

7. The Case Studies

This section describes six typical cases. The cases show the diversity of people entering the New Zealand health system with Type 2 diabetes. The key characteristics of each patient have been determined by consultation with diabetologists and other health organisation professionals such as the National Heart Foundation.

The following case studies indicate the different ways that people with diabetes access the health system:

- Person with known diabetes and self-management capacity on good income
- Person on a good income unaware of IGT status but who has self-management capacity when diagnosed
- Person with known diabetes with a middle to low income who has a poor diet and inactive lifestyle
- Person unaware of IGT status with a middle to low income who has a poor diet and inactive lifestyle
- Person with known diabetes from a low socio-economic group
- Person unaware of IGT status from a low socio-economic group

The case studies reflect the consequences of different lifestyles. Differences in propensity for Type 2 diabetes are largely a matter of lifestyle. Some research also sees ethnicity as a key factor. However, the likelihood of developing severe complications is highest in the low socio-economic group. While Maori and Pacific Island people do not predominate in this group, they are over-represented in proportion to their share of the population and this is one reasons that they are more likely to suffer from the more severe complications of diabetes than Europeans.

The case studies are neither gender nor ethnicity specific. In understanding their implications, though it is important to keep in mind that:

- 1 The prevalence of diabetes in Pacific Island and Maori populations is expected to grow significantly by 2020⁸¹.
- 2 There are important differences in requirements of Europeans, Pacific Islanders and Maori for services provided by the health sector.

⁸¹ *Diabetes 2000*

Currently, the (limited) available information finds that on average, Pacific Island and Maori people with diabetes are not accessing the services to manage their blood sugar levels as frequently as Europeans.

Access by Maori and Pacific Island people has a lot to do with the way services are delivered, who delivers them and where and when they are delivered. Closer examination of existing services to the three populations groups of people with diabetes and people with IGT shows that outcomes sought by the Ministry of Health to better meet the needs of Maori and Pacific Island people with diabetes cannot be achieved under the current structure of services.

Two groups of people are described by the case studies:

- People with diagnosed diabetes or with diabetes which was undiagnosed
- People with impaired glucose tolerance (IGT).

By dividing people up in this way, it is possible to discuss the potential differences in outcomes when diabetes services are widened to include universal services aimed at prevention and screening. It shows that prevention and screening are important complements to services provided only when diabetes has been diagnosed and is being well managed.

7.1 People Diagnosed with Diabetes

This section describes typical cases of people with diabetes who are aware that they have diabetes. It describes how increased access to timely services can improve the outcomes in terms of reducing or delaying the incidence and severity of complications. This is by means of early diagnosis, awareness and acceptance of the need for education and change in lifestyle.

The list of complications generally suffered by people with diagnosed Type 2 diabetes is relatively high, compared to many other health disorders. In summary these complications are:

- Retinopathy (which can lead to blindness – 50% of those with diabetes have some background retinopathy at 15 years after diagnosis)
- Kidney disease (diabetic nephropathy, now the leading cause of end stage renal failure in New Zealand, should be preventable)⁸²
- Peripheral and autonomic neuropathy (damage to nerves especially to pelvic area and legs). Up to 70% of older persons with diabetes have some recognisable neuropathy
- Coronary heart disease

⁸² Simmons 1996; Melville A, Richardson R, Listersharpe et alia, 2000.

- Sudden death
- Hypertension – at least 20%- 30% prevalence
- Stroke (several times more likely than for non-diabetic people)
- Peripheral vascular disease (together with neuropathy, can lead to toe or lower limb amputations).

The basis for the enhanced services and optimal services scenarios is supported by international research, which finds that more focused care and control of patients daily blood glucose and blood pressure will produce fewer complications⁸³.

The case studies compare outcomes based on the following:

- Early diagnosis of complications
- An emphasis on management of diabetes by both patient and medical professionals, called “Shared Care”

Although the characteristics described as ‘typical’ have been based on actual experience in the population to date, it is important to be careful when distinguishing cause and effect. For example, ethnicity alone does not explain the outcomes. If a European man worked part-time and had a BMI index over 35, a sedentary lifestyle with a high fat diet, then his experience with diabetes complications would be similar to those of a Pacific Islander with the same background. In effect then, the case studies portray why treatments need to vary according to the unique needs of the person.

