The Impact of Diabetes in South Australia

2000

The Summary

Jacqueline Parsons,
David Wilson and
Angelique Scardigno

South Australian Diabetes Clearing House
on behalf of the
Diabetes Health Priority Area Advisory Group

South Australian
Government

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To Dr Pat Phillips
who had the vision a decade ago to begin the collection of South Australian population data on diabetes.

Foreword

In recognition of the personal, social, and economic costs of diabetes to the Australian community, diabetes was made a National Health Priority in 1996 and a State Health Priority in 1997.

Forty-two thousand people in South Australia have been diagnosed with diabetes and it is likely that a further 42 000 people have diabetes but do not know it (undiagnosed). Diabetes affects people from childhood through to old age and may occur during pregnancy. Certain populations, for example, Aboriginal people, are at particular risk of developing diabetes.

If undetected or poorly controlled, diabetes can result in long-term health complications such as blindness, heart attacks, heart failure, strokes, kidney failure, and amputation. However, there is some good news. It is clear from the United Kingdom Prospective Diabetes Study (UKPDS) and the Diabetes Control and Complications Trial (DCCT) that good glycaemic control and management of high blood pressure significantly improve clinical outcomes and reduce diabetes-related complications. It is also likely that reductions in elevated serum cholesterol levels will have a significant impact on reducing complication rates.

People with diabetes who want good control of their blood glucose levels and high blood pressure often have to make significant lifestyle changes in order to best manage their condition. Diet, exercise, smoking cessation, and weight control are the cornerstones of treatment in the management of diabetes and are very much dependent on the individual. Therefore, it is important that consumers are fully informed about diabetes and participate in the development of diabetes services.

Diabetes is one of a number of chronic conditions commonly seen in Australia. Strategies aimed at ameliorating the consequences of chronic conditions, including diabetes, have common themes. Intervention and prevention strategies will be devised, attempts to delay the onset of diabetes will be undertaken, and early detection and screening of at risk populations will take place. Best practice principles based on evidence-based data will be applied to optimally manage diabetes and its complications. Finally, appropriate rehabilitation services and palliative care services

will be used to provide support to people with diabetes and with significant complications.

In recognition of the complexity of these issues, the South Australian Department of Human Services (DHS) established a Diabetes Health Priority Area Advisory Group in 1997 and the South Australian Diabetes Clearing House in 1998. The DHS has worked in partnership with the Diabetes Health Priority Area Advisory Group and consulted widely to develop a Strategic Plan for Diabetes in South Australia that was released in 1999. The strategic plan builds upon previous national and state plans in diabetes and identifies opportunities to optimise working relationships between health funders, providers, and the community in South Australia, in order to maximise health outcomes for people with diabetes.

It was clear during the development of the Strategic Plan for Diabetes that there were a large number of gaps in our knowledge about optimal levels of service provision and best clinical practice. The Diabetes Health Priority Area Advisory Group therefore asked the Diabetes Clearing House to examine the impact of diabetes in South Australia from an epidemiological perspective. *The Impact of Diabetes in South Australia* is the result of the Diabetes Clearing House review. It consists of two documents, this summary document, and the main work, 'The Evidence'. These documents draw on ten years of population studies in diabetes conducted in South Australia, and evidence from other local sources. South Australia is now equipped with the latest state, national, and world data on diabetes and is well placed to provide excellent services in the future to people with diabetes.

As Chairman of the Diabetes Health Priority Area Advisory Group I would like to acknowledge the support of the Minister for Human Services, The Honourable Dean Brown MP, and the Head of the Statewide Division of the Department of Human Services, Professor Brendan Kearney. Many more individuals have contributed significant time and effort to developing and improving diabetes services in this state (those individuals are identified in the strategic plan); to them we say thank you and continue your good work.

Dr Phil Popplewell
Chair
South Australian Diabetes Health Priority Area Advisory Group

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EXECUTIVE SUMMARY

Diabetes is a common condition that affects approximately 42 000 people in South Australia. It is a condition that results in impaired quality of life, and serious cardiovascular, renal, and eye complications. It is a major cause of premature mortality. As a result of the high personal and public cost of the condition, diabetes has been recognised in South Australia as a Health Priority Area, and goals and targets for the condition have been set. The Diabetes Health Priority Area Advisory Group was formed in late 1997 to facilitate improvements in health outcomes for people with diabetes. This group produced *A Strategic Plan for Diabetes in South Australia*, which was released in May 1999. The plan highlights thirty-four strategies for diabetes to be implemented over the five-year life of the plan.

The Diabetes Health Priority Area Advisory Group also established the South Australian Diabetes Clearing House to provide timely and relevant information about diabetes to planners and policy-makers, particularly in the area of epidemiology. *The Impact of Diabetes in South Australia* is the first major publication of the Clearing House and is a comprehensive account of diabetes epidemiology in this state. It brings together population-based data with clinical information, and draws on the relevant literature to provide not only a picture of who has diabetes and its complications, but also how the individual and the health system are affected by the condition.

The nine chapters in *The Impact of Diabetes in South Australia* address the various components of diabetes in South Australia. The principal findings of each chapter are outlined below.

The Prevalence of Diabetes

Of the people with diabetes in South Australia, approximately 41 500 are adults, which is 3.8% of the adult population. Approximately 500 children and adolescents also have diabetes. However, the overall prevalence of diabetes masks important differences in prevalence by age-group; people over 50 years are more likely than

younger people to have diabetes, and more than 10% of those aged 70–79 years have it. Furthermore, certain groups within the South Australian population are more likely to have diabetes than other Australians, particularly people of Southern European origin and Aboriginal people. The prevalence of diabetes among Indigenous Australians is two and a half times greater than that of other Australians, and this makes them a priority group for intervention. People living in rural and remote areas of South Australia have elevated rates of diabetes and should be given special consideration, given the fewer resources generally available for diabetes care in country areas.

Projections

Diabetes is a current health priority, but it will become even more important in South Australia for two reasons. First, the ageing of the population will result in more people being in the age-groups of higher prevalence, resulting in a 25% increase in the number of cases of diabetes. Second, if the current trend for the increasing prevalence of diabetes continues, the prevalence will increase to 5.7% by 2006, irrespective of the ageing of the population. The combined effect of increasing prevalence and the ageing of the population will therefore result in a substantial increase in the number of people with diabetes in South Australia. Careful planning of diabetes services will be required to cope with this projected demand. Preventing and delaying the onset of diabetes in people at risk of the condition and diagnosing new cases earlier should be priorities, given these projections.

Risk Factors

Risk factors for developing diabetes include a family history of diabetes, older age, ethnicity, obesity and physical inactivity. A large proportion of the South Australian population exhibit one or more of these risk factors, which must be modified if the increasing prevalence of diabetes is to be addressed. Age, family history, and obesity are appropriate criteria for screening to detect the condition early and to implement management strategies that prevent complications. If people with all three of these criteria were tested for diabetes, nearly one in three would have the condition. More than two-thirds of South Australians with diabetes are overweight and obese, compared to less than half the people without diabetes. People with diabetes also exhibit risk factors for diabetes complications, particularly cardiovascular complications. More adults with diabetes than without diabetes had a high last blood

pressure reading and a high last cholesterol reading. Overall smoking prevalence rates are lower in people with diabetes than people without, but this masks an alarmingly high rate of smoking (44%) among young people with diabetes. Hypertension, high cholesterol, and smoking should be addressed as priority areas in diabetes care.

Diabetes Complications

Management of diabetes complications is the most pressing aspect of current diabetes care. Rates of microvascular and macrovascular complications in the population with diabetes are very high, with more than 65% experiencing either neuropathy or nephropathy, and 53% experiencing ischaemic heart disease or peripheral vascular disease. The average length of stay in hospital for people with diabetes is longer than for people without diabetes. Most admissions to hospital are for circulatory system disorders, again highlighting the need for intervention in cardiovascular risk factors. Hospital admission for diabetes control is also common, which emphasises the need for appropriate and aggressive glycaemic control.

Mortality

Diabetes has a profound effect on mortality in South Australia, with at least 7.7% of all deaths being diabetes related. Diabetes-related deaths are more common in older people, Aboriginal people, South Eastern and Eastern Europeans, and people living in country regions than they are in other South Australians. The major cause of death for people with diabetes is cardiovascular disease, which highlights the need for control of cardiovascular risk factors and complications in people with diabetes. Lifetable analyses show that people with diabetes have a decreased chance of surviving to old age. Females with diabetes appear to lose the protective effect against cardiovascular disease that is apparent in females without diabetes. There is a greatly increased probability of dying of cardiovascular disease for both males and females with diabetes, particularly at younger ages. This effect is considerable in females, and this highlights younger females as a priority group for intervention.

Health–related Quality of Life

Diabetes has a substantial impact on physical and mental aspects of quality of life. People with diabetes are more likely than those without diabetes to score lower on the SF-36, a validated and reliable measure of health status. When compared to people with other common chronic conditions, people with diabetes have worse quality of life than those with asthma and hearing loss, and their profiles are more similar to people with more than one chronic condition. Diabetes complications also impact on quality of life, with microvascular complications having a large effect on physical and mental functioning. The effect of diabetes on health status points to more consideration being given to quality of life as both an incentive to, and an outcome of, successful management of diabetes.

The Cost of Diabetes

Diabetes is a costly condition in terms of health service use. People with diabetes are more likely than people without diabetes to use the services of a range of health practitioners. The cost of general practitioner use for people with diabetes is $3.8 million per year more than for people without diabetes. Length of stay in hospital is longer for people with diabetes, with an average of 4.7 days. Actual costs for hospital admissions for people with diabetes are $19.4 million per year more than expected costs if those people did not have diabetes. These figures highlight the expensive nature of diabetes-related care in the tertiary sector. It is important to remember that cost does not apply only to dollars spent in the health system. Costs to society in terms of time lost from normal duties are difficult to measure, yet they are important, given that people with diabetes are more likely than people without diabetes to lose time from their normal duties. Costs to the individual, including the effect of the condition on well-being and day-to-day functioning, are also components of this expensive condition.

Psychosocial Impact

Diabetes is a condition that requires substantial lifestyle adjustment and self-management on the part of the individual. However, self-management is not always successful, and this is shown in the high prevalence of risk factors such as smoking. The barriers individuals face in managing at least part of their condition are not well understood and are not well researched. However, it is clear that having knowledge

does not necessarily translate to action, and day-to-day lifestyle is an important factor in the motivation and ability of individuals to manage their diabetes. A multifactorial, whole-of-life approach is necessary to achieve success in diabetes outcomes.

Conclusions

There are four major aims for diabetes care that have been identified and addressed. The first aim is to prevent or delay the onset of diabetes. This is important as it will reduce the burden of diabetes in the future; however, it requires a concerted effort to inform the public about what they can do to prevent diabetes. Population-based programs, such as weight reduction and physical activity, will play an important role in reducing the risk of developing diabetes. General practitioners will have an opportunity to broaden their role in health promotion by monitoring and recalling people with risk factors for diabetes.

