The health of Canadians with diabetes. *Health Report*, 9, 47-52.

Joint Health Surveys Unit (1995). Health Survey for England 1994. London: The Stationery Office.

Joint Health Surveys Unit (1996). Health Survey for England 1995. London: The Stationery Office.

Joint Health Surveys Unit (1997). Health Survey for England 1996. London: The Stationery Office.

Joint Health Surveys Unit (1998). Health Survey for England 1997. London: The Stationery Office.

Joint Health Surveys Unit (1999). Health Survey for England 1998: Cardiovascular Disease, Volume 1: Findings. London: The Stationery Office.

Joint Health Surveys Unit (2000). Health Survey for England 1999. The Health of Ethnic Minorities. London: The Stationery Office.

Joint Health Surveys Unit (2001). Health Survey for England 2000. London: The Stationery Office.

Joint Health Surveys Unit (2002). Health Survey for England 2001. London: The Stationery Office.

Jung, R., (1997). Obesity as a disease. *British Medical Bulletin*, 53 (2), 307-321.

Kawakami, N., et al (1997). Effects of smoking on incidence of non-insulin-dependent diabetes mellitus, *Diabetes Care*, 16, 103-109.

Kelly, W., et al., (1993). Influence of social deprivation on illness in diabetic patients. *British Medical Journal*, 307, 1115-6.

Kelly, W., et al., (1994). Geographical mapping of diabetes patients from the deprived inner city shows less insulin therapy and more hyperglycaemia. *Diabetes Medicine*, 11, 344-8.

Khunti, K., et al., (1999). Quality of care of patients with diabetes: collation of data from multi-practice audits of diabetes in primary care. *Family Practice*, 16, 54-59.

Khunti, S., Ganguli, S., and Lowy, A., (2001). Inequalities in provision of systematic care for patients with diabetes. *Family Practice*, 18 (1), 27-32.

King, H., Aubert, R., and Herman, W., (1998). Global Burden of Diabetes, 1995-2025: Prevalence, numerical estimates and projections. *Diabetes Care*, 21, 1414-1431.

Kriska, A., and Bennett, P., (1992). An epidemiological perspective of the relationship between physical activity and NIDDM: from activity assessment to intervention. *Diabetes Metabolism Review*, 8, 355-72.

Kumar, S., et al., (1994). The prevalence of foot ulceration and its correlates in type 2 diabetic patients: a population based study. *Diabetes Medicine*, 16, 801-812.

Lakhani, A., Olearnik, H., Eayres, D. (eds.). *Compendium of Clinical and Health Indicators 2002*. London: Department of Health/National Centre for Health Outcome Development, 2003.

MacLeod, B., Thompson, J., and Rosenthal, A., (1988). The prevalence of retinopathy in the insulin-requiring diabetic patients of an English country town, *Eye*, 2, 424-430.

Manson, J., et al., (1991). Physical inactivity and reduced occurrence of non-insulin dependent diabetes mellitus in women, *Lancet*, 338, 774-78.

de Marco, R., et al., (1999). Cause-specific mortality in type 2 diabetes: the Verona Diabetes Study. *Diabetes Care*, 22, 756-761.

McKeigue, P., et al., (1988). Diabetes, hyperinsulinaemia, and coronary risk factors in Bangladeshis in East London, *British Heart Journal*, 60, 390-396.

Meadows, P., (1995). Variation of diabetes mellitus prevalence in general practice and its relationship to deprivation, *Diabetes Medicine*, 12, 696-700.

Mokdad, A., Engelgau, M., and Ford, E., (2000). Diabetes trends in the US: 1990-1998. *Diabetes Care*, 23, 1278-1283.

Moss, S., Klein, R., and Klein, B., (1991). Cause-specific mortality in a population based study of diabetes. *American Journal of Public Health*, 81, 1158-1162.

Most, R.I., et al., (1986). The accuracy of glucose monitoring by diabetic individuals in their home setting. In: V. Coates and J Boore (1996). Knowledge and diabetes self-management, *Patient Education and Counselling*, 29, 99-108.

Murray, C., and Lopez, A., (1996). Global Health Statistics: Global Burden of Disease and Injury 30. In N. Roper et al. (eds.) (2002). Cause-specific mortality in a population with diabetes: South Tees Diabetes Mortality Study. *Diabetes Care*, 25, 43-48.

National Audit Office (2001). Tackling Obesity in England. Report by the Controller and Auditor General HC220, Session 2000-2001, London: The Stationary Office.

Nazroo, J., (1997). *The health of Britain's ethnic minorities: findings from a national survey*. London: Policy Studies Institute.

Neil, H., et al., (1989). Diabetes in the elderly: The Community Oxford Study. *Diabetes Medicine*, 6, 608-613.

North West Public Health Observatory (2003) Index of Multiple Deprivation 2000 in the North West primary care trusts. <http://www.nwpho.org.uk/home.asp> (accessed June 2004).

North West Public Health Observatory
<http://www.nwpho.org.uk/home.asp> (accessed June 2004).

Office of National Statistics, (2000). Key Health Statistics from General Practice 1998, The Stationery Office: London.

Office of National Statistics, (2003). 2001 Census. The Stationery Office: London.

Office of Population Censuses and Surveys (1992). Health Survey for England 1991, The Stationery Office: London.

Office of Population Censuses and Surveys (1993). Health Survey for England 1992, The Stationery Office: London.