Further, in a budget-constrained health service, a homogeneous generic approach to service entitlement will result in widening the gaps in services for people with diabetes. This is because those people from the highest socio-economic groups have knowledge of ways to manage the disease and will take up every service available at little or no cost. In contrast, the barriers detailed in section 3, as well as a fear of facing up to the reality of diabetes, may limit the number and type of health services accessed by those people with diabetes in the lower socio-economic groups.

Perhaps more than any other condition, diabetes draws a clear delineation between entitlement and delivery, between service location and service availability and accessibility. The person with known diabetes and self-management capacity is likely also to be positioned to take time off work to access services. In contrast, the people on lower incomes find it more difficult to access services but also lack the resources to otherwise change their lifestyles.

⁸³ S.Bjork, 2000; UKPDS Studies, 1998-2000.

7.1(a) Person with known diabetes and self-management capacity on good income

<i>This person has the following characteristics</i>	
1. Age	50 years old
2. Employment status	Works in an office
3. BMI index	Over 30
4. Exercise levels	Plays one round of golf per month
5. No of children	Not applicable
6. No of alcoholic drinks per week	2-4 alcoholic drinks per week
7. Smoker or non smoker	Non smoker
8. Community Service Card (“CSC”) or not	No CSC
9. Age of diagnosis	Age 50 – identified when there are refraction (vision) problems
10. Typical diet	High in saturated fats
11. Income	\$60,000 plus
12. Education level	University level
<p>Assumptions relating to how services are accessed. The person:</p> <ul style="list-style-type: none"> • can afford time off work to attend GP and specialist visits • will use all available free services provided by the health sector • will attempt to gain good metabolic control, but current levels of support and education will compromise his success • has historically only seen GP when serious physical symptoms exist • is likely to have had diabetes for a number of years undetected and at least 8 – 10 years of undetected high blood sugar levels • will be able to afford to attend GP visits to obtain prescriptions • will be able to afford the personal costs of self management equipment such as meters, strips, additional healthy food and exercise equipment • is diligent at taking prescribed medicines and renewing prescriptions once diabetes has been diagnosed 	

This person, with a relatively inactive lifestyle and a diet high in saturated fats, is a key candidate for Type 2 diabetes. Once diabetes is diagnosed, however, such a person is highly likely to be good at self-management. People with self-management capacity are likely to be receptive to advice about lifestyle changes once their diabetes is diagnosed. Although some of the aspects of their lifestyle may be behind the tissue damage from a lengthy period of high blood sugar levels (8 to 10 years), all is not lost. With the diagnosis at age 50, this person should be able to go through life with few complications as long as they are diligent about GP visits, use of self-management equipment, changing their diet and exercise. For example, the change in exercise means at least three 40 minute walks a week, a considerable rise on playing one round of golf a month.

7.1(b) Person with known diabetes with a middle to low income who has a poor diet and inactive lifestyle

This person has the following characteristics

1. Age	45 years old
2. Employment status	Full-time process worker
3. BMI index	Over 30
4. Exercise levels	Sedentary
5. No of children	Not applicable
6. No of alcoholic drinks per week	5+ jugs of beer per week
7. Smoker or non smoker	Smokes 3 packets per week
8. CSC or not	Holds CSC
9. Age of diagnosis	Age 40 – identified when vision problems
10. Typical diet	High in saturated fats, low in fruit and vegetables
11. Income	\$30,000
12. Education level	Left school aged 15

Assumptions relating to how services are assessed. The person:

- cannot afford time off work to attend GP and specialist visits
- will generally not fully use all available free services provided by the health sector because of barriers other than cost (such as transport, location of services etc)
- will not gain good metabolic control, without intensive education and support
- is likely to have had diabetes for a number of years undetected and high blood sugar for even longer
- will not be able to afford to attend GP visits to obtain prescriptions
- will not be able to afford the personal costs of self management equipment such as meters, strips, additional healthy food etc
- is not diligent at taking prescribed medicines and renewing prescriptions
- is unlikely to attend all specialist visits recommended after medical procedures.

