Executive Summary

Diabetes mellitus is a major public health problem in South Carolina. At least 160,000 people in South Carolina are aware that they have diabetes, and an equal number are undetected. Thus, approximately 240,000-300,000 people in South Carolina have diabetes. The sixth leading cause of death in our state is diabetes, and it accounts for 14% of all hospital discharges. Total yearly hospital and emergency room costs from diabetes and its complications are about $850 million and an average cost of hospitalization was $12,664 in 1997. The prevalence of diabetes is more than doubled in our non-white population (9-10.7%) vs 4% among the white population. The disease is a chronic disorder which is often accompanied by complications, including blindness, kidney failure, heart attacks, strokes, and amputations. High blood pressure and abnormal cholesterol levels are frequent. Medical costs rise with increased duration of the disease, and lifespan is shortened by 5-10 years in most patients.

The Department of Health and Environmental Control (DHEC) has had a separately funded Diabetes Control Program (SCDCP) since 1994. In July, 1994, the S.C. Legislature established the Diabetes Initiative of South Carolina (DSC), with a Diabetes Center of Excellence at the Medical University of South Carolina and a governing Board, and active councils. The Initiative works closely with SCDCP/DHEC via its widely representative Board of Directors and through its Surveillance and Outreach Councils, committees, and task forces. A 10 Year Strategic Plan was implemented by DSC in 1998, and results from successive Burden of Diabetes in South Carolina reports are used to monitor progress.

The present report indicates that many of the trends recognized in the baseline Burden Report of 1996 are continuing. On the other hand, progress has been made in many areas, and numerous new programs have been started which are expected to gradually improve the lives of people with diabetes in S.C. Presently, disquieting trends are seen in the area of nutrition. More than half of adults in S. C. are overweight, and the rates have increased in the past decade. About 80% of people with type 2 diabetes are overweight, and this is a major contributor to the insulin resistance which characterizes the disease. One encouraging trend is that the rates of physical inactivity are steadily decreasing in S.C.; eventually this should be translated into a decreased prevalence of obesity. Another encouraging trend is a decrease in the prevalence of cigarette smoking among men with diabetes in the state.

The complications of diabetes may be prevented or delayed by specific actions. Improved blood sugar control will slow progression of eye, kidney, and nerve complications. Control of elevated blood pressure and high cholesterol, use of specific drugs for protein loss in the urine, improved nutrition, exercise, foot care, and low dose aspirin therapy have now all been shown to markedly reduce the risks of renal failure, blindness, stroke, heart attacks, and amputations in people with diabetes. New guidelines for care have recently been developed and DSC has disseminated them to all primary care health providers in S.C. The problem now is to make health professionals and diabetic individuals fully aware of these guidelines and to take immediate medical action. The DSC Strategic Plan calls for a ten year program directed at these issues.

Unfortunately, we have a long way to go! Survey data show that 70% of people with diabetes in S. C. check blood glucose less than one time a day and 75% have never heard of hemoglobin A1c (HbA1c), the gold standard marker of long term blood glucose control. Studies have conclusively shown that as little as a 10% reduction in the level of HbA1c will reduce the risks of eye, kidney, or nerve damage 25 to 50%! There are encouraging trends,

however. Over 50% of diabetic people have had their eyes checked in the past year, and close to 90% have had their feet examined. These steps are critical if one is to avoid the serious complications of blindness and amputations. On the other hand, serious complications of diabetes, such as hospitalizations for ketoacidosis admissions for kidney failure and/or dialysis, and amputation rates have all increased between 1992 and 1997. In all cases, significant increases have been seen particularly in non-white when compared to white individuals. Emergency room visits and costs are also on the increase-especially in non-whites.

Encouraging trends are apparent regarding pregnancy and diabetes. These probably reflect improved blood sugar control. Rates of congenital malformations (an indication of poor blood sugar control during pregnancy) have fallen 25% in the past 6 years, and infant mortality (also dependent upon good blood sugar control) has declined from 12.8 to 9.8/1000 births between 1991 and 1997. Finally, after a steady rise in mortality related to diabetes from 50.7 to 81/100,000 population between 1980 and 1995, mortality rates have fallen steadily in the past two years and the trend is expected to continue in future years.

The Burden Report concludes with descriptions of the present shortage of health professional coverage in the 46 counties of S.C., but also describes many of the exciting new trends that are occurring. Increasing numbers of primary care physicians, certified diabetes educators, and pharmacists trained in diabetes have emerged. The SCDCP/DHEC and DSC have an impressive number of new educational and outreach programs for people affected by diabetes and its complications. Improved training of health professionals at the college, graduate school, and postgraduate school levels is occurring. The Diabetes Initiative has an unprecedented dissemination of guidelines for care and management strategies to all primary care physicians in S.C. Coalition development by SCDCP/DHEC and DSC in 4 geographic areas in S.C. is now underway, and will serve as a direct link to communities and people affected by diabetes.

Results of these programs will be regularly monitored by the DSC Board and by SCDCP/DHEC. Objective data on costs, complications, morbidity and mortality will be reported in periodic issues of this Burden Report. We can be optimistic that this multi-faceted Statewide Program will gradually make a real impact upon the consequences of diabetes and its complications in S.C.

Introduction

Diabetes has an immense impact on public health and medical care in South Carolina. Diabetes is the sixth leading cause of death in South Carolina, claiming more than 1,600 lives each year. People with diabetes are at increased risk for blindness, lower extremity amputation, kidney failure, nerve disease, hypertension, ischemic heart disease, and stroke. Approximately 300,000 South Carolinians are affected by diabetes; many of whom were undiagnosed in 1998. One of every seven patients in a South Carolina hospital has diabetes. The direct costs of hospitalizations and emergency room visits were over $73 million in 1997. The burden of diabetes is more significant in minority and elderly groups.

This report is a description of that impact of diabetes, including trends, disparities, and long range planning of diabetes. We emphasize improved awareness and access to prevention and intervention services, and report on morbidity, mortality, and costs. The wide range of information presented here is intended to:

- assist health care professionals and family members of persons with diabetes to understand more fully the scope of the disease in our state;
- describe progress made in recent years with patient, physician, and other health provider education, and attempts to improve access to high-quality self-management training for persons with diabetes; and
- identify continuing needs and opportunities for diabetes control in South Carolina.

METHODS

The data presented in this report were compiled from a variety of sources including vital records, hospital discharge data, emergency room records, and the Behavioral Risk Factor Surveillance System (BRFSS). The former data sets are complete representations of events in South Carolina, however, the BRFSS is based upon a randomly selected, interview sample of South Carolinians over age 18 years. There are limitations to the BRFSS data in terms of the representation of all regions of the state and all population groups. Rural and African-American persons are under-represented by the telephone interview system. The frequency of responses by a particular population group (e.g., 65 years and older African-American women) may be rather small, so in several instances multiple years of data were pooled, or regions of the state were combined to achieve reliable frequencies for this report. In that regard, the racial composition of the data is divided into two groups, based on the designation of the census [population-level] data as white and nonwhite. The nonwhite component of South Carolinians, which is about 30% of the state population, is about 96% African-American.

Part I: The Burden of Diabetes in South Carolina

Chapter One: Risk Factors

Diabetes is a slowly developing, metabolic disease. The risk of diabetes increases with age and in persons who have a family history of the disease or ones who belong to high risk ethnic groups, for example, African-Americans and Hispanics. Many behavioral factors contribute to the development of diabetes and its complications. The BRFSS collects information about a variety of modifiable behavioral risk factors for diabetes, and information about patterns of care-seeking and utilization of care by persons with diabetes. These data are reviewed in the opening chapter with representations of trends over recent years, and across age, race, and gender groups among all South Carolinians.

Chapter Two: Morbidity

Diabetes imposes a major impact on health care

utilization and costs in South Carolina. This chapter describes the prevalence rate of diabetes across selected age, race and gender groups in South Carolina, with information about trends over time. Next, this chapter contains extensive data for the burden of diabetes on the medical care system in terms of hospitalizations, costs and lengths of stay. In addition, this chapter highlights data on a variety of diabetes-related complications, and conditions associated with higher risk in persons with diabetes. Also, this chapter contains information about the patterns observed for persons with diabetes related to Emergency Room visits. Diabetes among pregnant women and its impact on the outcomes of pregnancy is presented in this chapter, as well.

Chapter Three: Mortality

Deaths from diabetes and diabetes-related conditions are described in this chapter, over time, and by population groups (race, gender). Topics such as years of potential life lost, and impact for infant mortality from maternal diabetes are also presented.

Chapter Four: Resources for Diabetes Care

The DSC and SCDCP have made extensive efforts to identify groups and agencies working with persons with diabetes, whether in terms of patient education or clinical care, all across the state. The eventual objective is to form a state-wide coalition of these resources to enhance the quality of and distribution of diabetes-related information and care. The state-wide resources are presented in this section, as well a listing of information about how to contact these groups or organizations. See the county-specific reports (Chapter 2, Part II) for local resources.

Chapter Five: Where Do We Go From Here?

The DSC objectives for controlling diabetes are directed to promoting greater attention from primary care providers for regular medical surveillance of persons with diabetes; taking appropriate actions, and improving greater recognition of patient's personal responsibility of people with diabetes. The main goal is to reduce the disparity for avoidable morbidity, mortality and risk factors that exist between whites and African-Americans with diabetes in SC.

The objectives for the Diabetes Initiative of South Carolina, which were set forth in the state-wide plan for the control of diabetes, are listed in the last part of this report. To assist DSC with assessment needs and progress of diabetes control programs, a cross-reference of the data presented in this report in relation to each objective is provided in the Attachment.

PART II: The Burden of Diabetes at County Level

Chapter One: The Burden of Diabetes at County Level

This broad look at the county-level impact of diabetes for South Carolina is presented in the form of state-wide maps, with shading for high and low prevalence areas of the state, for a variety of characteristics, such as selected risk factors, hospitalizations, and mortality.

Chapter Two: County-specific Burden of Diabetes

For each county in the state, a single page profile of the burden of diabetes has been prepared. It is a condensed version of several of the data in this larger report, including: risk factors, hospitalizations, cost, and mortality. In addition, an intensive effort has been made to identify local resources for diabetes education and care for each county.

Part I
Burden of Diabetes in South Carolina

Chapter One
Risk Factors

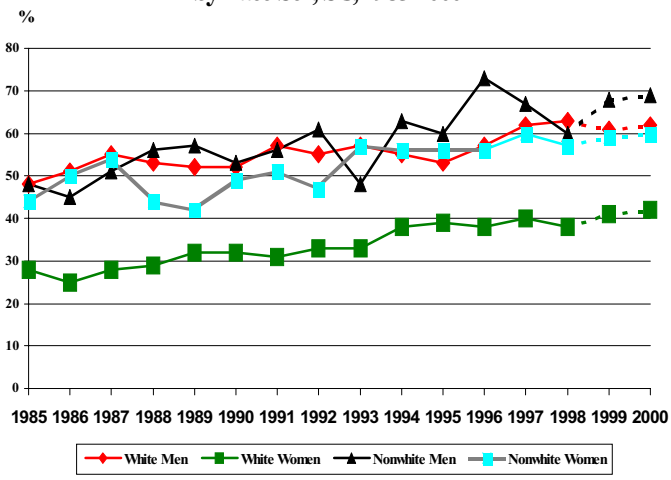
About 5% to 10% of all people with diabetes have type 1 diabetes. Type 2 diabetes represents the majority of cases of this disorder, accounting for about 90-95% of all people with diabetes. A family history of diabetes is more common in type 2 than in type 1. Major behavioral and lifestyle factors including overweight, physical inactivity, and unhealthy diet are predominant risk factors for the development of type 2 diabetes. Those factors along with inadequate preventive care contribute to the development of diabetes-related complications.

RISK FACTORS IN THE GENERAL POPULATION

Overweight

Overweight is an important risk factor for diabetes. Approximately 70-80% of people with type 2 diabetes are overweight. Over half of adult South Carolinians are overweight. The prevalence of overweight (i.e. a body mass index greater than 25 kg/m^2) was higher among nonwhites than among whites, and higher among men than among women. In 1998, white men had the higher prevalence rate (63%), followed by nonwhite men (60%) and nonwhite women (57%), while white women had the lowest rate (38%). The prevalence of overweight has increased 26%-35% since 1985 in all race-sex groups. White women, the race-sex groups that had relatively low prevalence rates in 1985, have seen the greatest increases (35%) since 1985. It is expected that approximately three of five men and nonwhite women and two of five white women will be overweight by the year 2000 , if these trends continue.

Figure 1. Prevalence of Overweight among Adults by Race-Sex, SC, 1985-2000*



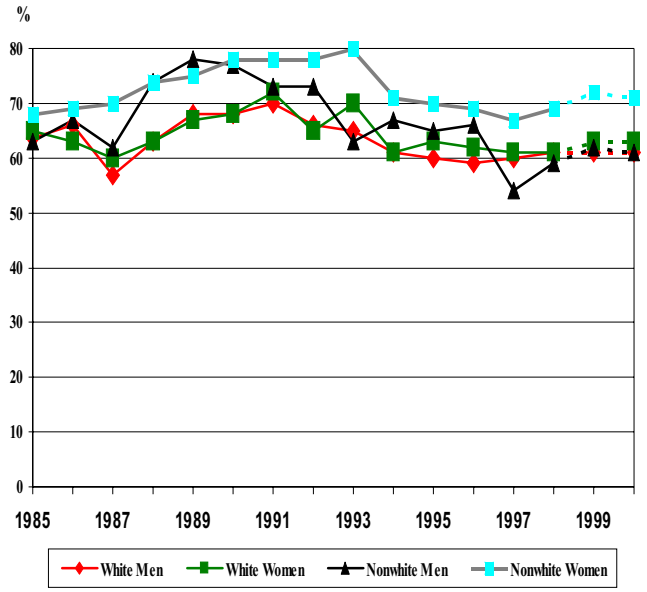
* Data in 1999-2000 were estimated based on data in previous years

Physical Inactivity

Regular physical activity reduces the risk of being overweight, and promotes the body's expenditure of energy. Approximately two thirds of adult South Carolinians are physically inactive (having less than 30 minutes moderate physical activity a day for most days in the week) in 1998. Figure 2 shows that nonwhite women had the

highest prevalence of physical inactivity (69%) in all race-sex groups. Compared with the prevalence 13 years ago, the prevalence of physical inactivity has not significantly changed for all race-sex groups through 1998. However, in the past five years, after a period of increasing trends, there has been an encouraging downturn in all race-sex groups.

Figure 2. Prevalence of Physical Inactivity among Adults by Race-Sex, SC, 1985-2000*



* Data in 1999-2000 were estimated based on data in previous years

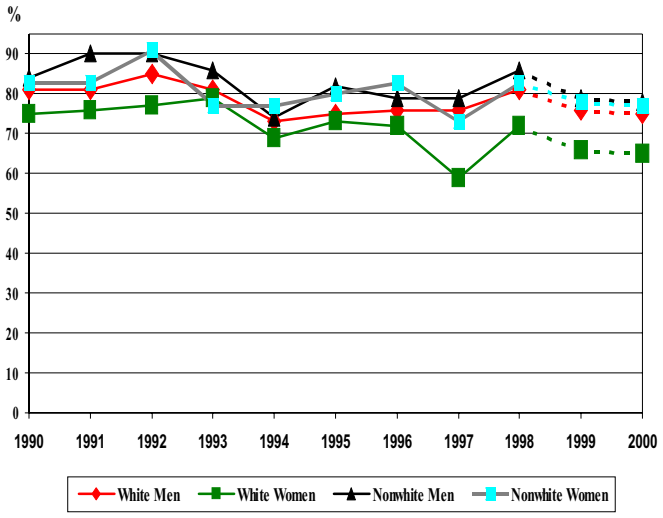
5-a-day

Consumption of at least five servings of fruits and vegetables a day (5-a-day) has been a standard recommendation for adults. Although consuming less fruits and vegetables than recommended is not a risk factor for diabetes per se, it reflects the extent of unhealthy dietary behavior that may lead to overweight. In South Carolina, approximately 78% of the adult population consumed less than five servings of fruits and vegetables per day in 1998. Nonwhites and men had higher prevalence of less than 5-a-day than whites and women. The prevalence of consuming fruits and vegetables less than 5-a-day has been stable in white men, nonwhite men and nonwhite women during 1990-1998. However, an encouraging trend appeared among white women, when the prevalence of less than 5-a-day decreased from 75% in 1990 to 72% in 1998.