The second aim is to manage diabetes in such a way that day-to-day functioning is optimised and complications are minimised. This impacts throughout the diabetes continuum, from those at risk of diabetes to those experiencing serious complications. Early detection is a vital component of better management; the sooner diabetes is recognised, the sooner it can be managed and complications prevented. Tailored screening programs will play a vital role in early detection. Patient education is another important component; however, methods, types, and personnel for the delivery of education need to be considered. In terms of management, cardiovascular risk factors, in particular hypertension and smoking, should be addressed as priorities to reduce the level of morbidity and mortality from diabetes-related cardiovascular disease.

The third aim is to manage diabetes in a cost-effective way. Although millions of dollars are spent on diabetes annually, there are not enough resources to care for people with diabetes adequately. More resources spent earlier in the natural course of the condition, such as on early detection and risk factor management, will help to ensure that costs at the other end of the spectrum, for example in treating end-stage complications, are minimised. Resources should also be distributed evenly, with efforts focused on those who need them most. This document has highlighted groups that should be prioritised, particularly Aboriginal people.

The fourth aim is to monitor outcomes and, where appropriate, modify programs in a timely manner to improve outcomes. This is an essential part of health care provision and will require systems to take baseline and follow-up measurements to assess progress. South Australia is in a unique position, as population-based diabetes information has been available for many years, and there are many opportunities to implement monitoring and evaluation programs.

Evidence about the prevalence, complications, personal and public costs, and premature mortality is essential to address diabetes in South Australia adequately. Improvements in diabetes outcomes will occur when interventions are appropriately targeted, monitored, and evaluated. This document provides this evidence for South Australia and will be used by the Diabetes Health Priority Area Advisory Group to improve the planning and implementation of diabetes care.

The Impact of Diabetes in South Australia: The Summary discusses each of these nine chapters in more detail. The full discussion is in the parent document, *The Impact of Diabetes in South Australia: The Evidence.*

Introduction

This summary brings together the main points contained in *The Impact of Diabetes in South Australia: The Evidence* which has been prepared to enable the South Australian Diabetes Health Priority Area Advisory Group to make decisions about future diabetes policy, services, programs, and other strategies that will lead to better health outcomes for South Australians with diabetes.

Diabetes is a priority health issue for this state, because of the large number of people affected by the condition and because of the serious consequences when it is poorly controlled. With our ageing population, the burden of diabetes is set to grow. Careful planning of health services for diabetes is necessary to ensure that care is provided in a timely, cost-efficient, culturally sensitive, and accessible way. Vital components of future diabetes planning will include programs that promote early detection, optimal management, and prevention of complications. Services will need to focus on initiatives that help prevent diabetes complications, especially those that require hospital care, and optimise functioning in the day-to-day lives of people with diabetes.

South Australia is well served in terms of diabetes epidemiology; extensive population data are available on a range of diabetes-related issues. Data sources used in *The Impact of Diabetes in South Australia: The Evidence* include population surveys such as the Health Omnibus Surveys and the SERCIS (Social Environmental Risk Context Information System) Health Priority Area Surveys; vital statistics such as births and deaths; and clinical studies such as the South Australian Diabetes Study.

The Impact of Diabetes in South Australia: The Evidence highlights target groups and priority issues for intervention across the diabetes continuum. It would fail in its duty if it did not point to aspects of the diabetes problem where there is considerable room for improvement. However, targets for intervention in diabetes have never been so clearly defined, and this evidence base will aid the Diabetes Health Priority Area Advisory Group in its goal of improving health outcomes.

The Diabetes Health Priority Area Advisory Group, representing the key stakeholders in diabetes in South Australia, has a pivotal role in developing future initiatives in diabetes services provision. *The Impact of Diabetes in South Australia: The Evidence* will be the basis of well-planned, evidence-based approaches to diabetes care in this state.

The Prevalence of Diabetes

Planning of diabetes services must be based on accurate estimates of prevalence among groups with the condition. The diabetes population is diverse, and this diversity is reflected in the problems experienced. Diversity must be understood when targeting the problem and planning interventions, and also in determining the type, distribution, and location of services.

The national[1] and South Australian diabetes strategies[2] identified several priority populations with diabetes—Aboriginal and Torres Strait Islanders, people from culturally and linguistically diverse backgrounds, people living in rural and remote regions, children and adolescents, and the elderly. The national strategy identified that 'in order to achieve significant improvement in diabetes health gain, [they] require special consideration in the planning, delivery and co-ordination of diabetes prevention and care services'.[1]

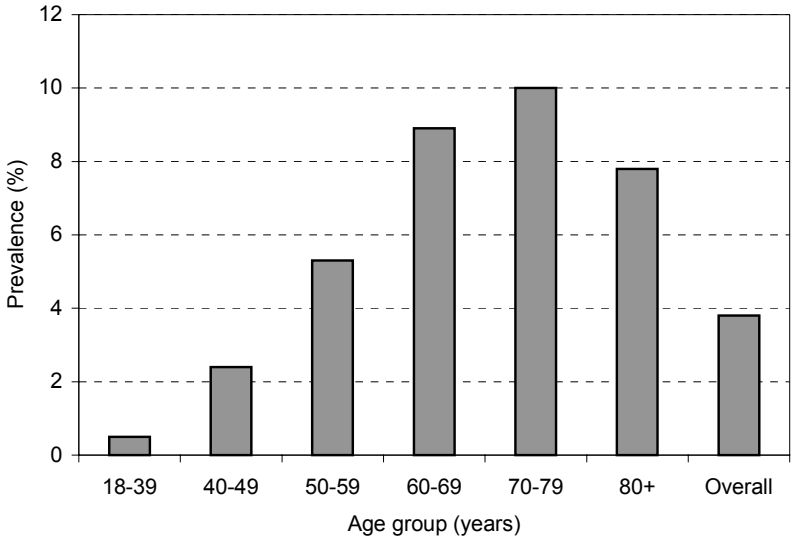
This section describes the prevalence and distribution of diabetes in South Australia so that all people with diabetes, including these priority populations, are adequately targeted.

A recent diabetes prevalence estimate was calculated by combining data from the 1997 and 1998 Health Priority Areas Surveys (n=11 977). The population self-reported prevalence of diabetes was 3.8% (95% CI: 3.4–4.1). This equates to approximately 41 000 adults aged 18 years or older in South Australia with diabetes.

It can be seen from Figure 1 that the prevalence of diabetes increases markedly in the 50–59 years age–group, and reaches peak prevalence in the 70–79 years age–group. The overall prevalence rate of diabetes masks these age-specific rates. It is important to note that the prevalence of diabetes doubles in each decade from 40 to 69 years of age.

People born in European countries and Aboriginal people are more likely to have diabetes than other South Australians. People with lower incomes and lower education levels are also more likely to have diabetes; however, this is partly because of the contributing effect of older age in these groups.

Figure 1: Prevalence of diabetes in adults in South Australia, by age-group



Source: Health Priority Areas Surveys 1997-98

The prevalence of type 1 diabetes is 0.5% and the prevalence of type 2 diabetes is 3.2% in South Australian adults. Approximately 14% of the population with diabetes have type 1 diabetes, and approximately 86% have type 2 diabetes.

Gestational diabetes mellitus is a form of diabetes that occurs in pregnant women. It affects 2.5% of all pregnancies in South Australia, and is more common in women who are older, women born outside of Australia, Aboriginal and Torres Strait Islanders, and those of low household socioeconomic status. Pregnancies where gestational diabetes is present are more likely to result in babies weighing more than 4501 grams, caesarean sections, complications of labour, and baby still in hospital at 28 days.

Aboriginal people are a priority group as they experience a diabetes prevalence rate of 9.6%, which is more than two and a half times the prevalence of other Australians. Aboriginal females in particular have high rates of diabetes, although there is little difference between Aboriginal people living in metropolitan and country areas of the state. The complex set of issues that surround Aboriginal health need to be taken into account if the high rates of diabetes and high rates of serious complications are to be addressed.

People from culturally and linguistically diverse backgrounds, particularly those from Southern and Eastern European countries, have higher rates of diabetes than other Australians. The Migrant Health Survey conducted in 1997[3] found that migrants from Poland, Greece and Cyprus, Italy, India, Sri Lanka, Bangladesh, the former USSR and Baltic States had higher rates of diabetes than the South Australian population overall.

People living in rural and remote areas of South Australia may be disadvantaged in terms of access to health services, occupational hazards, and sparse infrastructure.[4] In South Australia the overall prevalence of diabetes is higher in rural and remote residents, with 4.1% experiencing diabetes compared to 3.6% in metropolitan areas.

There are approximately 425 cases of type 1 diabetes in children and adolescents in South Australia.[2] Diabetes can be difficult to manage in children and adolescents because of many factors that characterise growing up, such as erratic eating patterns, variable illnesses, hormonal changes, and increasing responsibility for one's own management.[1] Special programs need to be developed to accommodate these special needs.

The elderly population are a priority group because they represent a growing proportion of the population with diabetes as a result of the overall ageing of the population, and they are more likely to experience the complications and associated costs of diabetes. In South Australia 28% of the population are over 50 years and 17.8% are over 60 years.

Key Issues

- All women who had gestational diabetes have the potential to proceed to type 2 diabetes and should be included in a recall system to detect this development at the earliest stage.

- General practitioner guidelines suggest that all pregnant women should be screened for gestational diabetes. There is Australian evidence that this may not be happening, and further research is required to investigate the reasons for this.

- A cohort of women with gestational diabetes should be followed to identify the proportion that develops diabetes, the length of time taken to develop the condition, and the development of complications.

- The Aboriginal population is a priority target group, given the prevalence of diabetes in this group in South Australia is more than two and a half times that of the non-Aboriginal population. Within the Aboriginal community females have an elevated risk of having diabetes.

- Migrant groups, particularly people from Poland, Italy, Greece, and Cyprus, are priorities for screening for diabetes.

- People from Asian backgrounds are identified as a primary prevention group for diabetes. These people should also be monitored to assess the development of diabetes in the future.

- If national estimates for type 1 diabetes in children and adolescents are applied to South Australia, they would underestimate the known cases registered at the Women's and Children's Hospital in 1998. There are little data on the progress and development of type 1 diabetes in South Australian children and adolescents.

- People living in South Australian rural and remote areas have elevated rates of diabetes. Given these areas generally have limited resources for the management of diabetes, these should be considered as high priority areas.

Projections

The number of people with diabetes in South Australia and indeed the world is increasing. This is partly caused by the effect of the ageing of the population on the number of people with type 2 diabetes. The prevalence of type 2 diabetes increases with age, and a greater proportion of older people in the population means that there is an increased number of people with diabetes. This increase will occur even if there is no increase in the prevalence of diabetes.