Even though this person’s diabetes has been diagnosed at a relatively young age, the risk is that having left school at 15 with limited scientific education, the prognosis of the future conditions may seem improbable. As a result, it will be harder to motivate changes in lifestyle – the fatty diet will still seem tasty and the low exercise habit is set so it will be replaced with other forms of inactivity.

This person is likely to experience complications – probably with their vision – and to seek treatment for the complications. More through luck than foresight, they may be persuaded by a determined service provider into a regime of treatment, including limited change in lifestyle, as part of the treatment for their vision (or other complication).

7.1(c) Person with known diabetes from a low socio-economic group

This person has the following characteristics

1. Age	45 years old
2. Employment status	Works part-time cleaning
3. BMI index	Over 35
4. Exercise levels	Sedentary
5. No of children	4 children
6. No of alcoholic drinks per week	Non drinker
7. Smoker or non smoker	Non smoker
8. CSC or not	Holds CSC
9. Age of diagnosis	Age 32 – after birth of fourth child
10. Typical diet	Typical low socio-economic diet, high in fat
11. Income	\$15,000
12. Education level	Left school aged 15

Assumptions about how these services are assessed. The person:

- despite the CSC, will not use all available free services provided by the health sector because of other (non-cost) barriers
- will be likely to have very little understanding of diabetes and its complications, in some cases due to language barriers. Therefore this person will struggle to gain good metabolic control.
- will not be able to afford to attend regular GP visits to obtain prescriptions
- will not be able to afford the personal cost of self management equipment such as meters, strips, additional healthy food, etc
- is not always diligent at taking prescribed medicines or renewing prescriptions and is likely to share those medicines which have been acquired with other family members (rather than taking the medicine as required)
- is unlikely to attend all specialist visits recommended after medical procedures.

Fortunately, a greater number of people in low socio-economic groups are giving up smoking and a growing proportion are drinking less alcohol. Still, the likely sedentary lifestyles and very-high fat diets will put them at great risk of Type 2 diabetes. Even when the diagnosis is at an early age, however, a typical case is likely to go on and develop serious complications such as eye problems, foot disease and may require dialysis from a relatively early age. This is because the socio-economic conditions include barriers to health services which do not help with the self-management of the disease and in any case, it will be seen as too costly and too hard to change their diet. A change in exercise, which has not ever been a part of the daily routine, will be difficult given the demands of the family.

7.2 People with Impaired Glucose Tolerance

The second main group of case studies describes people who have Impaired Glucose Tolerance, which is a pre-diabetes condition⁸⁴. The outcome sought for this group is to structure services and treatments which assist them to manage blood sugar levels, hence preventing or delaying the onset of diabetes and/or its later complications.

Research evidence in support of the precise menu of services which prevents the development of diabetes is currently inconclusive. There is sufficient practical experience, though, which has enabled hypotheses to be developed and there are currently studies (mainly overseas) being undertaken that are seeking to show that lifestyle changes (improved diet and exercise, monitoring of blood glucose levels and use of some pharmacological agents) may halt the onset of diabetes from an IGT status. This is thought to be taking steps to preserve residual Beta cell mass⁸⁵. The benefit of obtaining an outcome such as delaying the onset of diabetes and reducing later complications is that this outcome avoids costs of services required to treat diabetes, as well as avoiding the costs of delaying the complications⁸⁶.

Impaired glucose tolerance cases are most likely to benefit from the following:

- Implementing a co-ordinated public health strategy and building greater awareness of the importance of diet and lifestyle to health⁸⁷
- Primary health care services which are more accessible⁸⁸
- The impact of early diagnosis of IGT and diabetes
- Use of drugs, where appropriate, by those with IGT as a means of managing blood sugar levels and preventing tissue damage
- Reduction of other risk factors for complications, for example, smoking, hyperlipidaemia, hypertension.