Office of Population Censuses and Surveys (1993). 1991 Census, London, HMSO.

Office of Population Censuses and Surveys (1994). Health Survey for England 1993, The Stationery Office: London.

Payne, J., and Saul, C., (1997). Variations in the use of cardiology services in a health authority: comparison of coronary artery revascularisation rates with the prevalence of angina and coronary mortality. *British Medical Journal*, 314, 257-61.

QUIDS. Quality Indicators from Diabetes Services <http://www.quids.org.uk/> (accessed June 2004).

Raymond, N., et al., (1995). Insulin treated diabetes mellitus: causes of death determined from record linkage of population based registers in Leicestershire, UK. *Journal of Epidemiology and Community Health*, 49, 570-574.

Reilly, J., and Dorosty, A., (1999). Epidemic of obesity in UK children. *Lancet*, 354, 91-93.

Rimm, E., Manson, J., and Stampfer, M., (1993). Cigarette smoking and the risk of diabetes in women. *American Journal of Public Health*, 83, 211-214.

Rimm, E., et al., (1995). Prospective study of cigarette smoking, alcohol user, and risk of diabetes in men. *British Medical Journal*, 310, 555-559.

Riste, L., Khan, F., and Cruickshank, K., (2001). High prevalence of Type 2 diabetes in all ethnic groups, including Europeans, in a British inner city. *Diabetes Care*, 24, 1377-1383.

Roper, N., et al., (2001). Excess mortality in a population with diabetes and the impact of material deprivation: longitudinal, population based study. *British Medical Journal*, 322, 1389-1393.

Roper, N.A., et al., (2002). Cause-specific mortality in a population with diabetes: South Tees Diabetes Mortality Study. *Diabetes Care*, 25, 43-48.

Simmons, D., Williams, D., and Powell, M., (1989). Prevalence of diabetes in a predominantly Asian community: preliminary findings of the Coventry Diabetes Study. *British Medical Journal*, 298, 18-21.

Simmons, D., Williams, D., and Powell, M., (1991a). The Coventry Diabetes Study: Prevalence of Diabetes and Impaired Glucose Tolerance in Europeans and Asians. *Quarterly Journal of Medicine*, 81 (296), 1021-1030.

Simmons, D., Meadows, K., and Williams, D., (1991b). Knowledge of diabetes in Asians and Europeans with and without diabetes in Asians and Europeans with and without diabetes: the Coventry Diabetes Study. *Diabetes Medicine*, 8, 651-656.

Simmons, D., and Williams, D., (1992). Diabetes in the Elderly: An Under-diagnosed Condition. *Diabetic Medicine*, 10, 264-266.

Sinclair, A., et al., (2001). Prevalence of diabetes in care home residents. *Diabetes Care*, 24, 1066-1068.

Stevens, A. and Raftery, J. (1994). *Health care needs assessments, Volume 1*, London: Radcliffe Medical, 31-56.

Tang, M., Chen Y., and Krewski D., (2003). Gender-related differences in the association between socioeconomic status and self-reported diabetes. *International Journal of Epidemiology*, 32, 381-385.

Targher, G., et al., (1997). Cigarette smoking and insulin resistance in patients with non-insulin-dependent diabetes mellitus. *Journal of Clinical Endocrinology and Metabolism*, 82, 3619-3624.

Townsend, P., Phillimore, P., and Beattie, A. (1998). Health and Deprivation: Inequality and the North. London: Routledge.

Tuomilehto, J., et al., (2001). Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. *New England Journal of Medicine*, 344, 1343-1350.

UK Prospective Diabetes Study Group, (1991). UK Prospective Diabetes Study (UKPDS) VIII. Study design, progress and performance. *Diabetologia*, 34, 877-890.

UK Prospective Diabetes Study (UKPDS) Group (1998a). Intensive blood glucose control with sulphonylureas or insulin compared with conventional treatment and risk of complications in patients with type 2 diabetes (UKPDS 33). *Lancet*, 352, 837-853.

UK Prospective Diabetes Study (UKPDS) Group (1998b). Tight blood pressure control and risk of macrovascular and microvascular complications in type 2 diabetes (UKPDS 38). *British Medical Journal*, 317, 703-713.

Unwin, N., Watson, W., and Harland, J., (1995). Social class differences in the prevalence of glucose intolerance. *Diabetes Medicine*, 12, 531.

Vilbergsson, S., et al., (1998). Coronary heart disease mortality amongst non-insulin dependent diabetes subjects in Iceland: the independent effect of diabetes: the Reykjavik Study 17 year follow-up. *Journal of International Medicine*, 244, 309-316.

Waller, D., *et al.*, (1990). Health checks in general practice: another example of inverse care? *British Medical Journal*, 300, 1115-18.

Walters, D., (1992). The distribution and severity of diabetic foot disease: a community based study with comparisons to a non-diabetic group. *Diabetes Medicine*, 9, 354-358.

Watkins, J., *et al.*, (1967). Observation of medication errors made by diabetic patients in the home, *Diabetes*, 16, 882-885.

Whitehead, M., and Hanratty, B., (2004) Health care for rich and poor alike. In: Healy, J. and McKee, M., (eds) *Accessing health care: responding to diversity*. Oxford: Oxford University Press.

Williams, D., Wareham, N., and Brown, D., (1995). Undiagnosed glucose intolerance in the community: the Isle of Ely Diabetes Project. *Diabetes Medicine*, 12, 30-35.