

1. Background: Type 2 Diabetes Epidemic

Diabetes is a life-long, long-term condition caused by insufficient insulin or by insulin not working properly in the body. Insulin is a hormone produced by the pancreas. It helps to move glucose (or sugar) from the blood into the body's fat cells. A lack of insulin or its inability to function results in high blood sugar levels and hence diabetes.

In Type 1 diabetes the pancreas cannot produce sufficient insulin. It is not clear how this is caused but it appears to be an autoimmune disorder which is triggered by a variety of agents and possibly related to genetic abnormalities. Type 1 diabetes does not seem to be related to exercise or peoples' lifestyles. About 10 to 20% of people with diabetes have Type 1 diabetes. The total number of people with Type 1 diabetes is on the increase. It doubles about each decade¹⁴.

Somewhere between 80 to 90% of people with diabetes have Type 2 diabetes¹⁵. Type 2 diabetes is characterised by a deficiency of insulin as well as an inability of insulin to work properly in the body (insulin resistance). The causes of Type 2 diabetes also are not well known but seem to be linked closely with obesity, high blood pressure, and high lipid levels. Type 2 diabetes is increasing enormously with the modern lifestyle of too little exercise and fat rich diets¹⁶.

Impaired Glucose Tolerance (IGT) is now accepted by official professional groups as a precursor of Type 2 diabetes¹⁷. In IGT, the surviving mass of beta cells producing insulin cannot keep the blood sugar transported safely into fat cells at all times, especially after a glucose absorbed challenge. Many people with IGT will lose more insulin producing beta cells and develop Type 2 diabetes in the next 5 to 10 years.

Diabetes is not new to New Zealand. The growth in incidence and prevalence of diabetes has been steadily climbing for many years¹⁸ but the actual number of those already with diabetes and the total cost of diabetes is unknown. Diabetes is included within the Ministry of Health's thirteen health priorities for 2001. At the time of this study, however, there are only two full-time equivalent dedicated staff members concentrating on diabetes within the Ministry of Health. Government spending on diabetes (and research into its rising prevalence) has been falling in recent years¹⁹.

The publicly-funded services for people with diabetes define universal eligibility but are not designed for easy access and availability. The existing services have been adapted to manage within limited budgets and there is, effectively, a rationing strategy. In a practical sense, this means waiting lists for procedures and specialist visits, inadequate access to nurses for education and to dietitians for dietary advice.

¹⁴ Scott R, Brown L, 1991.

¹⁵ Alberti K, Zimmet P, 1998.

¹⁶ Burke J, Williams K, Gaskill S et alia, Results from San Antonio Heart Study, 1999.

¹⁷ New Classification and Criteria for Diagnosis of Diabetes Mellitus, a Joint Statement, 1999.

¹⁸ National Diabetes Working Group Annual Report 1999-2000.

¹⁹ New Zealand Health Research Council, 2001 [information supplied by].

The result is that many people with diabetes may continue to follow an inappropriate diet, are not encouraged to exercise more and do not have access to services to teach them how to manage to keep their blood glucose in the normal range. Government health policy has relied on this rationing strategy as a way to manage funding of health care. This produces a particularly harsh outcome for people with diabetes – they are more likely to develop complications from their disease like blindness, kidney, stroke or heart disease at an earlier age if blood sugars remain elevated.

The nature of diabetes is such that time is of the essence. The earlier an intervention, the more effective the treatment. An effective early intervention will, at least, delay the onset of complications, and provide the patient with an increased quality of life²⁰. Intervention received in the later stages of diabetes is usually aimed at treating complications acquired after years of raised blood sugars²¹. These later interventions are mainly focused on treating the symptoms and will be largely ineffective at preventing physiological change such as visual impairment including blindness, renal failure, lower limb amputation, stroke, coronary disease or sudden death.