As the three cases show below, obtaining the benefits of the above four strategies will depend on effectively customising the strategies to meet the needs based on the different backgrounds of those with IGT.

For example, an above-average income person with the capacity for self-management of their health is in a strong position to gain personal benefits from the early detection of IGT. Once the high blood sugar levels are detected, this person is likely to set up a new regime of lifestyle change. Included in this lifestyle change will be more visits to the doctor, more use of “free” services and more appointments for eye screening.

The challenge is to attract those from middle/lower income groups and those from lower socio-economic groups to undertake screening for IGT in the first place.

⁸⁴ New Classification & Criteria for Diagnosis of Diabetes Mellitus, 1999.

⁸⁵ Davies MJ, Metcalfe J, Gray JP et alia, 1993.

⁸⁶ Brown JB, Nichols GA, Glauber HS, Bakst AW, 1998.

⁸⁷ American Diabetes Assn, 2000.

⁸⁸ Braatvedt GD, 1999.

7.2(a) Person on a good income unaware of IGT status but who has self-management capacity when diagnosed

This person has the following characteristics

1. Age	55 years old
2. Employment status	Work in an office – high stress environment
3. BMI index	Over 30
4. Exercise levels	Has very little exercise
5. No of children	Not applicable
6. No of alcoholic drinks per week	2-4 alcoholic drinks per week
7. Smoker or non smoker	Ex-smoker (quit at age 35)
8. CSC or not	No CSC
9. Age of diagnosis	Currently has IGT but is unaware
10. Typical diet	High in saturated fats
11. Income	\$70,000 plus
12. Education level	Tertiary level

Assumptions relating to how services are accessed. This person:

- is likely to afford time off work to attend GP and specialist visits
- will use all available free services provided by the health sector
- only goes to GP when serious physical symptoms exist
- will be able to afford to attend GP visits to obtain prescriptions
- will be able to afford the personal costs of self management equipment such as meters, strips, additional healthy food etc
- is diligent at taking prescribed medicines and renewing prescriptions

Once the high blood sugar levels are detected, this person is likely to set up a new regime of lifestyle change. Included in this lifestyle change will be more visits to the doctor, more use of “free” services and more appointments for eye screening.

Herein lies the crunch for health policy. These people typically exercise their entitlements for health services. There is a risk, when there are only incremental increases in services, that they increase pressure on limited services by accessing services (early primary care and some outpatients) in greater numbers than the service can treat. If more services are provided, this group will commonly be the first in line.

On the other hand, their lifestyles are such that they are capable of self-management and more likely to delay complications. In summary, more services to the group will certainly lead to improved outcomes, but it will also lead to increased net costs to the government as the group treated widens from just those with diagnosed diabetes to those with IGT. The wider group will all use more services. The offsetting possible costs reductions from delaying complications is likely to be small since only a proportion will experience them, even in the absence of universal screening programmes.

7.2(b) Person unaware of IGT status with a middle to low income who has a poor diet and inactive lifestyle

This person has the following characteristics

1. Age	45 years old
2. Employment status	Full-time truck driver
3. BMI index	Over 30
4. Exercise levels	Sedentary outside work
5. No of children	Not applicable
6. No of alcoholic drinks per week	5+ jugs of beer per week
7. Smoker or non smoker	Smokes 5 packets per week
8. CSC or not	Holds CSC
9. Age of diagnosis	Currently has IGT but is unaware
10. Typical diet	High in unsaturated fats, low in fruit and vegetables
11. Income	\$30,000
12. Education level	Left school at age 15

Assumptions relating to how services are accessed. This person:

- is likely to be unable to afford time off work to attend GP and specialist visits
- will generally not fully use all available free services provided by the health sector because of barriers other than cost
- will struggle to gain good metabolic control, without intensive education and support
- is likely to have had undetected diabetes for a number of years
- will not be able to afford to attend GP visits to obtain prescriptions and will not be able to afford self management equipment such as meters, strips, additional healthy food, etc
- is not diligent at taking prescribed medicines and renewing prescriptions

This group of people unaware of IGT status on medium to low incomes is where new screening services should be targeted. On the one hand, this group has a lifestyle likely to result in a large number of people with Type 2 diabetes. On the other hand, early intervention has the potential of turning this around because early diagnosis should enable some lifestyle change which could prevent or delay severe complications.

