

# 4 Costs of diabetes in 1993–94

## Direct costs of diabetes mellitus

The total health system costs of diabetes mellitus are estimated at \$387 million in 1993–94 (Table 6, including costs of hypoglycemia and hyperinsulinism). Of this total cost, 26% is for pharmaceutical drugs, 27% for hospital care and 17% for medical services. The costs and health system use shown in this and the following section relate to health services for which diabetes mellitus is identified as the diagnosis or underlying problem. Diabetes mellitus also causes substantial morbidity and mortality due to eye and kidney diseases and limb amputation, and increases the risk of cardiovascular disease (McCarty et al. 1996). Some of the health system costs of these conditions can be attributed to diabetes mellitus, and the total attributable health system costs of diabetes mellitus are estimated in a later section of this report.

**Table 6: Diabetes mellitus: estimated health system costs by health sector, 1993–94 (\$ million)**

	Total costs	Hospital <sup>(a)</sup>	Medical <sup>(b)</sup>	Pharmaceuticals	Allied health services	Research <sup>(c)</sup>	Other <sup>(d)</sup>
Diabetes mellitus	371.9	96.0	65.5	99.4	18.5	19.8	72.6
Type 1 (Insulin dependent)	155.2	42.3	27.8	41.4	7.6	8.3	27.9
Type 2 (Non-insulin dependent)	216.7	53.7	37.7	58.1	10.9	11.5	44.7
Hypoglycemia and hyperinsulinism	15.9	6.9	1.8	0.7	0.4	1.0	5.0

(a) Public and private acute hospitals, repatriation hospitals and psychiatric hospitals. Includes public hospital non-inpatient services.

(b) Medical services for private patients in hospitals are included under Hospitals.

(c) Includes nursing home expenditure, home blood glucose testing equipment and supplies, and other institutional, non-institutional and administration expenditure. Does not include public health services, community health services, or ambulance services.

There are two major types of diabetes: Type 1 diabetes (also referred to as IDDM or insulin dependent diabetes) and Type 2 diabetes (also referred to as NIDDM or non-insulin dependent diabetes). Type 1 diabetes usually affects young people and is one of the most common serious childhood conditions in Australia, whereas Type 2 diabetes occurs in adults and is usually not diagnosed until after the age of 40 years. The 1995 ABS National Health Survey obtained self-report data on Type 1 and Type 2 diabetes as long-term conditions and as a reason for doctor visits in the last two weeks. Overall, 11% of people who reported that they had diabetes were classified as Type 1, consistent with previous estimates that approximately 10% of diabetes cases are Type 1 (McCarty et al. 1996).

Among those people with diabetes who visited the doctor in the last two weeks, a considerably higher proportion were classified as Type 1, ranging from 100% for ages 0–24 years to 60% for ages 25–34 and between 30 and 50% for ages above 35 years (see Appendix Table A.3 for details).

Although it is possible to distinguish Type 1 and Type 2 diabetes in the hospital inpatient data, diabetes mellitus is recorded as a single code in the other data sources. The estimated proportion of Type 1 diabetics among diabetics who visited a doctor in the last two weeks from the 1995 National Health Survey (unpublished data provided by ABS) was used to estimate non-hospital costs for Type 1 and Type 2 diabetes (see Appendix A for details).

As shown in Table 6, the total direct costs of Type 1 diabetes were estimated to be \$155 million in 1993–94 compared with \$217 million for Type 2 diabetes. A significant proportion of older people admitted to nursing homes from hospital had a principal diagnosis of hypoglycemia or hyperinsulinism (ICD-9 code 251) and it is likely that many of these older people had Type 2 diabetes. Health system costs for hypoglycemia and hyperinsulinism are also shown in Table 6 and totalled \$15.9 million in 1993–94. This diagnosis accounted for an estimated \$4.4 million in nursing home costs compared with \$12.3 million and \$7.3 million for Type 2 and Type 1 diabetes respectively. Because the estimates of non-hospital costs for Type 1 and Type 2 diabetes are based on self-reported survey data and relatively small numbers of respondents, the detailed age–sex distribution of health system costs for diabetes mellitus given in Appendix Table C.28 is not further sub-divided for the two types of diabetes.