Age-specific Prevalence of Major Behavioral Risk Factors

The prevalence of major behavioral risk factors differs by age. An understanding of the patterns of age-specific prevalence of risk factors may help in tailoring diabetes prevention programs. As shown in Figure 4, the prevalence of physical inactivity increased with age, from 54% in people under the age of 30 to 74% in people aged 80 and older. Older people tended to consume more fruits and vegetables than did younger counterparts. The prevalence of less than 5-a-day decreased from 83% in people age 30 and younger to 62% in people age 80 and older. The prevalence of overweight increased from 20% in people age less than 30 to 47% in people in their 50's, and then decreased to 20% in people aged 80 and older.

Figure 3. Prevalence of Consuming Fruits and Vegetables Less Than 5-A-Day among Adults by Race-Sex, SC, 1987-2000*



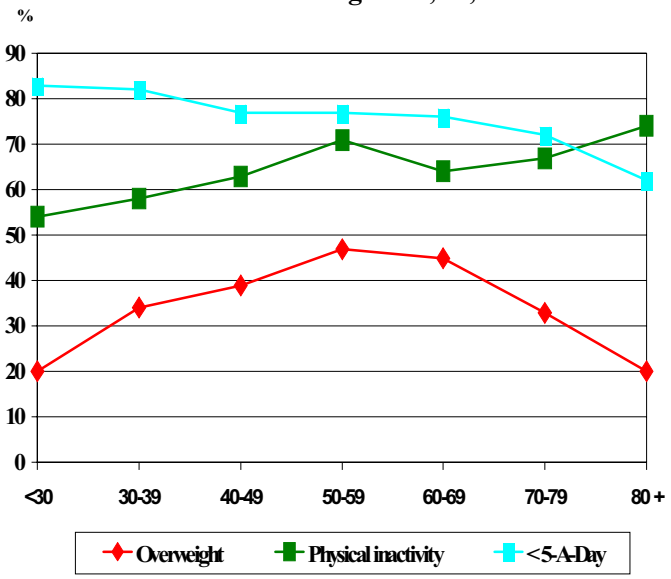
* Data in 1999-2000 were estimated based on data in previous years

RISK FACTORS FOR DIABETES RELATED COMPLICATIONS AMONG PEOPLE WITH DIABETES

Cigarette Smoking

Cigarette smoking increases the risk of heart disease, peripheral vascular disease, amputations, kidney disease, and respiratory infections in people with diabetes. In 1987-1998, the prevalence of current cigarette smoking in adults with diabetes (16.6% to 18.7%) was lower than the prevalence among adults without diabetes (24.4%-27.2%). Among adults who reported having been diagnosed with diabetes, nonwhite women had the lowest prevalence of current cigarette smoking during 1987-1998. Approximately 14% of white men with diabetes and 22% of white women with diabetes were current smokers in 1996-1998. The prevalence of smoking among adults with diabetes decreased from 34.8% in 1987-1989 to 26.9% in 1996-1998 among nonwhite men. However, the prevalence of smoking among white women with diabetes increased from 16.1% in 1987-1989 to 22.2% in 1996-1998.

Figure 4. Age-Specific Prevalence of Major Behavioral Risk Factors among Adults, SC, 1998



Hypertension and High Blood Cholesterol

Control of hypertension and high blood cholesterol is vital for preventing diabetes related complications. People with diabetes reported significantly higher prevalence of hypertension and high cholesterol than did people without diabetes in South Carolina during 1994-1997 (table 1). Among people with diabetes, prevalence of hypertension in nonwhites was higher than the rate in whites, and prevalence of high cholesterol among women was higher than the rate among men.

Figure 5. Prevalence of Current Cigarette Smoking among Adults with Diabetes by Race-Sex, SC, 1987-1998

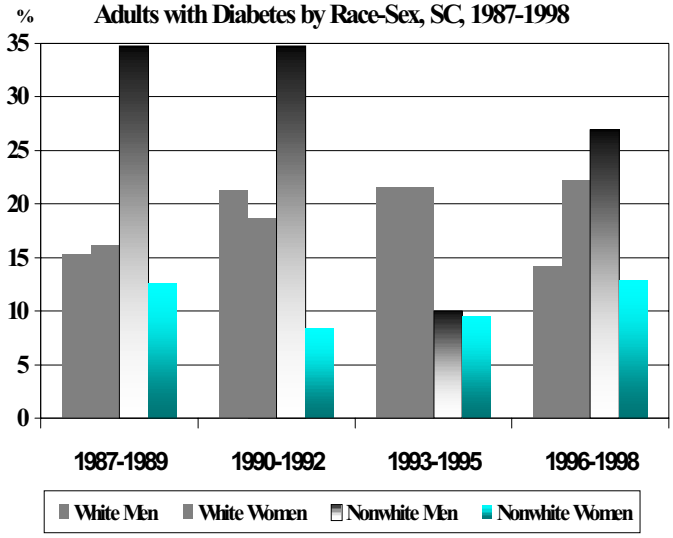


Table 1. Prevalence (%) of Hypertension and High Cholesterol in South Carolina, 1994-1997

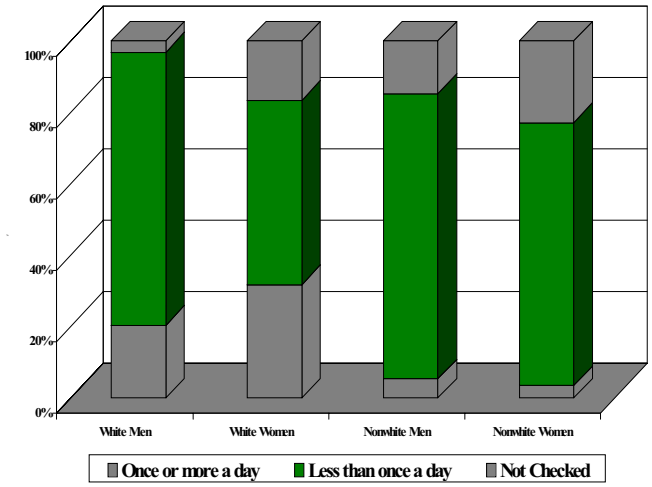
	Hypertension		High Cholesterol	
	People with Diabetes	People without Diabetes	People with Diabetes	People without Diabetes
White Men	40.7	19.4	34.7	24.3
White Women	57.1	22.7	45.3	27.4
Nonwhite Men	69.5	26.0	36.5	19.3
Nonwhite Women	74.8	30.3	45.3	25.3

Checking Blood Glucose

Regular self-monitoring of blood glucose level is important for adequate control of diabetes. Figure 6 shows the racial and gender differences among people with diabetes in this respect for 1994-1997:

- Approximately 14% of people with diabetes did not check blood glucose at all, and 70% of people with diabetes check their blood glucose sometimes but not every day.
- Women with diabetes were less likely to check their blood glucose than men;
- Nonwhites with diabetes were less likely to check their blood glucose, either occasionally or on daily basis, than whites.

Figure 6. Prevalence of Having Blood Glucose Checked among People with Diabetes by Race-Sex, SC, 1994-1997



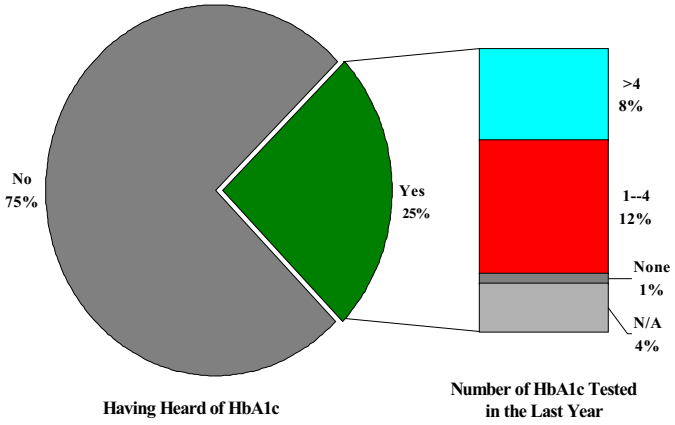
Checking HbA1c

Hemoglobin A1c (HbA1c) or glycosylated hemoglobin is a recommended measure of average blood glucose level in the past 2-3 months. The American Diabetes Association recommends that people with diabetes should have their HbA1c checked every 3 months for monitoring long term blood glucose control. According to the BRFSS survey in 1994-1997, approximately 75% of people with diabetes reported that they never heard of HbA1c. Figure 7 shows that 25% of people with diabetes were aware of this test. Only 8% of people with diabetes had HbA1c checked more than four times in the previous year.

Eye Examination

The diabetes standard of care guidelines issued by the American Diabetes Association recommends an annual dilated eye exam by an eye care specialist to detect early signs of retinopathy and start appropriate treatment. According to BRFSS data, during 1994-1997 less than two-thirds of people with diabetes reported having their eyes checked in the last year. Women with diabetes were less likely to report having their eyes examined than men with diabetes (Figure 8).

Figure 7. Prevalence of Having Heard of HbA1c and Being Checked for HbA1c among People with Diabetes, SC, 1994-1997



The percent of people with diabetes who reported having eye exams increased since 1994. In the 1994 BRFSS survey, only 91% of people with diabetes reported having their eyes examined (57% in the past year and 34 in a year ago). In 1997, 98% of people with diabetes reported having their eyes examined (59% in the past year and 38% in a year ago) (Figure 9).

Figure 8. Prevalence of Having Eyes Examined in the Last Year among People with Diabetes by Race-Sex, SC, 1994-1997

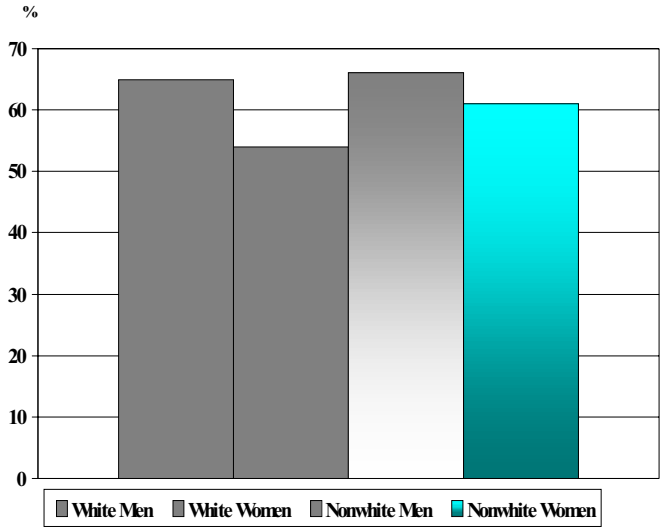
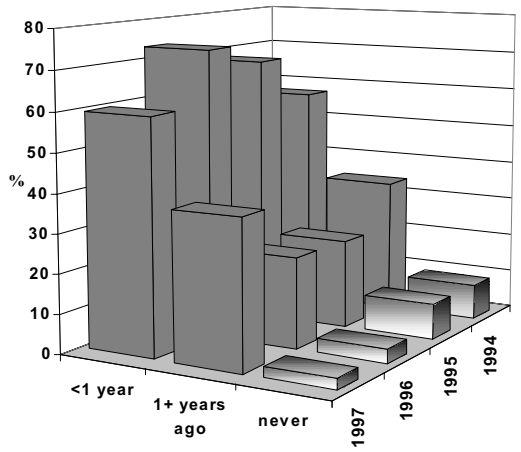


Figure 9. Prevalence of Having Eyes Examined among People with Diabetes by Time of Last Eye Examination, SC, 1994-1997



Foot Examination

Standard diabetes care also includes foot examinations at each medical visit. An analysis of BRFSS aggregated data from 1994 to 1997 by race and gender (Figure 10) indicated that the majority of people with diabetes reported having foot examinations in the past year. The prevalence of having one's feet checked was comparable among race-sex groups, except a slightly low prevalence among nonwhite women (89%).

Access to Medical Care

The 1997 BRFSS survey asked survey respondents if they could not see a doctor because of cost. Women with diabetes were more likely to report that they could not afford to see a doctor for their diabetes compared to men. More nonwhites than whites reported being unable to afford to see a physician (Figure 11).

Figure 10. Prevalence of Having Feet Checked in the Last Year among People with Diabetes by Race-Sex, SC, 1994-1997

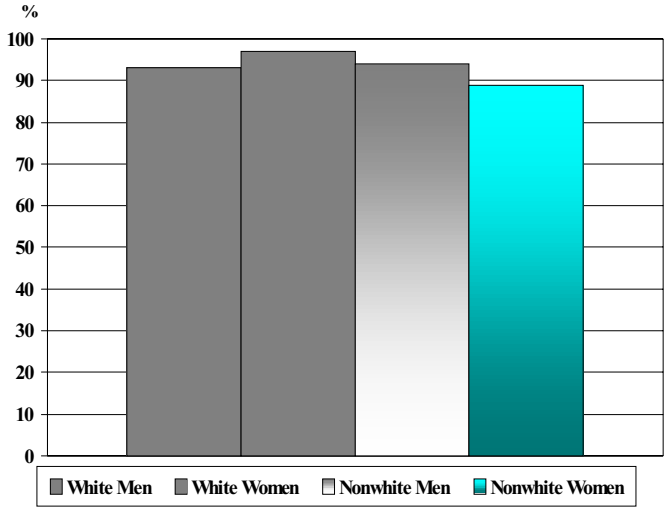
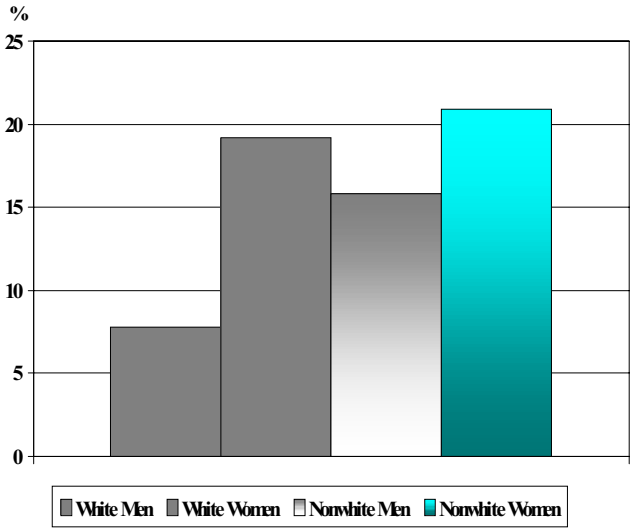


Figure 11. Prevalence of People with Diabetes Who Could Not Afford to See a Doctor in the Past Year, SC, 1994-1997



SUMMARY

Behavioral factors, such as weight control, exercise, healthy diet, and cigarette smoking cessation, play an important role in current management of diabetes and are modifiable. In addition, prevalent high blood pressure and high blood cholesterol levels and less than recommended eye, foot examinations, and HbA1c test demonstrate the great need for diabetes education in people with diabetes and in health professionals. Awareness of standard of diabetes care and access of medical care in South Carolina are factors associated with the quality of diabetes control. Diabetes patient education and diabetes professional education along with community outreach activities will improve the quality of diabetes control.

Overall, there has been an improvement in areas of knowledge of diabetes and access to prevention and intervention services. Short-term surrogate measures and actions such as HbA1c tests, foot examinations, and eye examinations have been improved in recent years. Continued efforts should emphasize major behavioral risk factor modification, racial and gender disparities in self-blood glucose monitoring, standards of care, accessibility, and affordability of care. Optimal management and treatment of diabetes and prevention of diabetes complications are a high priority of SCDCP and DSC continued efforts.

Chapter Two
Morbidity

INTRODUCTION

Diabetes frequently leads to complications and comorbidities. The major complications are diabetic ketoacidosis, blindness, kidney failure, and lower extremity amputation. The most common comorbidities include coronary heart disease, stroke, hypertension, and peripheral vascular disease. Significant high risk of complications and comorbidities in diabetes leads to more emergency visits, hospitalizations, increased mortality, decreased quality of life, and increased costs.

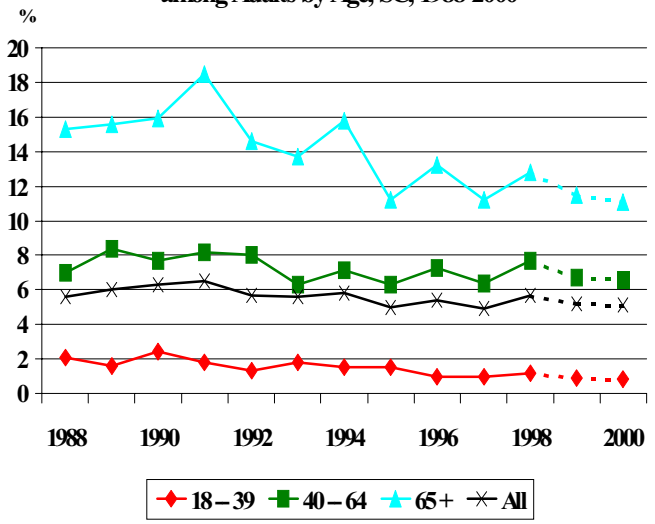
PREVALENCE

According to 1998 BRFSS survey, the statewide prevalence of self-reported diabetes was 5.7% among adults in 1998 , which was greater than the national average of 5.4% (median prevalence). Although South Carolina-specific prevalence of diabetes in children and adolescents is not available, it may be approximately 0.2% according to national survey (NHIS) data. Currently, approximately 240,000 to 300,000 South Carolinians have diabetes.

