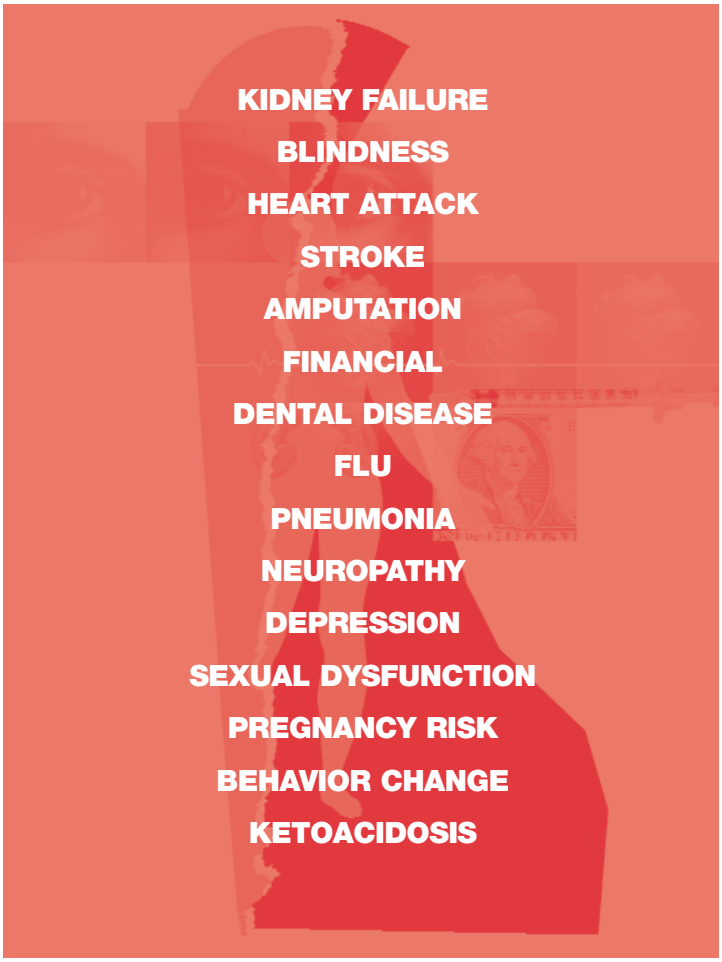
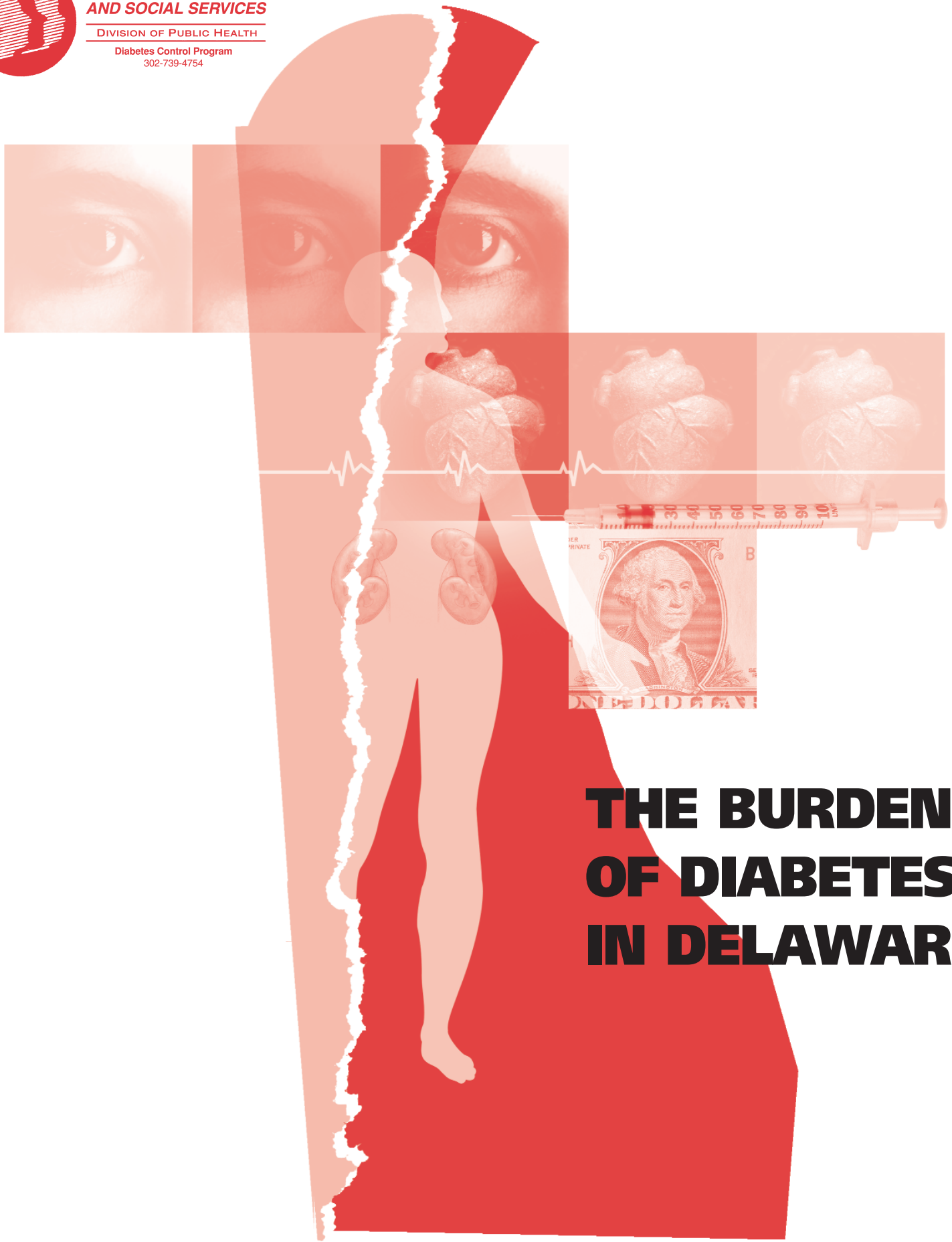
THE BURDEN OF DIABETES IN DELAWARE



DELAWARE HEALTH AND SOCIAL SERVICES
DIVISION OF PUBLIC HEALTH
Diabetes Control Program
302-739-4754

Doc. No. 35-05-20/02/02/16

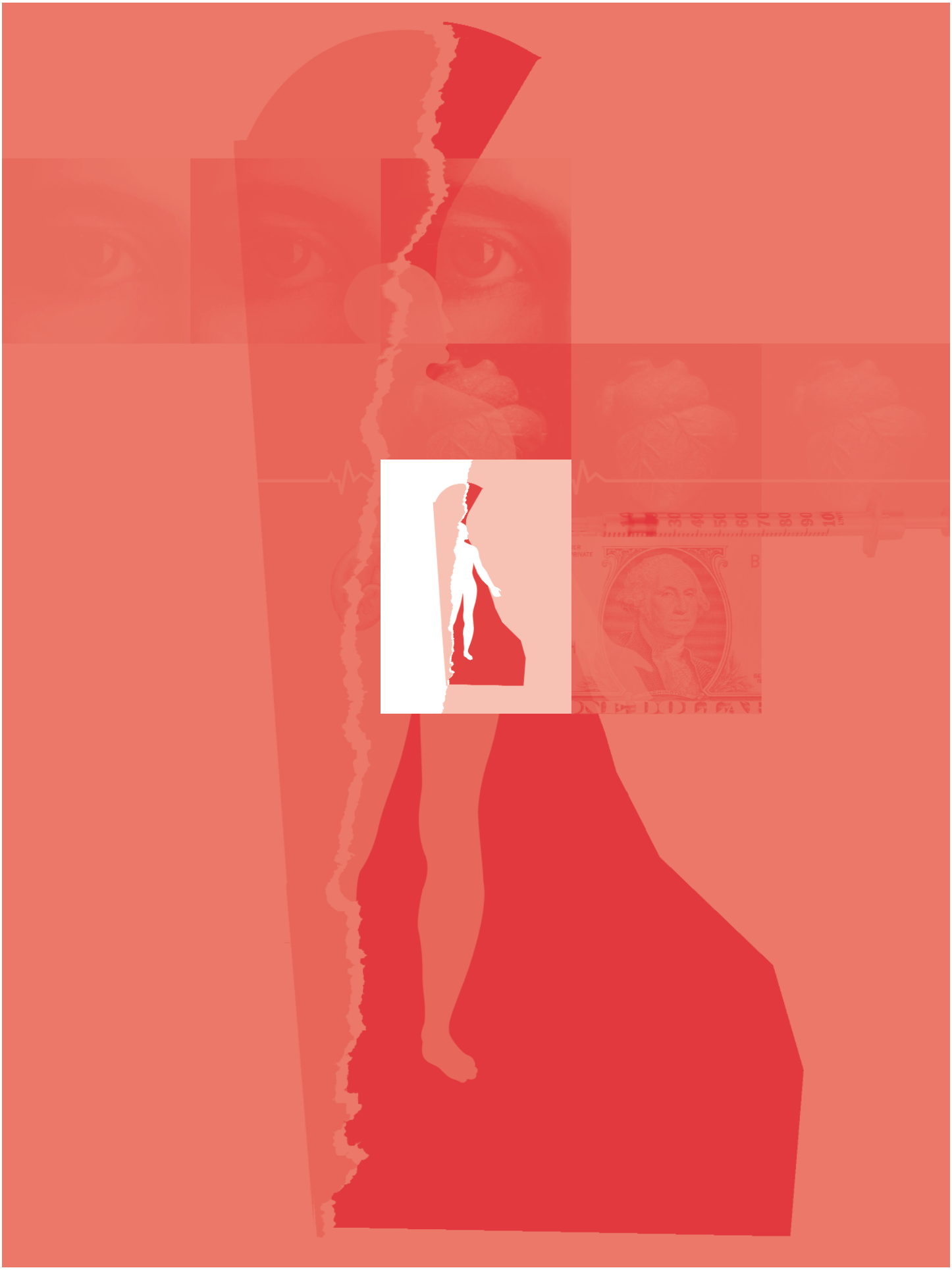
DELAWARE HEALTH
AND SOCIAL SERVICES
DIVISION OF PUBLIC HEALTH
Diabetes Control Program
302-739-4754



THE BURDEN OF DIABETES IN DELAWARE

TABLE OF CONTENTS

SUBJECT	PAGE
Executive Summary	1
Prevalence of Diabetes in Delaware	2
Morbidity from Diabetes in Delaware	8
Diabetes in Pregnancy in Delaware	16
Treatment and Economic Costs of Diabetes in Delaware	21
Mortality from Diabetes in Delaware	26
Special Populations	32
School Summary Results	36
Risk Factors for Diabetes in Delaware: A Window on the Future	37



EXECUTIVE SUMMARY

More than one in twenty Delawareans has diagnosed diabetes, and Delaware's rate of diabetes is high compared with most other states. *The Burden of Diabetes in Delaware* attempts to quantify the impact of the epidemic of diabetes on our state between 1995 and 1999. It presents information on the number of people with diabetes, their characteristics, and the consequences of the disease.

Two different data sources yielded similar estimates of the number of Delawareans with diabetes. Both the Behavioral Risk Factor Survey and the National Health Interview Survey suggested that there were over 45,000 people with diabetes in 1998: 30,000 who have been diagnosed, and another 15,000 who have not yet been diagnosed and are unaware that they have the disease. Diabetes affected more women than men. Most diabetes occurred in persons over age 65. African Americans had a higher rate of diabetes than other racial/ethnic groups. In 1996 Delaware ranked 7th among all the states in age-adjusted prevalence of diabetes.

Diabetes is a serious disease, requiring extensive medical monitoring and lifelong treatment, and is a common cause of disability and death in Delaware. During 1995–99, diabetes was directly responsible for more than 5,000 hospitalizations in Delaware; it was implicated as a secondary diagnosis in almost ten times as many cases. One hospital discharge in every eight involved a person with diabetes. Due to diabetes, almost 100 Delawareans each year develop kidney disease serious enough to require dialysis, and the number appears to be increasing. In 1998, about 10,000 Delawareans experienced disability because of diabetes. That same year, Delawareans with diabetes made an estimated more than 300,000 physician visits because of the disease.

More than 2,500 Delaware women aged 18–44 were estimated to have had diabetes during a pregnancy. Between 1995 and 1999, about 300 infants each year were born to such mothers who had diabetes as a medical risk factor in pregnancy. Diabetes affected a minority of pregnancies overall, amounting to fewer than one out of every thirty live births, but there is evidence of increasing risk to infants because of increasing incidence of type 2 diabetes in younger women.

Many Delawareans did not get widely recommended tests and treatments for diabetes. For example, one-quarter of Medicare beneficiaries aged 65–74 with diabetes did not receive either blood tests for glycated hemoglobin or dilated eye examinations in 1998–99, and 40 percent did not have tests for hyperlipidemia, even though Medicare covered all these tests in persons with diabetes. One-third of Delawareans with diabetes over age 18 did not have foot examinations in 1997–98. Not getting these tests increases the risk of serious complications of diabetes, e.g., blindness, heart attacks, and foot and leg amputations. Up to half of all Medicare beneficiaries with diabetes had not received a pneumonia shot, and a similar proportion did not receive annual influenza injections, increasing the risk of death from pneumonia.

Caring for persons with diabetes is expensive. In the late 1990s, the total economic burden due to diabetes in Delaware was immense. Payments to Delaware hospitals for care of persons with diabetes were more than $100 million per year between 1995 and 1999. The average payment per hospitalization for patients with diabetes was between $2,000 and $3,000 greater than the average payment for patients without the disease. The annual total economic cost of diabetes in Delaware in 1997 was estimated to be almost $300 million.

Delaware's high rate of diabetes and underutilization of services can be expected to result in complications and death from the disease. It is not surprising that Delaware had the fourth-highest death rate from diabetes (as the underlying cause of death) of all states in 1998. Death rates from diabetes were 30 times higher among Delawareans over age 65 than among younger people. African American death rates were two to three times higher than Caucasian rates.

This report examines diabetes in populations of special interest: recipients of public assistance, nursing home residents, school children and prisoners. For example, in 2001, diabetes affected:
- One-fifth of people over age 55 in one of the two Medicaid HMO plans serving the state;
- One-quarter of nursing home residents with Medicaid coverage;
- One sixth of all prisoners aged 60 and older; and
- Two out of every thousand school children.

Finally, the report describes the risk factors that increase the occurrence of diabetes or its complications. Obesity and lack of exercise are associated with increased incidence of diabetes, and may partially cause it. In Delaware, obesity has increased by 5% between 1990 and 2000, exceeding national rates of increase in the same time span. Smoking, hypertension and high blood lipid levels make diabetes worse once it is

present. Between 1990–2000 in Delaware, one-quarter of the population over age 18 smoked cigarettes, half of those over age 65 had high blood pressure and almost one-third of adults said they had high cholesterol levels.

The Burden of Diabetes in Delaware paints an alarming picture of a deadly chronic disease at epidemic levels in our state. The disease disproportionately affects some of the most vulnerable Delawareans, including racial minorities, the elderly, the poor and prisoners. The cost of care is expensive and increasing. There is no immediate end in sight, because increasing numbers of Delawareans are overweight and fail to get enough exercise. These findings should be a call to action to prevent diabetes through healthier living, provide treatment to those who have the disease, and reduce disparities in health caused by diabetes.

PREVALENCE

Data Sources and Methods

The Centers for Disease Control and Prevention (CDC) estimates there are 16 million people with diabetes, and that the proportion of diagnosed to undiagnosed cases has gone from 50 percent diagnosed and 50 percent undiagnosed to 66 percent diagnosed and 34 percent undiagnosed.

Some individuals with diabetes are unaware that they have diabetes. In this report, estimates of undiagnosed cases of diabetes reflect the latest classification and diagnostic criteria established by the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus of the American Diabetes Association (ADA). The revised classification system replaces the confusing terms insulin-dependent diabetes mellitus and non-insulin-dependent diabetes mellitus with the terms “type 1 diabetes” and “type 2 diabetes.” Type 1 diabetes is characterized primarily by an absolute deficiency of insulin. Type 2 diabetes is characterized primarily by insulin resistance and inadequate insulin secretory response.

Two methods were used to estimate the prevalence of diabetes in Delaware. The first method used nationwide prevalence estimates from the 1998 National Health Interview Survey (NHIS) (Adult Sample). Age, race, and gender specific estimates from the NHIS were applied to the 1998 population estimates from the U.S. Census Bureau for Delaware and its counties. This method produces synthetic estimates. Since results are based on national figures, they do not represent exact estimates for Delaware. Given this limitation, these figures may be combined with prevalence estimates from the Behavioral Risk Factor Surveillance Survey (BRFSS) 1995–1999 to provide a clearer picture of the prevalence of diabetes in Delaware.

The second method of estimation uses the results of the BRFSS over a five-year period that provides a second stable estimate of the prevalence of diabetes in Delaware. Respondents to the Delaware BRFSS are 18 years and older who answer questions anonymously regarding personal behaviors that may affect their health status. Responses from the annual BRFSS surveys provide estimates of diabetes prevalence and health behaviors of persons 18 years of age and over who report they have diabetes.

The question used in the BRFSS to estimate diabetes prevalence has been “Have you ever been told by a doctor that you have diabetes?” Because the prevalence of diabetes in the population is relatively low and the sample size in the BRFSS in any year is small, results from five years were combined to produce prevalence estimates. Sample responses were weighted to represent the demographics of Delaware.

The two estimates of diabetes prevalence among adults in Delaware, developed from the methodologies described above, were then used to develop an estimated range of diabetes prevalence.

Results

Both the NHIS synthetic estimate and the BRFSS produce similar estimates of diabetes prevalence in Delaware in the five-year period. The NHIS result is specific to 1998, whereas the BRFSS method is an approximate median of 5 single-year BRFSS measures. In either case, the estimated crude rate of diabetes in Delawareans age 18 and older was 5.3–5.4% (Tables 1 and 6).

The NHIS method estimated 30,518 persons with diagnosed diabetes in 1998. When undiagnosed cases are included, there were 46,239 persons with diabetes, which are almost as many people as the entire population of Wilmington in that year (Tables 1 and 4). The NHIS method predicted that most cases of diabetes occurred in Caucasian Delawareans (Table 2), and that women with diabetes were more numerous than men with the condition. A higher proportion of women had diabetes than men. Among the racial groups, African Americans had the highest rate of disease, though not the largest total number of cases.

Almost half of all Delawareans with diabetes were over age 65 (Table 3) and older women with the disease outnumbered men by nearly half. However, men with diabetes were more numerous at younger ages. Diabetes affected substantial numbers of people in each county (Table 4).

The estimated total number of persons with diabetes from the BRFSS and the NHIS methods agreed closely (Tables 11). However, race-specific rates differed markedly. The BRFSS non-Caucasian population with diabetes was estimated to be 6,632, compared with the sum of African American and other races from the NHIS method of 9,102. There were small differences in estimated Caucasian population with diabetes in the reverse direction.

The CDC ranks Delaware in the top 25% of states for age-standardized diabetes prevalence. In 1996, Delaware ranked 10th in crude prevalence rate of diabetes, and 7th in age-adjusted rate among all states.[1] Crude prevalence rates of 3.3% typified states with low prevalence rates, an absolute difference of about 2% from Delaware's rate. The CDC has also determined that prevalence of diabetes has increased steadily throughout the 1990s in the United States.