However, the prevalence of diabetes is increasing alongside the ageing of the population. This increase is beginning to be experienced worldwide. This is a result of an increase in the prevalence of risk factors such as obesity and physical inactivity in populations; the rapid adoption to high-risk lifestyles among immigrants from low-risk backgrounds; and Westernisation in developing countries, involving the adoption of high-risk behaviours such as poor diet, smoking, and inactivity, which all contribute to the increase in incidence and prevalence of type 2 diabetes.[5]

The increase in the number of people with diabetes has significant implications for health resources and for health-related quality of life because of the morbidity and premature mortality associated with diabetes. It is therefore important to plan for the future increased incidence of diabetes.

The first component in the increase in the number of people with diabetes is population ageing. Age-specific prevalence rates of diabetes from the Health Omnibus Surveys of 1991–98 have been applied to the ABS population projections for the population of South Australia, enabling the calculation of the projected number of people with diabetes. These calculations have assumed an unchanging prevalence rate in each age-group across all years. Table 1 presents future estimated cases of diabetes. There will be an increase in the number of predicted cases between 1998 and 2011, particularly in the 50–59, 60–69, and 80+ years age-groups. In the 50–59 and 60–69 years age-groups the overall increase is expected to be 48.9% and 48.1% respectively. The number of cases in the 80+ years age-group overall is expected to increase by 60.3%. The only decrease anticipated is in the 15–39 years age-group where there is an estimated overall decline of 4% in diabetes cases. Additionally, the increase for people aged 70–79 is lower than that of the age-groups around it. Both the decline in the 15–39 years age-group and the relatively small increase in the 70–79 years age-group are because of a smaller number of people in these age-groups by 2011. Both these smaller cohorts are caused by lower birth rates. The birth rate is

lower in those who will be in the 70–79 years age-group in 2011 because of the effect of the Second World War. It is lower in the 15–40 years age-group because of changing social conditions and a lower overall birth rate since the 1970s.

Table 1: Total number of people with diabetes in South Australia and predicted numbers for 2001, 2006, and 2011

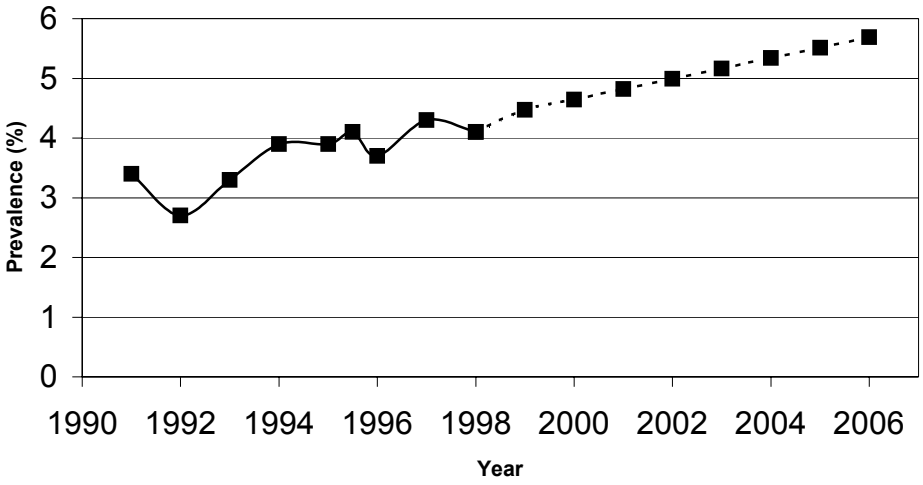
Age-group	1998	2001		2006		2011		
	Cases	Cases	Change 1998–2001 (%)	Cases	Change 2001–2006 (%)	Cases	Change 2006–2011 (%)	Change 1998–2011 (%)
15–39	6245	6356	1.8	6169	- 2.0	5995	- 2.8	- 4.0
40–49	5215	5598	7.3	5713	2.1	5578	- 2.4	7.0
50–59	7974	10197	27.9	11402	11.8	11875	4.1	48.9
60–69	9616	10109	5.1	11570	14.5	14243	23.1	48.1
70–79	9566	10661	11.4	10135	- 4.9	10238	1.0	7.0
80+	4474	5439	21.6	6517	19.8	7174	10.1	60.3
Total	46620	51871	11.3	54914	5.9	58390	6.3	25.2

Source: Health Omnibus Surveys 1991–98, ABS Population Projections 1996

The second component in the increase in the number of people with diabetes is an increasing upward trend in the overall population prevalence of the condition. The Health Omnibus Surveys between 1991 and 1998 collected data about the prevalence of diabetes in people aged 15 years or more, and this enabled the analysis of some diabetes trends in the South Australian population. Data collected in all years were age and sex standardised to control for changes in the age-sex structure of the population to allow an examination of the trend in prevalence between 1991 and 1998. Figure 2 shows the projected increasing prevalence of diabetes between 1991 and 2006. This increase is independent of the changing age structure of the population.

It is likely that South Australia will experience the effect of both the ageing of the population and the increasing prevalence of diabetes in the future. This will mean that a higher prevalence rate for diabetes will be applied to a larger population in the older age-groups, resulting in a substantial increase in the number of people with diabetes overall in this state. These findings will have a significant impact on the planning and provision of diabetes services. Additionally, if the current burden of diabetes complications is applied to the number of people who will have diabetes in the future, the condition will have a grave effect on morbidity and mortality and consequent use of health resources.

Figure 2: Projected age-adjusted increase in the prevalence of diabetes in South Australia



Source: Health Omnibus Surveys 1991–98

Key Issues

- By 2011 there will be an increase in the number of people with diabetes of more than 48% in the 50–59 years and 60–69 years age-groups, as a result of the 'baby-boomers', a large cohort moving into these age categories. This assumes that the prevalence of diabetes remains stable.

- If current trends for an increasing prevalence of diabetes continue, the overall prevalence of diabetes will increase from 4.1% in 1998 to 5.7% in 2006, without accounting for the increase in the proportion of the population in high prevalence age categories.

- The most likely scenario is that both population ageing and an increase in diabetes prevalence will occur in the future, which will result in a substantial increase in the number of South Australians with diabetes by 2006.

- Future health service planning needs to take into account the predicted increased burden of diabetes on the population.

Risk Factors

There are two clear contexts of diabetes risk factors. First, there are risk factors that are most frequently implicated in the development of diabetes (age, family history, ethnicity, obesity, inactivity, impaired glucose tolerance, and prior gestational diabetes). Second, there are risk factors that are most frequently implicated in the development and progression of diabetes complications (hypertension, hyperlipidaemia, hyperglycaemia, smoking, obesity, and inactivity).

The risk factors need to be understood in each of these contexts if appropriate and targeted policies and strategies are to be initiated, first to prevent the development of diabetes and second to reduce its impact.

Risk factors for the development of diabetes

The risk of developing type 2 diabetes increases with age, and if there is a family history of diabetes. In South Australia 23.9% of people without diabetes and 52.5% of people with diabetes had a first-degree relative (mother, father, sister, brother, grandfather, or grandmother) with diabetes, as illustrated in Figure 3. Analyses of these data showed that if people under 50 with a family history were screened for diabetes, 4.0%, or one in 25, would have diabetes. If people over 50 with a family history of diabetes were screened, just over 17.0%, or almost one in five, would have diabetes. The high yield in the over fifty age-group makes using the joint screening criteria of age and family history a viable strategy.

The prevalence of diabetes increases with age, with people 50 years of age and over experiencing prevalence rates that are statistically significantly higher than the expected (overall) rate. The 1996 Census showed that in South Australia, 42.6% of the population are aged over 40 years, 28.0% are over 50 years, and 17.8% are over 60 years. The proportion of people in these age categories most at risk for diabetes will rise in the next decade because of the ageing of the population.

People from some culturally and linguistically diverse backgrounds are likely to develop diabetes. The 1996 Census recorded 302 526 people (21.0% of the total population) living in South Australia who were born outside Australia. Of these, 16.6% of the total population were born in Europe (including the UK and Ireland) and the former USSR, and 2.6% were born in Asia.

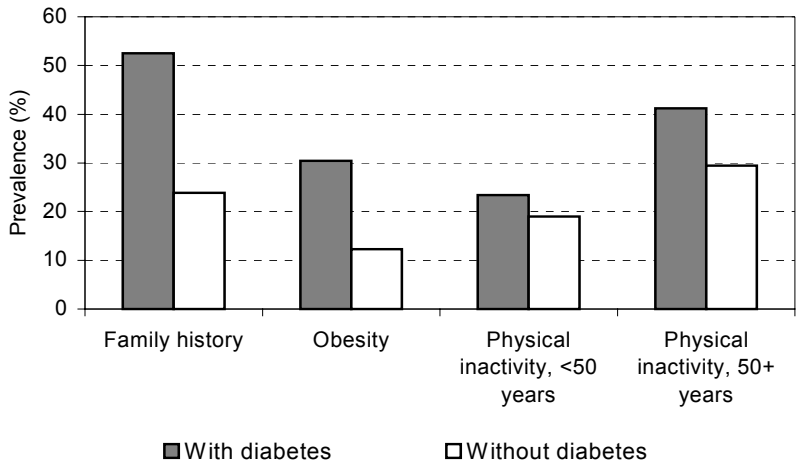
Indigenous Australians are another priority target group for diabetes intervention. Aboriginals comprise 1.4% of the total South Australian population, and nearly half of them live in metropolitan areas of the state.

Obesity is an established risk factor for type 2 diabetes. In the Health Omnibus Surveys from 1991 to 1998, 37.4% of the population with diabetes and 31.0% without diabetes were overweight. Figure 3 shows that a further 30.4% of people with diabetes and 12.3% without diabetes were obese. This means that a person with diabetes is two and a half times more likely to be obese than a person without diabetes.

These findings can also be applied to screening. If screening on the criteria of first-degree relative, age, and obesity were conducted, the number of people found to have diabetes would increase. If obese people under 50 years with a first-degree relative with diabetes were screened, 11% would have diabetes. If obese people over 50 years with a first-degree relative with diabetes were screened, 28% would have diabetes.

Exercise increases the sensitivity of insulin, improving its ability to moderate glycaemia. In several Health Omnibus Surveys, respondents were asked if they had walked for exercise or done moderate or vigorous exercise in the previous two weeks. People with diabetes were less likely to have done any exercise, with 36.2% reporting no exercise compared to 22.5% of the people without diabetes. People with diabetes were more likely to be physically inactive at all ages. This is illustrated in Figure 3.