The estimated statewide prevalence of diabetes among adults fluctuated between 4.7% and 6.5% and appeared to decrease slightly during 1988-1998. Older people had much higher prevalence than younger people. The prevalence in people 65 years and older was 10 times that in people under age 40. Diabetes prevalence tended to decrease in the past 11 years among people age 65 years and older and people under age 40. However, prevalence remained unchanged, around 7%, among people between ages of 40 and 64 during 1988-1998 (Figure 12).

Diabetes is much more common in nonwhites than in whites. Figure 13 shows the race-sex-specific prevalence of diabetes in South Carolina. Nonwhites, especially women, had higher prevalence of diabetes than their white counterparts. From 1988 to 1998, the prevalence among white men ranged from 3.6% to 5.2%; white women from 3.7% to 6.5%; nonwhite men from 5.2% to 9%; and nonwhite women from 7.2% to 10.7%. Racial gaps in the prevalence of diabetes have widened in recent years, as prevalence has increased in nonwhites and decreased in whites.

Figure 12. Prevalence of Self-Reported Diabetes among Adults by Age, SC, 1988-2000*



* Data in 1999-2000 were based on that in previous years

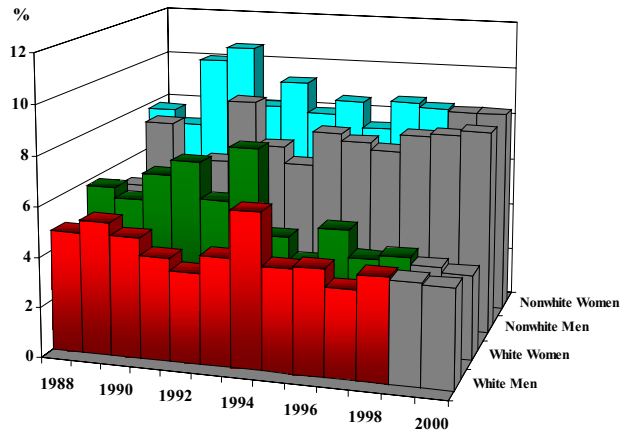
HOSPITAL DISCHARGES

Number of Discharges

In 1997, there were 7,493 hospital discharges with diabetes as the primary diagnosis, and 57,977 with

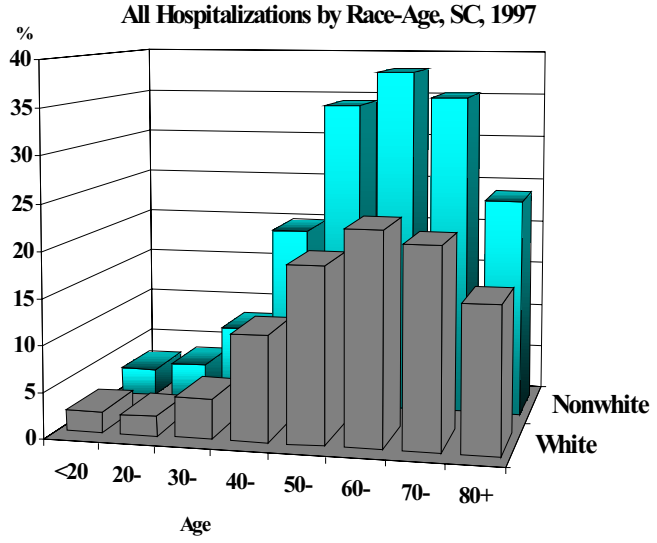
diabetes as the secondary diagnosis (diagnosis other than primary diagnosis). Overall, diabetes-related discharges accounted for 14% of the total number of hospitalizations in South Carolina.

Figure 13. Prevalence of Self-reported Diabetes by Race-Sex, SC 1988-2000*



* Data in 1999-2000 were estimated based on data in previous years

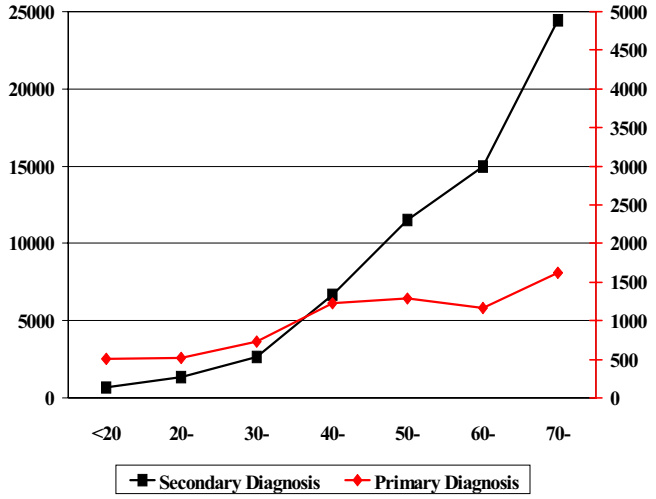
Figure 14. Proportion of Hospitalizations with Diabetes of All Hospitalizations by Race-Age, SC, 1997



As shown in Figure 14, the proportion of diabetes-related discharges increased with age for persons aged under 70 years and was higher in the nonwhite population for all age groups. Among hospitalized persons aged 50 years and older, one fifth of whites and one third of nonwhites had diabetes.

The number of hospitalizations for diabetes increases dramatically with the patient's age. In 1997, the number of discharges in patients 70 years and older was 3 and 36 times that for patient under age 20 for diabetes listed as primary diagnosis and as a secondary diagnosis, respectively. Patients age 50 and older accounted for approximately 58% of hospital discharges for diabetes as the primary diagnosis (Figure 15).

Figure 15. Number of Hospital Discharges with Diabetes by Age, SC, 1997



The age distribution of diabetic patients between 1986 and 1997 (Figure 16), reveals that the patients in 1997 were younger, on average, than patients in 1986. The largest differences in the age distribution of the diabetic patients between 1986 and 1997 were in the 30+ and 40+ age groups.

Nonwhites had a much higher hospitalization rate for diabetes than whites. This racial disparity in hospitalization rates was especially striking in nonwhite women. The hospitalization rate for diabetes as the primary diagnosis was 365 per 100,000 population in nonwhite women, nearly three times the rate for white women (Figure 17).

Figure 17 also shows that the hospitalization rate for diabetes as the secondary diagnosis was disproportionately higher among nonwhites, especially among nonwhite women.

Figure 16. Number of Hospital Discharges with Diabetes as Primary Diagnosis by Age in 1986 and 1997

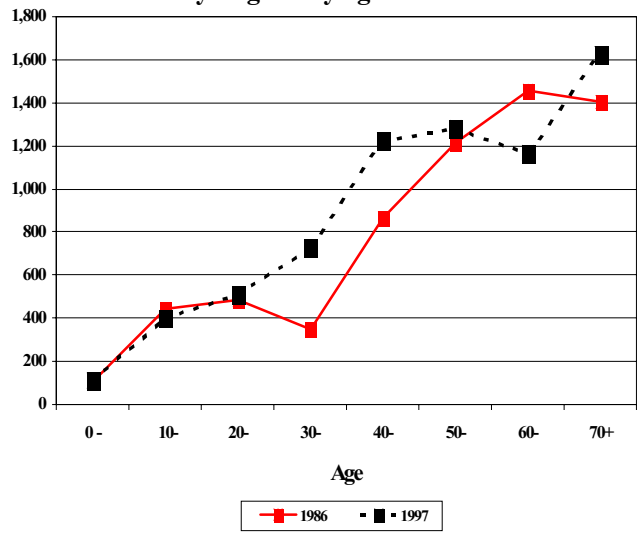
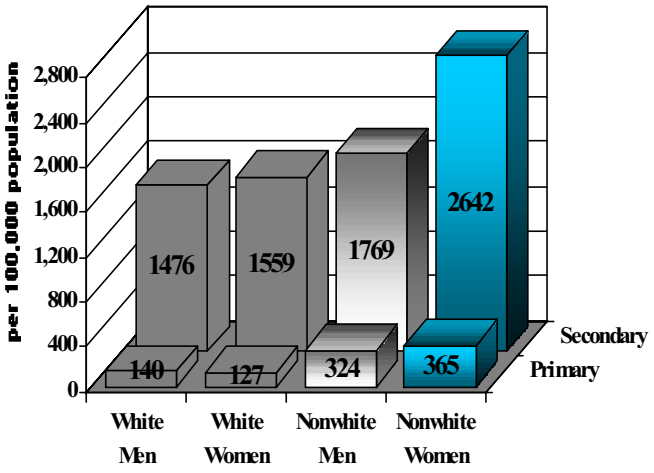
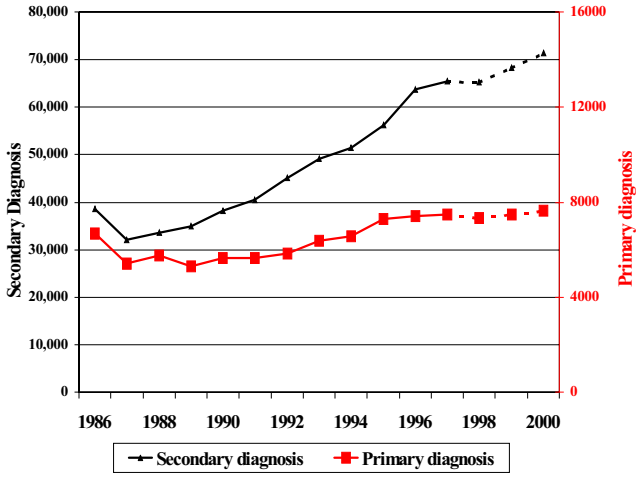


Figure 17. Rate of Hospitalizations with Diabetes as Primary or Secondary Diagnosis, SC, 1997



The number of hospital discharges for patients with diabetes has increased steadily from 1986 to 1997 (Figure 18). The increase in the number of discharges for diabetes as a secondary diagnosis was significant in the past decade. As the projection based on the data in 1986-1997 shows, the number of hospital discharges with diabetes as a secondary diagnosis is likely to continue to increase in the next few years. The number of discharges for diabetes as the primary diagnosis increased slightly, to 7,493 in 1997 from 6,671 in 1986. The number of discharges for diabetes as the primary diagnosis may approach 8,000 per year by the year 2000.

Figure 18. Number of Hospitalizations for Diabetes, SC, 1986-2000*



* Data in 1998-2000 were estimated based on data in previous years

Hospital Charges

In concordance with the increased number of hospitalizations for diabetes, the total hospital charges for patients with diabetes as the primary diagnosis increased to $70 million in 1997 from $22 million in 1987, and is expected to reach approximately $77 million by the year 2000 (Figure 19). The hospital charges for patients with diabetes, as either primary diagnosis or secondary diagnosis, was $850 million in 1997, and accounted for more than 9% of total hospital charges in South Carolina.

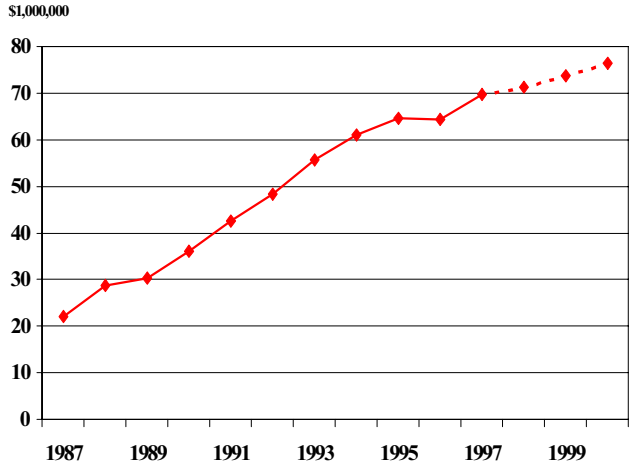
Figure 20 shows that the total hospital charges for patients with diabetes were significantly higher in 1997 than in 1987 for all race and sex groups. Of the $70

million hospital charges for patients with diabetes as the primary diagnosis, more than half were spent for women ($38.5 million). More hospital charges were spent for nonwhites ($38.1 million) than for whites ($31.9 million). Figure 17 also shows that the hospitalization rate for diabetes as the secondary diagnosis was disproportionately higher among nonwhites, especially among nonwhite women. The total charge for hospitalization with diabetes as a secondary diagnosis increased dramatically, from $161 million in 1987 to $780 million in 1997.

1997. For patients aged 60-69, for example, adjusted average charges increased 88% in the ten-year period, from $4,949 in 1987 to $9,332 (in 1987 dollar) in 1997.

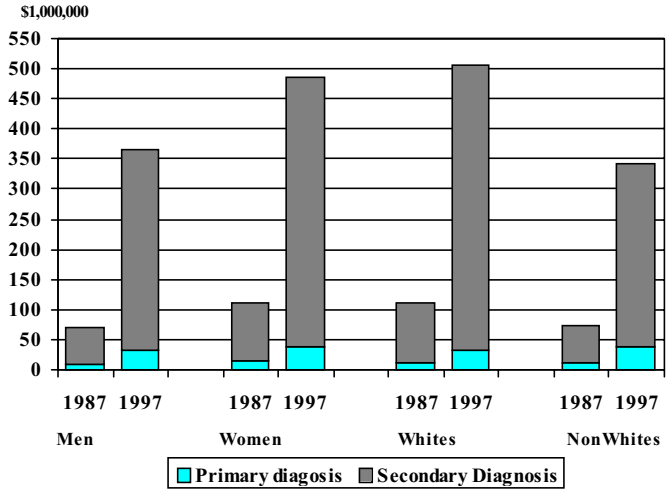
Who pays for the hospitalizations for diabetes treatment? In 1997, governmental programs paid two thirds of the costs for hospitalizations from diabetes. Medicare was the principal payer that paid 51% of total hospital charges for diabetes treatments (Figure 22).

Figure 19. Total Hospital Charges for Hospitalizations for Diabetes as the Primary Diagnosis, SC, 1987-2000*



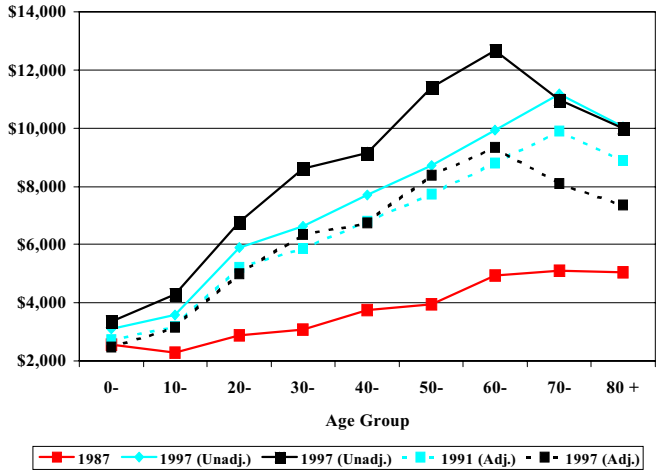
* Data in 1998-2000 were estimated based on data in three previous years

Figure 20. Total Charges for Hospitalizations among Patients with Diabetes by Race-Sex, 1987 & 1997



Two main factors might have contributed to the increase of hospital charges during the past decade: increased number of hospitalizations for diabetes and increased average charges per hospitalization. Figure 21 compares average age-specific hospital charges in 1987, 1991 and 1997, and reveals substantial increases in charges that were not adjusted for inflation during the ten-year period . Average unadjusted charges increased dramatically during 1987-1991, and further increased for most patients (except patients age 70 and older) during 1991-1997. For a patient in their sixties, the average unadjusted hospital charge increased from $ 4,949 in 1987 to $12,664 in 1997. Inflation was not the sole factor responsible for this dramatic increase. Figure 21 also shows average hospital charges increased substantially even after the charges were adjusted for inflation during 1987-

Figure 21. Change in Average Hospital Charge for Diabetes as Primary Diagnosis by Age, SC, 1987-1997



Length of Hospital Stay

In 1997 alone, patients with diabetes as the primary diagnosis stayed in a hospital for a total of 50,277 days (Figure 23). The total length of hospital stay for patients with diabetes has increased steadily since 1987. However, data in 1995-1997 showed a slight decline in total length of hospital stay. If the trend in the past three years remains unchanged, the total length of hospital stay for diabetes may decrease to 47,000 days by the year 2000.