Table 1: 10 Key Diabetes Facts

Fact One:	Approximately 105,000 people in New Zealand currently know they have Type 2 diabetes
Fact Two:	Undetected cases may be higher than 50,000 – but no one knows because of lack of universal screening
Fact Three:	Maori are facing at least a 90% increase in prevalence in the next 20 years (rising to approximately 47,000 people)
Fact Four:	Pacific Islanders are facing at least a 109% increase in prevalence in the next 20 years (approximately 18,000 people)
Fact Five:	Europeans are facing at least a 39% increase in prevalence in the next 20 years (approximately 101,000 people)
Fact Six:	New Zealand is facing an obesity epidemic ²² , so the above forecasts are likely to be underestimated
Fact Seven:	International research indicates that Type 2 diabetes and its complications may be substantially preventable
Fact Eight:	There is limited data collected on diabetes patients and diabetes outcomes. New Zealand specific research on diabetes is even more limited, so the extent of complications is not fully understood
Fact Nine:	Diabetes related complications are some of the most expensive medically, economically and socially ²³
Fact Ten:	There are currently no plans for diabetes prevention, education or for additional services related to avoiding diabetes-related complications within the Ministry of Health for the 2001/2002 and future years.

Source of facts: *Diabetes 2000*, Health Funding Authority, March 2000.

²⁰ Smith R, Mann J, 1999; UK Prospective Diabetes Study UKPDS 34.

²¹ Niccolucci A et alia, 1996.

²² Wilson B, Wilson N, Russell D, 2001.

²³ American Diabetes Assn, 1997; National Institute of Health (USA).

The New Zealand diabetes literature includes many papers and reports generated by both medical professionals and other Ministry of Health sources, outlining the potential epidemic of Type 2 diabetes in New Zealand. This has been known from as early as 1988, despite the continual efforts of health professionals to highlight the benefits of proper management of Type 2 diabetes and the potential costs to the country, action has not been taken which recognizes the extent of the problem.

If action is not taken to improve the level of services, their appropriateness, access and availability will worsen. The current Ministry of Health's incremental service increase strategy, as well as its limited research budget and lack of good evidence about diabetes, will spread this epidemic rather than manage it.

As a result of the lack of strategic planning and monitoring, more and more people are developing complications from Type 2 diabetes. This means treating diabetes could become unaffordable in the future, and will crowd resources that would otherwise be available for other types of disease. A comprehensive report, *Diabetes 2000*, was published by the Health Funding Authority (HFA) during its final year of existence.²⁴ The HFA's fact sheet indicates there will be at least 60,000 more (i.e. an increase of nearly 60%) with diagnosed Type 2 diabetes by 2021. This is likely to be a conservative estimate as New Zealand does not have good reliable statistical data on the use of medical services by people with diabetes.

Services for people with diabetes incur large costs in our hospitals²⁵. Diabetes complications, such as heart disease, blindness, kidney failure and lower leg amputations, are major contributors to the burden of disability experienced by people with diabetes²⁶.

Some people are admitted to hospital with infections/pneumonia and/or urinary tract infections and then found to have diabetes. These other diseases could have been exacerbated by lack of insulin leading to the admission for septicaemia, carbuncles or other cystic conditions.

The complications of diabetes also lead to increased costs of social welfare and reduced productivity which are not discussed in this report, but only the direct health costs are projected.

Results of this study suggest that by implementing more services aimed at the prevention or at the improved management of diabetes, the net cost to the taxpayer for diabetes will be less over the next 20 years.

²⁴ *Diabetes 2000*.

²⁵ Beavan D, Hegan K, 2000; Krebs J, 2000; Krebs J, Robinson G, Smith R et alia, 2000; Simmons D, Thomson C, Scott D, 1994; Simmons D, Laughton S, 1993; Bourn D, Mann J, 1992.

²⁶ HFA Quarterly Report – Diabetes Section Source Website, 2000.

1.1 Purpose of this study

This study was commissioned by Diabetes New Zealand and carried out by PricewaterhouseCoopers. Diabetes New Zealand, with 35 member societies, represents all New Zealanders with diabetes. Several focused workshops with those expert in providing diabetes services were held to provide a basis for specifying the key drivers of costs in treating Type 2 diabetes. Based on this evidence, a simple model has been constructed to understand the implications of these cost drivers for the government-funded health sector.