Figure 3: Prevalence of risk factors for the development of diabetes



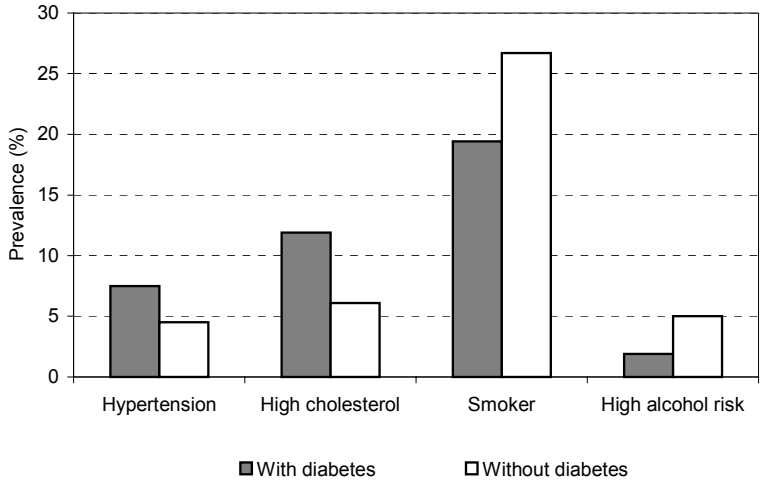
Source: Health Omnibus Surveys 1991–98

People with impaired glucose tolerance (abnormal glucose levels but not classifiable as diabetes) are at high risk to progress to type 2 diabetes. Estimates are that one-third of people with impaired fasting glucose will progress to diabetes, one-third will continue to have impaired fasting glucose, and one-third will revert to normoglycaemia.[6] At present, there are no estimates available for the South Australian population on the distribution of fasting glucose levels that would allow us to target this group. Women who develop diabetes during their pregnancy are also at increased risk for type 2 diabetes later in life. It is estimated that more than 40% of women with gestational diabetes will progress to type 2 diabetes within 10 years.[7] These groups with a known high risk for diabetes provide an opportunity for early detection and thus earlier management and control of the condition through screening and surveillance of other kinds such as registers.

Risk factors for diabetes complications in people with diabetes

Hypertension, high cholesterol, smoking, poor control of glycaemia, and high alcohol intake are major risk factors for the microvascular and macrovascular complications of diabetes. People with diabetes have higher rates of hypertension and high cholesterol when compared to people without diabetes. Overall, 7% of people with diabetes had a high last blood pressure reading, compared to 4% of people without diabetes. Nearly 12% of people with diabetes reported a high last cholesterol reading, compared to 6% of the population without diabetes. This is illustrated in Figure 4.

Figure 4: Prevalence of risk factors for diabetes complications



Source: Health Omnibus Surveys 1991–98

Figure 4 also shows that overall, the smoking rate for people with diabetes is lower than for people without, but this masks an alarmingly high rate of smoking (44%) among people less than 40 years old with diabetes. The rates of smoking for people with and without diabetes in the older age-groups are similar, indicating that progress has not been made in cessation for people with diabetes despite the lower overall rate. People with diabetes are less likely than people without diabetes to have an intermediate or high alcohol risk.

Control of glycaemia should be a primary aim of diabetes care. Recently, both the UK Prospective Diabetes Study and the Diabetes Control and Complications Trial found that a strict treatment schedule for blood glucose (HbA_{1c} approximately 7%) contributed to a lower risk for morbidity and mortality from microvascular disease.[8,9] The South Australian Diabetes Study assessed HbA_{1c}, and it was considered elevated if it was measured at 7% or more. Overall, 71.6% of people with diabetes had an elevated HbA_{1c}.

Diet is important to people with diabetes for two reasons: first, the contribution of diet to obesity, and second, the effect of particular foods on control of glycaemia. The National Nutrition Survey, a joint project of the Australian Bureau of Statistics and the Commonwealth Department of Health and Family Services, was conducted in 1995.[10] It found that only 33.2% of people with diabetes met the dietary guidelines for complex carbohydrates, only 23.7% of people with diabetes met the refined sugar guidelines, and 36.0% met the fat target. Nearly half the people with diabetes reached the dietary fibre guideline. Most people with diabetes did not exceed the recommended alcohol intake.

Thirty-five per cent of people without diabetes do not know any of the factors that contribute to the development of diabetes, compared to 25% of people with diabetes; 35% do not know any actions that delay the development of diabetes, compared to 34% of those with diabetes; and 41% do not know any of the early symptoms for diabetes, compared to 21% of those with diabetes.

Key Issues

- A large proportion of the South Australian population has risk factors for developing diabetes. These risk factors must be addressed if the prevalence of diabetes is to decrease in the future.

- Most people at increased risk of diabetes because of a family history of the condition do not perceive themselves to be at risk; rectifying this perception should be an education priority.

- Recall systems should be initiated for women who have been diagnosed with gestational diabetes.

- The trend of the population towards obesity will add significantly to the burden of diabetes.

- An important research priority is the need to identify the prevalence of impaired glucose tolerance and describe this group for targeting primary prevention and early detection measures.

- There is substantial gain to be made in diet and nutrition outcomes for the whole population and especially those with diabetes. Specialised dietary advice may be necessary for people with diabetes to help them understand the particular effects of diet on glycaemia.

- Some risk factors for complications, including hypertension and elevated cholesterol, are more prevalent in people who live in country regions. Special consideration needs to be given to addressing risk factors given the unique health care setting in country regions.

- There is a need for greater emphasis on smoking cessation initiatives tailored to the diabetes population.

- It is also essential to identify the target groups for hypertension and high cholesterol initiatives. This includes identifying people with the risk factors who are not being treated, and those who are being treated but whose hypertension is not under control. Prophylactic aspirin use should also be considered in people with diabetes who exhibit other cardiovascular risk factors.

Diabetes Complications

Diabetes that is poorly controlled, or where it is found in association with risk factors, is likely to lead to the development of diabetes-related complications. These complications not only affect the life of the person with diabetes, and may lead to premature mortality, but they also have an effect on the provision of health services. There is evidence that diabetes-related complications can be prevented or minimised, and this is the desired outcome in the provision of diabetes care.

The South Australian Diabetes Study was a National Health and Medical Research Council Study that investigated a representative population sample (n=173) of South Australians aged over 40 years with type 2 diabetes.[11] The sample was recruited via the South Australian Health Omnibus Survey. Participants were clinically examined at the study centre for the following diabetes related complications:

- Ischaemic heart disease
- Peripheral vascular disease
- Neuropathy
- Nephropathy
- Retinopathy.

Table 2 shows the prevalence of these complications in South Australians with diabetes.

Table 2: Prevalence of complications in people with diabetes

Complication	People with diabetes with complications (n=173)	
	%	95% Confidence Intervals
One or more microvascular condition	66.1	58.3 – 73.9
One or more macrovascular condition	52.7	44.5 – 60.9
Ischaemic heart disease (IHD)	34.4	26.7 – 42.1
Peripheral vascular disease (PVD)	31.9	24.3 – 39.5
IHD and PVD	13.7	8.1 – 19.3
Microalbuminuria	26.6	19.4 – 33.8
Macroalbuminuria	7.9	3.3 – 12.0
Neuropathy	47.9	39.9 – 55.9
Retinopathy (n=139)	19.0	12.6 – 25.4

Source: South Australian Diabetes Study 1998

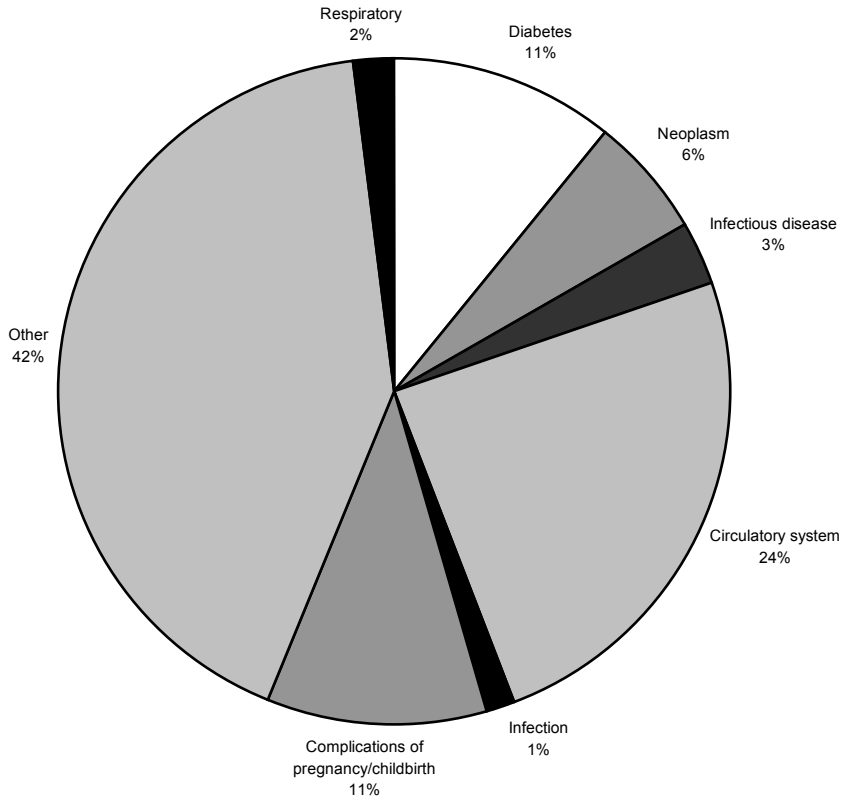
Females, people born in the United Kingdom and Ireland, and those who have had diabetes for less than 5 years are statistically significantly less likely than expected to have microvascular disease. Macrovascular disease was statistically significantly more prevalent than expected in rural areas and was higher in older age-groups. The higher rates of macrovascular complications in rural areas were largely explained by higher rates of ischaemic heart disease. Peripheral vascular disease was statistically significantly more prevalent than expected in migrants from the United Kingdom or Ireland, people of medium/low incomes, and those aged 71 years or older. Neuropathy was statistically significantly less likely than expected to occur in women, Australian-born people, and people who have been diagnosed for less than five years.

These results show that complication rates among South Australians with diabetes are of epidemic proportions. Complications result in a burden to the health system and have a significant effect on the individual with diabetes. Although it is clear that preventing diabetes or delaying its onset with appropriate targeted education and health promotion programs may ease the burden of diabetes in the future, management of diabetes complications is the most pressing aspect of current diabetes care. Management plans for the detection, diagnosis, and effective management of diabetes complications need to be reviewed to assess their relevance to dealing with diabetes complications. In addition, appropriate guidelines need to be supported by adequately coordinated systems that ensure continuity of care and recall of patients.

The Integrated South Australian Activity Collection[12] was used to determine the extent of diabetes-related hospital admissions for South Australia in 1996–97. Diabetes accounted for 6.3% of all nights in hospital in South Australia, which included 6.5% of all nights in public hospitals and 5.7% of all nights in private hospitals. The average length of stay in a public hospital for people with diabetes was 6.4 days, and for people without diabetes it was 4.3 days.

Figure 5 shows the primary reason for admission to hospital for people with diabetes. As a major category, circulatory system disorders are responsible for the majority of diabetes-related hospital admissions, along with diabetes-specific complications. This highlights the impact of poor glycaemic and cardiovascular risk factor control. The ‘other’ category comprises an extensive range of conditions without containing any obvious morbidity pattern. These data are the best available; however, it is possible that the data may underestimate the effect of diabetes because of under-reporting in hospital statistics.

Figure 5: Diabetes-related hospital admissions according to primary diagnosis



Source: South Australian Department of Human Services Inpatient Statistics 1996–97

Key Issues

- High rates of macrovascular and microvascular disease are apparent in South Australia. This high prevalence should prompt a review of the management of risk factors and complications.