Table 7 summarises estimated use of hospitals, doctors and drugs for diabetes. In total, diabetes accounted for an estimated 18,600 hospital admissions, 2.5 million medical services and 1.6 million prescriptions in 1993–94. More detailed utilisation estimates are also given in Appendix C.

**Table 7: Diabetes mellitus: estimated health services utilisation by sector, 1993–94**

Type of diabetes	Hospitals			Medical services ('000)			Drugs
	Admissions ('000)	ALOS (days)	Non-inp. services ('000)	GP	Specialist <sup>(a)</sup>	Total	Prescriptions ('000)
Diabetes mellitus	18.6	8.9	417	1,031	1,495	2,526	1,630
Type 1 (Insulin dependent)	9.5	7.7	164	432	620	1,052	664
Type 2 (Non-insulin dependent)	9.1	10.1	253	600	875	1,475	967
Hypoglycemia and hyperinsulinism	2.4	4.2	43	33	36	69	5

(a) Includes diagnostic imaging and pathology services.

According to the 1995 National Health Survey and hospital inpatient data, Type 1 diabetics use health services at a much greater rate than Type 2 diabetics. Based on the reported prevalence of Type 1 and Type 2 diabetes in the National Health Survey, the average number of medical services per annum is 5.8 times higher for a Type 1 diabetic on average than for a Type 2 diabetic and the average number of hospital admissions is around 8.4 times higher.

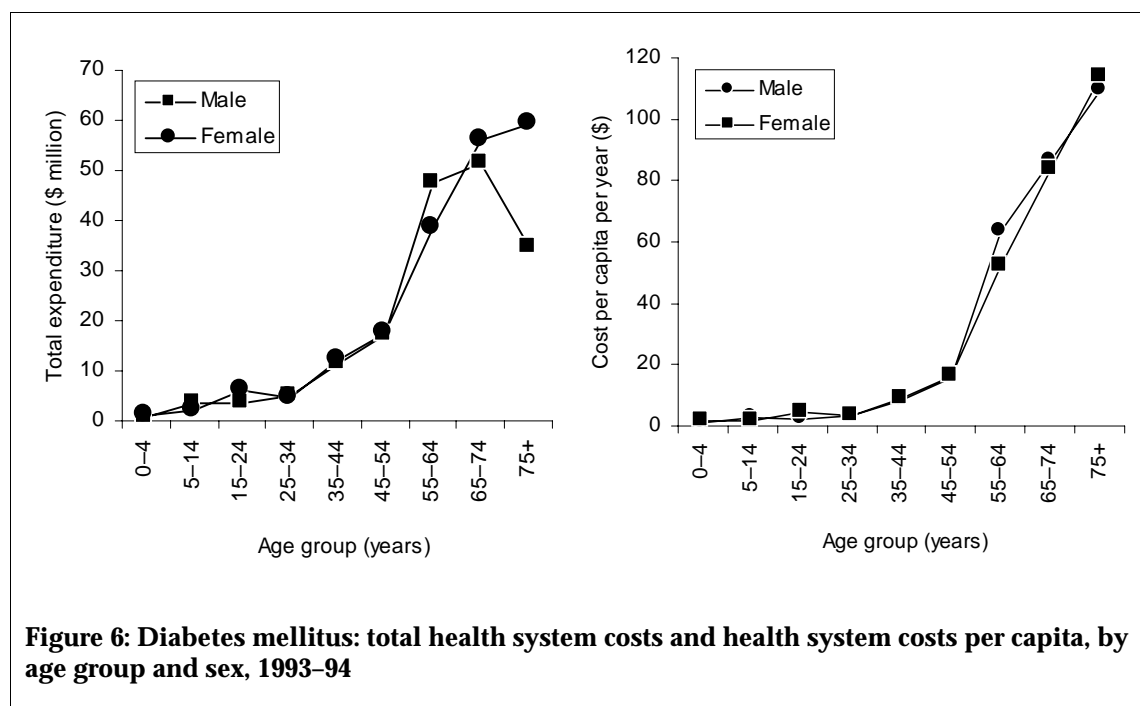
## Direct costs of diabetes mellitus by age and sex

Table 8 shows the estimated health care costs for Type 1 and Type 2 diabetes for males and females in 1993–94. Direct costs for females are 18% higher for Type 1 diabetes and 10% higher for Type 2 diabetes.