Figure 22. Sources of Payment for Hospitalization among Patients with Diabetes, SC, 1997 (Total Charges: $69,706,494)

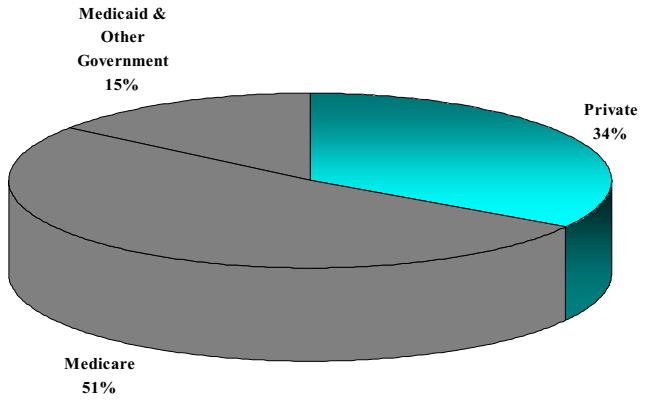
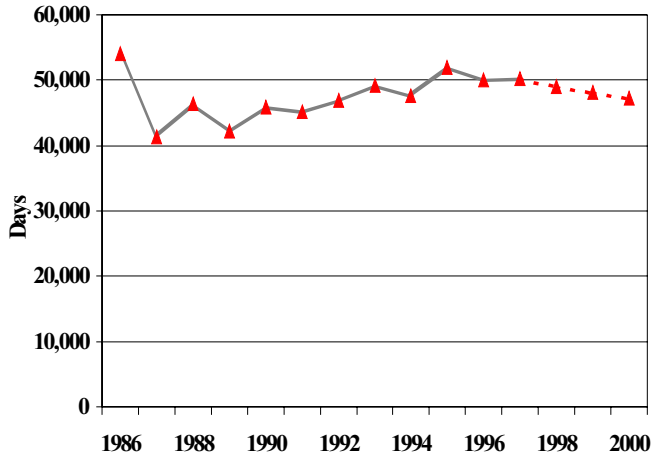


Figure 23. Total Length of Hospital Stay for Patients with Diabetes as the Primary Diagnosis, 1987-2000*



* Data in 1998-2000 were estimated based on data in three previous years

Complications

Diabetes is a major cause of cardiovascular disease, which is the most common cause of death in diabetes patients. The control of diabetes would not only lower the impact on morbidity, but also its contribution to many other cardiovascular disease like heart disease and stroke. In Figure 24, both stroke and other cardiovascular disease (CVD) hospitalizations each comprised of about 20% admissions among people with diabetes (when the population prevalence of diabetes is about 6% overall). This frequency shows that diabetes is a risk factor for both stroke and other CVD. Based on a 6% overall population prevalence of diabetes, there are three times as many hospitalizations for stroke and for other CVD as would be otherwise expected for diabetes.

Compared with prevalence of diabetes in the general population, the proportion of persons with diabetes is even greater among persons hospitalized for renal failure and dialysis, the common complication of diabetes. Diabetes patients comprised the majority of hospitalizations for lower extremity amputations in South Carolina in 1997. Nearly 60% of the amputation hospitalizations were for persons with diabetes, about 20 times the frequency for diabetes as in the general population. Diabetic lower extremity amputations may be prevented through careful foot exam and foot care.

Figure 24. Number of Hospitalizations for Major Diseases & Procedures by Diabetes Status, SC, 1997

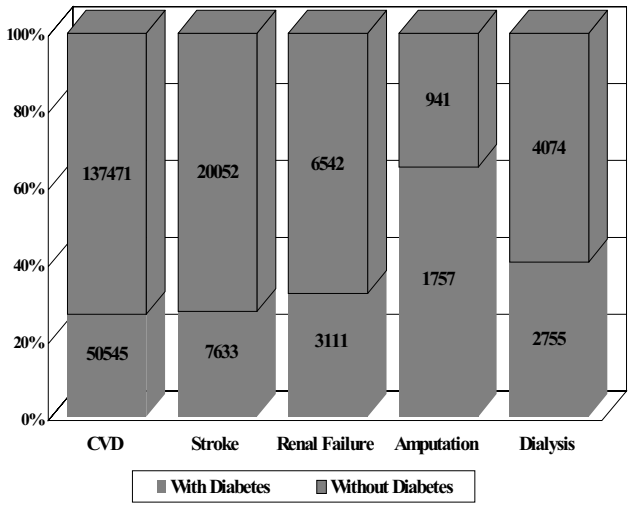
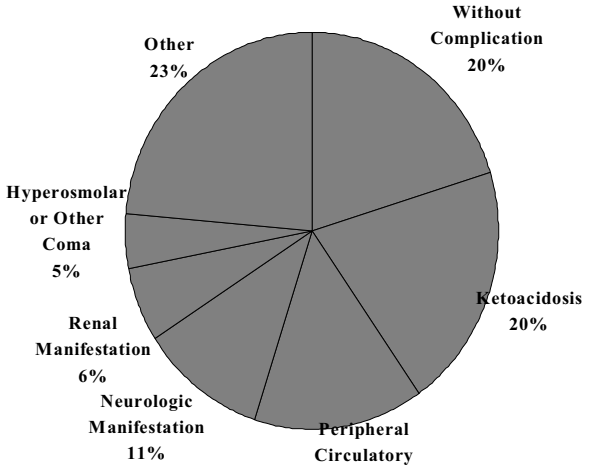


Figure 25 shows complications for hospitalizations with diabetes. Eighty percent of hospitalized patients with diabetes in 1997 had complications.

Figure 25. Distribution of Complications among Inpatients with Diabetes as Primary Diagnosis, SC, 1997



Ketoacidosis (20%) is the most common acute complication, resulting from failure of glycemic control (blood glucose management). Peripheral circulatory effects, or loss of blood flow to the extremities (a complication associated with amputations) is the next most common complication (18%), followed by neurologic and renal problems. Eight percent of the diabetic hospitalizations in 1997 were for persons in hypoglycemic (low blood glucose) coma or other forms of extreme metabolic distress; ketoacidosis may also induce coma. A variety of other complications were also present (23%). The following figures present specific patterns for some of the more common complications of diabetes.

Diabetic Ketoacidosis

Ketoacidosis is a very serious crisis for persons with diabetes. Persons diagnosed with type 1 diabetes often first learn of their disease when they experience ketoacidosis. Figure 26 shows that more women are hospitalized than men for ketoacidosis, which is also a national trend. Figure 26 also shows the preponderance of nonwhite hospitalizations due to ketoacidosis. African-Americans have a rate of hospitalization for ketoacidosis more than twice that of whites. The age-specific pattern for ketoacidosis admissions (Figure 27), is clearly shifted to younger persons for nonwhites. The preponderance of ketoacidosis hospitalizations for nonwhites, both genders, is around age 40 years. This may suggest a pattern in this age and race groups for less medical care, leading to crises of medical management.

Figure 26. Rate of Hospitalizations with Diabetic Ketoacidosis by Race-Sex, SC, 1992 & 1997

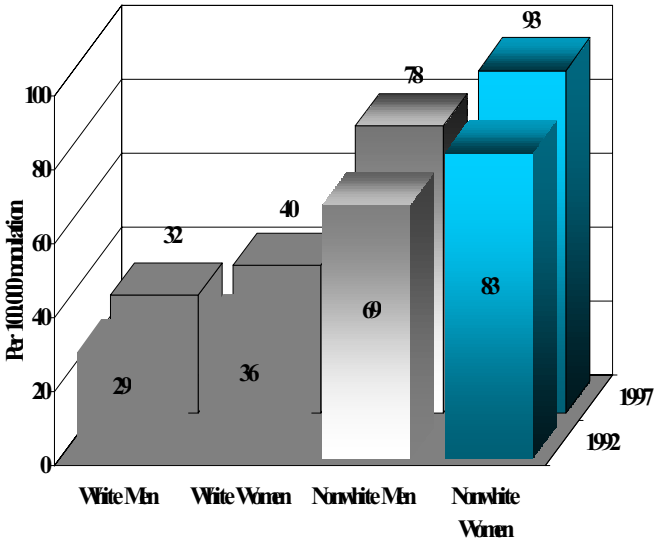
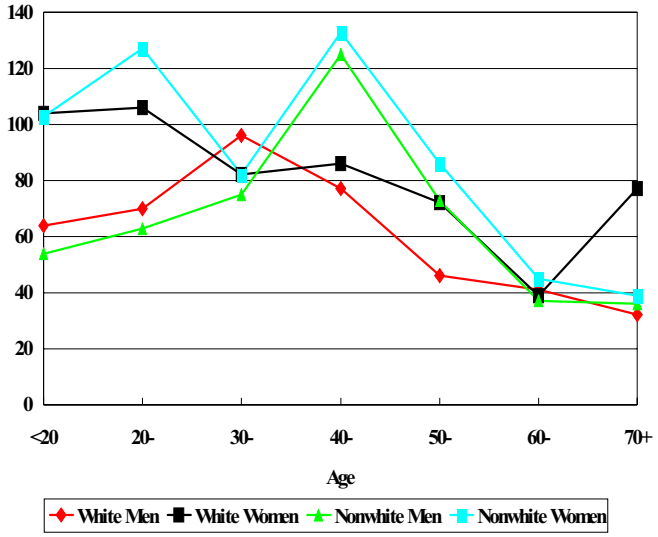


Figure 27. Number of Hospitalizations with Diabetic Ketoacidosis by Age and Race-Sex, SC, 1997



Renal Failure and Dialysis

Renal failure (end stage renal disease) is another very common manifestation for diabetes. After years of hyperglycemia accompanied with hypertension, diabetic nephropathy may lead to renal failure that requires life-long dialysis or kidney transplantation. The rate of hospitalization for renal failure among nonwhites with diabetes is more than twice the rate for whites with diabetes. The rate of renal failure increased for all race-sex groups during 1992-1997. However, a disproportionate increase in renal failure was seen among nonwhite men among whom the rate of hospitalization for renal failure increased nearly 50% during 1992 to 1997 (Figure 28).

Figure 28. Rate of Hospitalizations on Diabetic Renal Failure by Race-Sex, SC, 1992 & 1997

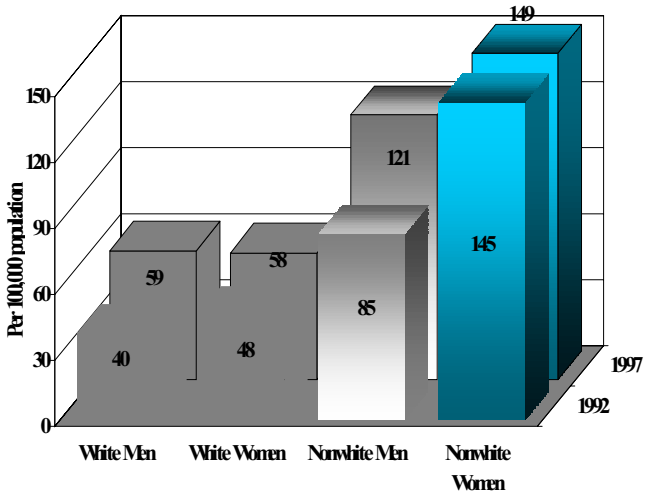


Figure 29 illustrates the age-specific pattern for renal failure hospitalizations in 1997. Women had more hospitalizations for diabetic renal failure than did their male counterparts. Clearly this complication affects more older persons with diabetes than young people. Of 3,111 hospitalizations for diabetic renal failure in 1997, 2047 (66%) were for patients aged 60 and older.

Persons with diabetic nephropathy may require dialysis . Dialysis is associated with older ages among people with diabetes (Figure 30). The preponderant age for this treatment is 60-69 years.

Figure 29. Number of Hospitalizations with Diabetic Renal Failure by Race-Sex and Age, SC, 1997

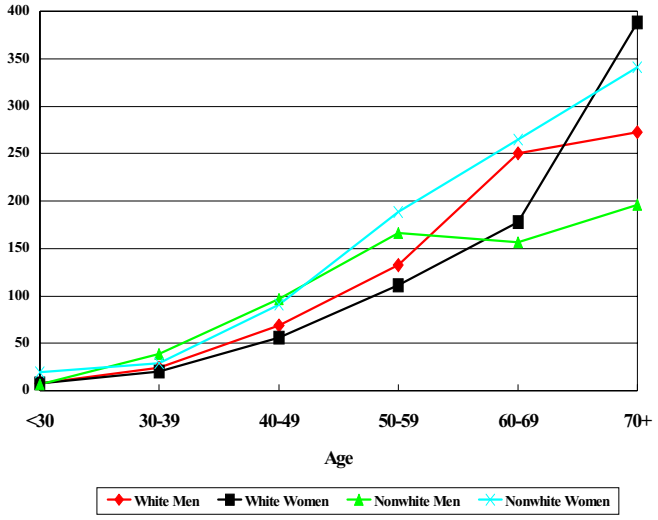
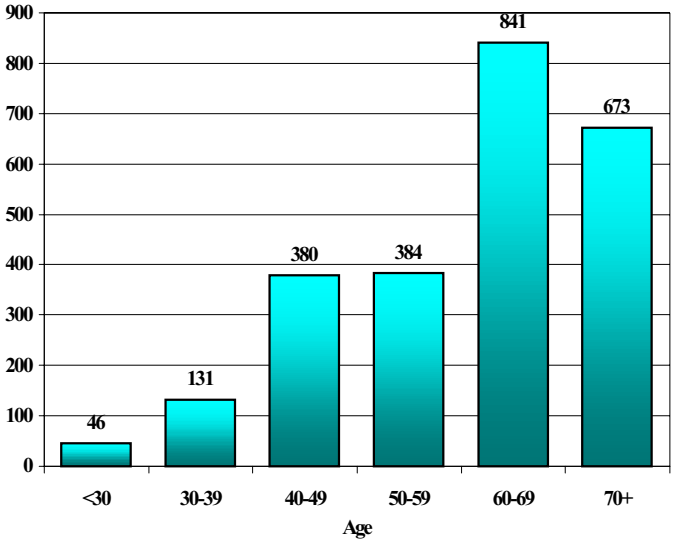


Figure 30. Number of Hospitalizations among Diabetic Patients on Dialysis by Age, SC, 1997



The rate of hospitalizations for dialysis among patients with diabetes is more than four times as frequent among nonwhites, especially nonwhite women (Figure 31). Although all race-sex groups experienced a rise in dialysis rate during 1992-1997, rates in nonwhite increased dramatically. As shown in Figure 30, it is the 60-69 de-

cade when dialysis peaks, but this specific effect is particularly dramatic among nonwhite females (Figure 32).