- If progress is to be made with the management of complications, it will be necessary to implement strategies to control risk factors and early complications at the earliest possible time.

- The most common reason for admission to hospital for people with diabetes is circulatory disorders. The need for better control of cardiovascular risk factors: smoking, hypertension, lipids, and glycaemic control, is apparent.

Mortality

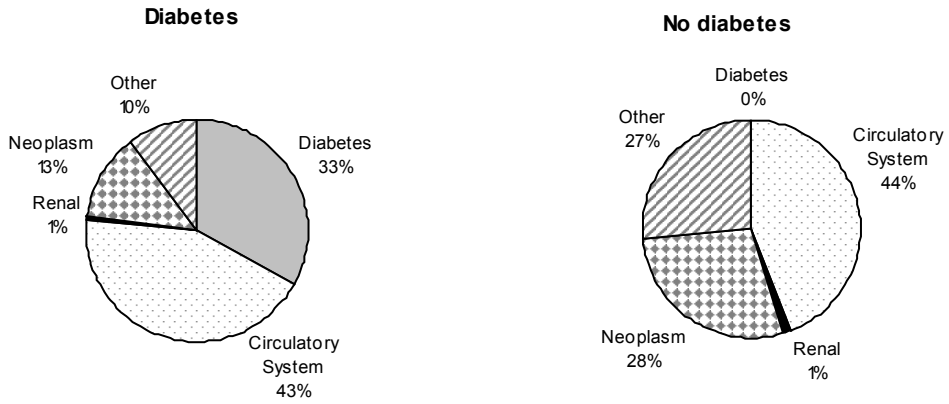
Diabetes and associated risk factors lead to the development of complications and premature death. Understanding who is most affected and the causes of mortality for different population groups will better inform priority setting in diabetes care.

South Australian death certificate data from 1994 to 1996 were used to provide information on the patterns of mortality in the state. Although diabetes was the primary cause of 2.5% of all deaths in South Australia, a total of 7.7% (n=2587) of all deaths recorded in South Australia in this period had diabetes recorded on the death certificate either as a primary or a contributing cause (a diabetes-related death). This rate ranged from 7.4% in 1994 to 8.0% in 1996. This marginal increase may reflect increasing diabetes-related mortality or it may be accounted for by changes in recording protocols on death certificates. Death certificates possibly underestimate the impact of diabetes as it may be under-reported as a cause of, or contributing cause to, death.

Diabetes-related death rates were statistically significantly higher than expected for people aged 65 years or older, people living in rural areas, Aborigines, and people born in South East or Eastern Europe. People living in the metropolitan area, younger than 55 years and older than 85 years, and people born in Australia, the UK or Ireland were less likely than expected to have a diabetes-related death recorded on the death certificate.

The principal cause of death was examined for people with and without diabetes, and the results are presented in Figure 6. Circulatory system disorders are the most common cause of death for people with and without diabetes, although a third of diabetes-related deaths are caused by diabetes-specific complications such as hypoglycaemic coma. Rates of circulatory system deaths are particularly high for people aged 50–59 years with diabetes, while Aboriginal people with diabetes are more likely than expected to have diabetes-specific complications as the primary cause of death, which indicates poor glycaemic control.

Figure 6: Principal cause of death of people with and without diabetes



Source: Australian Bureau of Statistics death records 1994-96

Lifetable analyses were conducted to assess the chances of survival for a person with and without diabetes aged 50 years. It was found that a person with diabetes had only a 60% chance of surviving to 75 years, compared to a 78% chance for a person without diabetes. The decreased chance of survival was apparent for both males and females with diabetes, although the impact was greater in females. A 50-year-old female with diabetes had only a 6% chance of surviving to 85 years, compared with a 65% chance for a female without diabetes. In addition, the proportion of all deaths attributable to circulatory system disorders was considerably elevated among younger females with diabetes. This indicates that females with diabetes may lose the protective effect against cardiovascular disease that is apparent in females without diabetes.

Key Issues

- Diabetes-related deaths increase with age, and this reflects the rising prevalence of diabetes with age.

- Diabetes as a principal cause of death is statistically significantly elevated in rural areas and among Indigenous South Australians. This points to the need for better education and control of diabetes complications in rural areas and in Aboriginals.

- There is little time to be lost in intervening with diabetes if related death rates are to be reduced. Because of the elevated rates early in the progression of diabetes, prevention of heart disease through the control of risk factors should start as soon as diabetes is diagnosed.

- Statistically significantly higher rates of circulatory diseases for people with diabetes occur when they are in their fifties and are apparent for every age-group thereafter. This is largely explained by an increase in ischaemic heart disease.

- Females with diabetes should be considered as a special group for early detection and prevention of heart disease.

- An overseas study has shown that tight blood pressure control in patients with hypertension achieves a clinically important reduction in the risk of deaths related to diabetes. Control of hypertension should be a priority diabetes intervention in this state.

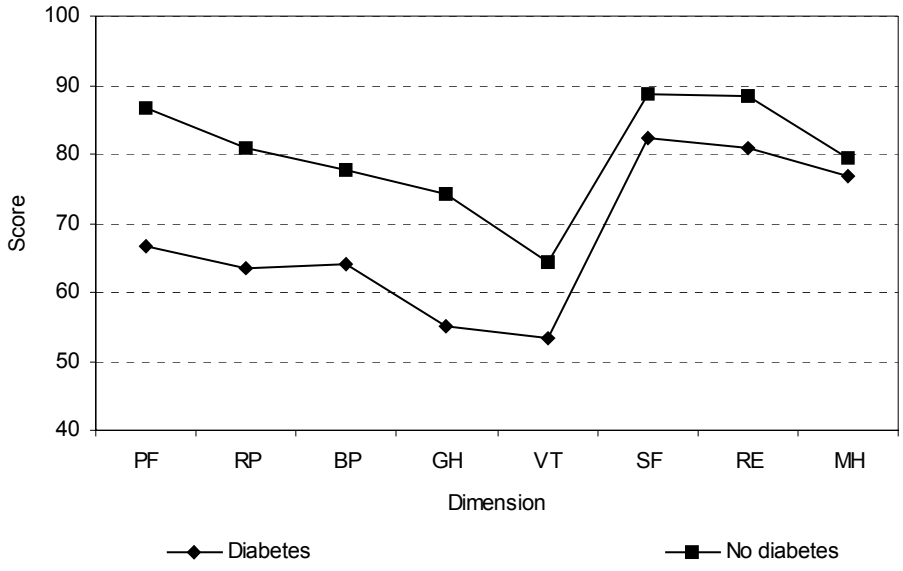
- International work suggests that more active strategies need to be developed to detect heart disease and associated risk factors such as high cholesterol, hypertension, and smoking early in the course of the disease for effective management of diabetes.

Health-related Quality of Life

Measuring differences and changes in health-related quality of life is becoming an increasingly important part of health outcomes assessment. The way a condition such as diabetes manifests itself can have widely differing effects on the physical, psychological, and social functioning of the individual.[13] Generic measures of health status, such as the SF-36 which has been used here, are particularly useful because they allow comparisons between different groups within the population on a range of general functioning indicators.

People with diabetes were compared to people without diabetes on the eight dimensions of the SF-36—physical functioning (PF), role-physical (RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role-emotional (RE) and mental health (MH). People with diabetes scored statistically significantly lower than people without diabetes on every dimension. The profile is illustrated in Figure 7. This demonstrates that diabetes is a condition that affects all aspects of physical, mental, and social functioning, and is not simply a physical health condition. Aspects of social and mental functioning should, therefore, be considered in the management of people with diabetes.

Figure 7: SF-36 scores for people with and without diabetes



Source: Health Omnibus Surveys 1994-95

People with diabetes were also compared to people with other common chronic conditions. People with diabetes scored lower than people with asthma, hearing loss, and people with none of these chronic conditions on all dimensions of the SF-36, and statistically significantly lower on the Physical Functioning and General Health dimensions. People with diabetes also scored statistically significantly lower than people with asthma on the Bodily Pain dimension.

People with diabetes who also had microvascular and macrovascular complications were compared. People with diabetes with microvascular complications (one or both of neuropathy or nephropathy) scored lower than people with diabetes without microvascular complications on all the dimensions of the SF-36. These differences are statistically significant on the Physical Functioning, Role-Physical, Social Functioning. and Mental Health dimensions. It is interesting to note that two of these significant differences are in mental health dimensions. The effect of visual impairment as a result of microvascular disease may account for some of this impact.

People with diabetes who have macrovascular complications (one or both of ischaemic heart disease and peripheral vascular disease) scored lower than people with diabetes without macrovascular complications on six of the eight dimensions of the SF-36, although none of the differences are statistically significant. It would appear that the macrovascular complications of diabetes do not impact as notably on health status as microvascular complications. Some explanations for the lesser effect of macrovascular complications may be the lack of visibility and pain of the symptoms of macrovascular complications compared to microvascular complications, and the effect the symptoms or the management of the complications have on functioning.

The health-related quality of life of people with diabetes who had multiple complications was analysed. Four groups were compared: people with diabetes without macrovascular or microvascular complications, people with diabetes with only macrovascular complications, people with diabetes with only microvascular complications, and people with diabetes with at least one of each type of complication. People with diabetes with macrovascular only complications do not score significantly differently from people with diabetes with no complications of any type. On several dimensions they score higher than people without complications, although these differences are not statistically significant. However, people with diabetes with microvascular complications or a combination of macrovascular and microvascular complications score lower than people without complications on all

dimensions, and statistically significantly lower on some of these dimensions. The primary contribution to diminished quality of life in people with both types of complication is from microvascular complications. This is supported by the similar pattern for people with microvascular complications and both microvascular and macrovascular complications, and lower scores for people with microvascular complications on the Bodily Pain, Social Functioning, and Role-Physical dimensions. The presence of microvascular complications has a substantial effect on the quality of life of people with diabetes.

Key Issues

- Diabetes is a condition that has a considerable effect on all aspects of functioning as measured by the SF-36. As a consequence, functional ability and lifestyle adjustment must be addressed in management plans.

- Diabetes complications also have an effect on health-related quality of life, with microvascular complications in particular having a large effect on both physical and mental functioning, possibly because of the visible and painful symptoms of these complications.

- Improvements in the health-related quality of life of people with diabetes complications should be considered as both outcomes of, and incentives for, the successful management of diabetes complications.

- The effect of diabetes on physical and mental functioning should be considered when diabetes care programs are designed.

The Cost of Diabetes

There are numerous health care costs associated with diabetes that have an impact on the health system and on individuals with diabetes. Costs associated with prevention, treatment, and detection of diabetes and its complications may be direct, indirect, or intangible. Direct costs are those incurred in health services, and the cost of supplies required for diagnosing and treating diabetes. Indirect costs are more difficult to measure, but are evident in loss of production through absence because of illness, premature death, and early retirement. Intangible costs are incurred in non-financial areas, such as lower health-related quality of life, pain, suffering, and the impact on the individual's ability to participate in society.