7.2(c) Person unaware of IGT status from a low socio-economic group

This person has the following characteristics

1. Age	40 years old
2. Employment status	Works part-time cleaning
3. BMI index	Over 35
4. Exercise levels	Sedentary other than work
5. No of children	4 children
6. No of alcoholic drinks per week	Non drinker
7. Smoker or non smoker	Non smoker
8. CSC or not	No CSC
9. Age of diagnosis	Currently has IGT but is unaware
10. Typical diet	Typical Pacific Island diet, high in fat
11. Income	\$15,000
12. Education level	Left school early

Assumptions relating to how services are accessed. This person:

- will not use all available free services provided by the health sector because of non cost barriers
- may have very little understanding of diabetes and its complications due to language barriers. Therefore patient will struggle to gain good metabolic control.
- will not be able to afford to attend GP visits to obtain prescriptions and will not be able to afford any self management equipment which needs to be acquired at personal cost such as meters, strips, additional healthy food etc
- is not diligent at taking prescribed medicines and renewing prescriptions and is likely to share medicines with other family members

People with IGT in the lower socio-economic groups are likely to benefit from widespread screening programs which have been designed to identify diabetes early to reduce or delay complications. The challenge with these people is breaking down barriers. Even once diagnosed with high blood sugar levels, they are unlikely to be able to commute to services which might assist because of distance, difficulty getting off work, language difficulties and so on.

7.3 Costs to the Government of Typical Cases

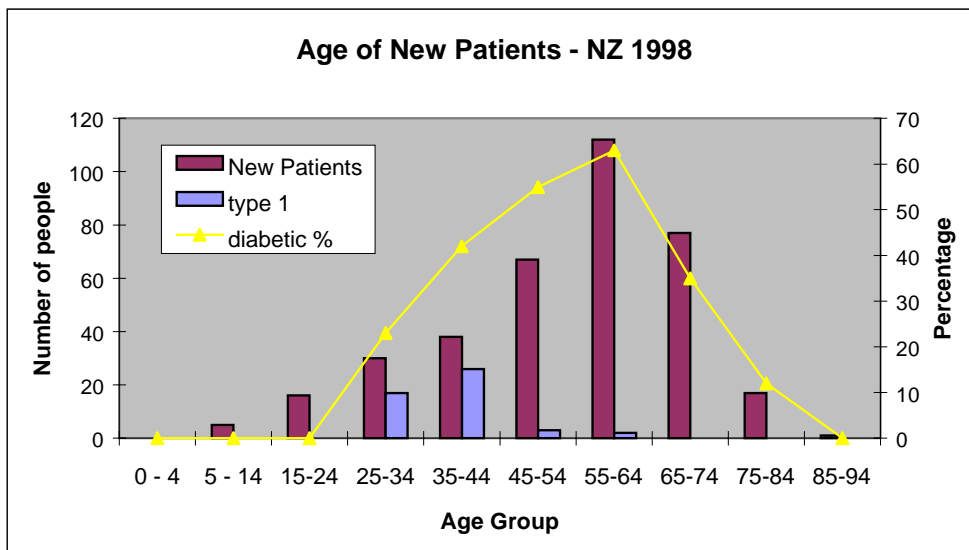
This section gives examples of the costs to the government of the above six typical cases over a 20 year period. Key costs to the government for people with diabetes include direct welfare benefit costs and health costs (i.e. primary, secondary and tertiary).

For simplicity purposes, we have estimated costs at each interval in current dollars. This removes any need for discounting at the aggregation stage and allows comparison with today's costs.

Based on the description of the cases, we have estimated the average annual cost of these to the taxpayer combining their medical costs and welfare costs. These are very much estimates and based on averages but provide basis for gaining a perspective on the challenges presented by diabetes epidemic.