Figure 31. Rate of Hospitalizations for Diabetic Patients on Dialysis by Race-Sex, SC, 1992 & 1997

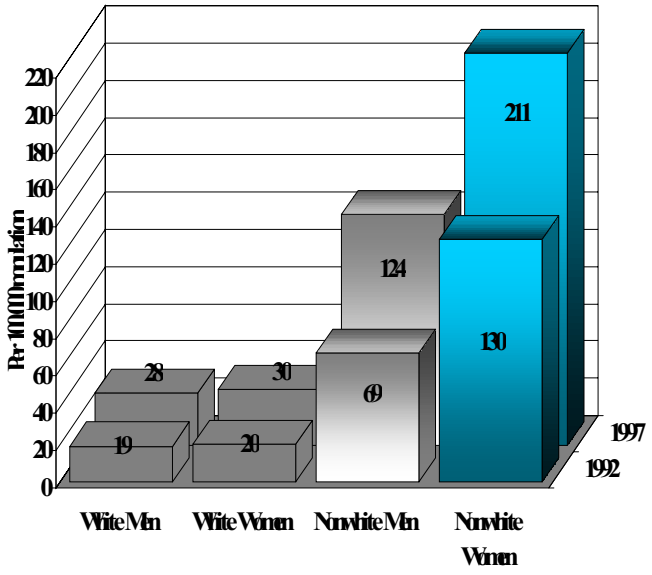
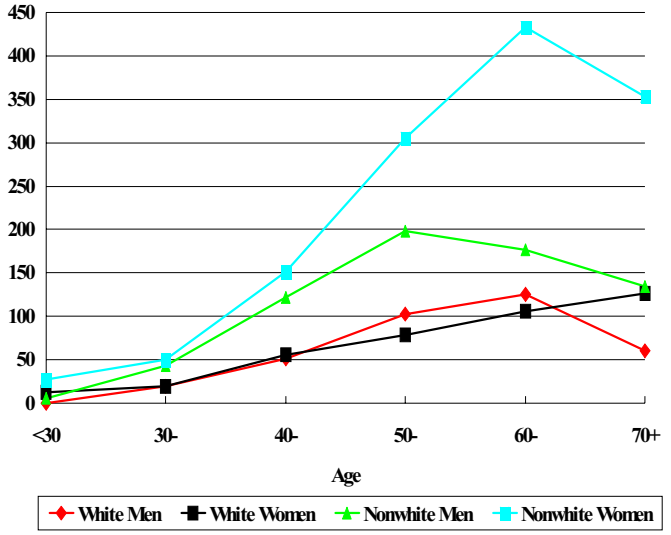


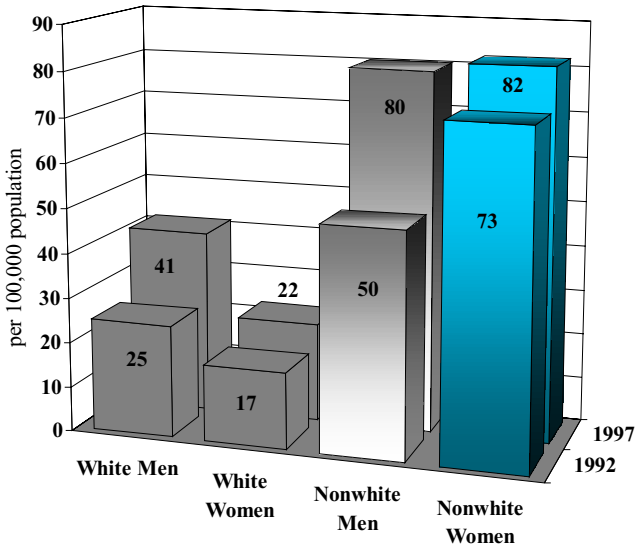
Figure 32. Number of Hospitalizations for Diabetic Patients on Dialysis by Age and Race-Sex, SC, 1997



Lower Extremity Amputation

The patterns for lower extremity amputation from 1992 to 1997 shows clearly an increased trend in all race-sex groups. This alarming pattern is among the reasons that daily self-check for foot ulcers and expanded training of primary care physicians to examine the lower extremities of persons with diabetes has been emphasized by diabetes control efforts in South Carolina. As shown in Figure 25, peripheral circulatory problems are present in one-sixth of persons hospitalized with diabetes. Peripheral circulatory problems mean that blood flow to the extremities is diminished. When reduced blood flow to the extremities is coupled with diabetic neuropathy, small scratches and simple infections may lead to the amputation of the limb or become life threatening. Clearly the occurrence of circulatory problems in the extremities rises with advancing age (Figure 34), notably for men and nonwhite women. The prevention of lower extremity amputation among South Carolinians is a pressing priority for SCDCP and DSC.

Figure 33. Rate of Hospitalizations for Diabetic Foot Amputation by Race-Sex, SC, 1992 &1997



GESTATIONAL DIABETES

Gestational diabetes is associated with infant mortality, congenital malformations, and complications of labor and delivery. In general, two to three percent of pregnant women are diagnosed with gestational diabetes. According to SC vital records, approximately 1,500-1,700 pregnant women are diagnosed with diabetes each year. The percentage of live births to mothers with diabetes increased from 2.5% in 1990 to 3.2% of in 1996 (Figure 35), remaining within the national norm in those years.

Figure 35. Number of Live Births by Mother's Diabetes Status, SC, 1990-1996

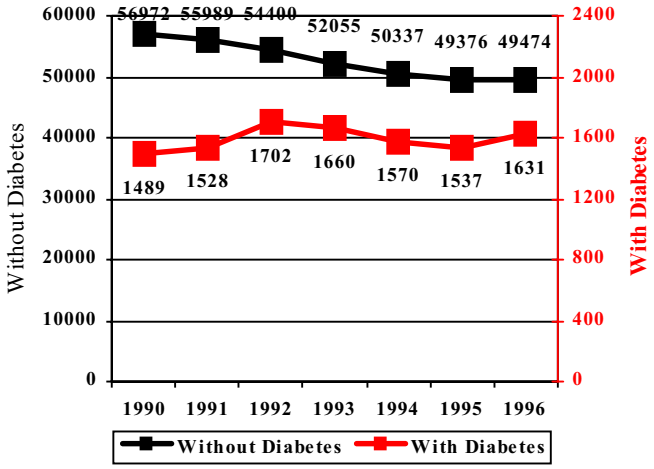
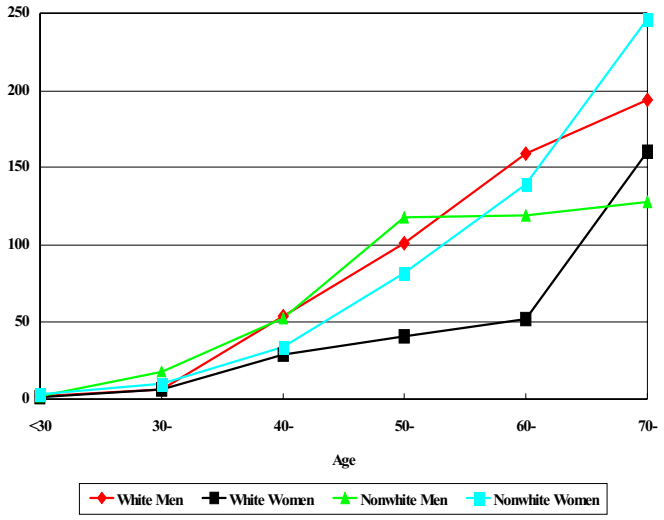
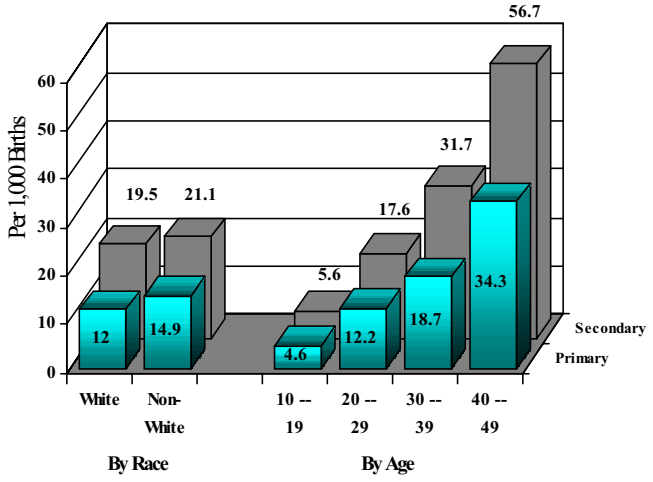


Figure 34. Number of Hospitalizations for Diabetic Foot Amputation by Age and Race-Sex, SC, 1997



In 1997, 684 pregnant women were hospitalized for gestational diabetes and another 1,048 pregnant women were hospitalized with gestational diabetes as a comorbidity. The rate of gestational diabetes as either primary diagnosis or secondary diagnosis was 50% higher among nonwhites than in whites. The rate of gestational diabetes was higher among older pregnant women than among younger women. Figure 36 indicates that the rate of gestational diabetes in women age 40 and older was nine times the rate of gestational diabetes among women under 20 years old.

Figure 36. Rates of Hospitalizations for Gestational Diabetes as Primary or Secondary Diagnosis, SC, 1997



Diabetes complicates labor and delivery. Incidence rates of complications of labor and delivery among diabetic pregnant women were 40% and higher during 1990-1996. These rates were higher in pregnant women with diabetes than in those without diabetes (Figure 37).

Maternal diabetes has a direct influence on embryogenesis during a critical and vulnerable developmen-

tal period, and is one of the causes of congenital malformations. In South Carolina, the incidence of congenital anomalies among infants of women with diabetes fluctuated around 30 per 1,000 live births during 1990 - 1996, and was higher than their nondiabetic counterparts (Figure 38).

Figure 37. Rate of Complications of Labor and Delivery by Mother's Diabetes Status, SC, 1990-1996

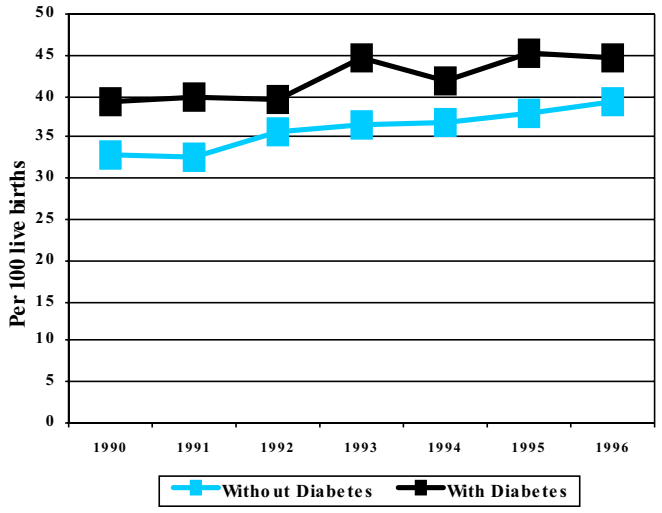
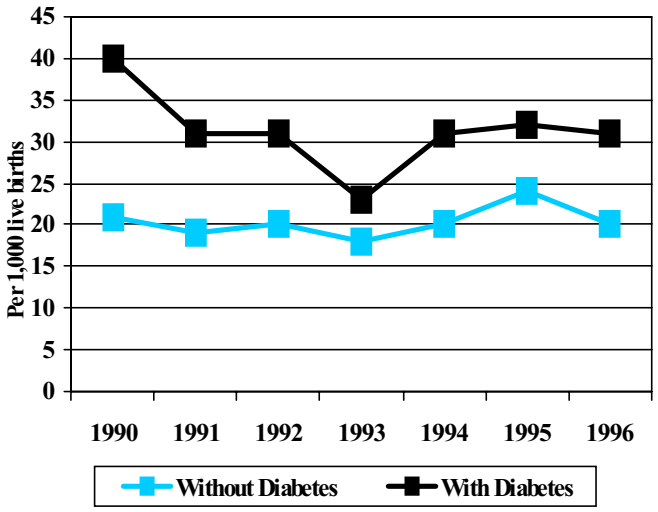


Figure 38. Rate of Infant's Congenital Malformations by Mother's Diabetes Status, SC, 1990-1996



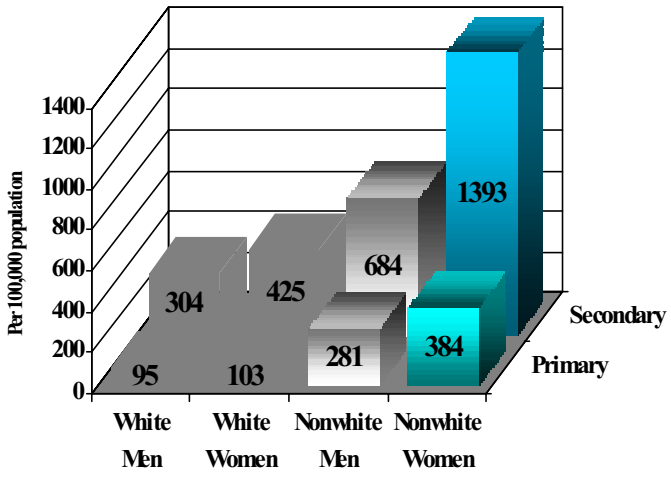
EMERGENCY ROOM VISITS

There is a striking racial disparity in rates of emergency room visits for diabetes. In 1997, the rates of visits for diabetes as the primary diagnosis among nonwhites were nearly three times that of whites for both sexes. The rates of ER visits for diabetes as the secondary diagnosis in nonwhites were also over twice that among whites. Nonwhite women had the highest rate of ER visits (1,393 per 100,000 population), which tripled the rate for their white counterparts (Figure 39).

Rates of ER Visits

The rates of emergency room visits with diabetes as the primary or secondary diagnosis increase with age. Figure 40 shows a sharp increase in the rate at age 60 years for diabetes as both a primary and secondary diagnosis. The rapid increase of rates of ER visits for diabetes among elderly patients maybe due to the fact that older people with diabetes have generally had the disease longer and are sicker. Lack of appropriate management and control of diabetes might also contribute to the high rates of ER visits, especially for those who visited ER with diabetes as the primary diagnosis.

Figure 39. Rate of ER Visits with Diabetes as Primary and Secondary Diagnosis by Race-Sex, SC, 1997



Complications

People with poor glycemic control are of increased risk for acute complications of diabetes. Figure 41 shows some selected diabetes-related acute and chronic complications by race and gender. All of the listed complications, especially neuropathy and hypoglycemia (which was coded as "Other") are much more common in nonwhite women than in other race-sex groups. Hypoglycemia and ketoacidosis are preventable with proper patient education and good patient compliance.

Figure 40. Rates of ER Visit with Diabetes as Primary or Secondary Diagnosis by Age, SC, 1997

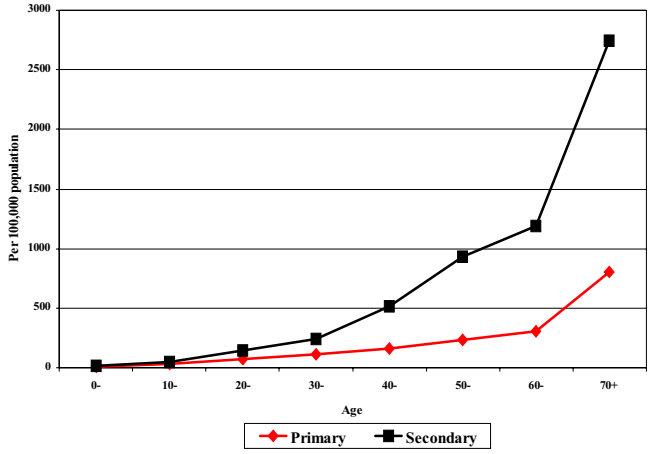
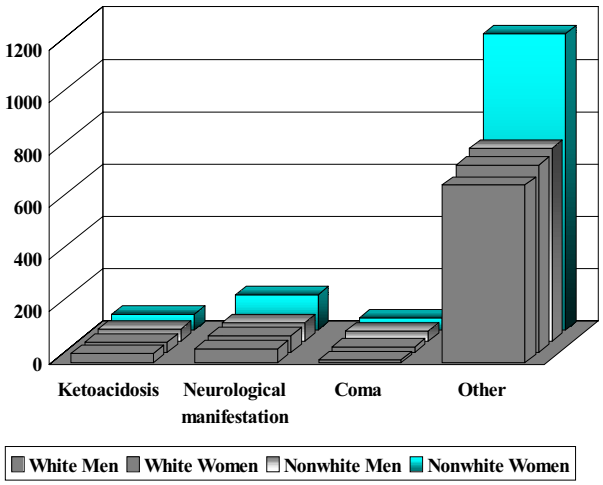


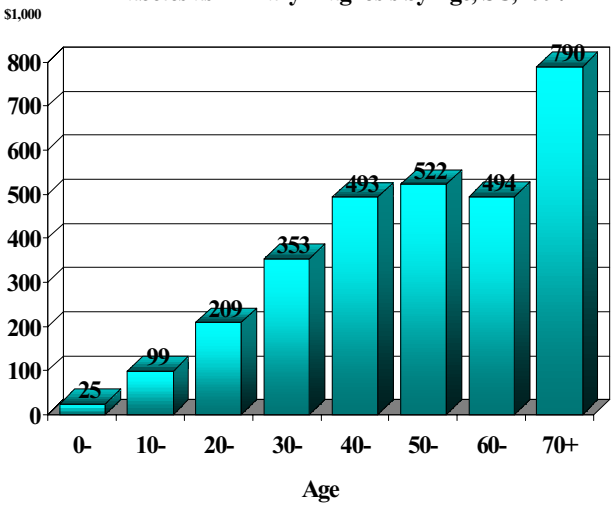
Figure 41. Number of ER visits with Selected Diabetic Complications by Race-Sex, SC, 1997



Charges

Charges of ER visits with diabetes as the primary diagnosis increases dramatically with age. In 1997, 68% of total ER charges were spent for people of 40 years and older. Charges in patients aged 70 years and older totaled $790,000, nearly one fourth of the total ER charges (Figure 42).