Conclusion and Implications

Two methods of estimating prevalence of diabetes in Delaware yielded similar results during 1995-99. Delaware's prevalence of diabetes was substantially higher than most other states in that period. Because of the steady increase in prevalence of adverse risk factors, this prevalence is likely to increase in the future unless a concerted effort is made to improve nutrition, exercise, and weight control among all of Delaware's citizens. If one accepts the definition of an epidemic as "more than the usual number of cases of a disease," then Delaware is, in all probability, in the midst of a slow epidemic of diabetes. The results will not be as dramatic as hundreds of deaths and tens of thousands of ill people during an influenza pandemic, but they will be every bit as devastating to affected individuals, families, and our health-care system.

References

1. Centers for Disease Control. 1999 Diabetes Surveillance Report. Vol. 2001, 1999.

Table 1.

Estimated Number and Rates of Persons with Diagnosed Diabetes by Age, Gender and Race[1]
Delaware 1998

AGE:	18–24	25–34	35–44	45–54	55–64	65+	
GENDER							**TOTAL[2]**
Male							
Population	33,138	57,433	63,145	45,577	29,621	40,664	**269,578**
Diagnosed	156	689	1,686	3,022	3,169	5,416	**14,138**
Rate[3]	4.7	12.0	26.7	66.3	107.0	133.2	**52.4**
Female							
Population	33,916	59,054	65,012	48,330	32,041	56,930	**295,283**
Diagnosed	231	632	1,547	2,605	3,617	7,748	**16,380**
Rate[3]	6.8	10.7	23.8	53.9	112.9	136.1	**55.5**
Delaware Total							
Population	67,054	116,487	128,157	93,907	61,662	97,594	**564,861**
Diagnosed	387	1,321	3,233	5,627	6,786	13,164	**30,518**
Rate[3]	5.8	11.3	25.2	64.0	110.1	134.9	**54.0**
RACE							
Caucasian							
Population	43,119	83,856	96,996	74,083	50,323	83,949	**432,326**
Diagnosed	191	488	1,541	3,626	5,062	10,508	**21,416**
Rate[3]	4.4	5.8	15.9	48.9	100.6	125.2	**49.5**
African American							
Population	13,251	24,316	24,297	15,563	8,906	10,585	**96,918**
Diagnosed	145	812	923	1,868	926	2,308	**6,982**
Rate[3]	10.9	33.4	38.0	120.0	104.0	218.0	**72.0**

[1] Synthetic estimates calculated from Delaware population estimates from the U.S. Bureau of the Census 1998 population estimates and diabetes prevalence estimates for the United States from the 1998 NHIS.
[2] Numbers may not add to total because of rounding.
[3] Rate/1000

Table 2.

Estimated Prevalence[1] of Diabetes by Gender, Race, Diagnosis Status and Rate
Delaware 1998 (Age ≥ 18)

	DELAWARE POPULATION	ESTIMATED DIAGNOSED	ESTIMATED UNDIAGNOSED	TOTAL PREVALENCE[2] NUMBER	RATE[3]
Gender					
Male	269,578	14,138	7,283	21,421	79.5
Female	295,283	16,380	8,438	24,818	84.0
Race					
Caucasian	432,326	21,416	11,032	32,448	75.1
African American	96,918	6,982	3,597	10,579	109.2
Other	35,617	2,120	1,092	3,212	90.2
DE Total	564,861	30,518	15,721	46,239	81.9

[1] *Synthetic estimates calculated from Delaware population estimates from the U.S. Bureau of the Census 1998 population estimates and diabetes prevalence estimates for the United States from the 1998 NHIS.*
[2] *Numbers may not add to total because of rounding.*
[3] *Rate/1000.*

Using the ratio of 66 percent diagnosed and 34 percent undiagnosed cases to estimate the total number of persons with diabetes in Delaware is an estimated 46,239 cases. This estimate extrapolates to a rate of 81.1 individuals per 1,000 residents of Delaware. The total prevalence in Caucasians, diagnosed and undiagnosed, is estimated at 32,448 or 75.1 per 1,000 while in African Americans 10,579 or 109.1 per 1,000. Persons classified as other accounted for 3,212 or 90.2 per 1,000.

Table 3.

Estimated Prevalence[1] of Diagnosed and Undiagnosed Diabetes by Age, Gender, and Rate
Delaware 1998

AGE:	18–24	25–34	35–44	45–54	55–64	65+	TOTAL[2]
GENDER AND DIAGNOSIS STATUS							
Male							
Population	33,138	57,433	63,145	45,577	29,621	40,664	**269,578**
Diagnosed	156	689	1,686	3,022	3,169	5,416	**14,138**
Undiagnosed	80	355	868	1,557	1,633	2,790	**7,283**
Total Prevalence	236	1,044	2,554	4,579	4,802	8,206	**21,421**
Rate[3]	7.1	18.2	40.4	100.5	162.1	201.8	**79.5**
Female							
Population	33,916	59,054	65,012	48,330	32,041	56,930	**295,283**
Diagnosed	231	632	1,547	2,605	3,617	7,748	**16,380**
Undiagnosed	119	326	797	1,342	1,863	3,991	**8,438**
Total Prevalence	350	958	2,344	3,947	5,480	11,739	**24,818**
Rate[3]	10.3	16.2	36.1	81.7	171.0	206.2	**84.0**
Delaware							
Population	67,054	116,487	128,157	93,907	61,662	97,594	**564,861**
Diagnosed	387	1,321	3,233	5,627	6,786	13,164	**30,518**
Undiagnosed	199	681	1,665	2,899	3,496	6,781	**15,721**
Total Prevalence	586	2,002	4,898	8,526	10,282	19,945	**46,239**
Rate[3]	8.7	17.2	38.2	90.8	166.7	204.4	**81.9**

[1] *Synthetic estimates calculated from Delaware population estimates from the U.S. Bureau of the Census 1998 population estimates and diabetes prevalence estimates for the United States from the 1998 NHIS.*
[2] *Numbers may not add to total because of rounding.*
[3] *Rate/1000.*

Table 4.

Estimated Prevalence[1] of Diagnosed and Undiagnosed Diabetes by County and City of Wilmington
Delaware 1998

COUNTY	POPULATION	DIAGNOSED	UNDIAGNOSED	TOTAL
City of Wilmington	53,001	2,862	1,474	4,336
Kent	94,372	5,096	2,625	7,721
New Castle	366,338	19,798	10,199	29,997
Sussex	104,151	5,624	2,897	8,521
Delaware	564,861	30,518	15,721	46,239

[1] Synthetic estimates calculated from Delaware population estimates from the U.S. Bureau of the Census 1998 population estimates and diabetes prevalence estimates for the United States from the 1998 NHIS.
[2] Rate/1000.

Table 5.

Estimated Prevalence[1] of Diagnosed and Undiagnosed Diabetes by City and Gender
Delaware 1998

CITY/GENDER	POPULATION	DIAGNOSED	UNDIAGNOSED	TOTAL
Wilmington	53,001	2,862	1,474	4,336
Male	25,281	1,365	703	2,068
Female	27,720	1,497	771	2,268

[1] Synthetic estimates calculated from Delaware population estimates from the U.S. Bureau of the Census 1998 population estimates and diabetes prevalence estimates for the United States from the 1998 NHIS.
[2] Rate/1000.

Data from the 1995 through 1999 BRFSS surveys were used to develop a second set of prevalence estimates for comparing and confirming the NHIS based Delaware estimates. Since the number of persons responding "yes" to the BRFSS question "Have you ever been told by a doctor that you have diabetes?" is not large enough to produce stable estimates for individual years, the responses from consecutive years have been aggregated to provide the BRFSS estimates reported in this document.

From the BRFSS surveys of 1995 through 1999, it is estimated the Delaware had an average of 29,509 persons 18 years old and older who had been diagnosed with diabetes. This represents 5.3% of the state's population in this age group. Based on these numbers and on the national ratio of undiagnosed to undiagnosed cases, it is estimated that Delaware had about 15,201 people with undiagnosed diabetes. When the number of diagnosed and undiagnosed cases are summed, it is estimated that 44,710 persons 18 and older or 80.3 per 1,000 persons (Tables 6 and 7).

Table 6.

Estimated Number of Persons 18 Years and Older with Diagnosed Diabetes
Delaware BRFSS 1995–1999

FREQUENCY	BRFSS SAMPLE SIZE	DELAWARE POPULATION 18+	PERSONS WITH DIABETES	% OF YES RESPONSES
Maximum	2,538	560,502	34,051	6.1%
Minimum	2,102	511,920	23,287	4.4%
Average	2,372	547,631	29,136	5.3%

Source: Delaware BRFSS 1995–1999.

Table 7.

Estimated Number and Rate of Persons 18 Years and Older with Diagnosed Diabetes
Delaware BRFSS 1995–1999

FREQUENCY	POPULATION 18 AND OLDER	DIAGNOSED	UNDIAGNOSED	TOTAL PREVALENCE	RATE[1]
Maximum	560,502	34,051	17,541	51,592	90.3
Minimum	511,920	23,287	11,996	35,283	65.1
Average	547,631	29,136	15,009	44,145	80.6

Source: Delaware BRFSS 1995–1999.
[1] Rate/1000

Table 8.

Estimated Diabetes Prevalence of Persons 18 Years and Older by Race
Delaware BRFSS 1995–1999

RACE	DIAGNOSED	UNDIAGNOSED	TOTAL[1]
Caucasian	22,504	11,593	34,097
Non-Caucasian	6,632	3,416	10,048
Delaware Total	29,136	15,009	44,145

Source: Delaware BRFSS 1995–1999.
[1] Numbers might not add to total because of rounding.

Table 9.

Estimated Prevalence of Diagnosed and Undiagnosed Diabetes in Individuals 18 Years Old and Older by Gender, Average Number and Average Rate
Delaware BRFSS 1995–1999

	AVERAGE POPULATION 18 YEARS/OLDER	AVERAGE DIAGNOSED	AVERAGE UNDIAGNOSED	TOTAL AVERAGE	RATE[1]
Gender					
Male	261,775	14,083	7,255	21,338	81.5
Female	285,856	15,053	7,754	22,807	79.8
Age					
18–34	181,030	1,969	1,014	2,983	16.5
35–64	269,538	14,080	7,253	21,333	79.1
65+	97,063	13,087	6,742	19,829	194.0
Total	547,631	29,136	15,009	44,145	80.6

Source: Delaware BRFSS 1995–1999.
[1] Rate/1000.

Table 10.

Estimated Mean Age at the Time of Diagnosis of Diabetes by Gender and Race, Persons 18 Years and Older
Delaware BRFSS 1995–1999

	SAMPLE SIZE	MEAN AGE ± STANDARD DEVIATION
Gender		
Male	59	50.6 ± 15.6
Female	82	50.4 ± 16.7
Race		
Caucasian	104	50.6 ± 17.0
Non-Caucasian	37	50.2 ± 14.0
Total	141	50.5 ± 16.2

Source: Delaware BRFSS 1995–1999.

Table 11.

Differences in Diabetes Prevalence Estimates for Population 18 Years and Older, by Information Source, Number and Mid-Points
Delaware 1998

SURVEY	DIAGNOSED	UNDIAGNOSED	TOTAL[1]
BRFSS	29,136	15,009	44,145
NHIS	30,518	15,721	46,239
Difference	(1,382)	(712)	(2,094)
Mid-Points	29,827	15,365	45,192

Source: Estimated from national rates from the 1988 NHIS and the Delaware BRFSS 1995–1999.
[1] Numbers may not add to total because of rounding.

Table 12.

Range of Diagnosed Cases of Diabetes 18 Years Old and Older Synthetic (NHIS) and BRFSS Estimates
Delaware 1998

VARIABLE	SYNTHETIC NHIS	DELAWARE BRFSS	MID-POINT ESTIMATES
Age			
18–34	2,588	2,983	2,786
35–64	23,706	21,333	22,519
65+	19,945	19,829	19,887
Total Age[1]	46,239	44,145	45,192
Gender			
Male	21,421	21,338	21,379
Female	24,818	22,807	23,813
Total Gender[1]	46,239	44,145	45,192
Race			
Caucasian	32,448	34,097	33,273
Non-Caucasian	13,791	10,048	11,919
Total Race[1]	46,239	44,145	45,192

Source: Estimated from national rates from the 1988 NHIS and the Delaware BRFSS 1995–1999.
[1] Numbers may not add to total because of rounding.

MORBIDITY DUE TO DIABETES

Introduction and Data Sources

In this chapter, we look at the illnesses caused by diabetes in Delaware's population. People with diabetes experience symptoms and make use of health care because of the disease itself, but, more commonly, have illnesses that are caused by diabetes or made worse by it. These conditions include kidney disease, eye diseases and blindness, heart and blood vessel disease, high blood pressure, stroke, infections, and neuropathy. For many diabetes-related conditions, there are published sources of information. Use of hospital services by persons with diabetes in Delaware, for example, can be analyzed and compared with use of services by those without diabetes. For others, there may not be local data, or the data may be unreliable. The prevalence of diabetic retinopathy in Delaware, for example, would be difficult to determine.

This chapter presents data on hospital visits by persons with diabetes as rough measures of major morbidity due to diabetes in Delaware. It also includes information on incidence of renal failure due to diabetes, and crude estimates of disability due to diabetes. The Delaware Health Statistics Center provided tabular information on hospital visits. The End Stage Renal Disease (ESRD) Network 4 contributed the renal disease incidence data.

Results

Hospitalization

Between 1994 and 1999, diabetes directly accounted for 5,850 (1.4%) of the 414,904 Delaware hospital discharges (Table 1). About one-third of these discharges were for some form of diabetic coma. If the "other specified manifestations" category is included, about half of discharges in all ages resulted from complications that impair consciousness. Nationally, there were more than 30 million hospital discharges in 1997, of which more than 371,000 or 1.2% were for diabetes.[1]

Two-thirds of hospital discharges for diabetes in Delaware during 1994–99 were in persons under age 65 (Table 2). Ketoacidosis was 6 times as common among the under-65-year-old patients as compared with those over 65; whereas peripheral neuropathy and other specified complications (principally hypoglycemia) accounted for a substantially greater proportion of diabetes hospitalizations among older Delawareans. Based on 1995–1999 population estimates, the discharge rates for diabetes from Delaware hospitals were 1.2 per 1,000 persons aged less than 65, and 4 per 1,000 persons aged 65 and older during this time period. National diabetes discharge rates were somewhat higher, ranging between 5 and 6.7 per 1,000 population in 1997, depending on age and gender.

The most serious acute manifestation of diabetes is coma. Type 1 diabetes is frequently diagnosed following emergency hospital admission for ketoacidosis. Non-ketotic hyperosmotic coma is more common with type 2 diabetes, but coma is a much less common complication of type 2 disease. Table 9 demonstrates these observations for Delaware. Of the 1,555 discharges with diabetic ketoacidosis between 1995 and 1999, 1,112 (72%) were in persons younger than 45 years old. The vast majority of the 221 discharges with hyperosmotic coma were in those 45 years of age or older.

Diabetes was nine times more frequent as a secondary rather than a primary diagnosis in Delaware hospital discharges during this period (Table 3). Most cases of diabetes coded as a secondary diagnosis, or complication, were without additional complications of diabetes. If diabetes as a primary or secondary diagnosis is counted, then the disorder was involved in more than one of every eight hospitalizations in the state (53,408 or 12.9%).

Diabetes was disproportionately involved in certain cases discharged from the hospital because diabetes is a risk factor for these medical conditions. They include: stroke (Table 4), ischemic heart disease (Table 5), heart failure (Table 6), pneumonia and influenza (Table 7), and lower extremity amputations (Table 8). The magnitude of the excess number of discharges among persons with diabetes can be gauged by comparing the proportion of discharges at any age with the prevalence of diabetes in that age group. For age 45-64, for example, the prevalence of diabetes is about 10% or less, yet more than 30% of persons discharged from Delaware hospitals with ischemic heart disease between 1995 and 1999 had a secondary diagnosis of diabetes. The overall proportion of diabetes in patients discharged from the hospital with each of these primary diagnoses is shown as Figure A, where the dotted line represents the proportion of diabetes in the population.

Renal Failure

One of the most serious complications of diabetes is kidney disease. Control of blood sugar levels and early treatment of signs of kidney damage can prevent or delay the onset of this problem. Concern about potential damage to the kidneys is the reason experts recommend periodic urine protein testing in persons with diabetes.

If diabetes is poorly controlled and early signs of kidney damage aren't treated, complete kidney failure can result. In the United States, people with this condition (called end stage renal disease or ESRD) are eligible for coverage under the Medicare program, which pays for dialysis and transplantation services. Therefore, counting participation in the ESRD program is a good way of estimating the number of persons with diabetes who have serious kidney disease.

According to ESRD Network 4, there were just over 200 new cases of ESRD each year in Delaware between 1995 and 1999. Of these, almost 90, or slightly more than 40%, were due to diabetes (Table 10). Delaware incidence of ESRD due to diabetes appears to be increasing through the time period, with 1999's proportion with diabetes significantly greater than the 5-year mean. The incidence rate for diabetes-caused ESRD in Delaware for that time period was 120 per 1,000,000 population; the incidence rate for all ESRD was 297 per 1,000,000 population during that same time period. In 1999, the national incidence rate for ESRD was 327 per 1,000,000 population, and 39% was due to diabetes[2].

Disability

According to the CDC, the age-adjusted prevalence of being limited in activity due to diabetes in the United States was about 33% in 1996[3]. This rate had been changing relatively slowly with time. Assuming that proportion holds true for Delaware in 1998, there would have been approximately 10,000 Delawareans with diagnosed diabetes whose activity was limited due to diabetes that year, or about 3.5% of the over 18 population.

Use of Physician Services

The CDC reports number of physician contacts for persons with diabetes. In 1996, persons with diabetes averaged 17.4 physician visits nationally[3]. There was a significant increasing trend in number of physician visits; when extrapolated to 1998, it would suggest that diabetes patients required approximately 17 visits each year. In 1998, all persons in the United States averaged just over 3 visits, age-adjusted; most of these persons did not have diabetes. In the ages most heavily represented in the population with diabetes (55+), the age-specific visit rates ranged from 5.69 to 6.59 annually, or approximately 6[1]. Taking that as the approximate crude rate of physician visits for persons without diabetes, one can estimate 11 excess physician visits annually for persons with diabetes, regardless of age. In Delaware in 1998 that would amount to approximately 330,000 excess physician visits caused by diabetes.

CONCLUSIONS AND IMPLICATIONS

Diabetes complications cause significant hospitalizations each year in Delaware; frequently these hospitalizations are for life-threatening conditions such as coma. However, diabetes is indirectly involved in nine times as many hospitalizations as it accounts for directly. Diabetes accounted for more than one-eighth of all hospitalizations between 1995 and 1999.

Incidence of complications of diabetes may be increasing in parallel with increasing prevalence of the disease. ESRD incidence probably increased from 1995 through 1999, but is still lower than the national rate. Other complications are likely also to be increasing along with prevalence, although the extent to which improved treatment is mitigating these expected increases in Delaware is not known at present.

The substantial excess of medical visits required by persons with diabetes as well as the steady prevalence of disability in persons with diabetes suggests increased demands for acute and long-term care services in the future. Although it is possible that improved treatment will reduce the amount of disability, medical care use among persons with diabetes appears to be on a long-term increasing trend. Health-care providers should be prepared to treat increasing numbers of patients with diabetes.

References

1. National Center for Health Statistics. Health, United States, 2000. Hyattsville, MD: National Center for Health Statistics, 2000:288–293.
2. Forum Clearinghouse of ESRD Networks. End Stage Renal Disease (ESRD) Network Program Annual Report Summary 1999. Baltimore, MD: Centers for Medicare and Medicaid Services, formerly the Health Care Financing Administration, 2000:1–6.
3. Centers for Disease Control. 1999 Diabetes Surveillance Report. Vol. 2001, 1999.

Table 1.