The overall purpose of this study was to estimate the financial impact of our current inadequate service compared with an adequate service funding approach for Type 2 diabetes over the next 20 years. It compares the direct impact costs of publicly provided health services under three scenarios. The current publicly funded health services (Scenario 1) focus on treating people when they need acute care for any diabetes-related complications. This study shows how more targeted services (Enhanced Services – Scenario 2) or services aimed at preventing diabetes-related complications (More Optimal Services – Scenario 3), cost less over time (even though available to a greater number of people). This is because there is now good evidence that such services slow the increase in the incidence of diabetes and assist in managing, delaying and even preventing some of the (many of the worst) complications²⁷.

The primary objectives of this study have been to:

- **Estimate the potential costs**, if the current and future Governments continue to ignore the implications of the expected diabetes epidemic in progress
- **Explore the potential for an improved service approach to improved outcomes and estimate the potential cost savings** of enhanced services approach and of an optimal service approach.

Other objectives of this study have been to:

- Describe the direct and indirect outcomes of a preventive funding approach versus the current spend in services (i.e. investment in services today will save the high costs of complications which may crowd out of other services in the future)
- Research the international medical literature and discuss the implications for the New Zealand situation in view of the lack of local research and data
- Illustrate the costs of complications that people with diabetes can develop during their lifetime, which could have been avoided, if more services were available and delivered in a timely manner
- Highlight the importance of a change in current health funding priorities
- Provide a document for discussion and decision about the combination of services which provide maximum benefit to people with diabetes.

²⁷ Australian Guidelines, 2000; Skyler J, 1999; The Diabetes Control & Complications Trial Research Group, 1995; Smith R, Mann J, 1999; United Kingdom Prospective Diabetes Study UKPDS 34; UKPDS 38, UKPDS 46.

This study estimates the costs of the three different scenarios for service delivery: current, enhanced and more optimal.

Diabetes impacts on the person with diabetes, their family, whanau, working life and communities. An active preventive and education programme would have benefits far beyond financial savings. It would add considerably to the quality of life of people with diabetes, reduce the stress on other family and whanau members, improve overall productivity and better local communities.

Diabetes is a disorder which affects individuals in many different ways. This study focuses on the financial costs of policy decisions surrounding Type 2 diabetes service provision. It does not fully cost the sociological, psychological or workplace costs of this disorder in the community. The *Diabetes 2000* report expects Type 2 diabetes to increase significantly in the next 20 years. Other studies suggest that those diagnosed with diabetes are only part of the picture and that further pressure on health services will come from those with undiagnosed diabetes and IGT.

Note that in New Zealand, practical experience has played a key role in the conclusion reached here because good data-based research has not received adequate funding and this has limited policymaking and strategies to control diabetes during the past decade.

A quote from the International Diabetes Federation²⁸ summarises the key issues:

“.... in a world in which the prevalence of diabetes is rising steadily and the availability and buying power of the health-care dollar is dwindling, the need to look rationally at the way we provide diabetes health care is of prime importance. Governments around the world must invest in prevention. If they fail to act they will find that the complications of diabetes will not only drain their financial resources, but also have knock on effects on mortality, employment and quality of life”

Maria L de Alva
IDF President 1998-99

International research, supported by the New Zealand research that has been resourced, indicates that there are ways to greatly enhance the effectiveness of services directed at people with diabetes. Initially, this would mean an increase in expenditure on services to those with a propensity towards diabetes which are designed to be more accessible, available and affordable including more research and services which are aimed at education and communication.

²⁸ International Diabetes Federation 1999 IDF1(a).

Such services could be regarded as an investment, however, as the available evidence indicates that through enhanced service provision, primary, secondary and public health will result in better outcomes for people with diabetes²⁹. The longer-term result is a healthier population and more effective workforce. A more direct result is that these services will lead to reduced severity of Type 2 diabetes and hence, lower the risk of increased acute care which, given the diabetes epidemic, could crowd other health services.

Effective diabetes services focus on:

Education
 Nutrition
 Exercise
 Self Monitoring of Blood Glucose
 Screening

1.2 Current Health Spending in New Zealand

Total government-funded health care expenditure in New Zealand in 1999 was approximately \$8.4 billion³⁰ in nominal terms.

New Zealand’s publicly-funded health expenditure as a percentage of Gross Domestic Product was 6.5% in 1998/99³¹. This percentage is low by OECD standards – many developed countries spend closer to 10% of their GDP on health services and the United States spends an even larger proportion.