Data on the cost of diabetes in Australia are not comprehensive, and few studies on cost have been conducted in South Australia. Segal and Dalton estimated the total direct and indirect costs of diabetes in Australia.[7] It was predicted that direct costs of diabetes would total $553 million and indirect costs $418 million, a total cost of $971 million, or $2774 per person with diabetes each year. From population studies it has been estimated that there are 42 000 people in South Australia with diabetes. At an annual cost of $2774 per person, this would amount to a total cost of $116.5 million for this state each year.

Health care utilisation was compared for people with and without diabetes. People with diabetes use health services more frequently than people without diabetes, and this applies to nearly all health care providers. Of particular importance is the fact that many people with diabetes used tertiary care services such as casualty or outpatients, and many have been admitted to hospital. This is illustrated in Table 3. When data are stratified by age, statistically significant increases for people with diabetes persist in the use of some health services. This is particularly evident in the use of casualty and outpatients.

Table 3: Use of health services in the previous twelve months for people with and without diabetes

	Percentage who used health service	
Service	**People with diabetes n=119**	**People without diabetes n=2880**
Specialist	57.1 ↑	33.8
Podiatrist	17.6 ↑	5.7
Eye Specialist	43.7 ↑	24.2
Chemist	10.8	15.9
General Practitioner	97.5 ↑	87.5
Casualty/ Outpatients	39.5 ↑	22.2
Hospital Admission	31.7 ↑	17.5
Of those admitted:	----------	----------
Once	60.5 ↓	80.0
More than once	39.5 ↑	20.0

↑↓ Statistically significantly higher or lower than people without diabetes

Source: Health Omnibus Survey 1995

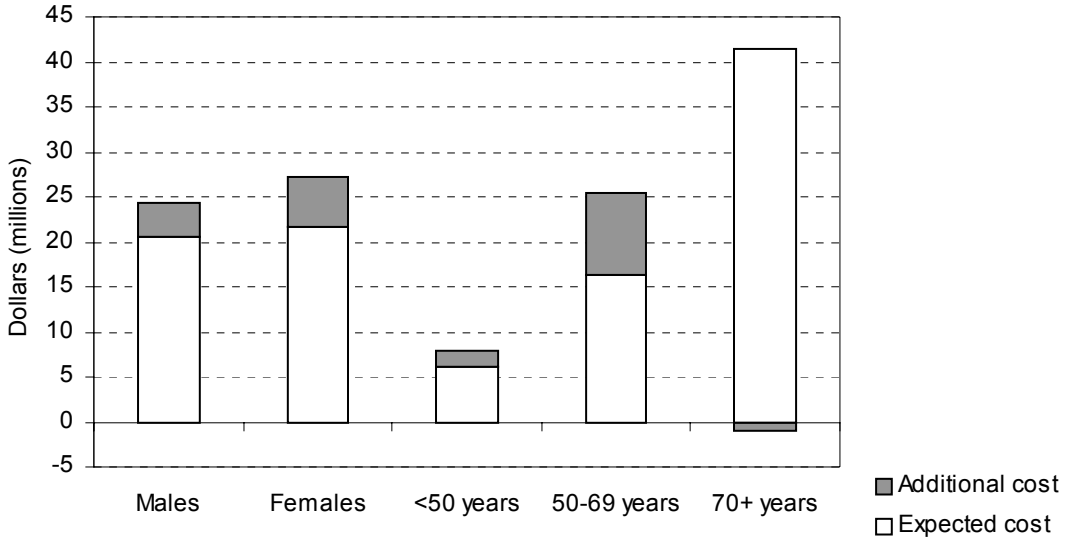
Further analysis was conducted to estimate costs for general practitioner and specialist services. The higher use of general practitioners by respondents with diabetes translated to an additional cost of $3.8 million across the state, and the use of specialist doctors to an additional $2.4 million.

A study of inpatient data from all South Australian hospitals in 1996–97 enabled calculation of the additional costs of inpatient visits where diabetes was either a principal or a contributing diagnosis.

The actual and expected costs of hospital admissions for people with diabetes are shown in Figure 8. The expected cost is calculated by applying the cost of an episode with an average length of stay for a person without diabetes to the number of admissions for people with diabetes. Actual costs are those applied to the length of stay for each person with diabetes. The additional cost is the difference between the actual and expected costs. The analyses have been adjusted for age and sex, therefore the costs represented here do not represent *total* costs but the comparative costs for people with and without diabetes. The greatest costs are incurred by the 70+ years

age-group, although the greatest additional cost burden is incurred by the 50–69 years age-group.

Figure 8: Expected and additional costs for diabetes-related hospital admissions in South Australia 1996–97



Source: Integrated South Australian Activity Collection 1996–97

Note: Results adjusted for age and gender.

The average length of stay in a public hospital for people with diabetes was 4.7 days, compared with an average of 3.6 days for those without diabetes. The comparison in the private hospital sector was 3.1 days for those with diabetes and 2.9 days for those without diabetes. The private hospital admissions may reflect different case severity or complications when compared to public hospital admissions.

Diabetes-related inpatient admissions were categorised into seven major groups according to the primary diagnosis. Expected costs were again calculated using the cost for people without diabetes and comparing them to the actual cost for each category. The results are shown in Table 4.

Pharmaceuticals are another direct cost. The overall estimated national costs in 1996 for subsidised drugs used in the treatment of diabetes from the 71 499 689 community prescriptions amounted to $94 812 435.[14] This would approximate to $7 679 807 in South Australia, using the proportion of the national population that lives in this state as a guide. This is likely to be an underestimation, as the population of South Australia is older than that of other states, thus South Australia is likely to incur

higher pharmaceutical costs of diabetes-related medications than the figure estimated above.

Table 4: Public hospital admission costs for people with diabetes, by primary diagnosis

Primary diagnosis	Expected cost	Actual cost	Additional cost of diabetes
Infectious (transmissible) diseases	$305,069	$271,971	– $33,098
Diabetes	$0	$5,013,470	$5,013,470
Circulatory system disorders	$8,186,645	$8,958,537	$771,892
Renal disorders	$427,932	$311,707	– $116,226
Neoplasm	$1,841,330	$1,627,670	– $213,660
Infection	$444,872	$677,328	$232,455
Other	$17,591,165	$22,788,835	$5,197,670

Source: Integrated South Australian Activity Collection 1996–97

Note: Results adjusted for age and gender.

Indirect health care costs of diabetes centre around the societal cost of days lost from work and other activity, because of morbidity, disability, and premature mortality.[15] In Australia, few studies have estimated indirect costs. Segal and Carter estimated indirect costs from absenteeism and premature mortality at $418 million per annum in Australia in 1992.[16] Using the proportion of the national population that resides in South Australia, these indirect costs would total $33 858 000 in this state. This estimate for South Australia is limited, as it does not account for the different age, sex, and occupational structure of the state and how this might affect the estimate. Limited data are available in South Australia to measure the indirect costs of diabetes. In the Health Priority Areas Surveys of 1997–98, respondents were asked if in the last four weeks they were totally unable to work or carry out their normal duties because of their health, and if they had to cut down the amount that they did in their work or normal duties because of their health. People with diabetes were statistically significantly more likely than people without diabetes to have their capacity to undertake their normal duties affected. Although this confirms that indirect occupational costs are incurred by people with diabetes, these data do not allow the calculation of the value of lost production.

Diabetes is sometimes seen as 'a threat to life's equilibrium' by those who have it.[17] This is evident in other intangible costs to the individual, particularly stress,

depression, anxiety, and associated feelings of sadness, panic, pain, and fear.[18] These may result in strain on relationships and social interactions, restrictions on employment and travel, physiological complications, and difficulties with adaptating and adjusting to life issues.[19] The measurement of these effects, sometimes called the psychological costs, is very difficult, and intangible costs are often excluded from economic studies because of these difficulties.[15]

Key Issues

- People with diabetes have higher rates of health service use of providers such as general practitioners, specialists, and allied health professionals, and tertiary care services. Guidelines for appropriate use of health care providers are necessary to ensure equity of access as well as cost efficiency.

- People with diabetes have a longer average length of stay for inpatient episodes in South Australian hospitals than those without diabetes. This implies that their conditions are more serious or more complicated, and highlights the way in which diabetes contributes to other morbidity.

- The additional cost for increased length of stay for people with diabetes is substantial, particularly in the 50–69 years age-group. This group should be investigated to explore the reasons for the extra cost.

- The cost of diabetes-related care in the tertiary sector is considerable, especially for hospital admissions where diabetes is a contributing factor to disorders of the circulatory system. This is another argument for the targeting of cardiovascular risk factors as a means of preventing circulatory system disorders that require hospitalisation.

- The cost of diabetes is not only financial. Diabetes has a substantial effect on personal well-being and daily functioning. These are important components of the cost of diabetes.

Psychosocial Impact

Little work has been done in the world on the psychosocial effect of diabetes, that is, how the problem interacts with the wider life context. The difficulties and problems an individual has in adapting to living with diabetes have considerable implications for its management. These difficulties do not only relate to the individual with diabetes, but also to the wider sociological context of work, family, leisure, and recreation. So far, management models do not adequately address these contexts.

One school of thought suggests we need to go beyond compliance factors and beliefs and determine what the problem and proposed solutions mean to the people involved. It may well be that a person has positive health beliefs and supportive environments yet still does not adhere to a particular management plan. This may be because the person has not accepted diabetes as a major priority, or because management is at variance with well-formed cultural or social habits, or because it is not important to him/her because of a lack of interest on the part of others in his/her personal and health care network. Understanding what the problem means to people with diabetes requires a new approach. In the past we have concentrated on the variables that seemed to explain diabetes and constructed a meaning from them, rather than investigating what the problem means and then determining how to explain these meanings. Addressing the meanings of the problem of diabetes from both the patient's and the general practitioner's point of view may clarify how we can make more progress with diabetes.

People who have health problems, take medicines, and undergo medical tests and interventions often place different meanings on these issues from the meanings that are understood by the health professionals who treat them and prescribe for them. Patients have to fit their medical problems and medical schedules into their daily lives. In doing so they will vary the advice and instructions given for their health problem and their medical schedule to accommodate the social, psychological, economic, and physical influences on their lives.[20] In summary, the context of a health problem and its treatment may have a very different meaning for the patient than it does for the health professional.

Failure to conform to a treatment regimen has often been called 'non-compliance' on the part of the patient. Trostle[21] has proposed that non-compliance is an unavoidable by-product of collisions between the clinical world and other competing worlds of

work, play, friendship, and family life. Patients who take medicines live in these worlds all the time and only intermittently visit the medical world. Non-adherence to management strategies has inherently blamed the individual for failure to meet goals or conform. Rarely is the collision of management strategies with the patient's world recognised as an important factor in non-adherence.