Diabetes Related Hospitalizations by Diagnosis and Gender
Delaware 1995–1999

PRIMARY DIAGNOSIS BY ICD-9-CM CODE	MALE NUMBER (%)	FEMALE NUMBER (%)	TOTAL NUMBER (%)
Diabetes Mellitus without mention of complications (250.0)	430 (7.4)	464 (7.9)	894 (15.3)
Diabetes with Ketoacidosis (250.1)	665 (11.4)	890 (15.2)	1,555 (26.6)
Diabetes with Hyperosmolarity (250.2)	113 (1.9)	108 (1.8)	221 (3.8)
Diabetes with other Coma (250.3)	37 (0.6)	43 (0.7)	80 (1.4)
Diabetes with Renal Manifestations (250.4)	77 (1.3)	113 (1.9)	190 (3.2)
Diabetes with Ophthalmic Manifestations (250.5)	5 (0.1)	12 (0.2)	17 (0.3)
Diabetes with Neurological Manifestations (250.6)	254 (4.3)	384 (6.6)	638 (10.9)
Diabetes with Peripheral Circulatory Disorders (250.7)	447 (7.6)	360 (6.2)	807 (13.8)
Diabetes with Other Specified Manifestations (250.8)	657 (11.2)	627 (10.7)	1,284 (21.9)
Diabetes with Unspecified Complication (250.9)	73 (1.2)	91 (1.6)	164 (2.8)
Total	2,758 (47.1)	3,092 (52.9)	5,850 (100.0)

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 2.

Diabetes Related Hospitalizations by Diagnosis and Age
Delaware 1995–1999

PRIMARY DIAGNOSIS BY ICD-9-CM CODE	<65 NUMBER (%)	65+ NUMBER (%)	TOTAL NUMBER (%)
Diabetes Mellitus without mention of complications (250.0)	622 (15.8)	272 (14.2)	894 (15.3)
Diabetes with Ketoacidosis (250.1)	1,439 (36.5)	115 (6.0)	1,554 (26.6)
Diabetes with Hyperosmolarity (250.2)	105 (2.7)	116 (6.1)	221 (3.8)
Diabetes with other Coma (250.3)	44 (1.1)	36 (1.9)	80 (1.4)
Diabetes with Renal Manifestations (250.4)	122 (3.1)	68 (3.6)	190 (3.2)
Diabetes with Ophthalmic Manifestations (250.5)	10 (0.3)	7 (0.4)	17 (0.3)
Diabetes with Neurological Manifestations (250.6)	487 (12.4)	151 (7.9)	638 (10.9)
Diabetes with Peripheral Circulatory Disorders (250.7)	323 (8.2)	484 (25.3)	807 (13.8)
Diabetes with Other Specified Manifestations (250.8)	682 (17.3)	602 (31.5)	1,284 (22.0)
Diabetes with Unspecified Complication (250.9)	104 (2.6)	60 (3.1)	164 (2.8)
Total	3,938 (67.3)	1,911 (32.7)	5,849 (100.0)

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 3.

Hospital Discharges with Diabetes as the Primary Diagnosis or any Secondary Diagnosis
Delaware 1995–1999

PRIMARY DIAGNOSIS BY ICD-9-CM CODE	PRIMARY NUMBER (%)	SECONDARY NUMBER (%)	TOTAL NUMBER (%)
Diabetes Mellitus without mention of complications (250.0)	894 (15.3)	39,783 (83.7)	40,677 (76.2)
Diabetes with Ketoacidosis (250.1)	1,555 (26.6)	348 (0.7)	1,903 (3.6)
Diabetes with Hyperosmolarity (250.2)	221 (3.8)	86 (0.2)	307 (0.6)
Diabetes with other Coma (250.3)	80 (1.4)	29 (0.1)	109 (0.2)
Diabetes with Renal Manifestations (250.4)	190 (3.3)	1,780 (3.7)	1,970 (3.7)
Diabetes with Ophthalmic Manifestations (250.5)	17 (0.3)	895 (1.9)	912 (1.7)
Diabetes with Neurological Manifestations (250.6)	638 (10.9)	2,626 (5.5)	3,264 (6.1)
Diabetes with Peripheral Circulatory Disorders (250.7)	807 (13.8)	748 (1.6)	1,555 (2.9)
Diabetes with Other Specified Manifestations (250.8)	1,284 (21.9)	956 (2.0)	2,240 (4.2)
Diabetes with Unspecified Complication (250.9)	64 (2.8)	307 (0.7)	471 (0.9)
Total	5,850 (10.9)	47,558 (89.1)	53,408 (100.0)

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 4a.

Stroke as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	2	36	199	250	245	82	814
With Diabetes	0	5	85	85	72	10	257
Total Male	2	41	284	335	317	92	1,017
% with Diabetes	0.0	12.2	29.9	25.4	22.7	10.9	24.0
Female							
Without Diabetes	1	40	167	254	296	177	935
With Diabetes	0	10	79	103	94	38	324
Total Female	1	50	246	357	390	215	1,259
% with Diabetes	0.0	20.0	32.1	28.6	24.1	17.7	25.7
Total							
With Diabetes	0	15	164	188	166	48	581
Without Diabetes	3	76	366	504	541	259	1749
% with Diabetes	0.0	16.5	30.9	27.2	23.5	15.6	24.9

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 4b.

Stroke as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	MISSING	TOTAL
Male								
Without Diabetes	11	178	979	1,263	1,243	338	1	4,013
With Diabetes	0	29	406	543	401	53	0	1,432
Total Male	11	207	1,385	1,806	1,644	391	1	5,445
% with Diabetes	0.0	14.0	29.3	30.1	24.4	13.6	0.0	26.3
Female								
Without Diabetes	10	187	824	1,196	1,449	845	1	4,512
With Diabetes	0	35	444	545	470	143	0	1,637
Total Female	10	222	1,268	1,741	1,919	988	1	6,149
% with Diabetes	0.0	15.8	35.0	31.3	24.5	14.5	0.0	26.6
Total								
With Diabetes	0	64	850	1,088	871	196	0	3,069
Without Diabetes	21	365	1,803	2,459	2,692	1,183	2	8,525
% with Diabetes	0.0	14.9	32.0	30.7	24.5	14.2	0.0	26.5

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 5a.

Ischemic Heart Disease as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	1	144	755	502	359	82	1,843
With Diabetes	0	31	257	218	118	19	643
Total Male	1	175	1,012	720	477	101	2,486
% with Diabetes	0.0	17.7	25.4	30.3	24.7	18.8	25.9
Female							
Without Diabetes	1	52	340	317	359	167	1,236
With Diabetes	0	29	195	221	127	34	606
Total Female	1	81	535	538	486	201	1,842
% with Diabetes	0.0	35.8	36.4	41.1	26.1	16.9	32.9
Total							
With Diabetes	0	60	452	439	245	53	1,249
Without Diabetes	2	196	1,095	819	718	249	3,079
% with Diabetes	0.0	23.4	29.2	34.9	25.4	17.5	28.9

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 5b.

Ischemic Heart Disease as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	MISSING	TOTAL
Male								
Without Diabetes	3	783	4,075	2,654	1,641	389	0	9,545
With Diabetes	0	126	1,174	1,007	543	81	1	2,932
Total Male	3	909	5,249	3,661	2,184	470	1	12,477
% with Diabetes	0.0	13.9	22.4	27.5	24.9	17.2	—	23.5
Female								
Without Diabetes	1	272	1,832	1,624	1,683	737	1	6,150
With Diabetes	0	119	965	929	633	137	1	2,784
Total Female	1	391	2,797	2,553	2,316	874	2	8,934
% with Diabetes	0.0	30.4	34.5	36.4	27.3	15.7	50.0	31.2
Total								
With Diabetes	0	245	2,139	1,936	1,176	218	2	5,716
Without Diabetes	4	1,055	5,907	4,278	3,324	1,126	1	15,695
% with Diabetes	0.0	18.8	26.6	31.2	26.1	16.2	66.7	26.7

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 6a.

Heart Failure as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	2.0	24.0	155.0	212.0	217.0	98.0	708.0
With Diabetes	0.0	15.0	135.0	137.0	118.0	20.0	425.0
Total Male	2.0	39.0	290.0	349.0	335.0	118.0	1,133.0
% with Diabetes	0.0	38.5	46.6	39.3	35.2	16.9	37.5
Female							
Without Diabetes	1.0	27.0	98.0	151.0	289.0	267.0	833.0
With Diabetes	0.0	18.0	138.0	178.0	184.0	47.0	565.0
Total Female	1.0	45.0	236.0	329.0	473.0	314.0	1,398.0
% with Diabetes	0.0	40.0	58.5	54.1	38.9	15.0	40.4
Total							
With Diabetes	0.0	33.0	273.0	315.0	302.0	67.0	990.0
Without Diabetes	3.0	51.0	253.0	363.0	506.0	365.0	1,541.0
% with Diabetes	0.0	39.3	51.9	46.5	37.4	15.5	39.1

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 6b.

Heart Failure as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	3.0	156.0	731.0	1,100.0	1,164.0	398.0	3,552.0
With Diabetes	0.0	67.0	602.0	663.0	548.0	99.0	1,979.0
Total Male	3.0	223.0	1,333.0	1,763.0	1,712.0	497.0	5,531.0
% with Diabetes	0.0	30.0	45.2	37.6	32.0	19.9	35.8
Female							
Without Diabetes	10.0	121.0	535.0	799.0	1,384.0	1,127.0	3,976.0
With Diabetes	0.0	76.0	630.0	808.0	747.0	202.0	2,463.0
Total Female	10.0	197.0	1,165.0	1,607.0	2,131.0	1,329.0	6,439.0
% with Diabetes	0.0	38.6	54.1	50.3	35.1	15.2	38.3
Total							
With Diabetes	0.0	143.0	1,232.0	1,471.0	1,295.0	301.0	4,442.0
Without Diabetes	13.0	277.0	1,266.0	1,899.0	2,548.0	1,525.0	7,528.0
% with Diabetes	0.0	34.0	49.3	43.6	33.7	16.5	37.1

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 7a.

Pneumonia or Influenza as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	MISSING	TOTAL
Male								
Without Diabetes	239.0	122.0	181.0	220.0	249.0	123.0	0	1,134.0
With Diabetes	0	10.0	60.0	72.0	79.0	25.0	0	246.0
Total Male	239.0	132.0	241.0	292.0	328.0	148.0	0	1,380.0
% with Diabetes	0	7.6	24.9	24.7	24.1	16.9	0	17.8
Female								
Without Diabetes	193.0	139.0	207.0	203.0	265.0	223.0	1.0	1,231.0
With Diabetes	0	15.0	69.0	78.0	70.0	34.0	0	266.0
Total Female	193.0	154.0	276.0	281.0	335.0	257.0	1.0	1,497.0
% with Diabetes	0	9.7	25.0	27.8	20.9	13.2	0	17.8
Total								
With Diabetes	0	25.0	129.0	150.0	149.0	59.0	0	512.0
Without Diabetes	432.0	261.0	388.0	423.0	514.0	346.0	1.0	2,365.0
% with Diabetes	0	8.7	25.0	26.2	22.5	14.6	0	17.8

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 7b.

Pneumonia or Influenza as the Primary Diagnosis and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	MISSING	TOTAL
Male								
Without Diabetes	1,271.0	650.0	836.0	1,079.0	1,158.0	579.0	0.0	5,573.0
With Diabetes	5.0	49.0	229.0	288.0	313.0	90.0	0.0	974.0
Total Male	1,276.0	699.0	1,065.0	1,367.0	1,471.0	669.0	0.0	6,547.0
% with Diabetes	0.4	7.0	21.5	21.1	21.3	13.5	0.0	14.9
Female								
Without Diabetes	1,045.0	761.0	935.0	938.0	1,253.0	939.0	2.0	5,873.0
With Diabetes	3.0	80.0	271.0	324.0	291.0	132.0	0.0	1,101.0
Total Female	1,048.0	841.0	1,206.0	1,262.0	1,544.0	1,071.0	2.0	6,974.0
% with Diabetes	0.3	9.5	22.5	25.7	18.8	12.3	0.0	15.8
Unknown								
Without Diabetes	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0
With Diabetes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Unknown	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0
Total								
With Diabetes	8.0	129.0	500.0	612.0	604.0	222.0	0.0	2,075.0
Without Diabetes	2,316.0	1,412.0	1,771.0	2,017.0	2,411.0	1,518.0	2.0	11,447.0
% with Diabetes	0.3	8.4	22.0	23.3	20.0	12.8	0.0	15.3

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 8.

Lower Extremity Amputations as any Procedure and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	1.0	14.0	41.0	32.0	17.0	10.0	115.0
With Diabetes	0.0	6.0	21.0	16.0	12.0	2.0	57.0
Total Male	1.0	20.0	62.0	48.0	29.0	12.0	172.0
% with Diabetes	0.0	30.0	33.9	33.3	41.4	16.7	33.1
Female							
Without Diabetes	0.0	5.0	21.0	12.0	22.0	18.0	78.0
With Diabetes	0.0	3.0	15.0	11.0	12.0	6.0	47.0
Total Female	0.0	8.0	36.0	23.0	34.0	24.0	125.0
% with Diabetes	0.0	37.5	41.7	47.8	35.3	25.0	37.6
Total							
With Diabetes	0.0	9.0	36.0	27.0	24.0	8.0	104.0
Without Diabetes	1.0	19.0	62.0	44.0	39.0	28.0	193.0
% with Diabetes	0.0	32.1	36.7	38.0	38.1	22.2	35.0

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 8b.

Lower Extremity Amputations as any Procedure and Diabetes as any Secondary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
Male							
Without Diabetes	7.0	67.0	235.0	179.0	149.0	52.0	689.0
With Diabetes	—	36.0	87.0	96.0	66.0	8.0	293.0
Total Male	7.0	103.0	322.0	275.0	215.0	60.0	982.0
% with Diabetes	—	35.0	27.0	34.9	30.7	13.3	29.8
Female							
Without Diabetes	1.0	26.0	121.0	131.0	98.0	86.0	463.0
With Diabetes	—	12.0	70.0	63.0	63.0	18.0	226.0
Total Female	1.0	38.0	191.0	194.0	161.0	104.0	689.0
% with Diabetes	—	31.6	36.6	32.5	39.1	17.3	32.8
Total							
With Diabetes	—	48.0	157.0	159.0	129.0	26.0	519.0
Without Diabetes	8.0	93.0	356.0	310.0	247.0	138.0	1,152.0
% with Diabetes	—	34.0	30.6	33.9	34.3	15.9	31.1

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 9.

Diabetes Related Hospitalizations Ketoacidosis, Hyperosmolarity or Other Coma as the Primary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	MISSING	TOTAL
KETOACIDOSIS WITHOUT MENTION OF COMA								
Male	177.0	310.0	144.0	21.0	10.0	3.0	0.0	665.0
Female	234.0	391.0	183.0	49.0	25.0	7.0	1.0	890.0
Total	411.0	701.0	327.0	70.0	35.0	10.0	1.0	1,555.0
Male %	26.6	46.6	21.7	3.2	1.5	0.5	0.0	42.8
Female %	26.3	43.9	20.6	5.5	2.8	0.8	0.1	57.2
Total %	26.4	45.1	21.0	4.5	2.3	0.6	0.1	100.0

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

Table 9b.

Diabetes Related Hospitalizations Ketoacidosis, Hyperosmolarity or Other Coma as the Primary Diagnosis by Gender and Age
Delaware 1995–1999

AGE:	<20	20–44	45–64	65–74	75–84	85+	TOTAL
HYPEROSMOLARITY							
Male	2.0	28.0	34.0	20.0	23.0	6.0	113.0
Female	1.0	16.0	24.0	24.0	32.0	11.0	108.0
Total	3.0	44.0	58.0	44.0	55.0	17.0	221.0
Male %	1.8	24.8	30.1	17.7	20.4	5.3	51.1
Female %	0.9	14.8	22.2	22.2	29.6	10.2	48.9
Total %	1.4	19.9	26.2	19.9	24.9	7.7	100.0
OTHER COMA							
Male	3.0	8.0	8.0	5.0	11.0	2.0	37.0
Female	2.0	8.0	15.0	4.0	8.0	6.0	43.0
Total	5.0	16.0	23.0	9.0	19.0	8.0	80.0
Male %	8.1	21.6	21.6	13.5	29.7	5.4	46.3
Female %	4.7	18.6	34.9	9.3	18.6	14.0	53.8
Total %	6.3	20.0	28.8	11.3	23.8	10.0	100.0

Source: Delaware Bureau of Health Planning & Resources Management, Delaware Health Statistics Center, Hospital Discharge Data.

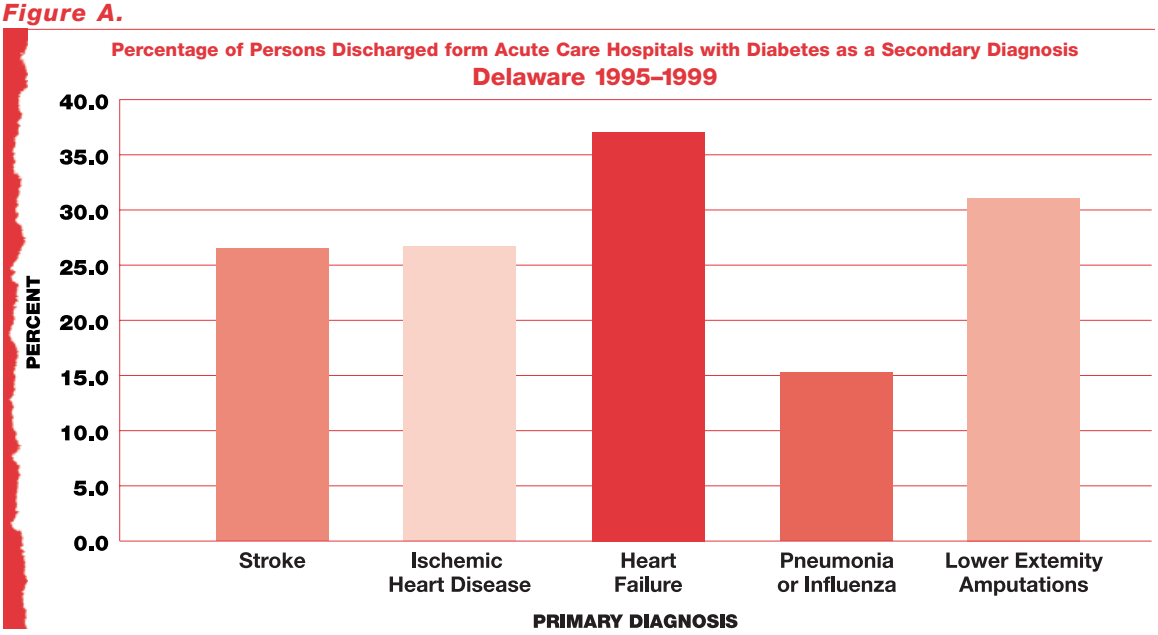
Table 10.

Incident End Stage Renal Disease Cases by Primary Cause
Delaware 1995–1999

YEAR	DIABETES	INCIDENT ESRD TOTAL	PERCENT DIABETES
1995	74	213	35%
1996	82	206	40%
1997	70	185	38%
1998	95	238	40%
1999	119	250	48%
Total	440	1092	40%

Source: ESRD Network 4.

Figure A.



DIABETES IN PREGNANCY

Introduction and Data Sources

This chapter presents information on the impact of diabetes on pregnant women and their children in Delaware. We present estimates of the number of women whose pregnancies were complicated by diabetes and the number of births in which diabetes was a risk factor. Although diabetes is known to cause congenital anomalies, the number and rate of congenital anomalies is too small in Delaware for reliable estimation in women with diabetes. Prevention of risk to mothers and their offspring due to diabetes and its complications is an important reason for monitoring diabetes in pregnancy.