**Table 8: Diabetes mellitus: total health system costs for males and females by type and female/male ratio, 1993–94 (\$ million)**

Type of diabetes	Males	Females	Female/male ratio
Type 1 (Insulin dependent)	71.3	83.9	1.18
Type 2 (Non-insulin dependent)	103.3	113.4	1.10
<b>Total diabetes mellitus</b>	<b>174.6</b>	<b>197.3</b>	<b>1.13</b>

Figure 6 illustrates the age–sex distribution of direct expenditure for diabetes mellitus and per-capita annual expenditure. These expenditures rise steeply with age from 40 years onwards. Per capita expenditure for diabetes reaches around \$100 per annum for men and women aged 75 years and over. Detailed information on diabetes costs and health services utilisation by health sector, age, and sex are provided in Appendix Tables C.28 and C.29.



## Health system costs attributable to diabetes

Diabetes mellitus causes substantial morbidity from cardiovascular complications, eye and kidney diseases and limb amputation (McCarty et al. 1996) and some of the health system costs for these conditions can be attributed to diabetes mellitus. Using the attributable fractions given in Appendix Table A.4, the health system costs attributable to complications of Type 2 diabetes have been estimated as shown in Table 9. Complications of Type 2 diabetes accounted for an estimated \$526 million in 1993–94, resulting in a total health system cost of \$681 million attributable to diabetes.

Table 10 gives a breakdown of the total health system costs attributable to diabetes by health sector for males and females aged under 65 years and for those 65 years and over. Over 67% of the total cost relates to men and women aged 65 years and over; this proportion is much higher for women (71%) than for men (62%). Figure 7 illustrates the distribution of health system costs attributable to diabetes by broad health sector for males and females in 1993–94.

**Table 9: Diabetes mellitus: total attributable health system costs for males and females by condition, 1993–94 (\$ million)**

Condition	Males	Females	Total
Type 1 diabetes	71.3	83.9	155.2
Type 2 diabetes	103.3	113.4	216.7
Hypoglycemia and hyperinsulinism	7.6	8.3	15.9
Complications of diabetes			
Hypertension	9.8	22.2	31.9
Ischaemic heart disease	37.7	30.5	68.2
Cerebrovascular disease	41.8	33.3	75.1
Heart failure due to diabetic complications	13.5	23.6	37.1
Atherosclerosis	3.5	2.3	5.8
Peripheral vascular disease	2.5	2.0	4.5
Glaucoma	1.3	2.4	3.8
Cataract	6.4	13.6	19.9
Blindness	1.4	2.8	4.2
Nephropathy	7.0	8.0	15.0
Chronic skin ulcer	8.2	16.9	25.1
Absence of extremities	1.7	1.0	2.7
<b>Total attributable costs</b>	<b>316.9</b>	<b>364.2</b>	<b>681.1</b>

Note: Costs of complications of diabetes estimated using attributable fractions shown in Appendix Table A.4.