Figure 42. Total Charges for ER Visits with Diabetes as Primary Diagnosis by Age, SC, 1997



Repeated ER Visits

Repeated ER visits for diabetes are preventable through appropriate diabetes management and patient education. However, Figure 43 shows that 647 patients made more than one ER visit for diabetes in 1996, and the number increased to 793 in 1997. Approximately 30% of these patients made three or more visits within a year. Figure 44 compares race-sex patterns of single visit versus repeated ER visits. More women made repeated ER visits than did men, and more nonwhites made repeated ER visits than did whites. Nonwhite women had much greater numbers of both single visit and repeated visits than any other race-sex group.

As repeated visits to the emergency room are mostly preventable, charges for repeated ER visits imposes an avoidable financial burden on payers. The total

charge of repeated ER visits was $3.8 million in 1996-1997. Figure 45 shows that two-thirds of this cost was paid by Medicare and Medicaid in 1996-1997. An appropriate strategy to prevent repeated ER visits will avoid or reduce this expense in the future.

Figure 43. Number of Patients with Multiple ER Visits for Diabetes as Primary Diagnosis, SC, 1996-1997

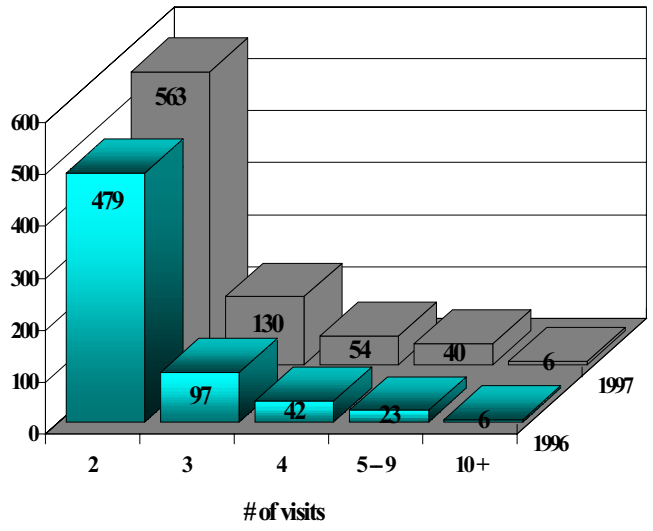


Figure 44. Number of Patients with One or Multiple ER Visit(s) for Diabetes as Primary diagnosis by Race-Sex, SC, 1997

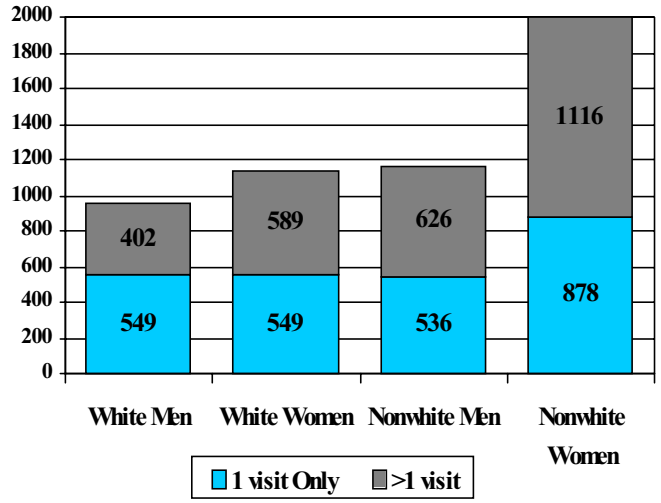
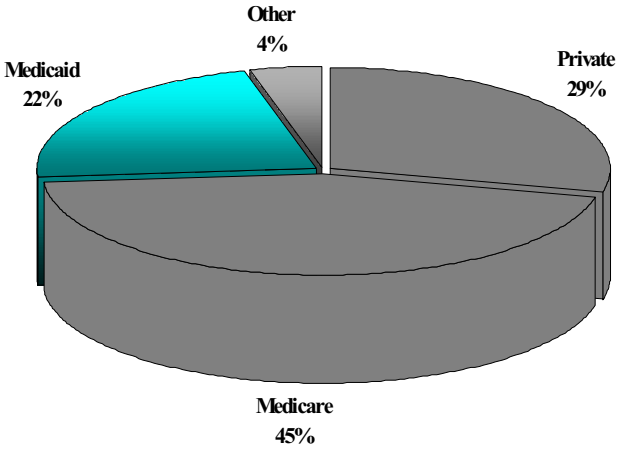


Figure 45. Sources of Payment for Diabetic Patients with Multiple ER Visits in 1996-1997, SC
(Total ER Charges: $3.8 million)



SUMMARY

The number of hospitalizations for people with diabetes over the last decade shows an increasing trend. Data in the most recent years suggest that the increasing trend has slowed down. Owing to the considerable cost considerations (notably associated with length of stay and cost-of-care), reducing hospitalizations for diabetes and related conditions continue to be a main objective for SCDCP and DSC programs in the near future. The racial disparity for these hospitalizations and the associated costs demand efforts to focus educational programs and medical access on nonwhite populations (predominantly African-Americans in South Carolina). South Carolina faces both challenge and opportunity in eliminating racial disparities in hospitalizations, and ER visits for preventable diabetes complications.

Chapter Three
Mortality

INTRODUCTION

Diabetes has been one of the leading causes of death in South Carolina. In addition to death from acute complications, diabetes increases risk of death from cardiovascular disease, and end-stage renal disease. Although increased death rates are seen for all ages and races, the highest rates are seen in minority populations and older populations. The mortality data in this chapter may underestimate the burden of diabetes because diabetes is likely to be under-reported on death certificates, according to previous studies.

MORTALITY RATES

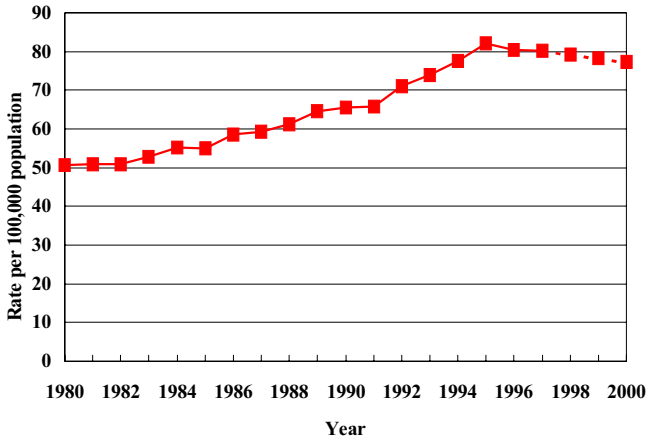
Crude Mortality

The annual number of deaths for which diabetes was the underlying cause increased in recent years, from 780 in 1992 to 1,029 in 1997. The annual number of diabetes-related deaths (deaths for which diabetes was recorded as one of the causes of death) increased from 1,995 in 1992 to 2,291 in 1997. Figure 46 shows that crude mortality rates for diabetes as one of the listed causes of death increased from 50.7 per 100,000 population in 1980 to 80.2 per 100,000 population in 1997. This reflects a 75% increase over 20 years. Data indicate that there was an encouraging decline between 1994 and 1997. Projections suggest that mortality rate for diabetes could decline to around 77 per 100,000 by the year 2000, if the recent trends remain.

Standardized Mortality

Among the four race-sex groups, nonwhite women had the highest age-standardized rates of 53 per 100,000 population in 1997. The greatest increase in mortality rate during 1992-1997 was seen for nonwhite men (19.8%), followed by nonwhite women (17.8%), the same pattern seen nationally in recent years. The mortality rate was almost level among white men and white women during 1992-1997. According to the patterns in recent years, the mortality rate may increase among nonwhites, but remain unchanged for whites (Figure 47).

Figure 46. Crude Mortality Rate for Diabetes as One of Listed Causes of Death, SC, 1980-2000*

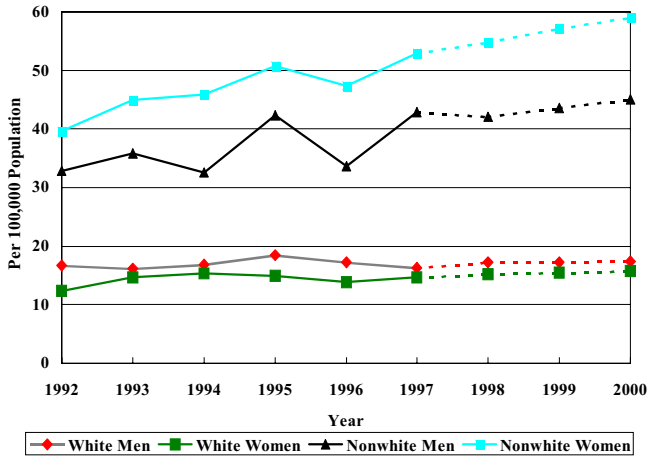


* Data in 1998-2000 were estimated based on data in three previous years

Age-specific Mortality

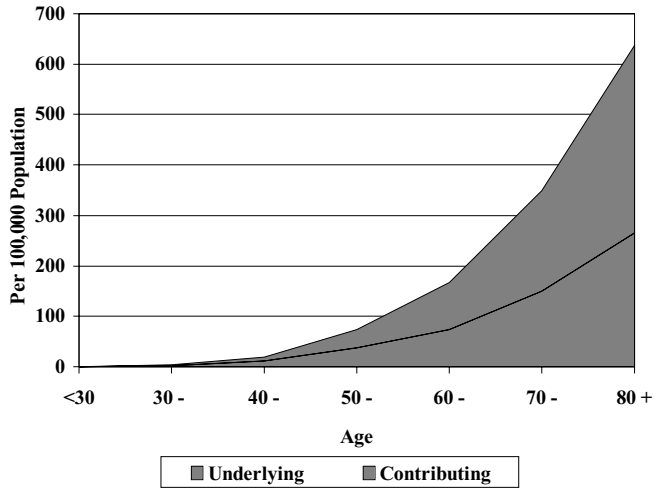
The age-specific diabetes mortality, both as underlying cause of death and as a contributing cause of death, increases dramatically with age. The increasing mortality rates for diabetes as a contributing cause of death among people aged 60 and older may indicate more deaths among persons with diabetes-related chronic complications, such as heart attacks, stroke, and kidney failure, which are found more often among the elderly.

Figure 47. Standardized Mortality Rate for Diabetes as Underlying Cause of Death by Race-Sex, SC, 1992-2000*



* Data in 1998-2000 were estimated based on data in previous years

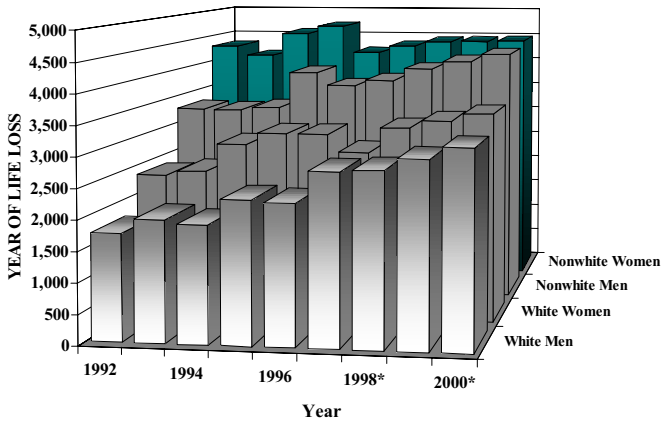
Figure 48. Age-Specific Mortality Rate of Diabetes, SC, 1997



YEARS OF POTENTIAL LIFE LOSS

Average life expectancy for diabetic patients is 5-10 years less than for nondiabetics. Years of potential life loss (YPLL) is calculated by adding all the years of life for people with diabetes who died before normal life expectancy (70 years for men, and 76 years for women). Figure 49 illustrates the YPLL due to diabetes for years 1992-2000. In 1997 alone, lives among people with diabetes were shortened by 13,823 years in total in South Carolina. YPLL is greater among nonwhites than whites. It is noteworthy that the rate calculated as YPLL per 100,000 population will be much greater for nonwhites than whites, given that nonwhites account for only 30% of the total SC population. YPLL increased in all race-sex groups during 1992-1997, and is expected to increase in the next few years unless drastic changes occur.

Figure 49. Year of Potential Life Loss for Diabetes as One of Listed Cause of Death by Race-Sex, SC, 1992-2000*

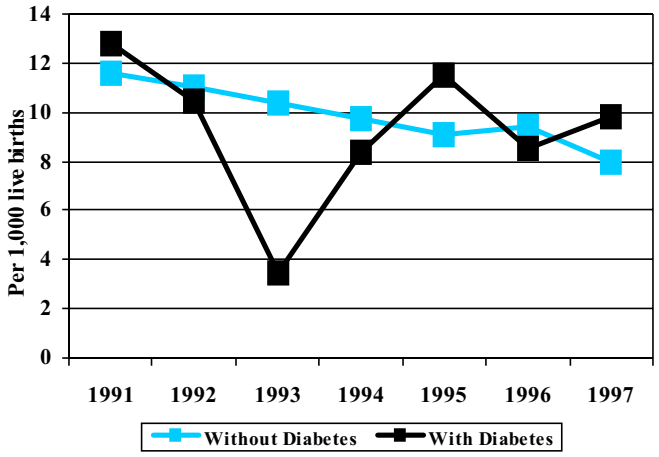


* Data in 1998-2000 were estimated based on data in previous years

INFANT MORTALITY

Infant (first year of life) and neonatal (first 28 days of life) mortality among newborns to women with diabetes was similar to that in the general population of South Carolina during 1991-1997 (Figure 50). The mortality among infants to mother with diabetes was 9.8 per 1,000 live births in 1997, which is a steady decrease from 12.8 per 1,000 in 1991.

Figure 50. Infant Mortality by Mother's Diabetes Status, SC, 1991-1997



SUMMARY

Approximately three thousand South Carolinians die from diabetes every year. Diabetes-related mortality appeared to decline in 1995 - 1997 after a decade long increase in SC. Data in South Carolina indicated that mortality of diabetes increased exponentially with age. The majority (82%) of deaths from diabetes occurred among people aged 60 and older. Race-sex specific mortality tracked closely with the patterns of diabetes-related risk factors and morbidity. Minorities, predominantly African Americans, experienced a substantially higher death rate and greater years of potential life loss than whites. Appropriate, innovative communication and education programs are needed to reduce the tremendous burden in this population. Meanwhile, increasing awareness, access to care, and diabetes management are critical for people with diabetes. Increasing resources of diabetes control in South Carolina, particularly rural health settings, targeting high risk populations are objectives of DSC and SCDCP.

Chapter Four
Resources for Diabetes Care

Sufficient resources are needed to decrease the tremendous burden of diabetes in South Carolina. These resources include:

* Adequate numbers of health professionals with knowledge about quality diabetes care and self-management education.
* Community and social service organizations, agencies, and programs that support infrastructure development, community-based care, education, and self-management training for all.
* Sources of payment including third party reimbursement for diabetes care and education, especially for those persons with limited income.
* Policies that facilitate quality diabetes care and education.
* Research that focuses on improving health services related to diabetes, surveillance of diabetes and complications, and program evaluation, as well as scientific and clinical research related to finding a cure for diabetes and its complications.

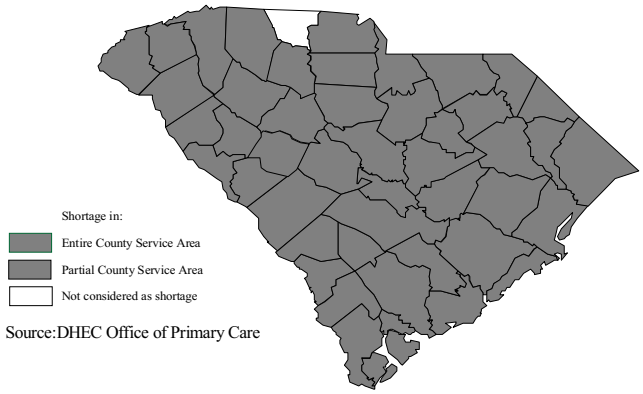
The purpose of this chapter is to outline identified resources in South Carolina for diabetes care, self-management education, infrastructure development, and research. Additionally, statewide policies that support third party reimbursement for care and self-management are identified. These initial efforts are not all inclusive and we urge you to assist us in compiling a more complete "catalogue of resources for diabetes in South Carolina" by forwarding information about your diabetes program via e-mail to jenkinsc@musc.edu or stepkat@musc.edu, or by mail to:

Diabetes Initiative of South Carolina
Outreach Council
Rutledge Tower, Room 273
PO Box 250565
135 Rutledge Avenue
Charleston, South Carolina 29425

HEALTH PROFESSIONALS

One of the first priorities is to have sufficient numbers of health professionals that are distributed according to need to provide ongoing, quality diabetes care and self-management education and support for persons with diabetes. Most counties in South Carolina have a shortage of health professionals as defined by the Office of Primary Care of DHEC. As shown in Figure 51, 23 of South Carolina's 46 counties have been identified as health professional shortage areas. Additionally, all but four of the other counties were identified with health professional shortages in parts of each county.