Data on live births were supplied by the Delaware Health Statistics Center from birth certificate data. Prevalence estimates were calculated from NHIS data based on the 1998 estimated female population aged 18–44, as described in Chapter I. The BRFSS provided estimates of self-reported diabetes in pregnancy, as well as estimates of rates of gestational diabetes.

Results

Tables 1 and 2 contrast prevalence estimates for diabetes in women of childbearing age in Delaware, by race and county. The synthetic estimate is for a single year, 1998, whereas the BRFSS estimate comes from five years of pooled data. The estimates both suggest that approximately 2,000 women with diabetes were at risk of having a pregnancy complicated by this disorder in Delaware in the late 1990s. This is further explored in Table 3. A mid-range estimate is that 2,083 women between the ages of 18–44 had diabetes in Delaware in 1998.

Table 4 shows estimates of the number of women who had diabetes during pregnancy based on Delaware women's responses to the BRFSS. The large year-to-year variation is due to the small number of women who say they have had diabetes in pregnancy in the survey each year. Based on the average estimated number (2,629) during 1995–99, it appears that somewhat more Delaware women of childbearing age have experienced diabetes during pregnancy than have diagnosed diabetes. It also is likely that the two groups are of nearly equal size.

The preceding data show the situation from the mother's perspective. The next few tables describe risk of exposure to diabetes from the infant's point of view. Table 5 summarizes the number of infants born between 1995 and 1999 who had diabetes as a medical risk factor reported on the birth certificate, by year and race of mother. The time trend is shown in Figure 1. In the five-year period, 1,696 infants, or more than 300 each year, reportedly were born to mothers with diabetes. The percentages of children born with diabetes as a risk factor were about equal in all three counties (Table 6; Figure 2), but the majority of

affected children were born in New Castle County. The relationship between maternal age and diabetes as a medical risk factor in offspring is shown in Table 7. In Delaware between 1995 and 1999, infants of mothers over 45 years old were 15 times as likely to have been exposed to diabetes than those born to the youngest group of women.

Conclusions and Implications

Diabetes was a medical risk factor in less than 400 births in Delaware each year between 1995 and 1999, but that still amounts to more than one in every thirty births. Because risk factors may be underreported in vital records, the proportion of infants exposed to diabetes in utero could have been larger. Only about 2,000 of the nearly 150,000 women of childbearing age in Delaware had diabetes during that time period, and a comparable number reported having had diabetes only in pregnancy.

At present, most women of childbearing age in Delaware do not have diabetes, and it is an uncommon (though not rare) medical risk factor for infants born in the state. Type 2 diabetes prevalence in younger persons has been increasing in the United States[1]. If this is occurring in Delaware, the number of infants at medical risk due to diabetes could increase rapidly, along with congenital malformations and related conditions.

References

1. Ludwig DS, Ebbeling CB. Type 2 Diabetes Mellitus in Children: Primary Care and Public Health Considerations. JAMA 2001; 286:1427-1430.

Table 1.

Estimated Numbers of Women Ages 18–44 with Diabetes by County and Race
Delaware 1998

ESTIMATED NUMBER: (POPULATION)	CAUCASIAN WOMEN RATE[1] (14.9)	AFRICAN AMERICAN WOMEN RATE[1] (20.9)	OTHER WOMEN RATE[1] (6.8)	ALL WOMEN RATE[1] (15.2)
COUNTY				
Kent	280 (18,755)	108 (5,180)	15 (2,166)	403 (26,101)
New Castle	1,144 (76,747)	433 (21,199)	60 (8,863)	1,647 (106,808)
Sussex	268 (18,016)	104 (4,976)	14 (2,080)	386 (25,072)
Total	1,692 (113,518)	655 (31,355)	89 (13,109)	2,436 (157,982)

Source: Race-specific synthetic prevalence rate estimates calculated from the 1998 NHIS.
[1] Prevalence rate/1,000 population.

Table 2.

Estimated Annual Numbers of Women Ages 18–44 with Diabetes by County and Race
Delaware 1995–1999 (Five-year average)

ESTIMATED NUMBER: (POPULATION)	CAUCASIAN WOMEN RATE[1] (10.8)	AFRICAN AMERICAN WOMEN RATE[1] (13.6)	ALL WOMEN RATE[1] (11.7)
COUNTY			
Kent	30 (21,608)	132 (7,531)	593 (29,350)
New Castle	474 (68,044)	338 (24,962)	812 (93,767)
Sussex	281 (19,872)	42 (4,957)	323 (24,911)
Total	1,185 (109,523)	512 (37,625)	1,728 (148,028)

Source: Race-specific prevalence rate estimates from Delaware BRFSS 1995–1999.
[1] Prevalence rate/1,000 population.

Table 3.

Range of Estimated Numbers of Women Ages 18–44 with Diabetes by County and Race based on Synthetic NHIS and BRFSS Estimates

	ESTIMATED NUMBER BASED ON SYNTHETIC NHIS	ESTIMATED NUMBER BASED ON DELAWARE BRFSS	MID-POINT ESTIMATES
County			
Kent	403	593	498
New Castle	1,647	812	1,230
Sussex	386	323	355
Race			
Caucasian	1,692	1,185	1,439
Non-Caucasian	744	512	628
Total[1]	2,436	1,728	2,083

Sources: NHIS — estimated from national rates from the 1998 NHIS.
BRFSS — estimated from the Delaware BRFSS 1995–1999.
[1] Numbers may not add to total because of rounding.

Table 4.

Estimated Numbers of Women 18 Years and Older Who Reported Ever Having Been Diagnosed with Diabetes But Only During Pregnancy
Delaware 1995–1999

TYPE OF ESTIMATE	ESTIMATED NO. DIAGNOSED DURING PREGNANCY	DIABETES PREVALENCE RATE[1]	NO. OF WOMEN AGES 18 AND OLDER
Average	2,629	17.7	148,537
Minimum	1,248	8.4	148,182
Maximum	4,009	26.9	148,892

Source: Delaware BRFSS 1995–1999.
[1] Prevalence rate/1,000 population.

Figure 1.

Diabetes as a Medical Risk Factor in Pregnancy as Reported on Certificates of Live Births by Race
Delaware 1995–1999

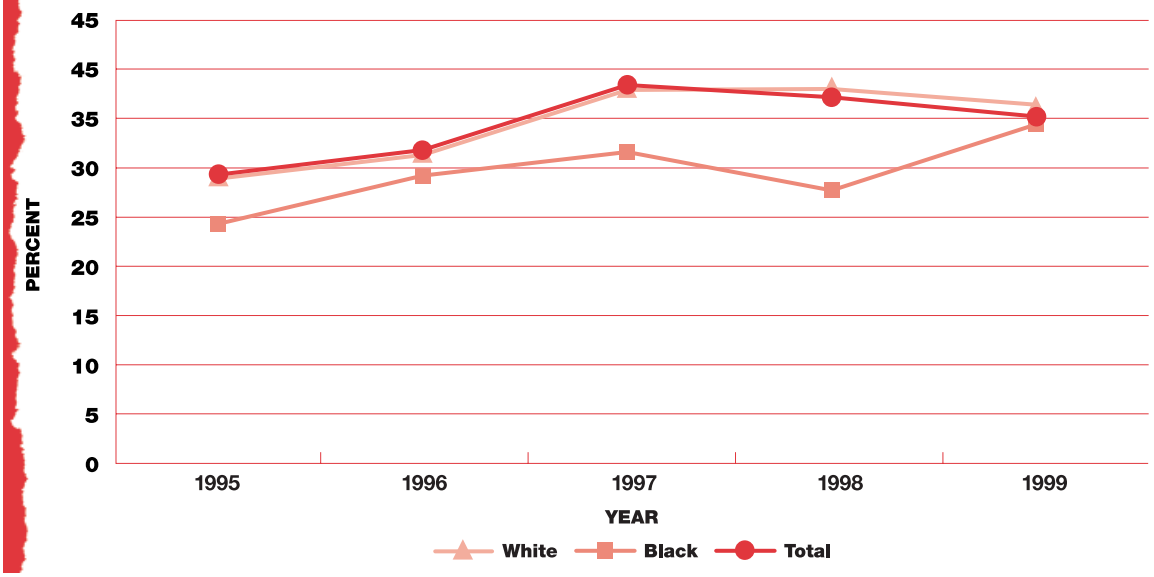


Table 5.

Prevalence of Diabetes as a Medical Risk Factor in Pregnancy as Reported on Certificates of Live Births by Race
Delaware 1995–1999

YEAR:	1995	1996	1997	1998	1999
RACE					
Caucasian					
Number	211	226	272	289	252
Rate[1]	29.3	31.8	38.4	40.3	35.2
African American					
Number	55	66	75	69	88
Rate[1]	24.3	29.2	31.6	27.7	34.4
Other					
Number	15	8	20	22	28
Rate[1]	56.8	34.8	85.1	66.5	71.6
Total Number	281	300	367	380	368
Rate[1]	28.9	31.3	37.9	38.0	36.4

Source: Delaware Health Statistics Center, certificates of live births.
[1] Prevalence rate/1,000 live births

Table 6.

Diabetes as a Medical Risk Factor in Pregnancy as Reported on Certificates of Live Births by County
Delaware 1995–1999

YEAR:	1995	1996	1997	1998	1999	AVERAGE 95–99
COUNTY						
Kent						
Number of Births	1,510	1,574	1,378	1,482	1,900	7.844
Diabetes as a Risk Factor	67	48	43	66	66	290
Rate[1]	44.4	30.5	31.2	44.5	34.7	37.0
New Castle						
Number of Births	6,510	6,370	6,508	6,633	6,533	32,554
Diabetes as a Risk Factor	161	191	268	249	249	1,118
Rate[1]	24.7	30.0	41.2	37.5	38.1	34.2
Sussex						
Number of Births	1,708	1,647	1,806	1,873	1,682	8,716
Diabetes as a Risk Factor	53	61	56	65	53	288
Rate[1]	31.0	37.0	31.0	34.7	31.5	33.0
Total Number	281	300	367	380	368	
Rate[1]	28.9	31.3	37.9	38.0	36.4	

Source: Delaware Health Statistics Center, certificates of live births.
[1] Rate/1,000 live births.

Figure 2.

Diabetes as a Medical Risk Factor in Pregnancy as Reported on Certificates of Live Births by County
Delaware 1995–1999

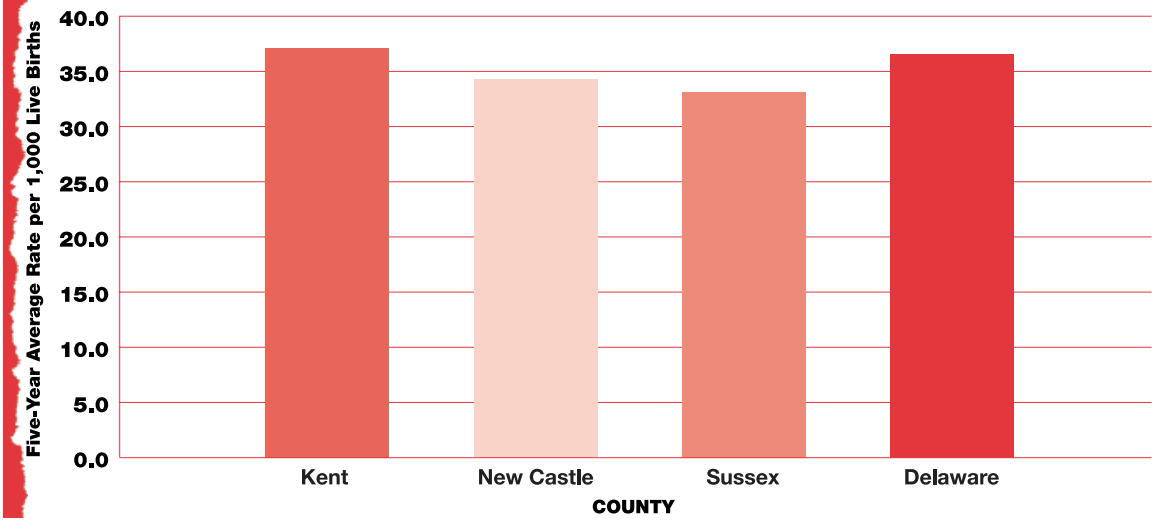


Table 7.

Diabetes as a Medical Risk Factor in Pregnancy as Reported on Certificates of Live Births by Age of the Mother
Delaware 1995–1999

AGE OF MOTHER	NUMBER OF BIRTHS WITH DIABETES AS A RISK FACTOR	DIABETES PREVALENCE RATE[1]	NUMBER OF LIVE BIRTHS
15–19	35	8.0	4,401
20–24	176	20.2	8,716
25–34	786	38.1	20,625
35–44	326	63.5	5,131
45+	5	147.1	34
Missing	368		10,113
Total	1,696	34.6	49,020

Source: Delaware Health Statistics Center, certificates of live births.
[1] Prevalence rate/1,000 live births

TREATMENT AND ECONOMIC COSTS

Introduction and Data Sources

This chapter provides information on current treatment of persons with diabetes in Delaware. Data on outpatient treatment are available from two sources: the CDC BRFSS (for all persons over age 18 with diabetes) and Medicare outpatient claims (for Medicare beneficiaries who are not enrolled in health maintenance organizations). BRFSS contains self-reports of services provided by physicians, which may differ from services actually delivered. The BRFSS diabetes module includes questions on testing for glycosylated hemoglobin (HbA1c), foot examinations, and dilated eye examinations.

The Medicare outpatient data were collected from health claims, which can only report services that are billed separately. The Centers for Medicare and Medicaid Services (CMS, formerly the Health Care Financing Administration) has provided case-level data for each state containing a record for every Medicare beneficiary aged 65–74 during 1998–99 who met claims-based criteria implying a diagnosis of diabetes. Each record on the CMS file includes information on whether the beneficiary had HbA1c testing in the previous year, an eye examination in the previous two years, and lipid screening in the previous two years.

In both data sources (BRFSS and claims), the patient's experience is compared with a standard of care: foot examinations and HbA1c at least annually, and eye and lipid tests during the previous two years. Many experts recommend HbA1c testing more frequently; annual testing can be considered a minimum standard applicable to all persons with diabetes[1]. Lipid and eye examination frequency also depend on clinical conditions, but every two years is a minimum standard for most persons with diabetes.

These services are important measures of effort to prevent complications of diabetes. HbA1c is a measure of degree of control of diabetes; persistent high levels are associated with increased prevalence of complications. Lipid tests are important in all persons at risk of cardiovascular disease; those with diabetes are already at high risk and require periodic screening. Eye and foot examinations screen for treatable early signs of complications, aiming to prevent blindness and limb loss.

Two other preventive measures can be tracked with the Medicare claims. They are vaccination against pneumonia and influenza. Diabetes decreases the body's resistance to infection, thus increasing the likelihood of death or hospitalization when influenza or pneumonia exposure occurs. Immunization protects against infection. Claims data probably under-report vaccination, because people can get shots from providers who don't file itemized bills for the services.

The data from Medicare claims can be compared BRFSS self-reports of immunization in persons with and without diabetes, for which data are available from 1995, 1997, and 1999. Respondents to surveys on prevention may overestimate their use of such services. BRFSS data are from a relatively small sample of state residents; estimates based on subgroups such as persons with diabetes may be misleading because of the small number of persons interviewed.

Information on payment for diabetes inpatient treatment was provided by the Delaware Health Statistics Center for all patients discharged from acute care hospitals in Delaware. For comparison, payments for Medicare fee for service discharges in persons age 65 and older are presented. These data are from CMS inpatient claims from 1995 through 1999.

Finally, a rough estimate of the total economic burden of diabetes in Delaware in 1998 is presented, based on the American Diabetes Association national model[2] and diabetes prevalence estimated in this report.

Results

Use of specific medical services

Table 1 shows the proportion of fee for service Medicare beneficiaries with diabetes who had the three clinical services in 1998–99 by race and gender. About three-quarters of the Medicare beneficiaries had eye examinations and HbA1c tests in the recommended time period, whereas only three-fifths met the lipid testing standard. Non-Caucasian beneficiaries with diabetes were less likely to have had lipid examinations (62% of Caucasian beneficiaries vs. fewer than half of African American and other race beneficiaries).

Table 2 gives the percentages of all persons over 18 in Delaware with self-reported diabetes who said they had received three clinical services in 1997–98. Only 23% of survey respondents said they had had HbA1c testing in the previous year, vs. 68% for foot examinations and 84% for dilated eye examinations. We report the proportion of all persons with diabetes who said they had had glycosylated hemoglobin tests; however, only 37 (25%) of the survey respondents indicated that they had ever heard of the test.

Preventive care

Influenza and pneumonia vaccine claims rates for Medicare beneficiaries with diabetes are shown in Table 3. Elderly fee-for-service Medicare beneficiaries with diabetes in 1999 had about 50% chance of having a claim for influenza immunization that year in Delaware. Two-fifths of them had claims for pneumonia vaccination in the previous eight years. Medicare only covered many for a part of that time period. African American beneficiaries were significantly less likely to have claims for influenza immunization than Caucasians (41.6% vs. 58.7%); a similar gap held for pneumonia vaccination (43.1% vs. 33.1%).

Interview data shows a larger proportion of Delaware residents with diabetes who say they received influenza and pneumonia vaccine in 1999; comparative data for 1995 and 1997 are also shown in Table 4. In each of the three years reported, more Delawareans over age 65 with diabetes said they'd had pneumonia vaccines than those without diabetes (e.g., 71% vs. 58% in 1999). Figure 1 illustrates the trend in self-reported use of these preventive measures over time, where there was little apparent change in influenza vaccine uptake and possibly a small increase in pneumonia vaccine. For both pneumococcal vaccination and influenza vaccination, rates from self-reporters were substantially higher than for claims.

Cost of hospital care

Table 5 and Figure 2 illustrate some costs of diabetes medical care, showing total payments to Delaware hospitals for Medicare fee-for-service patients with and without a secondary diagnosis of diabetes by year. In 1995, beneficiaries with diabetes accounted for less than one-fifth of Medicare hospital payments; by 1999, the proportion had increased to nearly 22%. In 1999, Medicare expenditures for hospital care of beneficiaries with diabetes exceeded $40 million in Delaware, with the amount having increased by one-third in five years. For all Delaware hospital discharges between 1995 and 1999, payments for care of persons with diabetes were more than $100 million annually (Table 6). Average payments per discharge were highest for those with a secondary diagnosis of diabetes than for those with no diabetes diagnosis by between $2,000 and $3,000, depending on year, and average payments per discharge were higher when diabetes was a primary diagnosis than when there was no diabetes present. Over the 5-year period, almost 15% of all hospital payments in Delaware were for care of people who had diabetes.

Estimated total economic cost of diabetes

The American Diabetes Association's estimate of the total economic costs of diabetes in the United States in 1997 was $98.2 billion. This figure consists of 45% direct medical costs and 55% indirect costs (including lost productivity due to disability and the cost of early mortality). Based on the CDC national estimated number of adults with diabetes in the United States in 1997 of 10.3 million[3], the estimated per-capita cost of diabetes in that year was $9,579. Applying this to the CDC-estimated prevalence of diabetes in Delaware in 1997 yields a total economic cost estimate of $278 million for 1997.

Conclusion and Implications

In Delaware, persons with diabetes require extensive medical care, and in the late 1990s they used these services less frequently than recommended. There were significant disparities among racial groups in the use of important preventive and treatment services. For example, African Americans were less likely to have had lipid testing or immunizations than Caucasians.