In South Australia Hepworth and Mensforth[22] have addressed this dimension of diabetes in a qualitative in-depth interview study of people with diabetes that explored what diabetes means to the individual and to the doctor who manages it. In this study, people with diabetes were mostly aware of what was required of them in the management of diabetes in terms of diet and weight loss, exercise, taking medication, not smoking, and drinking alcohol in moderation. However, most reported at least some difficulty in following the recommended course of action. Many barriers were identified as to why behaviours were not changed, and these findings highlight that education and the resultant increase in knowledge about the disease are not sufficient for behaviour change. Denial also played a part in management of diabetes. Some people with diabetes felt they were not very ill, even in the face of evidence to the contrary. Diabetes was often perceived as more of an inconvenience that impinged on people's lives rather than as a serious life-threatening illness. Some participants also felt somewhat stigmatised by having diabetes.

Key Issues

- To be successful, diabetes interventions need to take into account the perspective of the person with diabetes, and the barriers to self-management he or she faces.

- People with diabetes have varying degrees of knowledge about what they need to do to achieve better health outcomes. In some cases, however, there are important gaps in knowledge, particularly of retinopathy and cardiovascular diseases.

- Conflict exists between what the patient knows he or she should do and what he or she can actually achieve. Investigation of the barriers to desirable outcomes should be part of the patient education approach.

- Significant others in the patient's life are important in achieving desirable outcomes. Educating families about diabetes and setting goals is important.

- Problems affecting the patient's ability to achieve health outcomes include stressful work and family situations, traumatic events in the family, depression, and financial situations. A multifactorial, whole-of-life approach is therefore necessary to manage diabetes successfully.

- Many of the reasons behind non-adherence are not adequately understood and consequently do not form part of the treatment plan. For example, for a treatment plan to address the risk factor of smoking successfully, we need to understand why factors such as lack of emphasis by the GP, boredom and irritability, heavy addiction to nicotine, perception of the need for an indulgence, and previous failure remain as barriers to quitting.

- Although exercise is an important diabetes management tool, other physical health problems of people with diabetes are seen as preventing any exercise.

- For the successful management of diabetes, doctors rely on support from multidisciplinary teams, including nurse educators, dietitians, podiatrists, ophthalmologists, and hospitals, yet barriers such as costs, time, and waiting lists may prevent access to these services.

Conclusions

It is pertinent to ask three fundamental questions when assessing how the evidence in this publication may be translated into better diabetes outcomes for South Australia. First, what do we expect or desire from diabetes care? Even though this may seem obvious, it is still important to ask this question as it helps to identify the common goals. Second, are we achieving what we expect or desire? For the most part the evidence suggests that we are not – at least not for all people and not to the required extent. Third, how can we achieve what we expect or desire?

It is also useful to ask what is achievable in the South Australian context. The South Australian Health Goals and Targets for Diabetes outline specific achievable targets for a limited number of diabetes-related outcomes.[23] These are:

- To reduce the age- and sex-adjusted hospital admission rates by 10% by 30 June 2000 for people with diabetes and coronary heart disease, cerebrovascular disease, vascular disease, lower limb amputations, kidney failure, or renal disease.
- To reduce the incidence of diagnosed diabetes, especially in Aboriginal people, children, pregnant women, people from high-risk ethnic groups, and people living in rural and remote areas.
- To reduce by 10% by 30 June 2000 the proportion of people with diabetes who are obese or overweight, have hypertension, smoke, do insufficient physical exercise, lack knowledge of diabetes, have poor glycaemic control, and have dyslipidaemia.
- To increase by 10% by 30 June 2000 the proportion of the general population who are aware of the risk factors for and early symptoms of diabetes.

These goals, which are due for revision in early 2000, give some estimate of what is achievable in specific aspects of diabetes care in South Australia. However, for other aims outlined in this chapter and for the strategies outlined in the Strategic Plan for Diabetes in South Australia, stakeholders will need to decide what is attainable and set new and/or additional targets.

The goals and targets outlined above were considered in the development of the Strategic Plan for Diabetes in South Australia.[23] The evidence produced in the present document also reinforces the focus and direction of the strategic plan. Together this work suggests that four primary aims for diabetes care could be considered to be:

1. To prevent or delay the onset of diabetes.
2. To manage diabetes in such a way that day-to-day functioning is optimised and complications are minimised.
3. To manage diabetes in a cost-effective way.
4. To monitor and evaluate outcomes and, where appropriate, modify programs in a timely manner to improve outcomes.

Each of the Health Goals and Targets for Diabetes and the strategies outlined in the Strategic Plan for Diabetes in South Australia falls under one or more of these broad aims. The three fundamental questions identified above apply to each of the four aims. Each aim will now be discussed in turn, drawing on both the findings of this document and the literature.

To prevent or delay the onset of diabetes

What do we expect or desire from diabetes care?

Preventing or delaying the onset of diabetes is important as it will reduce the burden of diabetes in the future. To achieve this would require an increased awareness in the general public of what they can do to prevent diabetes. It would also require the general public to know if they are at risk of developing the condition. Additionally, the prevalence of risk factors for diabetes in the general population, such as obesity and lack of physical activity, would need to be reduced. Reducing the number of people who progress to diabetes is a desirable outcome as it decreases the burden of disease on both the population and the health system.

Is this aim being achieved?

There is substantial evidence to show that this aim is not being met. Risk factors for diabetes in the general population are highly prevalent, and with the ageing of the population, the prevalence will increase. Knowledge of the risk factors for diabetes and awareness of actions that can be taken to delay the onset of the condition are generally recognised to be deficient. Only a small proportion of those at risk of diabetes appear to perceive themselves to be at risk. A possible effect of this is that people who do not perceive themselves to be at risk will not take any action to reduce that risk and hence prevent or delay the onset of diabetes.

How can we achieve what we expect or desire?

There are two levels of action that could be taken to achieve this aim. First, advantage could be taken of general health promotion messages directed at the whole population. Such programs include Active Australia, which promotes physical activity, and Acting on Australia's Weight, which promotes healthy weight attainment. At both a state level and a local level, messages like these can be individualised to promote action. Diabetes-specific health promotion, for example, from Diabetes Australia, can be used for the same purpose. The Community Awareness of Diabetes program run by Diabetes Australia will attempt to increase risk factor and early symptom awareness in the general population. Local programs could link with this program to take advantage of the ground swell of interest in diabetes.

A second level of action to prevent and delay the onset of diabetes could be started at the community level and individual level. Groups with special needs, including Indigenous Australians, migrants from specific ethnic backgrounds, and people with previous impaired glucose tolerance or gestational diabetes, have been identified as clear targets for primary prevention of diabetes. Targeting preventive strategies at groups with well-established risk may prove more cost efficient and result in fewer progressions to diabetes.

Opportunities to promote diabetes prevention messages may also arise with the general practitioner or other health professional, or at the community level such as in service clubs or sports clubs. General practitioners have an opportunity to broaden their role in health promotion, particularly by addressing risk factors before diabetes is present, and by implementing monitoring and recall programs for people with diabetes risk factors.

To manage diabetes in such a way that day-to-day functioning is optimised and complications are minimised

What do we expect or desire from diabetes care?

This aim has an impact throughout the diabetes continuum, from those at risk of diabetes to those experiencing the tertiary complications of diabetes. This aim has implications for individuals with diabetes, because with better management their

health is likely to improve, and for the health system, because better management should result in fewer and less severe complications. The first component of this is the early detection of diabetes, which can increase the chances of preventing the development of complications because management can begin early in the natural history of the disease. In managing the condition there may be barriers to the attainment of health care that need to be addressed. That is, people should have access to the care they require when and where they need it, and care should be delivered in a culturally appropriate manner. Recall systems for essential components of diabetes care (such as blood pressure and glycaemia monitoring, ophthalmological checks, and foot checks, complications monitoring and management) should be in place to ensure that management of the condition is maintained. Education for people with diabetes should be provided as it is assumed that people who receive instruction are in a better position to participate in their own health care.[24] Education should be directed at increasing empowerment of individuals by improving their compliance, knowledge, and self-care. This involves encouraging patients to play an active role in their health care when they are able and willing to do so.

Is this aim being achieved?

Again there is abundant evidence to show that management goals are not realised. First, diabetes is not diagnosed early in the natural history of the disease, as indicated by the presence of complications at diagnosis. The health status of people with diabetes is significantly worse than those without, and high prevalence rates for diabetes risk factors and complications persist. Health professionals acknowledge the lack of time available to address issues such as foot care, diet, exercise, and smoking. It appears that specialists in these areas are not adequately resourced or used. Diabetes education seems diffused, poorly targeted, and variable, and simply having knowledge does not necessarily lead to the behaviour change that is required to improve management.

How can we achieve what we expect or desire?

Early detection

Early diagnosis is the first stage in the diabetes continuum where these outcomes can be achieved. Early identification of diabetes is important, because the sooner the condition is diagnosed, the sooner management strategies can be implemented. The Diabetes Control and Complications Trial found that greatest risk reduction from tight glycaemic control in retinopathy and neuropathy was achieved in those with no

existing retinopathy and albuminuria before the intensive glycaemic control was initiated.[25] At present, identification of diabetes occurs reasonably late in the course of the disease, and one American study estimates that at diagnosis, diabetes has been present for 10-12 years.[26]

Screening for diabetes enables identification and diagnosis of diabetes and other diseases or complications, and this document has advocated screening as a priority management tool across the spectrum of diabetes care. There are no mandatory screening procedures in Australia but there are guidelines for general practice.[27] These guidelines offer recommendations for the identification of risk factors and subsequent testing procedures. High-risk groups identified in the guidelines include:

- People over 40 years
- People with a strong family history of diabetes
- Overweight people
- Certain ethnic groups, e.g. Australian Aborigines, Indian and Maltese immigrants
- Mothers of babies with birth weight more than 4.5 kilograms or with a poor obstetric history
- Patients with recurrent urinary infection or staphylococcal and monilial skin infections
- Any child with an acute abdomen
- All pregnant women.

The American Diabetes Association Clinical Practice Recommendations 1998 state that community programs that identify individuals at high risk for having undiagnosed diabetes (such as through a questionnaire), and then refer them for appropriate medical testing may have a place in screening programs.[28] The efficacy of such a program is unknown, although community-based strategies provide a means of enhancing public awareness of diabetes. In any campaign to increase the profile of diabetes in the general public, appropriate strategies must be in place to facilitate screening and management in detected cases.

Education

Appropriate strategies for the management of diabetes include adequate and appropriate education and empowerment, which are regarded as cornerstones of optimal care. Education and empowerment ideally would give individuals the opportunity to participate in their own care, give them a sense of control over their

condition, and, perhaps most importantly, enable them to identify when they need help and where to get that help.