Figure 51. South Carolina Health Professional Shortage Areas by County, 1999



In 1994, 34 of the 46 counties of South Carolina were designated MEDICALLY UNDERSERVED AREAS by the U.S. Public Health Service. This designation takes into account physician to population ratio, infant

mortality rate, poverty level, and percent of population age 65 years and older. In health professional shortage areas, there are 18 federally funded community health centers distributed throughout the state. These health centers provide services based on a "sliding fee scale" that can assist those with limited incomes who may need assistance with financing health care, self-management education, medications, and monitoring supplies. (A listing of South Carolina's Community Health Centers may be obtained via the internet at http://web.infoave.net/~scphca/community_health_centers.htm)

Physicians

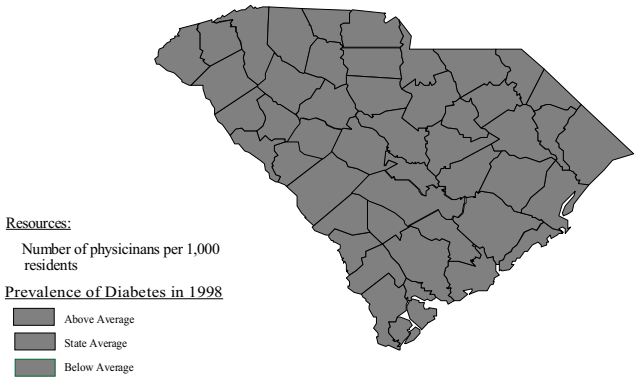
Physicians play important roles in health care for diabetes. A recent report was made to the Commission on Higher Education and the South Carolina Data Oversight Council by the Health Professions Functional Work Group, Primary Care Subcommittee, and South Carolina Budget and Control Office of Research and Statistics (1995). This report predicted a 21% shortage of primary care physicians in South Carolina by the year 2000 and 20% by the year 2005. The projected demand for total primary care physicians on a statewide basis for the years 2000 and 2005 is 2,804 and 2,971 while the projected supply is 2,217 and 2,382 for the years 2000 and 2005. Of the primary care physicians, Family Practice is expected to see a mere 3.6% increase between 1994 and 2005. Pediatrics, Internal Medicine, and Obstetrics/Gynecology physicians are expected to increase by 36.4%, 29.2%, and 21.2% respectively between 1994 and 2005.

Table 2. Physician Specialties Most Involved in Diabetes Care in SC

Specialty	Number	Ratio of patients per physician
Endocrinology	29	8,276
Nephrology	55	4,364
Neurology	109	2,202
Cardiology	185	1,297
Ophthalmology	196	1,224
Internal Medicine	870	276
Family Practice	1,113	216

Table 2 lists the number of Physicians (based on data from South Carolina Medical Association, 1999) in those specialties most involved with diabetes care. The table also lists ratios of patients to physician (i.e. number of people with diabetes served, on average, by one physician of that specialty). Using the figure of 240,000 persons with diabetes in South Carolina gives one a sense of the relative paucity of physician care available to patients with diabetes.

Figure 52. Number of Physicians Per 1,000 Residents by County, SC, 1998



In addition to the number of physicians available being far less than needed, the geographic distribution of physicians imposes another problem for people with diabetes. Most of South Carolina's physicians are located in three major city areas; very few of them practice in the counties that have higher prevalence rates for diabetes. As shown in Figure 52, physician-to-population ratio is as low as 2 per 1,000 population in 12 of 15 counties that have a high prevalence of diabetes (previously greater than state average).

Other Health Professionals

In addition to physicians, many other health professionals, including podiatrists, certified diabetes educators (CDEs), dietitians, pharmacists and nurses play a vital role in diabetes care and education. Table 3 shows that the number of nurses and CDEs has increased since 1994. The Diabetes Initiative and its partners have offered training courses to help prepare eligible health pro-

fessionals to become CDEs. As the choices of medications for management expands, the pharmacist's role is increasingly vital in the control and management of diabetes. Great efforts have been made to provide diabetes disease management training programs for pharmacists in recent years. At least 94 pharmacists have completed an advanced diabetes disease management program. Some of these pharmacists have developed diabetes self-management education programs for their clients, and are working with other health providers to improve diabetes outcomes.

Table 3 Number of Other Health Professionals, SC

Specialty	Number in 1999	Number in 1994 *
Certified Diabetes Educators	139	85
Pharmacists with advanced diabetes education	94	N/A
Podiatrists	76	102
Physician Assistants	206	N/A
Advance Practice Nurses	2,220	N/A
Registered Dietitians	746	751
Registered Nurses (RNs)	37,402	23,435
Licensed Practical Nurses	11,240	8,572

* abstracted from 1996 Burden of Diabetes Report

Figure 53 shows that in 1999 approximately one fourth of the counties in South Carolina do not have any CDEs or pharmacists with advanced diabetes education. In the 15 counties with the highest prevalence of diabetes, seven do not have any CDEs and three do not have any pharmacists with advanced diabetes education.

ORGANIZATIONS AND AGENCIES

Today, there are multiple organizations, agencies, and programs that are working to decrease the burden of diabetes in South Carolina. SCDCP and DSC have recently compiled a list of diabetes resources in South Carolina. Programs, projects and identified resources for diabetes care, self-management education and infrastructure development are included in "Diabetes Resources Manual, 1999". This manual is available by e-mail:
Stepkacr@musc.edu
boateny@columb61.dhec.state.sc.us

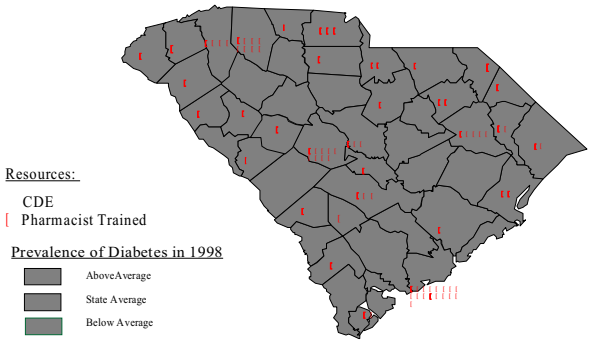
The following summary highlights some of these efforts to improve diabetes care, education, and self-management in South Carolina.

STATEWIDE AGENCIES THAT FOCUS ON REDUCING THE BURDEN OF DIABETES

Diabetes Initiative of South Carolina

John Colwell, M.D., Ph.D., C.D.E., Chairman of Board
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0968
Web site address: http:/www.musc.edu/diabetes

Figure 53. Number of CDE and Pharmacist(s) with Advanced Diabetes Management Training, SC, 1999



The Diabetes Initiative of South Carolina (DSC) was established by legislative action in July, 1994. The DSC includes a board of directors and three councils: Diabetes Center, Outreach, and Surveillance. The Board and Councils have liaisons with the SCDCP and the American Diabetes Association. The DSC is home-based at the Medical University of South Carolina and works closely with the University of South Carolina, the Office of Research and Statistics for the Budget and Control

Board, Carolina Medical Review, DHEC Epidemiology Division, and DHEC Office of Public Health Statistics and Information System.

The missions of the DSC are to:

- Provide education about diabetes and its complications to the general public, individuals with diabetes, health professionals, and health care systems.
- Develop community-based programs to promote life-style change to prevent or delay the onset of diabetes and its complications.
- Provide ongoing epidemiologic information and surveillance of diabetes and its complications.
- Work with other organized groups to improve outcomes for diabetes and its complications.
- Conduct research on selected clinical issues in diabetes.

DSC Diabetes Center Council

Pamela Arnold, RN, MSN, CDE
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0973

The Diabetes Center Council coordinates the following educational programs for health care professionals and health care professional students.

Annual Diabetes Primary Care Symposium, offered each fall, provides continuing education updates on diabetes for primary care health professionals. Students from health professional programs also attend at reduced rates

Review course for Certified Diabetes Educators is offered twice each year throughout South Carolina. The goal of these programs is to assist health professionals in preparing for the certification examination for CDEs.

Foot Care Course offers nurses an opportunity to learn basic and advanced foot care. The course provides "hands-on" experience with foot care.

Pharmacy Diabetes Management Program, which is offered through the College of Pharmacy, provides advanced diabetes disease management education and practice for community pharmacists.

Diabetes care and education for students enrolled in health professional education programs are offered to graduate and undergraduate nursing students, nurse practitioners, physician assistants, medical students, graduate students in health administration, interdisciplinary health courses, as well as those in internship and residency programs.

Community-oriented primary care for diabetes is offered to various student groups including third-year medical students, dental students, nurses, health administration students, dietetic interns, medical residents, and others. The focus is on examining the needs of populations of persons with diabetes and working with the community to develop, implement, and evaluate interventions.

Emergency Medical Technician education programs related to management of acute problems related to diabetes is available to educational programs throughout the state.

Office-based Diabetes Care and Management education programs are available upon request. Additionally, a **manual** for providing office-based diabetes care and education has been distributed to primary care providers in South Carolina. A copy of the manual is available on the DSC homepage.

The Model Diabetes Patient Education Program was implemented in South Carolina in September of 1996 through a partnership between DSC and SCDCP. This model program has incorporated the ADA standards, and the South Carolina Medicaid requirements into a single simplified approached to establish a diabetes educa-

tion program. See Figure 54 for program sites in the state.

DSC Outreach Council

Carolyn Jenkins, Dr.P.H., M.S.N., R.N., R.D., C.D.E.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-792-4625

The DSC Outreach Council offers the following programs and activities.

Regional coalitions for diabetes are currently under development. The regional coalitions for diabetes will meet to form the DSC/SCDCP Statewide Coalition for Diabetes.

Cheryl Stepka-Tracey, M.S., R.N., C.D.E.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0975

Yaw Boateng, M.S., M.P.H., R.D.
Diabetes Control Program
SC DHEC
2600 Bull Street
Columbia, South Carolina 29201
803-898-0537

Risk Factor Assessment, Identification, and Intervention Program was developed as DSC worked with several community-based groups. The program can be implemented in a clinic, primary care office, or in other community sites in collaboration with area health providers. One of the key communities that developed, implemented, and evaluated this program at the community level was PRO-Hampton County's Diabetes Connection that is coordinated by Diane Kennedy, M.H.P.E, Associate Director for Low Country AHEC. A manual that assists with program implementation will be available in late 1999.

Cheryl Stepka-Tracey, M.S., R.N., C.D.E.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0975

Diabetes Media Campaign is currently under development.

Elizabeth Todd Heckel, M.S.W., C.D.E.
USC DSC Site
Department of Family and Preventive Medicine
6 Richland Medical Park
Columbia, SC 29203
803-434-2442

National Diabetes Education Program in South Carolina is a national program that focuses on increasing diabetes awareness, improving diabetes self-management and care throughout the US.

Ellen Baab, M.P.H., R.D.
Diabetes Control Program
SC DHEC
2600 Bull Street
Columbia, SC 29201
843-395-6383

Carolyn Jenkins, Dr.P.H., M.S.N., RD, CDE
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-792-4625

Charleston Enterprise Hypertension and Diabetes Management and Education Program was developed by the MUSC Diabetes Center and the College of Nursing in response to identified community needs to address diabetes and hypertension education and management. The program works with the community to provide community-based diabetes education and case management, along with foot care and eye screening, to reduce complications and improve

outcomes for diabetes and hypertension. Currently, a primary care clinic that focuses on creating an environment to maximize learning about diabetes self-management is under construction.

Carolyn Jenkins, Dr.P.H., R.D., C.D.E.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-792-4625

Diabetes Education Program for Underserved Communities is a community - based education program that focuses on underserved areas of South Carolina and is coordinated by the MUSC Diabetes Center. Certified diabetes educators travel to communities to present programs about diabetes, its causes, treatment, and complications to interested lay groups throughout the state.

Cheryl Stepka-Tracey, M.S., R.N., C.D.E.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0975

Partners in Wellness is a collaborative effort between MUSC, South Carolina Area Health Education Consortium, and the State Historically Black Colleges and Universities that is designed to educate college students about diabetes, hypertension and associated community programs. This program focuses into attracting more African American students into health professional education programs and health careers.

William S. Robinson, M.A.
Medical University South Carolina
135 Rutledge Avenue, Room 273
Charleston, SC 29425
843-876-0971

DSC Surveillance Council

Dan Lackland, Dr.P.H.
Department of Epidemiology and Biometry
Medical University of South Carolina
135 Rutledge Avenue
Charleston, SC 29425
843-876-1142

Youjie Huang, M.D., Dr.P.H.
Epidemiology Division
SC DHEC
2600 Bull Street
Columbia, SC 29201
803-898-0286

The Surveillance Council coordinates surveillance activities and health services research to document the burden of diabetes and evaluate program outcomes. The surveillance system is a joint effort of the SCDCP and the Surveillance Council, and includes data obtained from numerous collaborating groups. Major existing data resources include the Behavioral Risk Factor Surveillance System (BRFSS), emergency room visit data, hospital discharge data, data from the End Stage Renal Disease Network, vital records, and population data. Periodic surveys and studies are conducted. Surveys have been completed among patients with diabetes, primary care providers, pharmacists, and community health centers to assess the barriers, adherence to recommended guidelines for practice, needs, and costs related to diabetes. The Surveillance Council is examining Medicare claims data, Medicaid data, and currently exploring sources of data on blindness related to diabetes. Additionally, the Council is developing a network of researchers with interests and ongoing research projects related to diabetes. Some of the major activities include:

Documenting the Burden of Diabetes in South Carolina and collaborating with DHEC to publish "Burden of Diabetes in South Carolina Report". The first report was published in 1996.

DSC HomePage is located at http:/ www.musc.edu/diabetes and contains information

about programs, clinical practice guidelines for diabetes care and education, and surveillance data.

South Carolina Diabetes Control Program

Yaw Boateng, M.P.H., M.S., R.D.
Diabetes Control Program
SC DHEC
2600 Bull Street, PO Box 101106
Columbia, SC 29210
(803) 898-0537

The South Carolina Diabetes Control Program (SCDCP) is housed and managed within the South Carolina Department of Health and Environmental Control (DHEC), Division of Community Health, Chronic Disease Prevention and Control Branch. The Program is administered by a core staff comprised of a Program Director/ Coordinator, Epidemiologist, Community Educator, Professional Educator, and a Administrative Assistant. The Program is funded by the Centers for Disease Control and Preventions (CDC).

The overall goal of the program is to reduce the burden of diabetes in South Carolina. The objectives include:

Defining and monitoring the burden of diabetes in SC (Surveillance);

Developing new approaches to reduce the burden of diabetes;

Implementing specific approaches to reduce the burden; and 4. Coordinating and integrating efforts to reduce the burden.

The accomplishments of the program since 1994 include the following:

Established a contract with the Medical University of South Carolina (MUSC) to provide various services including maintaining the Diabetes Initiative of South Carolina (DSC) Board and its committees; and providing technical assistance, consultation, and training for institutions and organizations that provide diabetes patient education.

Collaborated with the DSC, the American Diabetes Association (ADA), and other partners to publish an disseminate a document titled A 10 Year Strategic Plan for the state of South Carolina.

In collaboration with the DSC, developed a model diabetes patient education program.

Signed a number of agreements with various health organizations including; Companion Healthcare (CHC), a 114,000 member statewide HMO and South Carolina Primary Care Association (SCPCA), to provide office-based provider diabetes education to their providers; and the Medical University of South Carolina (MUSC), to coordinate and conduct surveillance activities and annual reports about "Diabetes in South Carolina".

Established several Diabetes Today Programs in the state. This is a CDC signature program designed to equip community leaders/representatives with skills to mobilize community members to conduct diabetes intervention activities.

Collaborated with the American Diabetes Association and Providence Hospital in Columbia, SC to co-sponsor the Annual African American Diabetes Conference.

Implemented and managed both the National Diabetes Education Program and the Life Preservers Flu Campaign in the state.

The following reports have been funded and produced by the SCDCP.

Evaluation of a Diabetes Professional Education Program Using HMO Claims Data.

Barriers to Diabetes Care and Management.

Patient Education for Persons with Insulin Dependent Diabetes by Primary Care Physicians: A

Survey Report.
Pharmacy Practice and Type 2 Diabetes in South Carolina: A Survey Report of Registered Pharmacists.