Medical care for diabetes in Delaware is expensive. Between 1995 and 1999 people with diabetes accounted for more than 15% of all hospital payments, while only 5% of the population. This proportion could actually be higher if underreporting diabetes as a secondary diagnosis was accounted for. The overall costs of diabetes in Delaware are enormous, and increasing, driven by increasing cost of medical care and increasing proportions of diabetes in the population. Only prevention—both of diabetes and its complications—is likely to moderate or reverse this trend.

References

1. American Diabetes Association. Standards of Medical Care for Patients With Diabetes Mellitus. Diabetes Care 2001; 24:s33-s42.
2. American Diabetes Association. Economic consequences of diabetes mellitus in the United States in 1997. Diabetes Care 1998; 21:296-309.
3. Centers for Disease Control. 1999 Diabetes Surveillance Report. Vol. 2001, 1999.

Table 1.

Proportion of Delaware Medicare Beneficiaries Age 65–74 with Diabetes Having Specified Medical Procedures
Delaware 1998–1999

	GENDER NUMBER (%)		RACE* NUMBER (%)			
INDICATOR	**MALE**	**FEMALE**	**CAUCASIAN**	**AFRICAN AMERICAN**	**OTHER**	**TOTAL**
Hemoglobin A1c in past year	1431 (70.4%)	1644 (73.3%)	2402 (72.9%)	585 (69.2%)	74 (65.5%)	3075 (71.9%)
Lipid screen in past 2 years	1183 (58.2%)	1348 (60.1%)	2062 (62.5%)	411 (48.6%)	50 (44.2%)	2531 (59.2%)
Eye examination in past 2 years	1520 (74.8%)	1808 (80.6%)	2586 (78.4%)	644 (76.2%)	81 (71.7%)	3328 (77.9%)
Total Beneficiaries	2032	2242	3297	845	113	4274

**With less than 0.4% race unknown.*
Source: HCFA Medicare claims data 1998–1999.

Table 2.

Proportion of Delawareans Age 18 or Older with Diabetes who had Glycosylated Hemoglobin Tests in the Previous Year, Foot Examinations in the Previous Year, or Dilated Eye Examinations in the Previous Two Years
1998

PROCEDURE	**NUMBER (%) HAVING PROCEDURE**	**95% CONFIDENCE LIMITS**
Glycosylated Hemoglobin in Past Year	34 (23%)	16–30%
Foot Examination in Past Year	100 (68%)	60–76%
Dilated Eye Examination in Past Two Years	122 (84%)	77–90%

Source: BRFSS Diabetes Module (1995, 1997 and 1999). U.S. Department of Health & Human Services. CDC.

Table 3.

Delaware Medicare Beneficiaries with Diabetes Who Were 65–74 Years Old in 1998 Who Were Still Living on September 1, 1999 By Influenza and Pneumonia Vaccination Claim Status, Race and Gender

	GENDER NUMBER (%)		RACE NUMBER (%)			
VACCINATION/YEAR	MALE	FEMALE	CAUCASIAN	AFRICAN AMERICAN	OTHER	TOTAL
Pneumonia 1991–99						
Claims	798	850	1,349	256	43	**1,648**
% with claims	41.8%	40.1%	43.1%	33.1%	33.6%	**40.9%**
Influenza 1999						
Claims	1,044	1,180	1,837	322	65	**2,224**
% with claims	54.6%	55.7%	58.7%	41.6%	50.8%	**55.2%**
Total Patients with Diabetes	1911	2119	3128	774	128	**4030**

Source: HCFA Medicare claims data 1991–1999.

Table 4.

Proportion of Delawareans Over 65 with and without Diabetes Who Reported Having Influenza Shots in the Previous Year Or Pneumonia Vaccination Ever

1995, 1997, and 1999

	WITH DIABETES		WITHOUT DIABETES	
	NUMBER (%)	95% CONFIDENCE LIMITS	NUMBER (%)	95% CONFIDENCE LIMITS
Pneumonia Vaccine Ever				
1995	25 (57%)	42–71%	152 (40%)	35–45%
1997	46 (55%)	45–66%	233 (48%)	44–53%
1999	48 (71%)	60–81%	220 (58%)	53–63%
Influenza Vaccine, Past Year				
1995	28 (64%)	50–78%	222 (58%)	53–63%
1997	57 (69%)	59–79%	323 (67%)	63–71%
1999	44 (65%)	53–76%	234 (62%)	57–67%

Source: BRFSS Diabetes Module (1995, 1997 and 1999). U.S. Department of Health & Human Services. CDC.

Table 5.

Total Hospital Payments for Medicare Fee for Service Beneficiaries over Age 65 With and Without a Diagnosis of Diabetes

1995–1999

	WITH DIABETES DIAGNOSIS		WITHOUT DIABETES DIAGNOSIS	
	DISCHARGES	PAYMENTS	DISCHARGES	PAYMENTS
1995	5111	$30,895,018.57	20,207	$131,277,260.55
1996	5541	$38,258,649.13	19,011	$139,760,685.36
1997	5775	$40,236,979.23	19,139	$142,418,806.98
1998	5845	$38,497,781.66	19,831	$141,104,416.17
1999	6270	$41,951,131.04	21,616	$151,160,243.16

Source: Delaware hospital claims 1995–1999.

Figure 1.

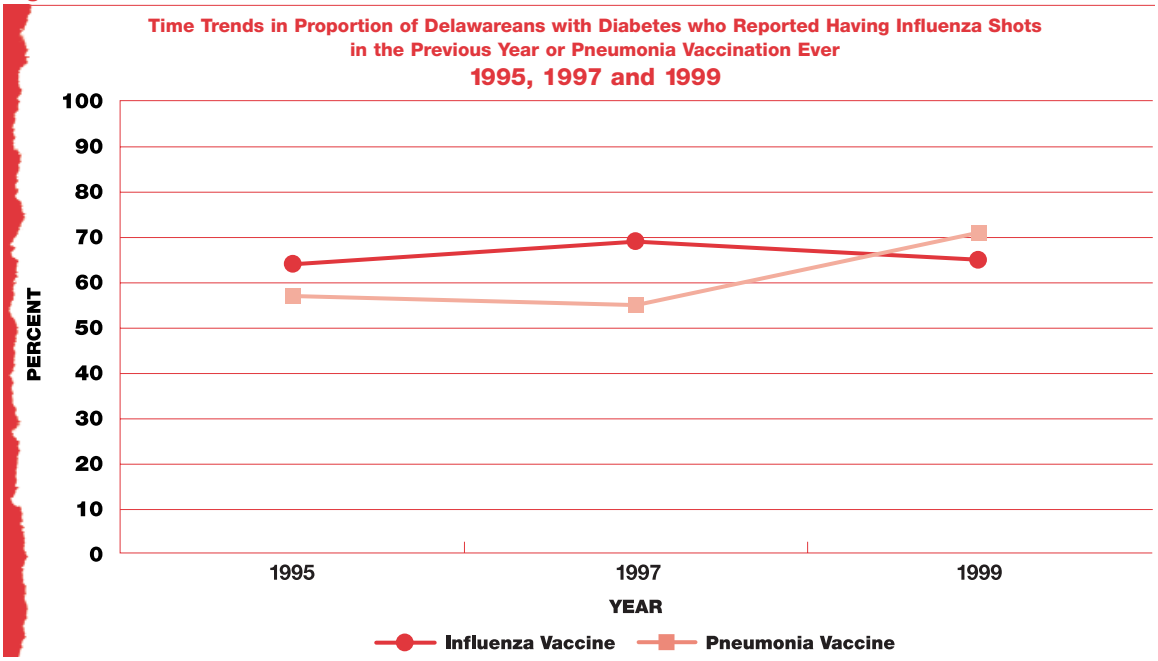
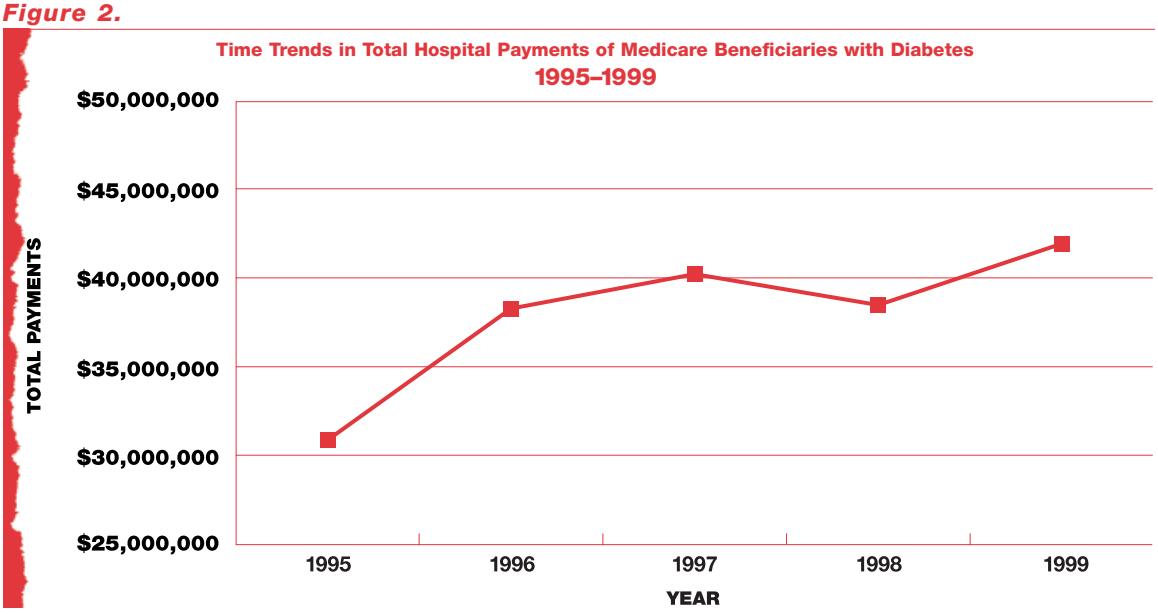


Figure 2.



DIABETES MORTALITY

Introduction and Data Sources

This chapter describes the toll of diabetes deaths in Delaware, and puts diabetes into perspective as a deadly chronic disease. We show the relative ranking of Delaware compared with the other states in death rates from the disorder. Characteristics of Delawareans who died from diabetes during 1994–98 are also noted.

The national data are from compilations by the Division of Diabetes Translation, CDC. The rates are higher than in other tables in this chapter, because they include both deaths directly due to diabetes, and the more numerous cases where the disease is listed as a contributing cause of death. Delaware state data were provided by the Delaware Health Statistics Center, and are derived from official death certificates of Delaware residents. Data are presented from 1994 through 1998 because of changes in coding of cause of death in 1999.

Results

Table 1 compares Delaware diabetes death rates with the United States in 1994 through 1996. This table is the only one presented that shows deaths from diabetes as any listed cause of death. The table shows both crude and age-adjusted death rates; the latter are more appropriate for comparing states because they correct for differences in age among state populations.

The age-adjusted death rate for diabetes as any mentioned cause of death in Delaware was 66.1 per 100,000 population. This means that, on average, about 500 Delawareans died each year partly or entirely because they had diabetes. Delaware ranked fifteenth highest among all states in age-adjusted death rate for diabetes in those years.

The remaining tables and figures deal with underlying cause of death. Table 2 illustrates that diabetes deaths occur principally among older Delawareans; in 1998, over half of the deaths occurred in persons 75 years of age or older. Table 3 underscores this, by showing age-, race-, and sex-specific rates. Delawareans age 65 and older had death rates approximately 30 times higher than younger persons' rates. African Americans had rates two to three times those of Caucasians, and men had slightly higher death rates than women.

These differences were persistent over the five-year period from 1994 through 1998. Figure 1 shows the small excess mortality rate in men in Delaware between 1994 and 1998 when adjusted for age. Table 4 illustrates the approximately three-fold difference in age-adjusted death rates between African Americans in Delaware (61.7 per 100,000 per annum) and Caucasians (29.1) during those five years. Figure 2 shows the difference pictorially.

There was slight variation in diabetes death rates among Delaware's counties during the five-year period, with New Castle County's rate slightly lower than the other two counties' (Figure 3). Figure 5 shows the long-term time trend of deaths from diabetes in Delaware and each of its counties covering 1979 through 1998. While there was little change in statewide deaths from diabetes during this time period, the downstate counties appeared to have increasing trends. Deaths in Kent and Sussex counties have largely caught up to the high rates in New Castle County.

Table 6 compares diabetes with other leading causes of death in Delaware from 1994 to 1998. As in most states, heart disease and cancer had the highest rates. Diabetes had about the same death rate as pneumonia and influenza and suicide (data not shown for suicide).

Conclusions and Implications

Compared with the United States, Delaware has much higher death rates from diabetes, whether one considers all mentioned causes or just underlying causes. Delaware's underlying cause of death rate for diabetes ranked fourth among the states in 1998[1], suggesting that the high any-mentioned-cause rate was not simply due to better documentation of diabetes in Delaware death certificates.

Racial disparities in mortality due to diabetes are a serious concern. These may reflect problems in access to health care, use of health care, and variations underlying risk factors for diabetes and its complications. Closing the gap in death rates from diabetes in Delaware will be an important challenge in meeting 2010 health objectives.

References

1. Centers for Disease Control. Compressed Mortality File. Vol. 2001: National Center for Health Statistics, 1998.

Table 1.

Three-Year Average Mortality Rates[1] and State Ranks for Diabetes as Any Listed Cause by State
United States, 1994–1996

STATE	CRUDE RATE[1]	CRUDE RANK	ADJUSTED RATE[1,2]	ADJUSTED RANK
Alabama	67.2	33	52.1	42
Alaska	26.5	51	55.1	36
Arizona	48.8	46	44.9	48
Arkansas	62.0	39	47.1	47
California	65.5	37	68.7	9
Colorado	46.8	50	51.0	43
Connecticut	77.2	14	61.6	22
Delaware	76.1	16	66.1	15
Dist. Of Columbia	102.4	2	42.8	50
Florida	67.0	34	44.7	49
Georgia	55.3	43	53.1	39
Hawaii	68.9	29	41.3	51
Idaho	54.4	45	49.4	45
Illinois	74.9	19	64.8	17
Indiana	77.9	13	69.3	8
Iowa	79.1	12	61.4	24
Kansas	67.8	32	57.4	34
Kentucky	68.6	30	61.6	21
Louisiana	66.7	35	56.1	35
Maine	80.5	9	67.5	12
Maryland	84.1	6	74.5	4
Massachusetts	72.2	26	58.3	32
Michigan	76.6	15	68.0	11
Minnesota	68.0	31	63.3	19
Mississippi	72.7	22	57.7	33
Missouri	79.5	11	64.2	18
Montana	62.3	38	61.5	23
Nebraska	72.7	23	61.3	25
Nevada	48.5	48	49.1	46
New Hampshire	72.6	25	73.1	6
New Jersey	75.0	18	61.2	26
New Mexico	54.5	44	52.3	41
New York	66.6	36	54.9	38
North Carolina	82.6	7	68.3	10
North Dakota	73.0	20	49.6	44
Ohio	98.5	4	82.5	2
Oklahoma	72.1	27	60.2	29
Oregon	75.1	17	66.3	14
Pennsylvania	102.3	3	74.3	5
Rhode Island	90.7	5	70.0	7
South Carolina	81.3	8	66.7	13
South Dakota	72.9	21	61.0	28
Tennessee	71.5	28	61.0	27
Texas	61.2	40	64.8	16
Utah	47.7	49	59.2	30
Vermont	80.0	10	75.1	3
Virginia	59.8	41	54.9	37
Washington	58.5	42	58.7	31
West Virginia	111.1	1	88.5	1
Wisconsin	72.6	24	63.1	20
Wyoming	48.7	47	52.3	40

SOURCE: Centers for Disease Control and Prevention, National Center for Health Statistics, National Vital Statistics System. U.S. Bureau of the Census, census of the population and population estimates. Data computed by the Division of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention.

[1] Rate per 100,000 population.

[2] Adjusted for age and race.

Table 2.

Number and Percent of Deaths with Diabetes Listed as the Underlying Cause by Age and Gender
Delaware 1998

AGE	MALE NUMBER (%)	FEMALE NUMBER (%)	TOTAL NUMBER (%)
Under 45	3 (2.8%)	1 (0.8%)	4 (1.7%)
45-54	4 (3.7%)	7 (5.6%)	11 (4.7%)
55-64	18 (16.7%)	12 (9.6%)	30 (12.9%)
65-74	23 (21.3%)	33 (26.4%)	56 (24.0%)
75 +	60 (55.6%)	72 (57.6%)	132 (56.7%)
Total	108	125	233

Source: Delaware Health Statistics Center.

Table 3.

Numbers of Deaths and Crude Mortality Rates for Diabetes Listed as the Underlying Cause by Age, Race and Gender
Delaware 1998

	UNDER 65		65 AND OVER		TOTAL	
RACE/GENDER	NUMBER OF DEATHS	CRUDE MORTALITY RATE[1]	NUMBER OF DEATHS	CRUDE MORTALITY RATE[1]	NUMBER OF DEATHS	CRUDE MORTALITY RATE[1]
Caucasian	32	6.2	143	169.1	175	29.1
Male	18	6.9	62	172.7	80	27.1
Female	14	5.5	81	166.4	95	31.1
African American	13	10.9	43	437.2	56	43.5
Male	7	12.2	19	488.6	26	42.5
Female	6	9.7	24	403.5	30	44.4
Other	0	0.0	2	281.7	2	14.3
Male	0	0.0	2	662.3	2	30.1
Female	0	0.0	0	0.0	0	0.0
Total Number	45	5.9	188	197.7	233	31.3
Male	25	5.6	83	207.1	108	29.7
Female	20	6.1	105	180.8	125	32.9

Source: Delaware Health Statistics Center.
[1] Rate per 100,000 population.

Figure 1.

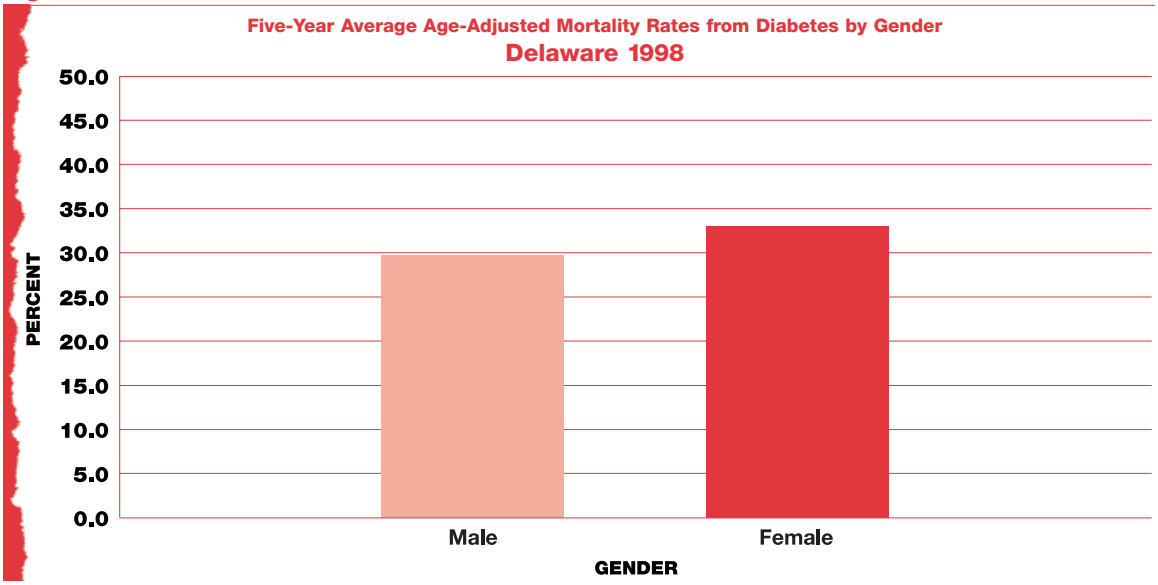


Figure 2.