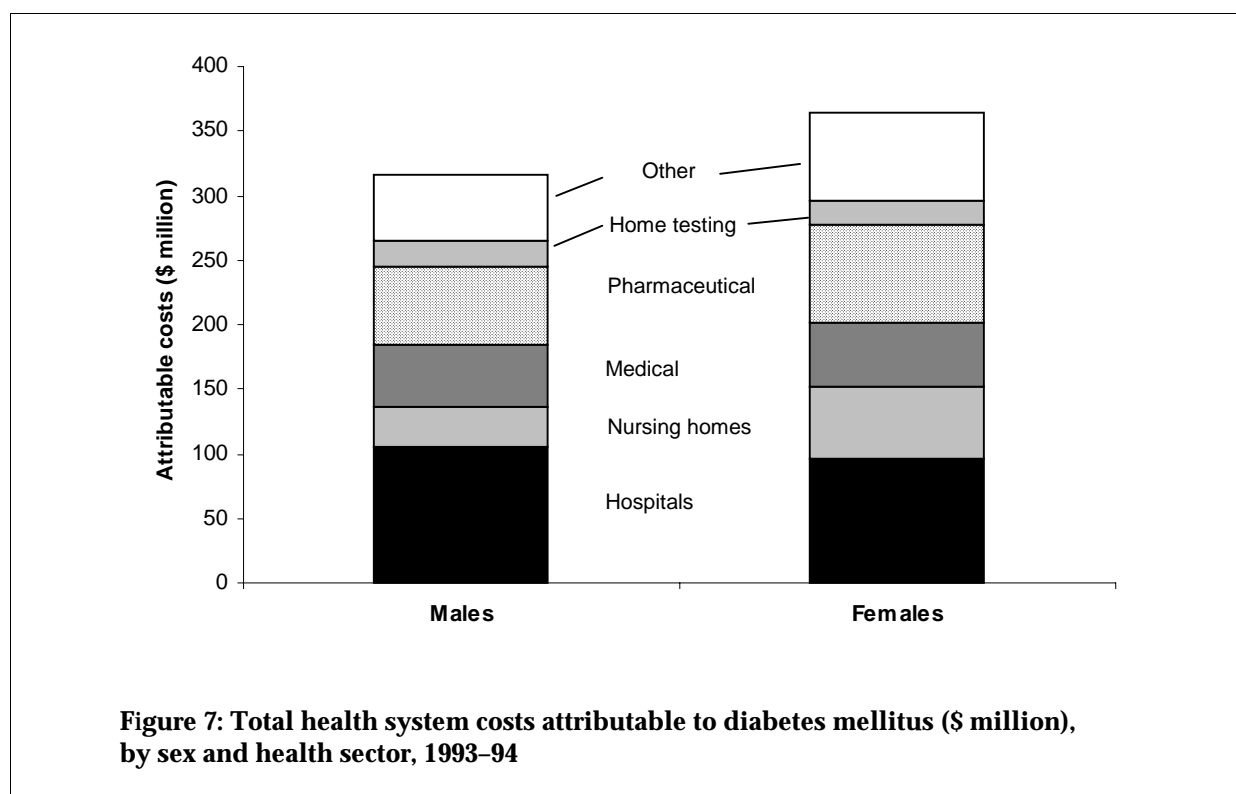
**Table 10: Diabetes mellitus: estimated attributable health system costs<sup>(a)</sup> by health sector, sex and age group, 1993–94 (\$ million)**

	Total costs	Hospitals <sup>(b)</sup>	Nursing homes	Medical <sup>(c)</sup>	Pharmaceuticals
<b>Males</b>					
Aged less than 65 years	120.8	33.6	0.5	22.4	28.8
Aged 65 years and over	196.2	71.5	30.5	25.7	32.2
<i>All ages</i>	<i>316.9</i>	<i>105.2</i>	<i>31.0</i>	<i>48.2</i>	<i>61.0</i>
<b>Females</b>					
Aged less than 65 years	105.4	25.1	1.5	19.1	27.5
Aged 65 years and over	258.7	70.3	55.1	31.0	47.2
<i>All ages</i>	<i>364.2</i>	<i>95.4</i>	<i>56.6</i>	<i>50.1</i>	<i>74.7</i>
<b>Total</b>	<b>681.1</b>	<b>200.6</b>	<b>87.7</b>	<b>98.3</b>	<b>135.7</b>

(a) Costs of complications of diabetes estimated using attributable fractions shown in Appendix Table A.4.

(b) Public and private acute hospitals, repatriation hospitals and psychiatric hospitals. Includes public hospital non-inpatient services.

(c) Medical services for private patients in hospitals are included under Hospitals.