The graph below shows that the majority of new dialysis patients have Type 2 diabetes. Given the high costs of treatment of \$25,000 in the first year and \$20,000 yearly after that, this statistic is important in framing the relationship between screening and costly complications in our estimates of the average costs by typical case.

Graph 4: The age of new patients presenting for dialysis



Source: Ministry of Health

The table below shows the estimated average costs for each typical case of people with known diabetes based on the three scenarios for government-provided health services. The higher costs incurred by those with middle or low incomes or who are in the socio-economic group, are reflective of the barriers to adequate care, ultimately leading to complications.

Table 22: Estimated average direct costs to the government of each person with known diabetes (includes health costs and social welfare costs)

Estimated average annual direct costs of 3 typical cases with Type 2 diabetes (average over 20 years – MOH and welfare costs)			
	Scenario One Current Services \$	Scenario Two Enhanced Services \$	Scenario Three More Optimal Service \$
Self-management capacity	1,920	1,949	1,943
Middle and low income	13,834	7,751	3,286
Low socio-economic group	20,956	3,651	2,832

Source: PricewaterhouseCoopers in conjunction with diabetes workshop participants

The individual cost for people with diabetes with a background for self-management remains constant over the three scenarios (approximately \$1,900 per year). The average cost of current services is similar to the cost even when additional services are available (under the enhanced and more optimal services scenario) aimed at reducing complications. This is because, as a result of active self-management, this group is less likely to suffer complications compared to other groups. However, under Scenarios Two and Three, the health outcomes for this group will improve remarkably. There are over 70,000 people with diabetes in this group and the cost saving to the wider economy will be large if this group is healthier and can remain productive and free of complications until the age of retirement.

Under Scenario One, the Current Services Scenario, the average annual cost for people in low socio-economic groups is more than 10 times higher than for those with a self-management capacity. This cost reflects the high amount of acute health treatment required, as well as the incapacity of the person needing them to go on a sickness benefit and to make greater use of their Community Services Card.

Those people from lower socio-economic groups need the costliest services under the current service structure. The costs are high because lower socio-economic groups face barriers which impede early diagnosis and diabetes management. This can lead to admission to hospital with urinary, skin or pulmonary infections which (at a cost of approximately \$10,000 per admission) allows the diagnosis to be made for the first time. Later come other expensive complications in the long-term such as visual reduction, amputation and possible dialysis. The availability of additional services will be effective in reducing the high average cost for these people with diabetes.

Costings for enhanced services in the table above are based on the assumption that initially the Government’s strategy to increase access to services will be for those with a background in self-management.

Note, however, that the average annual cost people from lower socio-economic groups face under the enhanced services scenario is significantly lower in comparison to the other scenarios due to the way that health outcomes are modelled in this case study. Under the current service barriers, this person has a high likelihood of developing kidney failure, leading to the need for dialysis, and dialysis is an expensive health intervention. In addition, this person will need to go on a sickness benefit. Clearly, treatments which put off the need dialysis will produce cost savings over time for all groups.

Targeted approaches to “at risk” people do enable health providers to manage restricted budgets in the long run, but to achieve the most desirable health outcome (optimal service scenario) for that individual, less restricted budgets are essential. Each person with diabetes starts with different health conditions, has a different range of services available, experiences different health resources and accesses services differently.

Moreover, the diagnosis for Type 2 diabetes may be made anywhere from a few years to 15 years after the onset of damaging high blood sugar and blood lipid levels. More intensive service delivery aimed at reducing complications can be shown to be cost effective per person when the population accessing the service(s) is kept the same. An optimal health outcome for the wider population would mean a substantial increase in service range and coverage to ensure the wider diabetes population all benefits.

The table below estimates the average annual costs for a patient with IGT which later develops into diabetes. IGT often develops into undetected diabetes and it is only when the person experiences some form of health complication that diabetes is formally diagnosed. Wisconsin, USA and Western Australian figures show that it takes an average of 8 to 10 years (there is no comparable NZ data) for people with IGT and undiagnosed diabetes to come under effective treatment.