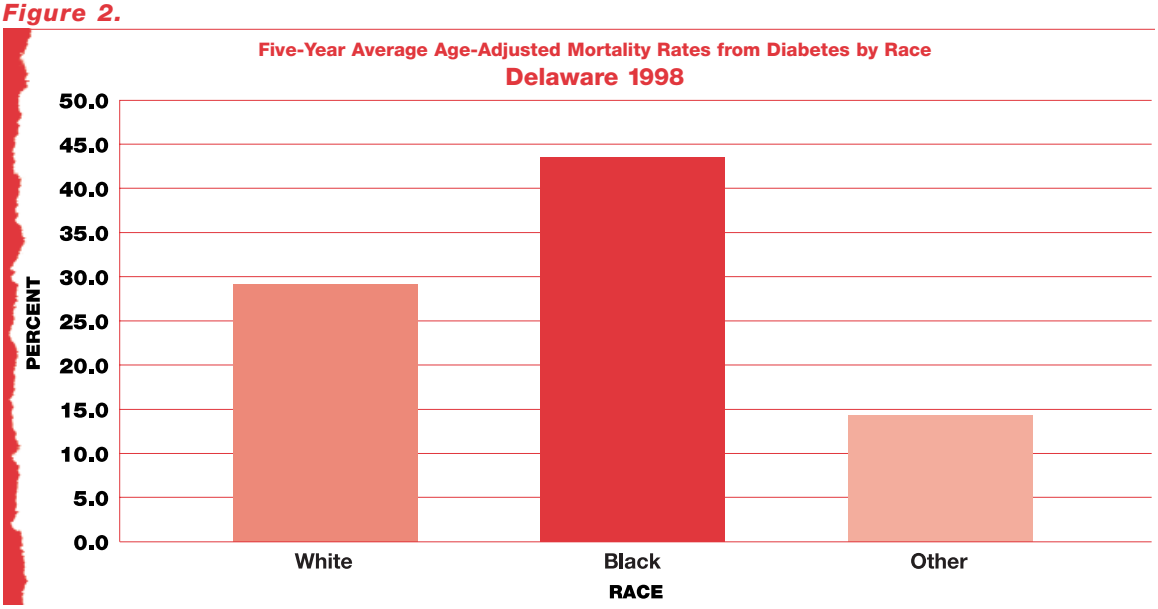


Table 4.

Numbers of Deaths and Age-Adjusted Mortality Rates[1] for Diabetes as the Underlying Cause by Gender and Race
Delaware 1994–1998

	NUMBER OF DEATHS	FIVE-YEAR AVERAGE ADJUSTED MORTALITY RATE[2]
GENDER		
Total	988	29.1
Male	425	30.7
Female	563	28.3
RACE/GENDER		
Total[3]	988	29.1
Caucasian	739	24.9
Male	318	26.2
Female	421	24.0
African American	240	61.7
Male	101	65.7
Female	139	60.1

Source: Delaware Health Statistics Center.
[1] Age-adjusted by the direct method using 2000 U.S. population as standard.
[2] Rate per 100,000 population.

Table 5.

Numbers of Deaths and Five-Year Average Adjusted Mortality Rates[1] for Diabetes as the Underlying Cause by County
Delaware

COUNTY	NUMBER OF DEATHS	FIVE-YEAR AVERAGE ADJUSTED MORTALITY RATE[2]
Kent	161	31.1
New Castle	581	28.0
Sussex	246	31.2
Total	988	29.1

Source: Delaware Health Statistics Center.
[1] Age-race-sex-adjusted by the direct method using 2000 U.S. population as standard.
[2] Rate per 100,000 population.

Figure 3.

Five-Year Average Age-Adjusted Mortality Rates from Diabetes by County
Delaware 1994—1998

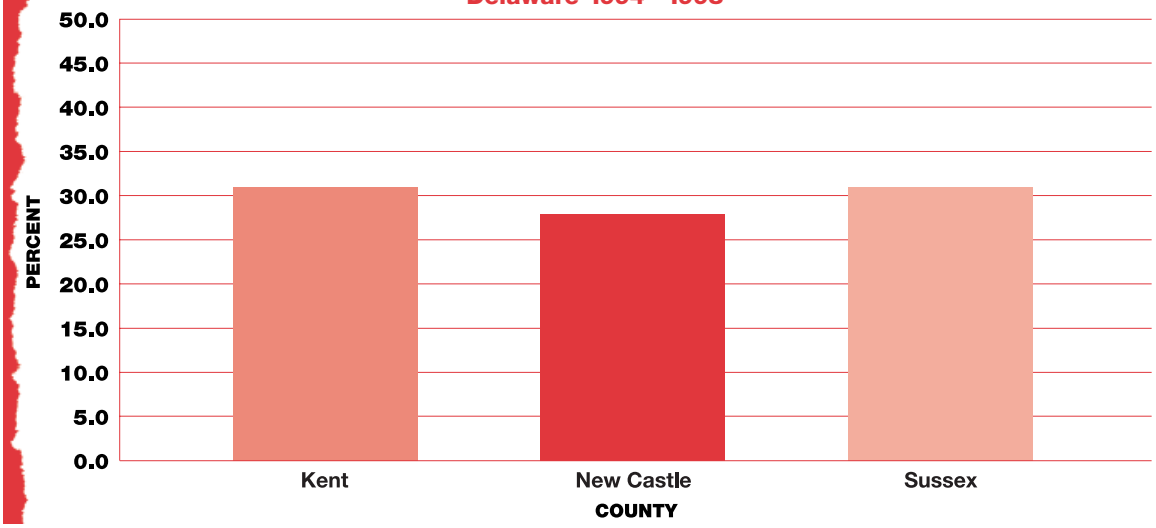


Table 6.

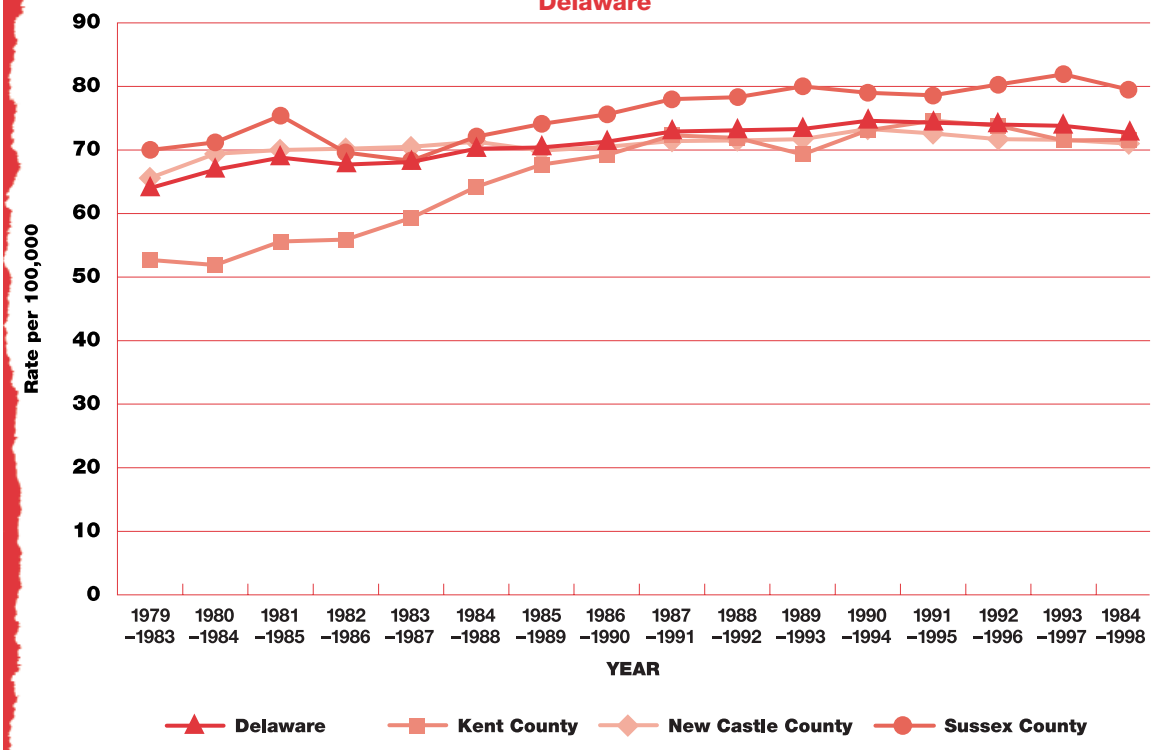
Five-Year Average Adjusted[1] Diabetes Mortality Rates[2] for Selected Leading Causes of Death
Delaware 1994–1998

UNDERLYING CAUSE OF DEATH	MORTALITY RATE[2]
Diabetes Mellitus	29.1
Diseases of the Heart	302.8
Malignant Neoplasms	237.9
Cerebrovascular	53.8
Pneumonia and Influenza	34.6

Source: Delaware Health Statistics Center.
[1] Age-race-gender-adjusted by the direct method using 2000 U.S. population as standard.
[2] Rate per 100,000 population.

Figure 4.

Five-Year Average Age-Adjusted Mortality Rates from Diabetes by Time Period and County
Delaware



DIABETES IN SPECIAL POPULATIONS

Introduction and Data Sources

This chapter presents descriptions of the extent of the burden of diabetes in several special populations in Delaware: Medicaid recipients, skilled nursing facility patients, and prisoners. An appendix will provide information on diabetes and other chronic disease problems in Delaware's school children. These special groups have two common characteristics: vulnerability because of dependency or potential lack of access to medical care, and a shortage of objective data on prevalence and consequences of specific disorders such as diabetes.

Medicaid data are self-reported prevalence, demographic, and quality of care data provided by the two Diamond State Health Plan managed-care organizations (First State Health Plan and Coventry Health Care). The data are more recent than the intended scope of this report. Because Medicaid managed-care plan enrollment has shifted significantly in recent years, they are probably not representative of the prior period. However, First State Health Plan's submission contains interesting and useful information on current prevalence of diabetes in Delawareans on Medicaid based on claims data, while Coventry has documented quality of care measures based on its quality monitoring submissions under the Health Employers Data and Information Set (HEDIS), which can be compared with similar quality measures reported for elderly Delawareans with Medicare coverage in Chapter IV.

The skilled nursing facility data are the product of a small survey conducted by the Delaware Division of Health and Social Services, Medicaid Long Term Care Unit in July through September 2001. It covers 2,426 Medicaid residents of nursing homes. According to the Delaware Bureau of Licensing and Planning, there were 4,869 skilled nursing beds in Delaware as of December 31, 2000. The survey includes only about half of the nursing home residents. We would expect lower rates of illness in the remainder of the population, which is distinguished by having a higher income. Higher-income persons are about half as likely to have diabetes as poor people[1]. The survey sought to enumerate recipients with diabetes in the Medicaid skilled nursing facility (SNF) population, asked about common diabetes complications such as blindness, foot disorders, and neuropathy, and also inquired about diabetes-related conditions such as obesity, hypertension, and heart disease.

Data on diabetes in prison inmates was provided by Delaware Department of Corrections. Demographic data on prisoners is available for the previous five years. Data on the number of prisoners with diabetes, however, was only available for the current year. Based on population trends in diabetes prevalence, it is probable that the diabetes rate was somewhat lower in previous years than the rate reported here.

Quality Insights of Delaware is currently collecting data from Delaware public schools. School health personnel are reporting the number of students with different chronic diseases, including diabetes to assess the overall impact of chronic disease among students on school programs. Results will be issued as an appendix to this report.

Results

Medicaid recipients

First State Health Plan (FSHP) identified 986 Medicaid recipient members with diabetes as of June 2001. This represents 2.3% of its 43,475 Medicaid recipient members as of October 2001 (neglecting changes in enrollment during July–September). Most Medicaid recipients are young: 60% of FSHP recipients are younger than 18 years of age. Table 1 shows the number of FSHP Medicaid recipients with diabetes by age, and the rate of diabetes in each age and sex category. Diabetes prevalence appears to exceed 20% in Medicaid recipients over 55 years of age. Table 2 shows distribution of Medicaid recipients with diabetes among Delaware's counties, the vast majority of whom live in New Castle County.

Coventry Health Plan was able to identify recipients with diabetes in two consecutive calendar years (2000 and 2001). Coventry's total number of enrolled Medicaid recipients with diabetes increased from 342 to 710 during that period; the increase is believed to be due to rapidly changing plan enrollment. In both time periods, three-quarters of the recipients with diabetes were female (a proportion very similar to FSHP's overall percentage of females with diabetes). Coventry was also able to supply data on compliance with HEDIS indicators for this population. These are shown as Table 3, for 1999 and 2000.

Skilled Nursing Facilities

Table 4 shows the number of Medicaid recipients in skilled nursing facilities during the summer of 2001 who had a diagnosis of diabetes by age, race, and sex, as well as the rate of diabetes per 100 residents in each category. African American recipients and all recipients between ages 65 and 74 in nursing homes each had a one in three chance of having a diagnosis of diabetes. The overall diabetes rate in this population was more than 25%.

Table 5 gives the prevalence of complications of diabetes in the Medicaid nursing home population, by age. At all ages, about half of the residents had one or more complications of diabetes. In Table 6, prevalence of individual complications is described. Ischemic foot disease and neuropathy were most common, each being present in two-fifths of the recipients. Tables 7 and 8 describe prevalence of diabetes-related conditions in the SNF patients with diabetes. Nine out of ten of them had one or more such condition, with hypertension being most common.

Prisons

According to Delaware Corrections, prison populations in the state fluctuated between about 5,000 and 6,500 inmates between 1996 and 2001. Data on prevalence of diabetes among prisoners in 2001 is shown in Tables 10 and 11. Table 9 illustrates increasing prevalence of diabetes among older prisoners. There were 116 prisoners with diagnosed diabetes in prison. Inmates over age 60 were nearly twenty times as likely to have diabetes as those younger than 25. Rates of disease were similar in both major racial categories.

Conclusions and Implications

Diabetes is quite common among Medicaid recipients. The one in five prevalence in recipients over age 55 suggests that focusing efforts on prevention and early detection to this vulnerable group might be beneficial. One-quarter of Medicaid recipients in skilled nursing facilities have diabetes, demonstrating the contribution of diabetes to disability. Diabetes is also common among older prisoners.

The three special populations described above show striking findings that are ominous in respect to eventual public health-care costs. The high prevalence of diabetes among older Medicaid recipients could force increasing shifts of program expenditures from children (who are more numerous) to chronically ill adults (whose per-capita costs are the greatest). Clearly diabetes and its complications are major contributors to the need for institutional care in Medicaid recipients. If longer prison sentences result in an aging prison population, management of diabetes and its complications will add to costs of prison health care.

References

1. Centers for Disease Control. Behavioral Risk Factor Surveillance System Prevalence Data. Vol. 2001: National Center for Chronic Disease Prevention & Health Promotion, 2000.

Table 1.

Number of Medicaid Recipients With Diabetes and Rate (Percent) of Recipients With Diabetes, by Age
First State Health Plan, Delaware 2001

AGE RANGE	MALE	FEMALE	TOTAL
0–17	23 (0.2%)	33 (0.3%)	56 (0.2%)
18–44	94 (2.7%)	241 (2.4%)	335 (2.4%)
45–54	72 (9.0%)	178 (13.1%)	250 (11.6%)
55–64	73 (15.9%)	216 (25.2%)	289 (22.0%)
65 and older	17 (20.7%)	39 (20.1%)	56 (20.3%)
Total	279 (1.5%)	707 (2.8%)	986 (2.3%)

Source: First State Health Plan claims data as of June, 2001.

Table 2.

Number of Medicaid Managed Care Recipients with Diabetes, by Age and County
First State Health Plan, Delaware 2001

COUNTY:	NEW CASTLE		KENT		SUSSEX	
	MALE	FEMALE	MALE	FEMALE	MALE	FEMALE
AGE RANGE						
0–17	17	26	1	4	5	3
18–44	68	176	12	30	14	35
45–54	53	139	7	22	12	17
55–64	52	172	8	18	13	26
65–74	11	25	1	1	3	2
75 and Older	2	11	0	0	0	0
Total	203	549	29	75	47	83

Source: First State Health Plan claims data as of June, 2001.

Table 3.

Percent of Medicaid Managed Care Recipients with Diabetes, Meeting HEDIS Measures, by Year
Coventry Health Plan, Delaware 1999–2000

HEDIS HYBRID MEASURE	1999	2000
Hemoglobin A1c Test	52.4%	76.2%
Eye Exam	29.9%	47.2%
Lipid Screening	44.4%	69.6%
Number of cases	334	411

Source: Coventry Health Plan.

Table 4.

Proportion of Delaware Skilled Nursing Home Residents with Diabetes

AGE NO. (%)				GENDER* NO. (%)		RACE NO. (%)			TOTAL NO. (%)
< 65	65–74	75–84	85 +	MALE	FEMALE	CAUCASIAN	AFRICAN AMERICAN	OTHER/ KNOWN	
83	117	203	210	171	441	398	195	20	613
29.3	38.7	27.2	19.2	26.9	24.7	22.2	34.2	30.8	25.3

Source: Nursing Facility data abstraction done by The Delaware Division of Health and Social Services, Medicaid Long Term Care Unit, Medicaid Reimbursement Nurses.
**8 cases had gender missing.*

Table 5.

Proportion of Delaware Skilled Nursing Home Residents with Diabetes Having Diabetic Complications

AGE	COMPLICATIONS NUMBER (%)
< 65	48 (57.8)
65–74	64 (54.7)
75–84	98 (48.3)
85 +	111 (52.9)
Total	321 (52.4)

Source: Nursing Facility data abstraction done by The Delaware Division of Health and Social Services, Medicaid Long Term Care Unit, Medicaid Reimbursement Nurses.

Table 6.

Proportion of Delaware Skilled Nursing Home Residents with Diabetes by Complications

COMPLICATION	NUMBER (%)
Retinopathy	108 (33.6)
Blindness	48 (15.0)
Renal Failure/Dialysis	85 (26.5)
Lower Extremity Ulcers	88 (27.4)
Ischemic Foot Disease	129 (40.2)
Amputations	50 (15.6)
Neuropathy	136 (42.4)

Source: Nursing Facility data abstraction done by The Delaware Division of Health and Social Services, Medicaid Long Term Care Unit, Medicaid Reimbursement Nurses.

Table 7.

Proportion of Delaware Skilled Nursing Home Residents with Diabetes Having One or More Related Conditions

AGE	ONE OR MORE RELATED CONDITION NUMBER (%)
< 65	74 (89.2)
65–74	108 (92.3)
75–84	175 (86.2)
85 +	199 (94.8)
Total	556 (90.7)

Source: Nursing Facility data abstraction done by The Delaware Division of Health and Social Services, Medicaid Long Term Care Unit, Medicaid Reimbursement Nurses.

Table 8.

Proportion of Delaware Skilled Nursing Home Residents with Diabetes Having Specified Related Conditions

RELATED CONDITION	NUMBER (%)
MI/Ischemic heart disease	141 (25.4)
HTN	472 (84.9)
CAD/hypercholesterolemia	273 (49.1)
Stroke	239 (43.0)
Heart Failure	186 (33.5)
Obesity	147 (26.4)
Smoker	56 (10.1)

Source: Nursing Facility data abstraction done by The Delaware Division of Health and Social Services, Medicaid Long Term Care Unit, Medicaid Reimbursement Nurses.

Table 9.

Proportion of Diabetes in Delaware Prisons in 2001 by Age

AGE	NO. OF PRISONERS	NO. OF DIABETES	RATE (%)
Under 25	1526	14	0.9
26–40	2744	40	1.5
41–60	1258	40	3.2
Above 60	71	12	16.9
Total	5599	116	2.1

Source: Kathleen English, Deputy Bureau Chief, Bureau of Management Services, Delaware Corrections.