McCarty et al. (1996) estimated that the direct health care costs associated with diabetes in 1995 were \$561 million (see Table 11). They included in this estimate hospital inpatient costs, nursing home costs, medical costs, drug costs and allied health professional costs, but not other types of health expenditure. Dalton and Segal (1996, see Table 11) estimated that the health care costs attributable to diabetes mellitus in 1995 were \$650 million. This is reasonably similar to the estimate given above of \$681 million for 1993–94, although different costing methods were used, and the current study used attributable fractions for

complications based on US estimates. Nevertheless, we can be reasonably confident that the total health system costs attributable to diabetes mellitus in Australia around 1994 to 1995 are in the vicinity of \$650 million to \$700 million.

McCarty et al. (1996) also estimated partial indirect costs associated with diabetes of \$418 million, resulting in the estimate that the total costs, direct and indirect, of diabetes in Australia are in the vicinity of at least one billion dollars per annum. As explained in Section 1, this report has not attempted to estimate the indirect costs of diabetes or other diseases.

**Table 11: Recent estimates of attributable health system costs of diabetes mellitus in Australia**

Study	Year	Health system costs (\$ million)		Comments
Gross and Tiffen (1991)	1990	420		
McCarty et al. (1996)	1995	561		Does not include research or 'Other administrative costs'
Dalton and Segal (1996)	1995	650		As quoted in Segal, Dalton and Richardson (1996)
AIHW Disease Costs and Impact Study	1993–94	681		See Tables 9 and 10

## Annual health costs per treated diabetic

McCarty et al. (1996) have reviewed estimates of the prevalence of diagnosed and undiagnosed cases of diabetes in Australia up to 1995. More recently, data have become available from the ABS 1995 National Health Survey of self-reported diabetes in Australians in 1995. Welborn et al. (1995) analysed similar data from the 1989–90 National Health Survey and assumed that the prevalence of self-reported diabetes gave an estimate of the prevalence of diagnosed (or treated) diabetes. To include individuals with 'undiagnosed' Type 2 diabetes, they doubled the adult prevalences from the National Health Survey.

Table 12 shows the estimated prevalence of 'diagnosed' current diabetes by age and sex for Australia in 1993–94 estimated by applying the prevalence rates from the 1995 National Health Survey to the 1993–94 Australian population. The overall reported prevalence of diabetes is 2.0% and 1.9% for males and females respectively, corresponding to a total of

**Table 12: Estimated prevalence of diagnosed diabetes mellitus by sex and age group, Australia, 1993–94**

Age group	Males		Females		Persons	
	Per cent	Number	Per cent	Number	Per cent	Number
Under 25 years	0.16	5,390	0.21	6,831	0.19	12,221
25–64 years	2.01	94,309	1.71	79,249	1.86	173,558
65 and over	8.94	83,765	7.01	85,414	7.85	169,179
<b>All ages</b>	<b>2.04</b>	<b>183,464</b>	<b>1.89</b>	<b>171,494</b>	<b>1.97</b>	<b>354,958</b>

Source: 1995 National Health Survey (unpublished data provided by ABS).

355,000 Australians with diagnosed diabetes in 1993–94. The reported prevalence rates of diabetes in Australian men and women aged 25 years and over in the 1995 survey are very similar to those from the 1989–90 National Health Survey for men and women aged 25 years and over (Welborn et al. 1995). The overall prevalence of diabetes (diagnosed and undiagnosed) in the Australian population is estimated to be almost 4% (McCarty et al. 1996).

Table 13 shows the estimated average annual health system costs per treated case of diabetes for males and females in 1993–94, calculated by dividing the total attributable health system costs for diabetes mellitus by the estimated prevalence (number) of people with diagnosed diabetes. Average annual costs per diagnosed patient are around \$1,730 for males and \$2,120 for females. The annual health system costs are higher for males than females in the 0–24 years age group, almost identical in the 25–64 year age group, and substantially lower for older men than women. The lower costs of diabetes for older men than women reflects the higher death rates of older men from a range of causes, reducing the time that they live with diabetes. For diabetes in people aged less than 25 years, which is predominantly Type 1, average annual treatment costs are estimated at \$1,370. Average annual costs of diabetes treatment drop slightly to around \$1,200 in the age range 25–64 years and then more than double to \$2,690 in older people, where the health system costs of diabetes complications start to become much larger.