Table 23: Average annual cost of each person with IGT

Estimated average annual direct costs of each person with IGT who later develop diabetes			
(average over 20 years – MOH and welfare costs)			
	Scenario One Current Services \$	Scenario Two Enhanced Services \$	Scenario Three More Optimal Service \$
Self-management capacity	8,577	1,054	1,505
Middle and low income	7,398	1,982	1,910
Low socio-economic group	10,953	2,198	2,875

Source: PricewaterhouseCoopers in conjunction with diabetes workshop participants

Enhanced services include primary care and targeted screening. This scenarios shows the potential benefits of identifying at risk people with IGT early are significant. All three typical cases show a cost benefit from having been identified early and being allocated additional services. The group with self-management capacity under a more optimal service, Scenario Three, would require additional resourcing. These services would be designed to optimise outcomes over a bigger population group and this creates a higher average cost than the average cost of treating complications that occur (i.e. status quo).

Implementing a more optimal package of services has the potential to produce the most desirable outcome. Whether the cost of providing an optimal package of services is cost effective compared to the current services will depend largely on the severity of the complications avoided and the unknown rates of the increase of diabetes in the future.

Based on population trends, there appear to be significant cost savings over the twenty year period for people with IGT who later develop diabetes⁸⁹. The results indicate that early identification of diabetes and the provisions of services to delay its complications will be cost effective because of very high hospital costs of complications of all sorts.

The comparison of costs for typical cases suggest that a moderate increase of targeted services can improve outcomes, both for those with diabetes and for government spending on health and income support. A more optimal range of services can improve outcomes for a larger proportion of those diagnosed with diabetes.

⁸⁹ Engelan M et alia, 1998; Gu K, Cowie CC, Harris M, 1998, Hanefield M, Temelkova-Kurktshev T, Schaper F et alia, 1999.

7.4 Applying Known Information to Derive Assumptions to Specify the Model

This study has shown how little is known about the linkages between diabetes services in New Zealand. In the absence of actual practices which can be monitored, assumptions are used to link known facts about services to describe some likely outcomes. Official statistics provide limited or unaggregated information about the characteristics of those with diabetes and existing research evidence.

Diabetes is a condition which, once acquired, stays with the person throughout their lifetime. A register of patients with diabetes and their treatments would provide knowledge about the linkages between diagnosis, treatment and outcomes. Currently, there are a couple of local registers and some Primary Care organisations have some registration of their own patients by disease status. Much less is known about diabetes than for other health conditions such as cancer and kidney failure. Further, records are incomplete about which, when and how many people with diabetes end up with complications such as, for example of heart failure and lower limb amputations. Even when people with diabetes experience these complications, it is not always officially classified that the person with the complication has diabetes.

Lack of adequate data makes a health strategy aimed at investing in long-term outcomes very challenging. It is particularly challenging when there are limited funds to be assured of achieving an improvement in outcomes. With the growth in serious complications putting pressure on services generally, there is much tension on getting the targeting of any new services.

The Otago Diabetes Team register collects valuable empirical information but it is restricted to a regional population group. Further, while it does describe some of the relationships between the characteristics of the person with diabetes, the services accessed, the complications and other outcomes, the short time series provides only a limited perspective. Another source of empirical data is the Ministry of Health population data.

These two sources provide the basic information required to specify our simple model. While these are good data sources as far as they go, they do not fully link complications to diabetes as a primary causal factor.

It is important to acknowledge, then, that even when our assumptions are based on empirical data, more detailed (and necessary) future research may revise our current understanding of the relationship between (non) treatment and complications.

7.5 Conclusion

This section has described some cases in detail to explain why people with different backgrounds need different types of services to be effective.

The epidemic of diabetes is a challenge, not just because of the additional services required to manage blood sugar levels, but because of the fact that the condition of Type 2 diabetes typically leads to complications.

The previous section, Section 6, described a simple model for gaining a perspective of the implications of existing services for people with diabetes.

The next sections apply the insights gained about typical cases of diabetes to specify the three scenarios that underpin the model:

- Current services (Scenario 1)
- Enhanced services (Scenario 2)
- More optimal services (Scenario 3).