Table 10.

Proportion of Diabetes in Delaware prisons in 2001 by Race

RACE	NO. OF PRISONERS	NO. OF DIABETES	RATE (%)
Caucasian	2081	40	1.9
African American	3513	69	2.0

Source: Kathleen English, Deputy Bureau Chief, Bureau of Management Services, Delaware Corrections.

SCHOOL SUMMARY RESULTS

Prevalence of Diabetes

The reports summarized in Table 1 covered 82,245 students in Delaware primary and secondary schools in October 2001. The majority (64%) of these students went to schools in New Castle County; 21% and 15% went to Kent and Sussex County schools, respectively. The schools reported large numbers of students with specific chronic conditions.

The specific condition of statewide interest is diabetes, whose overall prevalence was 0.25% (mostly type 1 diabetes), or 204 children with diabetes. This rate is consistent with nationally reported rates in school-age children[1]. The majority of schools had no children with diabetes.

Limitations of results

Although a majority of schools participated in the survey, we have not attempted to determine if non-participants differed from participants in ways that might have affected survey results. Therefore, these results are not necessarily representative of all Delaware schools. The submissions have not been audited for reliability of diagnosis reporting. Physicians and other health care providers may differ in standards of diagnosis, and schools may differ in level of documentation required to establish a student's diagnosis. As no guidance was provided for inclusions and exclusions, schools may also differ on definitions of broad disease categories, e.g., cardiac disease. The survey sought medically diagnosed disorders, so it is probable that such conditions as obesity were substantially under-reported. Obesity is known to have reached epidemic levels nationally. There were some minor discrepancies in reporting (e.g., rows and columns in the form did not always yield consistent totals).

References

1. LaPorte R, Matsushima M, Chang Y-F. Prevalence and incidence of insulin-dependent diabetes. Diabetes in America. Bethesda: NIDDK NIH, 1995.

Table 1.

Chronic Illness in Delaware Children Enrolled in Schools
2001

ILLNESS:	TOTAL STUDENTS SURVEYED	DIABETES TYPE I NUMBER (%)	DIABETES TYPE II NUMBER (%)	OBESITY NUMBER (%)
COUNTY				
Kent	17618	35 (0.20)	9 (0.05)	34 (0.19)
New Castle	52681	124 (0.24)	12 (0.02)	190 (0.36)
Sussex	11946	21 (0.18)	3 (0.03)	206 (1.72)
Total	82245	180 (0.22)	24 (0.03)	430 (0.52)

Source: Survey conducted in conjunction with Delaware State Department of Education Schools Nurses and Quality Insights of Delaware.

RISK FACTORS FOR DIABETES IN DELAWARE: A WINDOW ON THE FUTURE

Introduction and Data Sources

This chapter examines data from the Behavioral Risk Factor Survey, an annual telephone survey of Delaware households, conducted for the Division of Public Health by the University of Delaware. Sponsored by the CDC and Prevention, a comparable survey has been administered in most states since the 1980s.

Although prevention of type 1 diabetes is currently not feasible because the factor or factors triggering destruction of pancreatic islet cells have not been determined, public health researchers have suspected that incidence the more common type 2 diabetes could be reduced by reducing the prevalence of conditions known to be risk factors for the disease. Recent literature supports this belief[1, 2]. Both excess body weight and lack of exercise are strongly associated with incidence of diabetes in populations. If the proportion of people who are overweight increases with time, it's reasonable to expect that diabetes will increase in subsequent years; similarly, a decline in this risk factor might presage a reduction in diabetes incidence.

Results

Smoking, hypertension, and high blood cholesterol all are associated with complications in people who have diabetes, principally diseases of the heart and blood vessels. Thus, if these risk factors increase, Delaware should prepare for more heart attack and stroke hospitalizations, more health-care expenses, and more deaths from cardiovascular disease.

People with diabetes are at increased risk of infection, because diabetes weakens the body's immune defenses. Two preventive measures offer significant benefits to those with diabetes: pneumonia and influenza vaccination. To the extent that Delawarean with diabetes get these immunizations, the state can expect reduced hospitalization and death from infections in this vulnerable group.

What does the future hold for Delaware? Tables 1 and 2 give the prevalence of health risk due to being overweight and lacking exercise in the state from 1995 through 1999. Figures 1a and 1b illustrate time trends of excessive weight in Delawareans by sex and race during this time period. For the five-year period, there is little evidence of a time trend. Unfortunately, a longer time span (1990–2000) shows an almost 5% absolute increase in overweight Delawareans; this increase exceeded the national trend during the same time period, and the proportion of Delawareans who are overweight is now well ahead of the national median.

In Delaware, the proportion of the overweight population has increased consistently with age, up to age 65, then declined, during the five years reported. Sussex County has had the highest proportion overweight, and New Castle the lowest; these differences are probably due to different demographic characteristics in the counties' populations. Females and males show little difference in prevalence of overweight; there is a consistent difference among racial groups: non-Caucasian Delawareans have at least 5% higher prevalence of overweight in every year studied, compared with Caucasian Delawareans.

Most Delawareans are considered at risk because of lack of exercise. In the two years studied, about five-sixths of all Delawareans reported either no leisure physical activity, or inadequate amounts of it. This proportion was slightly higher than the median national state rate of approximately 80% in both years.

Table 3 shows that the smoking rate among Delawareans has been relatively stable over the five years studied, at just under 25% of the population. Smoking rates were highest among younger people (Figure 2a), but there is little difference between sexes and racial groups (Figure 2b). There were no significant time trends in smoking prevalence.

Table 4 illustrates the proportion of Delawareans who say that a health professional has said they have high blood pressure. This proportion increased significantly with age in all time periods. Almost half of Delawareans over 65 said they had high blood pressure. This proportion is similar to national rates. Non-Caucasian Delawareans tended to report a greater prevalence of hypertension; however, most of the excess was among African Americans. Hispanic and other racial groups reported very low prevalence of hypertension, but there were not enough individuals in these groups to make valid comparisons.

Table 5 shows the similar results for persons reporting high cholesterol levels. Almost 30% of all Delawareans reported this condition. As with hypertension, the rate increased with age to nearly half of those over age 65.

Influenza and pneumonia immunization rates are compared among those with and without diabetes in Tables 6 and 7. The proportion of all Delawareans who have received these shots differs dramatically by whether or not they also say they have diabetes. Since influenza and pneumonia immunization is not indicated or not a high priority for people younger than 65 who do not have diabetes, it's important to compare rates of immunization by age. In Delaware, during the time period studied, immunization against influenza and pneumonia was generally more common among persons with diabetes than those without diabetes in each age group. (In some instances, e.g., age 18–34, the small number of respondents invalidates comparisons, but the general conclusion is correct). Caucasian Delawareans were more likely to report these immunizations than non-Caucasians.

Implications

The high and increasing rates of obesity and lack of exercise should be a cause for alarm, as they suggest diabetes incidence in Delaware will continue to increase for some years. This implies increasing need for treatment. Potentially there will be more deaths and disabilities from diabetes, unless treatment is available to, and used by, all who develop the disease. Relatively high rates of hypertension, high blood cholesterol, and smoking mean that cardiovascular disease will continue to complicate the course of many Delawareans' diabetes. Decreasing smoking rates with age may be a cause for mild optimism, to the extent that the declining smoking rate is not caused by premature death among smokers. Immunization usage by persons with diabetes is a bright spot in an otherwise bleak picture. That Delawareans with diabetes are likely to receive these important shots suggests that other preventive measures important to this group of people could be accepted and used—if promoted with appropriate public health messages and supported by medical practitioners. Smoking cessation, balanced nutrition, and regular exercise significantly improve the health of all Delawareans, particularly those persons with diabetes.

References

1. Hu FB, Manson JE, Stampfer MJ, et al. Diet, lifestyle, and the risk of type 2 diabetes mellitus in women. N Engl J Med 2001; 345:790-7.
2. Tuomilehto J, Lindstrom J, Eriksson JG, et al. Prevention of type 2 diabetes mellitus by changes in lifestyle among subjects with impaired glucose tolerance. N Engl J Med 2001; 344:1343-50.

Table 1a.

Estimated Proportion and Number of Delawareans Over the age of 18 Who are at risk for health problems related to being overweight, by Gender and Race.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
GENDER					
Male	254 (29.7) (28.1–31.3)	267 (32.5) (28.8–36.2)	340 (33.6) (30.3–36.9)	353 (34.2) (29.9–38.5)	380 (32.2) (28.4–35.9)
Female	395 (31.5) (28.5–32.7)	381 (31.1) (28.1–34.1)	490 (31.4) (28.7–34.1)	487 (31.5) (28.4–34.6)	491 (31.8) (28.4–35.1)
RACE					
Caucasian	495 (29.3) (26.9–31.7)	492 (29.3) (26.8–31.8)	623 (31.4) (29.0–33.8)	631 (31.5) (28.6–34.5)	665 (30.6) (27.8–33.3)
Non-Caucasian	154 (36.0) (30.4–41.6)	156 (41.1) (31.9–50.3)	207 (36.8) (31.9–41.7)	209 (37.9) (32.9–42.9)	206 (38.6) (33.5–43.7)
Total (%)	649 (30.6)	648 (31.8)	830 (32.5)	840 (32.8)	871 (32.0)
99% CI	(28.3–32.9)	(29.5–34.1)	(30.3–34.7)	(30.3–35.3)	(29.4–34.5)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
BMI ≥ 27.8 for men and BMI ≥ 27.3 for women.
% = Percentages, CI = 99% Confidence Interval.

Table 1b.

Estimated Proportion and Number of Delawareans Over the age of 18 Who are at risk for health problems related to being overweight, by Age and County.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
Age					
18–24	29 (15.2) (8.9–21.5)	32 (17.9) (11.2–24.6)	27 (13.3) (7.8–18.8)	37 (16.7) (9.1–24.3)	53 (14.0) (9.1–18.9)
25–34	100 (22.7) (13.4–32.0)	113 (25.5) (20.8–30.2)	136 (28.5) (23.8–33.2)	132 (31.1) (24.9–37.5)	144 (30.2) (24.5–35.8)
35–44	146 (33.2) (28.2–38.2)	162 (36.5) (31.3–41.7)	179 (32.6) (28.3–36.9)	197 (33.9) (28.0–39.8)	198 (33.8) (28.1–39.4)
45–54	129 (37.9) (31.7–44.1)	130 (36.2) (30.5–41.9)	164 (42.3) (36.8–47.8)	170 (42.3) (36.0–48.6)	174 (37.9) (31.6–44.1)
55–64	101 (44.0) (36.7–51.3)	95 (43.5) (36.0–51.0)	135 (44.7) (38.0–51.4)	128 (37.5) (30.1–44.9)	135 (40.8) (33.5–48.0)
65+	144 (34.5) (29.2–39.8)	116 (32.3) (27.0–37.6)	188 (33.5) (29.2–37.8)	176 (33.0) (27.9–38.1)	164 (33.7) (28.0–39.3)
County					
Kent	153 (30.6) (25.8–35.4)	124 (30.6) (25.4–35.8)	210 (34.9) (30.5–39.3)	295 (33.8) (30.2–37.4)	279 (34.1) (30.3–37.9)
New Castle	348 (28.5) (25.5–31.5)	371 (28.5) (25.7–31.3)	410 (31.3) (27.3–35.3)	285 (31.9) (28.4–35.4)	258 (29.2) (25.6–32.8)
Sussex	148 (37.5) (31.9–43.1)	126 (37.5) (31.5–43.5)	190 (34.6) (30.0–39.2)	260 (35.2) (31.2–39.2)	328 (39.8) (36.0–43.6)
Total (%)	649 (30.6)	648 (31.8)	830 (32.5)	840 (32.8)	871 (32.0)
99% CI	(28.3–32.9)	(29.5–34.1)	(30.3–34.7)	(30.3–35.3)	(29.4–34.5)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
BMI ≥ 27.8 for men and BMI ≥ 27.3 for women.
% = Percentages, CI = 99% Confidence Interval.

Table 2a.

Estimated Proportion and Number of Delawareans Over the age of 18 Who are not at risk for health problems related to lack of exercise by Gender and Race.

	1995	1996	1997	1998	1999
	% CI	% CI	% CI	% CI	% CI
GENDER					
Male	No Data*	148 (17.9) (14.9–20.8)	No Data*	176 (18.0) (14.3–21.7)	No Data*
Female		196 (14.6) (12.6–16.5)		246 (16.5) (14.0–19.0)	
RACE					
Caucasian		292 (16.8) (14.9–18.8)		349 (17.2) (14.7–10.7)	
Non-Caucasian		52 (13.3) (9.4–17.2)		73 (17.4) (13.6–21.0)	
Total (%)		344 (16.1)		422 (17.2)	
99% CI		(14.4–17.9)		(15.0–19.4)	

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1995, 1997, 1999.*

Table 2b.

Estimated Proportion and Number of Delawareans Over the age of 18 Who are not at risk for health problems related to lack of exercise by Age and County.

	1995	1996	1997	1998	1999
	% CI	% CI	% CI	% CI	% CI
Age					
18–24	No Data*	34 (19.8) (12.8–26.8)	No Data*	48 (23.5) (15.9–31.1)	No Data*
25–34		80 (17.5) (13.4–21.6)		90 (18.2) (12.8–23.4)	
35–44		80 (16.3) (12.7–19.9)		82 (16.1) (10.8–21.4)	
45–54		59 (14.1) (10.4–17.7)		76 (17.8) (13.1–22.5)	
55–64		33 (13.9) (9.4–18.4)		47 (13.6) (8.3–18.9)	
65+		58 (15.2) (11.2–19.1)		70 (14.8) (10.9–18.7)	
County					
Kent		69 (16.1) (12.1–20.1)		152 (17.3) (14.4–20.2)	
New Castle		213 (15.8) (13.6–18.0)		147 (17.2) (14.4–20.0)	
Sussex		62 (17.4) (12.9–21.9)		123 (17.2) (14.1–20.3)	
Total (%)		344 (16.1)		422 (17.2)	
99% CI		(14.4–17.9)		(15.0–19.4)	

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1995, 1997, 1999.*

Table 3a.

Estimated Proportion and Number of Delawareans Over Age 18 who are Current Smokers by Gender and Race.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
GENDER					
Male	218 (27.5) (24.0–31.0)	211 (25.0) (21.7–28.4)	289 (29.2) (25.7–32.7)	275 (27.3) (23.2–31.4)	298 (27.6) (24.4–30.8)
Female	296 (23.6) (20.9–26.3)	305 (23.5) (20.8–26.2)	361 (24.2) (21.7–26.7)	354 (21.9) (19.1–24.5)	370 (23.5) (21.1–25.9)
RACE					
Caucasian	425 (26.0) (23.6–28.4)	430 (24.5) (22.1–26.8)	529 (26.9) (24.5–29.3)	517 (24.4) (21.7–27.1)	533 (24.5) (22.3–26.7)
Non-Caucasian	89 (23.4) (18.6–28.2)	86 (23.6) (18.7–28.5)	121 (25.6) (21.2–30.4)	112 (24.1) (17.3–30.9)	135 (28.2) (23.6–32.8)
Total (%) 99% CI	514 (25.5) (21.2–29.8)	516 (24.2) (22.1–26.4)	650 (26.6) (24.4–28.8)	629 (24.5) (22.0–26.8)	668 (25.5) (23.6–27.4)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.

Table 3b.

Estimated Proportion and Number of Delawareans Over Age 18 who are Current Smokers by Age and County.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
Age					
18–24	49 (30.5) (22.6–38.4)	43 (25.7) (18.2–33.2	62 (34.6) (26.5–42.5)	62 (28.2) (19.8–36.6)	87 (37.1) (30.5–43.7)
25–34	150 (31.9) (27.0–36.8)	128 (27.8) (23.1–32.6)	151 (31.3) (26.8–35.8)	145 (31.4) (25.3–37.5)	146 (27.1) (22.4–31.8)
35–44	134 (31.0) (26.2–35.8)	138 (28.9) (24.4–33.3)	176 (31.8) (27.5–36.1)	177 (29.2) (23.5–34.9)	184 (35.0) (30.5–39.5)
45–54	84 (25.6) (20.2–31.0)	91 (24.4) (19.6–29.2)	131 (30.8) (25.7–35.9	118 (24.2) (19.3–29.1)	118 (22.4) (18.0–26.8)
55–64	54 (19.3) (13.6–25.0)	56 (24.7) (18.5–30.8)	62 (19.0) (13.7–24.3)	73 (26.0) (18.6–33.4)	71 (19.7) (14.9–24.5)
65+	43 (10.1) (6.8–13.4)	60 (13.0) (9.5–16.5)	67 (10.3) (7.6–13.0)	54 (7.8) (5.3–10.3)	62 (10.6) (7.3–13.9)
County					
Kent	143 (30.3) —	112 (26.7) (21.9–31.5)	171 (27.6) (23.6–31.6)	237 (26.0) (22.7–29.3)	230 (27.8) (24.3–31.3)
New Castle	280 (24.7) (20.2–29.2)	308 (22.9) (20.3–25.5)	335 (26.4) (23.7–29.1)	212 (24.3) (21.1–27.5)	207 (24.5) (21.2–27.8)
Sussex	91 (21.8) (16.1–27.5)	95 (26.4) (21.1–31.7)	143 (26.2) (22.1–30.3)	180 (23.8) (19.5–27.3)	231 (27.0) (23.6–30.4)
Total (%) 99% CI	514 (25.5) (21.2–29.8)	516 (24.2) (22.1–26.4)	650 (26.6) (24.4–28.8)	629 (24.5) (22.0–26.8)	668 (25.5) (23.6–27.4)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.

Table 4a.

Estimated Proportion of Delawareans Over Age 18 Who Have Ever Been Told by a Doctor, Nurse, or Other Health Professional That They Have High Blood Pressure by Gender and Race.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
GENDER					
Male	169 (19.2) (16.3–22.1	No Data*	260 (24.3) (21.2–27.4)	No Data*	285 (26.1) (22.5–29.6)
Female	310 (23.2) (20.8–25.6)		454 (26.6) (24.1–29.1)		365 (25.0) (21.6–28.3)
RACE					
Caucasian	384 (21.1) (19.1–23.3		560 (24.9) (22.7–27.1)		519 (26.0) (23.1–28.6)
Non-Caucasian	95 (22.0) (17.3–26.7)		154 (27.8) (23.3–32.3)		131 (24.7) (20.3–29.1)
Total (%)	479 (21.3)		714 (25.5)		650 (25.5)
99% CI	(19.4–23.2)		(23.5–27.5)		(23.1- 27.8)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1996, 1998.*

Table 4b.

Estimated Proportion of Delawareans Over Age 18 Who Have Ever Been Told by a Doctor, Nurse, or Other Health Professional That They Have High Blood Pressure by Age, County.

	1995 % CI	1996 % CI	1997 % CI	1998 % CI	1999 % CI
Age					
18–24	15 (8.1) (3.9–12.4)	No Data*	18 (7.8) (4.1–11.5)	No Data*	20 (6.4) (2.8–9.9)
25–34	38 (7.8) (5.3–10.3)		61 (11.5) (8.2–14.8)		48 (10.4) (6.8–13.9)
35–44	60 (13.8) (10.4–17.2)		104 (17.6) (14.1–21.1)		86 (17.9) (11.6–24.1
45–54	90 (26.0) (20.6–31.4)		121 (29.2) (24.1–34.3)		128 (29.3) (23.4–35.1)
55–64	90 (36.7) (30.1–43.3)		136 (44.9) (38.6–51.2)		133 (40.3) (33.0–47.5)
65+	186 (43.9) (38.8–49.0)		274 (47.6) (42.9–52.3)		231 (50.8) (44.7–56.8)
County					
Kent	93 (17.2) (13.1–21.1)		184 (27.4) (23.4–31.4)		216 (27.3) (23.8–30.8)
New Castle	270 (20.7) (18.1–23.3)		338 (23.5) (20.9–26.1)		208 (24.8) (18.1–31.5)
Sussex	116 (28.6) (23.5–33.7)		192 (30.9) (26.6–35.2)		226 (26.3) (22.9–29.7)
Total (%)	479 (21.3)		714 (25.5)		650 (25.5)
99% CI	(19.4–23.2)		(23.5–27.5)		(23.1–27.8)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1996, 1998.*

Table 5a.