Given New Zealand’s low level of GDP and the depreciating exchange rate, the actual resources available to the government for any form of health spending are low by international standards. As a result, most government health services are rationed and their budgets are calculated to fit within the government’s health priorities. Hence, it is necessary to prioritise so that the health services provided are as effective as possible. Ideally the, the priorities should be based on the outcomes identified when funding decisions are made.

The real cost of diabetes is unknown. *Diabetes 2000* estimates that current funding for diabetes and diabetes related complications was \$160 million in 1998/99. This is broken down as follows:

²⁹ Eriksson K, Lingarde E, 1991; US Senate Committee item on Health Report, 1999; Beavan D, Hegan K, 2000; Burke J, Williams K, Gaskill S et alia, Results from San Antonio Heart Study 1999; Simmons D, Kenealy T, Beavan D, 1999; Skyler J, 1999; The Diabetes Control & Complications Trial Research Group, 1995.

³⁰ Ministry of Health, 2000.

³¹ Ministry of Health, 2000.

Table 2: Estimated Health Funding for Diabetes

Funding for Diabetes Health Services 98/99		\$m
Inpatient costs		80
Outpatient costs		10
Primary Care		70
Total Health Vote Funding for diabetes		160*
Patient user pay charges		35
Total known cost of diabetes health services		195

Source: *Diabetes 2000*, Health Funding Authority, Wellington, NZ

The *Diabetes 2000* record of the cost of diabetes services, based on identified spending for diabetes services in 1998/99, is significantly lower than estimated by other health researchers.

Some examples of other estimates include:

- In 1988, Neal and Beaven estimated the total economic cost of diabetes at \$450 million, of which \$242 million was in direct medical costs³²
- Simmons estimated in 1996 that the direct health care costs of diabetes lie between \$250 and \$600 million³³. Simmons' cost for hospital alone was \$200 million in contrast to the Ministry of Health identified costs of \$90 million.

The differences in estimates of the direct health cost of diabetes between *Diabetes 2000* and other research come about because, in the absence of a formal identification of people with diabetes (such as a register), it is not possible to accurately determine what services all people with diabetes are receiving or using. Further, in the absence of universal screening services, there are many people with undiagnosed diabetes or IGT who may only show up in the statistics once they suffer an identified (often acute) hospital admission.

Routinely collected hospital statistics, using International Classification of Diseases (ICD9) coding, are shown to severely underestimate the number of in-patients with diabetes (Dunedin by 29%³⁴, Middlemore surgical by 75%³⁵, Middlemore medical by 25%³⁶).

The results shown in these studies further back up evidence from Scott Brown, and Clifford 15 years ago of 33% accuracy when 33,000 case records were reviewed. Medical professionals believe that hospital statistics are underestimating treatment rates for people with diabetes. This suggests that the taxpayer's total health cost of diabetes is (far) greater than the officially recorded figures³⁷.

³² Neal, D and Beaven, D 1988.

³³ Simmons D, 1996.

³⁴ Phillips DE, Mann JI, 1991.

³⁵ Simmons D, Laughton SJ, 1993.

³⁶ Bhoopatkar H, Simmons D, 1994.

³⁷ Beaven D, Hegan K, 2000; Krebs, Robinson G, Smith R et alia, 2000.

For the purpose of our simple model, Simmons’ estimates are used to calculate actual base year funding for hospitalisation. Although \$200 million is considerably more than the \$90 million identified by the HFA, it is conservative compared to other evidence. Our estimated base year funding does not adjust for the possibility that primary care spending is also likely to be higher because of GPs providing services for diabetes symptoms without formally identifying that the person has diabetes.

Table 3: Estimated Health Funding for Diabetes

Funding for Diabetes Services 98/99³⁸		PwC Estimate ^(b)
	\$m	\$m
Inpatient costs	80	180 ^(c)
Outpatient costs	10	20 ^(c)
Primary Care	70	70
Total Health Vote Funding for diabetes	160^(a)	270

^(a) Source: *Diabetes 2000*, Health Funding Authority

^(b) Based on actual hospitalisation

^(c) Source: Based on Simmons, NZ Medical Journal 1996

1.3 Diabetes Direct, Indirect and Intangible Costs

Diabetes costs include:

- (a) Direct health costs
- (b) Indirect health costs
- (c) Intangibles costs.