**Table 13: Estimated average annual attributable health system costs (\$) per diagnosed case of diabetes mellitus, by sex and age group, 1993–94**

Age group	Males	Females	Persons
Less than 25 years	1,406	1,348	1,374
25–64 years	1,200	1,214	1,207
65 years and over	2,342	3,029	2,689
<b>All ages</b>	<b>1,727</b>	<b>2,124</b>	<b>1,919</b>

## Lifetime health costs of diabetes

This section presents some approximate estimates of the lifetime health system costs associated with diabetes mellitus. These are calculated by dividing the total annual attributable health system costs by an estimate of the incident (new) cases occurring in the same year. Such lifetime cost estimates are approximate because they are based on the assumption that incidence and mortality rates have been steady over time. Where incidence rates have been increasing or decreasing over time, or where improvements in treatment are altering survival rates, the approximate costs derived below will underestimate or overestimate the actual lifetime costs of treatment. These estimates in 1993–94 dollars also assume that the real cost of treatment at various ages and stages through the course of the illness remain constant at their 1993–94 values.

McCarty et al. (1996) reviewed available studies of the incidence of Type 1 diabetes in Australia. Two recent studies for Western Australia (Kelly et al. 1994) and New South Wales (Verge et al. 1994) estimated that the incidence of Type 1 diabetes in children aged 0–14 years was 14.9 per 100,000 and 14.4 per 100,000 respectively. Using the sex-specific incidence

rates of Verge et al. (1994) results in an estimated 557 incident cases of Type 1 diabetes in children aged 0–14 years in 1993–94.

We are not aware of any studies that have attempted to estimate the incidence of Type 2 diabetes among Australians. Murray and Lopez (1996) have developed a computer program called DISMOD for modelling the relationship between incidence, remission, case-fatality and prevalence of a disease. This program was used to estimate the age- and sex-specific incidence of diagnosed diabetes mellitus in Australia from the self-reported prevalence data of the 1995 National Health Survey (see Table 12), on the assumption that remission rates are zero and that diabetic cases have twice the mortality rate of the general Australian population (McCarty et al. 1996). This resulted in an estimated 520 incident cases of diabetes in the age range 15–24 (which we assumed to be half Type 1 and half Type 2) and an estimated 20,800 new diagnosed cases of Type 2 diabetes for Australians aged 25 years and over in 1993–94.

Using these estimates of new annual cases together with estimated attributable health system costs of diabetes mellitus, we can make an approximate estimate of the lifetime costs of a case of diabetes mellitus as shown in Table 14. The estimated lifetime costs of Type 1 diabetes are around \$190,000 compared with \$25,000 for Type 2 diabetes. This is not surprising given that Type 1 diabetes is usually diagnosed in childhood, whereas most Type 2 diabetes is diagnosed at middle and older ages. Lifetime costs for females are substantially higher than for males (46% higher for all diabetes combined), reflecting higher annual treatment costs (Table 13) and higher life expectancies for females.

These lifetime cost estimates are very approximate because they are based on incidence rates modelled from prevalence rates with a number of assumptions, and on the assumption that incidence and mortality rates have been steady over time. They also assume that the real cost of treating diabetes mellitus at various ages and stages through the course of the disease remain constant at their 1993–94 values.

**Table 14: Estimated lifetime attributable health system costs (\$) per diagnosed case of diabetes mellitus, by sex, 1993–94**

Type of diabetes	Males	Females	Persons
Type 1 (Insulin dependent)	175,200	204,700	190,000
Type 2 (Non-insulin dependent)	20,750	30,400	24,970
<b>Total diabetes</b>	<b>25,880</b>	<b>37,830</b>	<b>31,140</b>