Estimated Proportion of Delawareans Over Age 18 Who Have Ever Been Told by a Doctor, Nurse, or Other Health Professional That Their Blood Cholesterol is High by Gender and Race.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
GENDER					
Male	164 (27.8) (23.7–31.9)	No Data*	211 (27.9) (24.4–31.4)	No Data*	259 (31.7) (27.3–36.0)
Female	296 (32.0) (28.8–35.3)		369 (29.7) (26.8–32.6)		359 (31.5) (27.9–35.0)
RACE					
Caucasian	400 (31.4) (28.5–34.3)		449 (29.4) (26.8–31.8)		549 (33.6) (30.4–36.7)
Non-Caucasian	60 (23.6) (17.4–29.8)		91 (26.7) (21.3–32.1)		69 (23.2) (18.0–28.4)
Total (%) 99% CI	460 (30.0) (27.4–32.7)		590 (28.9) (26.5–31.3)		618 (31.6) (28.8–34.3)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1996, 1998.*

Table 5b.

Estimated Proportion of Delawareans Over Age 18 Who Have Ever Been Told by a Doctor, Nurse, or Other Health Professional That Their Blood Cholesterol is High by Age, and County.

	1995 N (%) 99% CI	1996 N (%) 99% CI	1997 N (%) 99% CI	1998 N (%) 99% CI	1999 N (%) 99% CI
Age					
18–24	9 (11.3) (2.9–19.8)	No Data*	14 (12.7) (5.1–20.3)	No Data*	6 (7.3) (0.2–14.3)
25–34	39 (14.1) (9.7–18.4)		55 (18.4) (13.1–23.7)		34 (9.6) (5.6–13.5)
35–44	83 (27.8) (22.3–33.4)		92 (21.2) (16.9–25.5		98 (23.6) (17.7–29.4)
45–54	81 (31.6) (25.2–38.0)		107 (29.4) (23.9–34.9)		145 (34.1) (27.8–40.3)
55–64	94 (40.7) (33.8–48.1)		113 (41.2) (34.5–47.9)		141 (47.0) (39.5–54.4)
65+	154 (44.1) (38.7–49.5)		209 (40.9) (36.2–45.6)		189 (49.4) (43.1–55.6)
County					
Kent	74 (23.5) (17.9–29.1)		161 (32.5) (27.7–37.3)		172 (30.3) (26.0–34.6)
New Castle	285 (31.2) (27.7–34.7)		275 (26.1) (23.0–29.3)		214 (31.0) (27.0–35.0)
Sussex	101 (33.6) (27.4–39.8)		154 (35.4) (26.7–44.1)		232 (34.7) (30.5–38.9)
Total (%) 99% CI	460 (30.0) (27.4–32.7)		590 (28.9) (26.5–31.3)		618 (31.6) (28.8–34.3)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.
**No data for Delaware—1996, 1998.*

Table 6.

Estimated Proportion of Delawareans Over Age 18 who have had a Flu Shot during the past 12 Months by Gender, Race, Age, and County.

	WITH DIABETES			WITHOUT DIABETES		
	1995	1997	1999	1995	1997	1999
	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI
GENDER						
Male	19 (46.7) (27.7–65.7)	38 (57.2) (43.7–70.7)	42 (56.0) (44.1–67.9)	206 (25.8) (22.3–29.3)	299 (29.5) (26.1–32.9)	267 (26.6) (23.3–29.9)
Female	25 (41.7) (27.5–55.9)	63 (55.3) (44.9–65.7)	43 (54.6) (42.2–66.8)	283 (20.7) (18.1–23.3)	449 (29.7) (26.9–32.5)	423 (32.0) (29.2–34.8)
RACE						
Caucasian	38 (44.3) (31.7–56.9)	83 (58.9) (49.7–68.1)	67 (56.4) (46.6–66.2)	421 (24.3) (21.9–26.7)	625 (30.7) (28.3–33.1)	596 (32.7) (30.3–35.1)
Non-Caucasian	6 (41.8) (14.8–68.8)	18 (47.6) (29.3–65.9)	18 (52.2) (34.8–69.6)	68 (18.7) (14.4–23.3)	123 (25.7) (21.1–30.3)	87 (16.4) (12.4–20.4)
Age						
18-34	0 —	2 (35.7) —	1 (9.7) —	89 (14.9) (11.7–18.1)	99 (13.8) (10.8–16.8)	139 (18.6) 15.3–21.9
35-64	16 (33.6) (18.2–49.0)	42 (45.7) (34.1–57.3)	40 (50.2) (33.8–66.6)	178 (17.6) (14.9–20.30	327 (28.2) (25.2–31.2)	315 (24.0) (21.3–26.7
65+	28 (62.4) (45.9–78.9)	57 (71.7) (60.5–82.9)	44 (67.2) (54.4–80.0	222 (56.4) (50.7–62.1)	322 (68.1) (63.3–72.9)	236 (67.8) (62.4–73.2)
County						
Kent	5 (32.9) (4.6–61.2)	21 (32.5) (18.4–46.6)	27 (46.1) (31.5–60.7)	129 (28.2) (23.5–32.9)	186 (32.0) (27.5–36.5)	216 (28.9) (25.2 - 32.6)
New Castle	28 (47.9) (32.7–63.1)	49 (60.6) (48.3–72.9)	28 (62.1) (45.6–78.6)	267 (20.5) (17.8–23.2)	401 (28.9) (26.0–31.8)	234 (29.1) (25.5–32.7)
Sussex	11 (40.9) (19.5–62.3)	31 (66.4) (51.2–81.6)	30 (47.0) (33.3–60.7)	93 (22.5) (17.6–27.4)	161 (30.3) (25.8–34.8)	240 (31.5) (27.7–35.3)
Total (%)	44 (43.9)	101 (56.1)	85 (55.4)	489 (22.7)	748 (29.6)	690 (29.5)
99% CI	(27.6–55.3)	(47.9–64.3)	(46.8–64.0)	(20.6–24.8)	(27.5–31.7)	(25.8–33.2)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
% = Percentages, CI = 99% Confidence Interval.

Table 7.

Estimated Proportion of Delawareans Over Age 18 who have ever had a Pneumonia Vaccination by Gender, Race, Age, and County.

	WITH DIABETES			WITHOUT DIABETES		
	1995	1997	1999	1995	1997	1999
	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI	N (%) 99% CI
GENDER						
Male	13 (35.3) (15.3–55.3)	22 (31.9) (19.0–44.8)	44 (55.9) (45.2–66.6)	97 (11.4) (8.8–14.0)	155 (15.9) (13.1–18.7)	168 (20.0) (17.0–23.0)
Female	16 (25.1) (12.7–37.5)	50 (46.1) (35.7–56.5)	42 (59.2) (47.1–71.3)	146 (11.0) (9.0–13.0)	230 (15.0) (12.8–17.2)	221 (17.9) (15.6–20.2)
RACE						
Caucasian	25 (28.2) (16.5–39.9)	65 (45.4) (36.0–54.8)	72 (59.8) (50.1–69.5)	211 (11.9) (10.1–13.7)	334 (16.8) (12.0–21.6)	340 (20.4) (18.3–22.5)
Non-Caucasian	4 (33.9) (7.2–60.6)	7 (22.7) (7.4–38.0)	14 (49.2) (31.4–67.0)	32 (8.1) (4.9–11.3)	51 (10.0) (6.8–13.2)	45 (10.6) (7.2–14.0)
Age						
18-34	0 —	2 (25.9) —	2 (27.9) —	26 (5.4) (3.3–7.5)	(8.8) (6.3–11.3)	54 (10.1) (7.5–12.7)
35-64	4 (8.8) —	24 (23.9) 0	35 (43.7) (32.0–55.4)	66 (6.5) (4.7–8.3)	(8.3) (6.5–10.1)	115 (9.1) (7.2–11.0)
65+	(61.4) (43.8–79.0)	46 (61.0) 0	48 (76.1) (64.4–87.8)	151 (39.0) (33.3–44.7)	232 (51.1) (43.8–58.4)	220 (64.8) (59.2–70.4)
County						
Kent	1 (8.8)	18 (27.0) (13.6–40.4)	22 (40.5) (25.8–55.2)	36 (8.4) (5.4–11.4)	82 (15.8) (6.9–24.7)	100 (14.2) (11.3–17.1)
New Castle	17 (27.2) (13.3–41.3)	31 (41.9) (29.4–54.4)	28 (64.6) (48.1–81.1)	145 (11.1) (9.0–13.2)	206 (14.2) (12.0–16.4)	143 (19.5) (16.3–22.7)
Sussex	(42.6) (21.1–64.1)	23 (47.6) (31.3–63.9)	35 (55.1) (41.5–68.7)	62 (15.3) (11.0–19.6)	97 (19.5) (15.5–23.5)	146 (20.4) (16.7–23.7)
Total (%)	29 (29.1)	72 (40.1)	85 (57.4)	243 (11.1)	385 (15.4)	389 (18.8)
99% CI	(18.4–39.8)	(31.9–48.3)	(48.8–66.0)	(9.5–12.7)	(13.7–17.1)	(16.9–20.7)

Data Source: Delaware Behavioral Risk Factor Surveillance Survey 1995–1999.
Percentages are weighted to population characteristics.

Figure 1a.

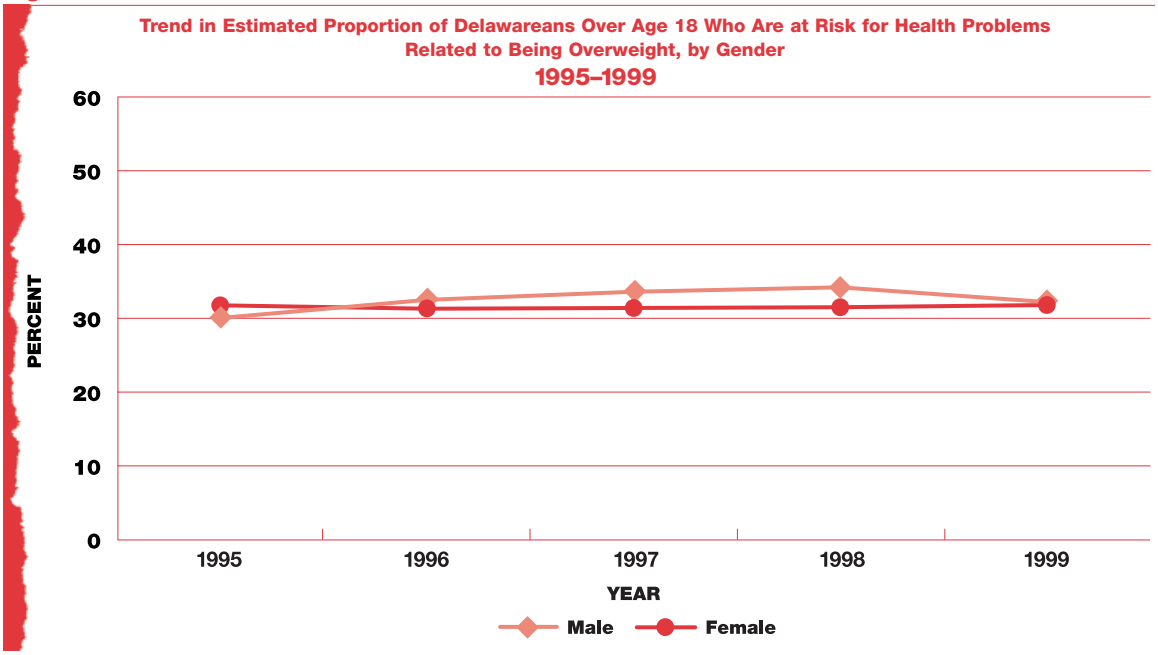


Figure 1b.

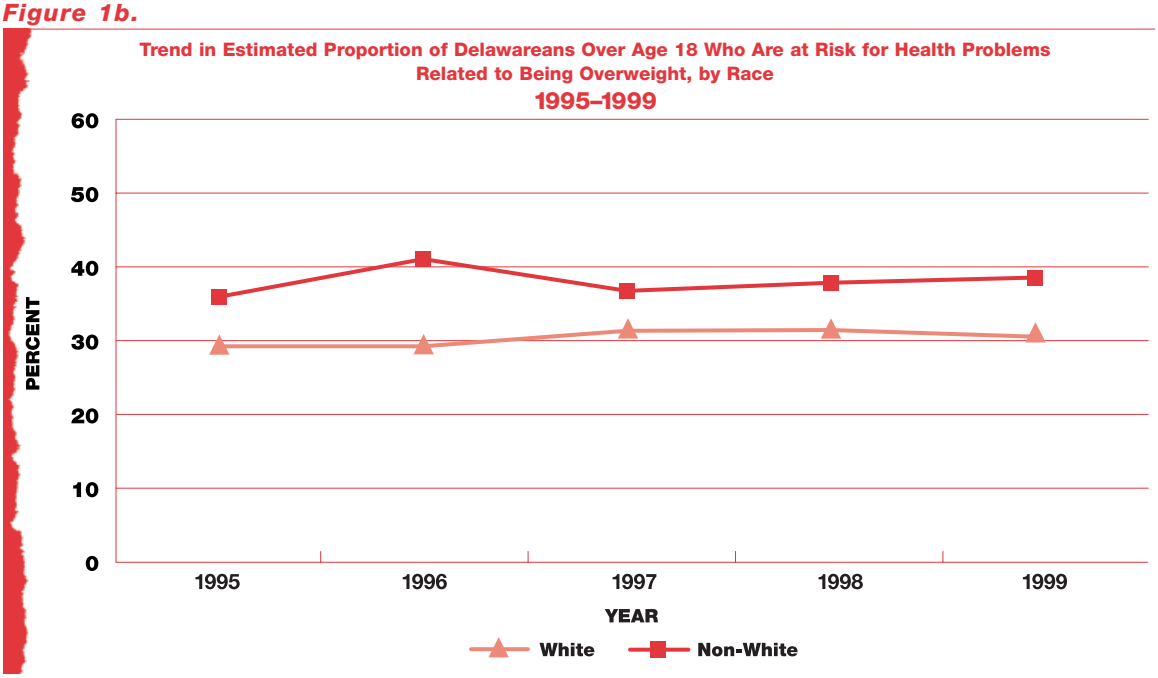


Figure 2a.

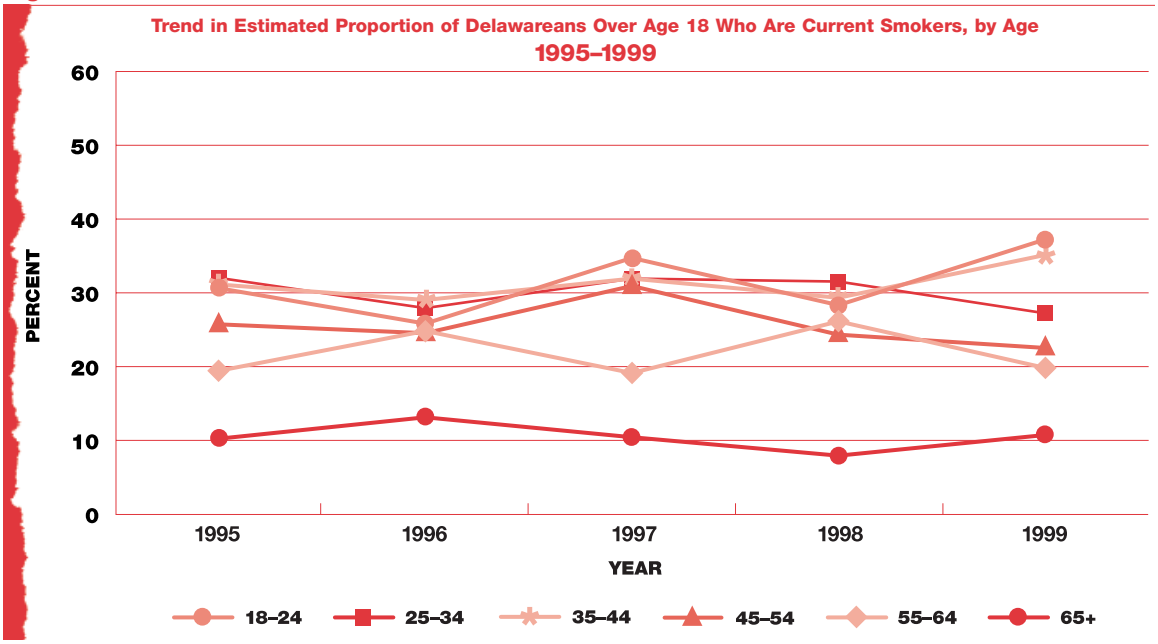
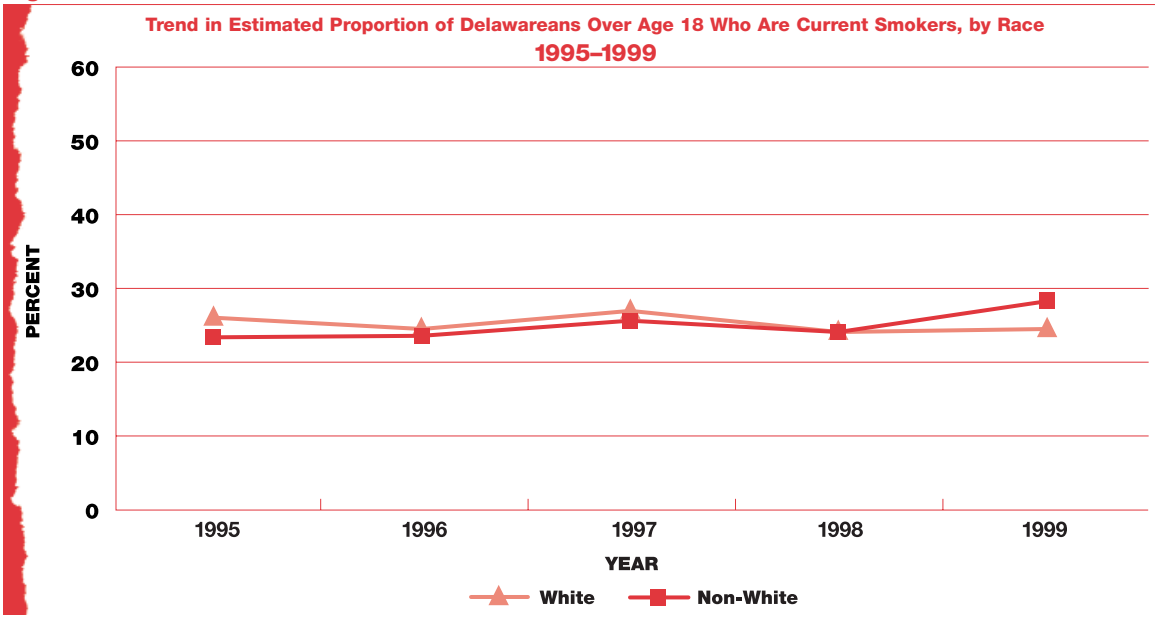


Figure 2b.



NOTES