(a) Direct Costs to the Health-Care Sector

Direct medical costs for diabetes currently cover a diverse range of health services. These range from relatively low-cost services – primary care consultations and hospital outpatient episodes – to very high-cost services such as long hospital inpatient stays for the treatment of complications such as yearly dialysis. Dialysis costs approximately \$25,000 per year per patient. These services are described in later sections from the perspective of availability, access, the requirements of typical cases with diabetes and the associated costs.

³⁸ *Diabetes 2000*.

Hundreds of acceptable scientific studies agree that people with Type 2 diabetes have an increased risk of:

Early death
Blindness
Heart disorders
Renal failure
Feet problems
Amputations
Stroke

The International Diabetes Federation estimates that based on the assumption that the prevalence of diabetes in any country is 6%, the cost of healthcare for a person with diabetes is 2.5 times higher than that of a person without diabetes³⁹. A similar American study showed that healthcare expenditures are as much as five times as high for people with diabetes as for people without diabetes⁴⁰. Cost analysis studies have demonstrated that the major proportion of healthcare expenditures for diabetes, approximately 75% of direct medical costs, may be attributed to hospital care associated with treatment of late, end-stage, microvascular, neuropathic and cardiovascular complications of diabetes⁴¹. To conclude, the direct medical costs of diabetes complications are enormous.

Yet, the international research based on the experience of good treatment to avert and/or better manage diabetes indicates that many of these high medical costs are preventable.

(b) Indirect Costs

Indirect costs represent the present and future opportunities lost to the individual as a consequence of the disease in question⁴². Many people with diabetes may not be able to continue working or many are not able to work as effectively as they could before the onset of their condition. This is especially true as the length of time since the first diabetes condition increases. Transport costs, sickness absence, disability, premature retirement or premature mortality can cause loss of productivity. This has negative impacts on both the quality of life of the person with diabetes at home and in the community and the output of the economy.

³⁹ International Diabetes Federation, 1999 IDF1(c).

⁴⁰ American Diabetes Association, 1998.

⁴¹ American Diabetes Association, 1993; Rubin RJ, Altman WM, Mendelson DN, 1994.

⁴² TJ Songer, 2000.

Recent estimates of the indirect costs of diabetes compared to estimates of the direct health care costs show that the indirect costs are likely to be higher than the direct costs⁴³. All international figures show that community medical costs for diabetes are equal to hospital only costs and that indirect costs are at least twice or double the medical costs. The indirect costs that New Zealand faces from an increase in the prevalence of diabetes is very important when considering the impact of diabetes.

A particular concern is that Type 2 diabetes hits people in the economically productive age groups (i.e. the 40-64 year band). Further, the propensity towards Type 2 diabetes increases with age⁴⁴. New Zealand faces an ageing population over the next 20 years with an expansion of the 45-64 age group compared to the 20-44 age group.

(c) Intangible Costs

Intangible costs cover the following

- Psychosocial costs – stress, pain, anxiety
- Life expectancy
- Quality of life
- Discrimination in employment as consequence of the loss of productivity associated with diabetes

1.4 Conclusion: Focus on Direct Costs

Indirect costs and intangible costs of diabetes are likely to be high. This study models the **direct (government-funded) health costs only caused by the Type 2 diabetes epidemic**. The focus solely on government health services still paints a very dramatic picture, both in relation to the health outcomes for people with diabetes and the burden of expenditure for diabetes services in relation to the rest of the health spending. But as the case studies describe, there are many other costs of diabetes. It is important to remember when reading the results of this study, that the direct costs potentially reflect less than 50% of the real cost of diabetes to New Zealand in terms of premature death⁴⁵, poor health, stresses on family and community life and reduced productivity.

⁴³ International Diabetes Federation, 1999.

⁴⁴ Lintott C, Hanger H, Scott R et alia, 1992.

⁴⁵ Melville A, Richardson R, Listerssharp et alia, 2000; Gu, K, Cowie C, Harris M, 1998.