Patients who receive instruction are presumed to be in a better position to participate in their own health care and thus maximise the therapeutic benefits.[24] Diabetes education for people with established and diagnosed diabetes aims to teach and support self-help to improve an individual's ability to manage and control his or her illness. The emphasis in diabetes education should be on management of the disease and empowerment of the patient, rather than simply information giving.[29] When patients become active collaborators in treatment planning, goal-setting, and health maintenance, compliance with medical regimens improves. Increased feelings of self-control contribute to improved emotional and physical functioning. This rising interest in self-help coincides with a shift in medical treatment goals from cure to management and maintenance of an acceptable quality of life.[30]

However, improving knowledge will not necessarily lead to an initiation of appropriate action, or improved control of symptoms.[31,32] Non-compliance is high in chronic disease because medication does not offer a cure, and a permanent alteration to the individual's lifestyle is required.[33] Patients' motivation to learn and adhere to treatment is also greatly influenced by individual factors, both psychological and environmental, that need to be taken into account.[34]

Education aims to increase empowerment of individuals with diabetes by improving their compliance, knowledge, and self-care. Improvement in these factors results in better glycaemic and metabolic control, lowering in body mass index, better dietary practices, increased physical activity, and improved quality of life. Anderson et al.[35] indicate that patient empowerment is conducive to improving blood glucose control, and, in an ideal setting, patient education would address blood glucose management and the psychosocial challenges of living with diabetes equally.

From a wellness perspective, health is viewed in a broad sense that encompasses interrelationships between physical, mental, social, emotional, and spiritual components.[36] People's everyday lives, living with and in spite of illness, need to be considered, remembering that people who are sick spend only a fraction of their time in a patient role.[37] Such a perspective necessarily focuses on the meaning of illness, the social organisation of the individual's world, and the strategies used in adaptation. This approach to health and illness is particularly applicable in diabetes management because diabetes affects all areas of a person's life—work, family, social, and

recreational. The boundaries of diabetes education therefore need to be expanded to address this holistic view.[36] Patient education is considered most effective when it is encouraged throughout diabetes care and it becomes a part of lifestyle habits.[38] Education should not only be aimed at improving knowledge of the disease, but also at helping individuals to manage their treatment better and adapt their diabetes control to the constant changes in daily life.[29]

Health Professionals and the Health Care System

At the next level, health professionals can help to achieve optimal management in their clients with diabetes. The general practitioner is the key manager for most people with diabetes. This is preferable because general practitioners have detailed knowledge of the patient's medical and social history, and the local clinic is a non-threatening environment for the provision of care.[39] However, general practitioners are limited in their ability to provide the care and education that is required, because of the constraints of the general practice environment and potential inadequacies in training and expertise. Collaboration with other health professionals would be a vital aspect of improved management. A multidisciplinary approach to diabetes education will rely on the cooperation of health care providers and clear role delineation, both to enhance and use the specialist skills of the providers and to ensure that people with diabetes receive optimum care. Guidelines for diabetes management that outline care expectations should add to the ability of the health system to reach best practice in South Australia.

Education of health professionals is as important as patient education in bridging the gap between people with diabetes and those who can contribute to their own management. Education demands a lot from health care providers in specific training, teaching skills, good communication, a supportive attitude, and a readiness to listen and to negotiate.[34] Findings from a survey of diabetes patients and general practitioners suggested that clinicians giving a diagnosis of diabetes should be aware of patient variability in their needs for emotional support and information preferences, offer choices if available, provide more information about treatment, and increase patient involvement in discussions about therapy.[40] A collaborative team approach involving the patient; diabetes nurse educator; general practitioner; dietitian; varied specialists, including podiatrist, endocrinologist, ophthalmologist, and physiotherapist; and family members ensures a comprehensive diabetes education program.[27] Pharmacists are also recognised as ideal providers of diabetes education as they are readily accessible and have a strong focus on patient counselling.[41]

At the system level, the model of health care delivery in diabetes needs to be considered. Barriers to care may include waiting lists to see specialists, limited accessibility to specialised care, and the financial cost of managing a chronic condition such as diabetes. Additionally, there may be only a limited opportunity for the psychosocial context to be taken into account, particularly in the tertiary sector. A more holistic approach to the provision of care for people with chronic conditions may be found in a 'Chronic Disease Centre' model. In this model a range of practitioners are available to address all the relevant aspects of chronic disease management. This would be an expansion of the current model of diabetes centres and would include specialist care, podiatry, and dietetics, and skilled education for both the practical components of diabetes management (such as blood glucose monitoring) and the knowledge and action components. It would also include education to help people with diabetes act on the advice they receive, for example, smoking cessation programs and weight loss programs. 'Chronic Disease Centres' would make the functioning of recall programs simpler to ensure regular review. Obviously 'Chronic Disease Centre' is not an appropriate name for such a model in the public arena. However, the model, which aims to reduce barriers to health care and to provide optimal care for people with a chronic condition, may prove a useful option.

Specific issues in diabetes management

Some specific issues in diabetes management should be addressed as priorities, according to the evidence presented in this document. These issues are glycaemic control, hypertension, smoking, and obesity. Approaches to the management of these issues appear to be sub-optimum, and new and alternative ways of improving outcomes may be required. Studies have shown that good glycaemic control is achievable but requires dedication on the part of health care providers and the individual. Education is a vital component of this, because people with diabetes need to be responsible for monitoring their blood glucose and for implementing other components of therapy. Management strategies need to take individual circumstances, lifestyle, and coping abilities into account in order to gain the most from intensive blood glucose control and to minimise the side-effects such as hypoglycaemia.

The control of high blood pressure in individuals with diabetes is also a priority issue. Many trials have implemented blood pressure control mechanisms, which have

included diet therapy, medication, and exercise.[42] It is certain that adequate control of blood pressure requires the input of a case manager, in most cases the general practitioner, to ensure appropriate monitoring and adjustment of therapy as required. This document has shown that nearly all people with diabetes have contact with their general practitioner at least yearly, thus this is the most obvious intervention point for blood pressure management.

Smoking is a serious problem among people with diabetes. Wakefield et al. propose a range of recommendations for dealing with people with diabetes who smoke.[43] These recommendations are the result of a study on people with insulin-dependent diabetes, but they apply just as well to smoking cessation in people with type 2 diabetes. The recommendations for practice involve: an appropriate attitude from the health care provider, who is supportive and non-punitive and recognises the barriers to quitting; encouragement for the partners and family of people with diabetes to support smoking cessation attempts by also quitting, or banning smoking in the home and car; the delivery of clear information about the lesser known microvascular complications exacerbated by smoking, including joint problems, dental disease, and impotence in men; and advice about weight gain and dietary adherence when smokers with diabetes quit. Most importantly, smoking cessation advice from practitioners should be appropriate to the readiness of the smoker to quit. Supervised use of nicotine replacement therapy should be included as part of the cessation program. In South Australia, we are in an ideal position to seize the challenge of smoking cessation, as structural support, such as bans on smoking in public places, is widespread.

Obesity is another priority issue, although the way forward for this risk factor is not so clear. Weight reduction programs in people with and without diabetes continually fail, or fail to maintain weight loss after an extended period of time. Achieving ideal body weight is not a simple task, and as Tattersall states, it is wrong to blame the patient for the failure of diets to achieve either glycaemic control or weight reduction.[44] Again it is clear that a multidisciplinary approach to managing obesity should be applied.

To manage diabetes in a cost-effective way

What do we expect or desire from diabetes care?

This is an outcome for the health system. It means that resources should be allocated so that maximum gains are made from input, and interventions should be proven effective or pilot-tested to assess effectiveness. New approaches to funding a mix of diabetes services should be explored. Where possible, guidelines should ensure that use of health services is appropriate.

Is this aim being achieved?

Millions of dollars are spent on diabetes in this state each year, yet there are not enough resources to control diabetes optimally. Resource use in diabetes is concentrated at the tertiary end of management, in treating complications. It is likely that resources used earlier along the diabetes continuum would help to prevent complications that require tertiary stage care. Value for money should not only be addressed in monetary terms. There are non-monetary gains to be made as well, in particular in quality of life. Outcomes for cost-effectiveness should include non-monetary measures alongside dollars spent and saved.

How can we achieve what we expect or desire?

Health systems certainly wish to manage chronic conditions such as diabetes in a cost-effective way. However, this is not simply a matter of dollars and cents. Resources in diabetes should be used appropriately, which not only means that value for money should be obtained, but also that resources should be evenly distributed. This even distribution applies between people and groups of people, and it also applies along the diabetes continuum. It is reasonable to expect that more resources spent earlier in the natural course of the condition, such as on early detection and risk factor management, would help to ensure that costs at the other end of the spectrum, for example on treating end-stage complications, are reduced. In a more even distribution of resources, efforts should focus on those groups who require them most. These groups have been identified in this document and include early detection among high-risk groups and more effective management among groups with poorly controlled diabetes. Programs that are implemented in South Australia should also be carefully assessed for their potential effect. Interventions that are proven, or can be piloted, should be priorities for diabetes resources.

To monitor and evaluate outcomes and, where appropriate, modify programs in a timely manner to improve outcomes

What do we expect or desire from diabetes care?

This is a vital step in the delivery of diabetes care. All programs should be assessed for their effectiveness. This includes assessing the impact on the population with diabetes, the impact on the health services and the individual practitioner, and satisfaction with diabetes care. If we do not evaluate the impact of programs, then they are open to serious questions about efficacy. Guidelines are an important facet of the provision of services, and where guidelines for care exist, adherence to them should be assessed. Guidelines also need to encompass a better understanding of the sociological context of diabetes.

Is this aim being achieved?

Little is known about the health care utilisation patterns of people with diabetes, or the use of other services or networks, particularly informal networks, to cope with the condition. It is difficult to monitor costs and outcomes of diabetes care. Universal guidelines for diabetes care are limited and adherence to existing guidelines is unknown.

How can we achieve what we expect or desire?

Monitoring and evaluating inputs and outcomes is an essential part of health care provision. This will require appropriate baseline observations taken of relevant outcome measures and the use of systems to follow up those measures over time. In South Australia we are in a unique and privileged position in that population-based information about diabetes has been available for many years, and opportunities to use resources such as SERCIS and the Health Omnibus Survey to implement monitoring and evaluation abound. Epidemiology plays a key role in achieving this fourth goal. Leeder is a firm believer in the role of epidemiology in public health. He highlights the capacity of epidemiology to explore the mechanisms of health and ill-health within empirical science, and sees a vital place for epidemiology in the pursuit of understanding the social context of disease beyond the physical manifestations.[45] The challenge of defining, measuring, and evaluating the social context of health will be an important development in diabetes care.

A final word

The Impact of Diabetes in South Australia: The Summary has highlighted some serious health issues in relation to diabetes. A full explanation of the issues and the supporting evidence are contained in the complete document, *The Impact of Diabetes in South Australia The Evidence*. Along the diabetes continuum opportunities for better diabetes outcomes for the individual, the practitioner, and the health system are apparent, and this last chapter has highlighted some of these. The next step is to make decisions about diabetes care in South Australia, based on evidence from the main document, and then identify the best ways to implement those decisions. The support of the Diabetes Health Priority Area Advisory Group and the institutions and people they represent will be essential to the improvement of diabetes health outcomes. Evidence-based decision-making to achieve better health outcomes in diabetes is a continuing process that requires policy support and investment.

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