Primary Care Physicians' Practices related to Type 2 Diabetes .

The following manuals have been funded and produced by the SCDCP and their partners.

Model Diabetes Management Program outlines a step by step approach to "the how to" of setting up a diabetes management program in any institution.

Camp Adam Fisher: a Unique Training Experience is a training manual for professionals interested in the state-of-the-art management of diabetes using a diabetes camp as a training site.

Provider Education in Diabetes Management is a manual of procedures and handouts for providing diabetes management training for primary care physicians and their staff.

American Diabetes Association, SC Office

Southern Region American Diabetes Association
South Carolina Office
Suite 205
2711 Middleburg Drive
Columbia, SC 29210
803-799-4246

ADA's Signature Programs include:

Alert is an annual one-day awareness effort to reach all South Carolinians who do not know they have diabetes. Held the fourth Tuesday in March, the Alert's goal is to encourage the public to find out if they are at risk for diabetes by taking a simple written test. If they are at risk, they can be referred for a free blood glucose screening in their community.

American Diabetes Month is an annual month-long program for people with diabetes and their families. The program's goal is to raise awareness about three serious and often-preventable diabetes complications: blindness, amputation and heart disease. The American Diabetes Association, in partnership with South Carolina Society of Ophthalmologists, the Opometeric Association and the Podiatric Association, offers free dilated eye screenings and free foot screenings during November.

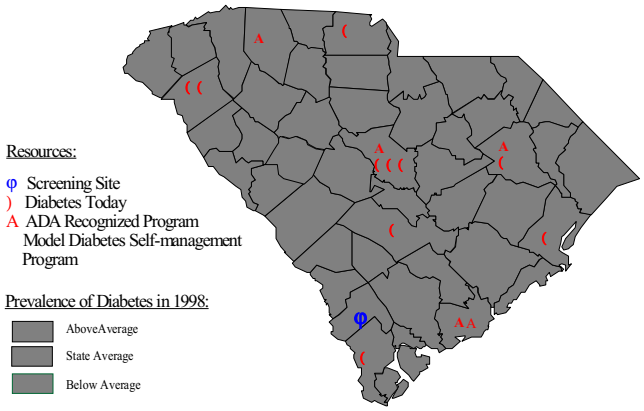
Diabetes Information and Action Line (D.I.A.L.) provides the latest information on diabetes, support groups, specialists and activities in your community.

African American Program seeks to increase the awareness about the serious problem of diabetes and the importance of early diagnosis and treatment. The African American Program includes fun and informative church and community activities such as "*Diabetes Sunday", "Get Up and Move"* and "*Healthy Eating".* Soul Food Recipe Samplers and Bible Bookmarks are just two of the special items developed for program participants.

Diabetes Advocates spend less than one hour each month writing letters, making phone calls and sometimes visiting their legislators. This year ADA is going to make diabetes a national priority for congress. South Carolinian Steve Smith leads this effort.

ADA's Camp Adam Fisher is a week-long camp for children with diabetes and adolescents (seven to 17 years old) with diabetes. The camp is held at the Bob Cooper 4-H Leadership Center in Summerton, SC. The Camp provides young people with an organized environment to practice healthy management skills and interact with others with diabetes. Volunteers and health professionals with expertise in diabetes function as camp counselors.

Figure 54. Diabetes Programs in South Carolina, 1999



STATEWIDE ORGANIZATIONS/AGENCIES WITH FUNDED DIABETES PROJECTS/SERVICES

Chronic Disease Branch of Epidemiology Division, DHEC

Tim Aldrich, Ph.D., Chief
Chronic Disease Branch
Epidemiology Division
SC DHEC
P.O. Box 101106
Columbia SC 29201
(803) 898-0779

Established in 1998, within the new Division of Epidemiology, the CDEB is comprised of several specialized epidemiologists and graduate assistants from the USC School of Public Health. Emphasis programs include diabetes, cardiovascular disease, and risk factor reduction. A close collaboration with the SC Central Cancer Registry provides a capacity for cancer epidemiology as well. The Branch performs directed analyses in support of the chronic disease control programs of DHEC. Staff also respond to requests for data analyses from the DHEC district staff, health officials, and the public. CDEB leads the development of a variety of publications, and assets with the construction of others. Statistical analyses, interpretation, and synthesis are principal capacities. CDEB database assets include vital records, hospital discharges, emergency room visits, Behavioral Risk Factor Surveillance System, demographic statistics; along with considerable graphic and mapping capacities. The Branch is the single point of contact for DHEC with disease cluster reports and small area investigations. The Branch is active with research programs from the medical schools and larger universities of the state.

Ketoacidosis Study is a demonstration of research of sentinel health events at the CDEB. Deaths from ketoacidosis were chosen as a warning that health care services are failing or missing. Women are recognized as being at slightly higher risk of ketoacidosis, as are African Americans. See Figure 27 for the pattern of hospitalizations in South Carolina for diabetic ketoacidosis in 1997. In that year, 134 deaths from diabetic ketoacidosis occurred, the majority among women and African American women in particular. The CDEB performed an analysis of the geographic pattern of these deaths to identify a potential pattern of the deaths in the state such as "cluster" might signal an opportunity for patient education or provision of medical attention in a more timely fashion. A cluster of eight cases in Georgetown County was identified as such a public health sentinel events. In-depth studies of these eight deaths will hopefully identify the basis for their occurrence and signal means to avoid this unfortunate, extreme outcome from diabetes in the future.

Carolina Medical Review

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250 Berry Hill Road
Suite 101
Columbia, SC 29210
803-731-8225

South Carolina Primary Health Care Association

2211 Alpine Rd.
P. O. Box 6923
Columbia, SC 29223
803-788-2778

The mission are to assure that adequate and appropriate quality health care services are accessible and affordable to every South Carolina community.

South Carolina Health Alliance

Post Office Box 6009
West Columbia, SC 29171-6009
803-796-3080

The South Carolina Health Alliance is a private , not for profit organization. It is made of 1,000 member hospitals and health systems and about 900 personal members associated with our institutional members. To facilitate the continuous improvement of South Carolina's health status by representing and advocating; leading change; mediating problems; and providing a forum for ideas.

Medical University of South Carolina

Project SUGAR is a research study within the Division of Endocrinology, Diabetes, and Medical Genetics at MUSC that provides community screening and education focusing on African Americans in coastal (Sea Islands) South Carolina. The project has purchased a mobile health unit that is staffed by nurses who work with this research project. The mobile unit has participated in over 25 community health screenings and more than 1,500 persons have been educated about risk factors for diabetes.

W. Timothy Garvey, M.D., Principle Investigator
Ida Spruill, MSN, MSW, Project Director
Medical University South Carolina
Department of Medicine
Diabetes and Medical Genetics
171 Ashley Ave
Charleston, SC 29425
843-792-5158

It's Your Body: A Mini-Medical School is a program sponsored by the Medical University of South Carolina's Office of Public Education, and is presented at selected colleges throughout South Carolina. The program helps participants develop an understanding of health sciences, increases their comfort with seeking medical help, and motivates them to develop healthy life-style. One of the educational sessions addresses diabetes prevention and management.

Linda Austin, M.D.
Office of Public Education
Medical University of South Carolina
51 Bee Street, PO Box
Charleston, South Carolina 29425
843-792-5802

University of South Carolina

USC DSC site

Elizabeth Todd Heckle, MSW, CDE
USC DSC Site
Department of Family and Preventive Medicine
6 Richland Medical Park
Columbia, SC 29203
803-434-2442

The USC DSC site was established by legislative action in July 1998. It works closely with DSC and its partners and assists with the professional and community programs described under the DSC Diabetes Center Council. In addition, USC DSC site has developed the following professional and community programs:

The Governing Committee provides oversight for USC DSC Site program and activities;

The diabetes Interdisciplinary Collaborative Research Consortium includes a multidisciplinary group of USC professionals and community agencies interested in diabetes;

Camp Adam Fisher is a camp for persons with diabetes from ages 7-17 and their brothers, sisters and friends. It is held every June at Camp Bob Copper in Summerton, SC.

Vocational Rehabilitation Training Program is held annually to provide education regarding

diabetes, diabetes care and management to vocational rehabilitation personnel and counselors.

The State health Plan Prevention Partners is an educational/screening program for state employees who have diabetes. It is offered in Columbia and Charleston annually.

USC School of Public Health

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The Nutrition Coding Center for the Diabetes Prevention Program (DPP), funded by NIH, is the largest clinical trial to date of different approaches to primary prevention of type 2 diabetes. This central unit manages dietary assessment protocols, training, and data management for the 27 clinical centers throughout the nation.

Strategies for Weight Management in Type 2 Diabetes: Pounds Off with Empowerment (POWER), funded by CDC, is a clinical trial of the effectiveness of a state-of-the-art behavioral weight management intervention, delivered in medically underserved communities in SC.

Vitamin E, Insulin Resistance and Atherosclerosis, funded by ADA, examines the role of vitamin E in the development of insulin resistance and atherosclerosis among White, Hispanic, and African American adults, an ancillary study to the NIH-funded Insulin Resistance and Atherosclerosis Study.

Clemson University

Clemson University, Department of Public Health

The Health Improvement Project (CHIP) is one-year epidemiologic study conducted by a team from the School of Nursing and the Department of Public Health. Goals of the project are: (1) determine the prevalence of diabetes and its associated complication; (2) describe the characteristics of person at risk of diabetes; and (3) determine the implementation and evaluation of diabetes programs in Orangeburg and Calhoun counties. The project is using six strategies to facilitate achievement of its goals: mortality data analysis, a retrospective chart review of hospitalized diabetic patients, an administrative record review, a health system study, an outcome assessment, and a literature review of environmental factors.

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Clemson University, College of Nursing

Assessment of Foot Care Behaviors for Adults with Diabetes: In cooperation with Anderson Area Medical Center, this comparative survey examines differences in foot care behaviors and other diabetes related characteristics (age, duration of diabetes, foot pathology) of adults with diabetes who have received care at a Clinical Nurse Specialist managed foot care clinic as compared to adults who have not received such care. The total sample tended to be older (between 65 and 75), Caucasian, and female. Sixty-eight percent had at least on concurrent illness, with heart disease being the most common. Eight three per cent had four or more primary care visits per year, with 40% having more than six. Findings showed several differences between the two groups. Patients receiving care at the clinic were more likely to have existing foot pathology, to have special shoes and to have their feet examined at each health care visit. Those not attending were more likely to engage in inappropriate foot care behaviors, including going barefooted and delaying treatment for lower extremity lesions. This study is funded by Clemson University Research Grants Program.

Deborah F. Willoughby, PhD, RN, CS
Donna Burroughs, MS, RN, CS
College of Nursing
Clemson University

106 J.R. Edwards Hall
Clemson, SC 29634-1703

Metabolic control of indigent clients with diabetes: The purpose of this study is to determine whether there are differences in the level of metabolic control for indigent clients who receive care at an indigent clinic which offers a monthly program of diabetes education, monitoring, and counseling as compare to those who receive care at an indigent clinic that does not offer special services for clients with diabetes. The study is a comparative descriptive design using HbA1c as the measure of control. Data collection has been completed and data analysis is underway. The study is funded by Clemson University Research Grants Program.

Deborah Willougby, PhD, RN, CS
Tommy Johnson, RPh, CDE
College of Nursing
Clemson University
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Clemson, SC 29634-1703

The impact of a program of education, monitoring, and counseling on the metabolic control of indigent clients The purpose of this study is to determine the impact of a program diabetes education, monitoring, and counseling on the metabolic control of indigent clients who receive care at an indigent clinic that has not offered these services in the past. The study is a pre-post intervention design. Clients are referred to the program by the clinic staff. Initial assessments include HbA1c, lipid profiles, microalbumuria, foot exam, as well as height/weight, blood pressure, and a diabetes knowledge test. The intervention is a three month program of education, monitoring and counseling. Services are provided by registered nurses and nursing students and by nutritionists and nutrition students. Four one hour group sessions are presented on self-care, monitoring and nutrition. Clients are then seen individually for assessment and follow-up. Clients are seen weekly for the first month, then bi-weekly for the next two months. They are provided with monitors and strips and asked to keep a log of their blood sugars, as well as exercise and diet diaries. Post-data is being collected on the first cohort of clients in Fall, 1999 and the second cohort is being recruited.

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Juvenile Diabetes Foundation (JDF)

Ashley Goldstein
Low Country Chapter Juvenile Diabetes Foundation
4 Carriage Lane
Charleston, SC 29407
803-763-1973

American Association Diabetes Educators

American Association Diabetes Educators (Midlands Chapter)

Carol Upton
648 Brandon Court
Lexington, SC, 29072
1-803-568-2000

American Association Diabetes Educators (Trident Chapter)

2424 Shadow Creek Court
Charleston, SC 29406-9127
843-792-2300

American Association Diabetes Educators (Upper Piedmont Chapter)

Lori Wade
Palmetto Baptist Medical Center
200 Fleetwood Drive
Easley, SC 29640
864-855-7798

SC Lions Inc

Richard Black, Executive Director
110 Medical Circle
W. Cola, SC 29169
1-803-796-1304

SC Commission for the Blind

Debra Singleton, Interim Director
Prevention of Blindness Program
P.O. Box 79
Columbia, SC 29202-0079
1-803-898-8700

AGENCIES AND PROGRAMS THAT PROVIDE FINANCIAL SUPPORT FOR DIABETES CARE AND/OR EDUCATION WHEN PATIENT MEETS ELIGIBILITY REQUIREMENTS

SC Vocational Rehabilitation

Jan Westmoreland
South Carolina Vocational Rehabilitation Department
1410 Boston Ave
West Columbia, SC 29170
803-896-6579

Commun-I- Care

Ken Trogden, Executive Director
P.O. Box 186
Columbia, SC 29202-0186
1-803-933-9183
1-800-763-0059

INTERNET SITES FOR NATIONAL DIABETES AGENCIES AND ORGANIZATIONS

American Diabetes Association
http://www.ada.org
1-800-232-6733

American Association Diabetes Educators
http://www.aadenet.org
1-800-383-3633

American Dietetic Association
http://www.eatright.org
1-800-877-1600

Juvenile Diabetes Foundation / Kids site
http://www.jdf.org/kids

National Certification Board for Diabetes Educators
NCBDE (CDE Exam)
http://wwwapplmeapro.com/ncbde
1-847-228-9795

National Diabetes Educator Initiative
http://www.ndei.org/

National Institutes of Health
http://www.niddk.nih.gov

National Diabetes Information Clearinghouse
http://www.niddk.nid.gov/Brochures/NDIC.htm

Center for Disease Control and Prevention
http://www.cdc.gov/nccdphp/

Summary

The preceding list of statewide and local resources for promoting diabetes prevention and control is part of an ongoing effort to increase awareness and promote interventions that reduce the burden of diabetes. There are active efforts to train health care providers, to educate and encourage persons with diabetes to take control of their diabetes through self-management (dietary changes, exercises, smoking cessation, seeking regular medical care, and performing visual inspections of extremities), and to promote changes in the health care system and the community to improve diabetes outcomes. The identification of these resources for local communities is part of a concerted effort to mobilize resources in every community in South Carolina to focus on prevention of diabetes and its complications and to promote better care and self-management for persons with diabetes.

Chapter Five
Where Do We Go From Here?

In 1998, the Board of Directors of the Diabetes Initiative of South Carolina approved a 10 Year Strategic Plan which defined and quantitated specific goals and objectives which would materially reduce the burden of diabetes in South Carolina. The report was developed by a widely representative committee and was reviewed and modified by Board members and critical organizations and agencies which deal with diabetes and its complications. The Diabetes Control Program, SC DHEC, was closely involved in developing the plan, and continues to work closely with the Diabetes Initiative of S.C. in assuring its implementation. Some portions of this Burden Report serve as monitors for the Plan, and cross-references to these goals and objective is included in a separate section of the Report.

The Diabetes Initiative of South Carolina has nine long-range goals:

1. Improve knowledge of diabetes, quality of life, and access to prevention and intervention services.

2. Increase utilization of short-term measures and actions.

3. Increase services and education in health professional shortage areas.

4. Reduce morbidity and disability.

5. Reduce (age-adjusted) mortality rates

6. Target high risk groups.

7. Decrease preventable hospital admissions and charges.

8. Decrease preventable emergency room visits.

9. Improve statistical basis for estimating prevalence of diabetes and its complications.

A focus on preventive care will yield success. This means that seven sensible, proven goals must be achieved by people with diabetes, with help from health professionals and focused programs:

- Decrease weight and increase physical activity.
- Achieve normal blood pressure levels.
- Stop smoking.
- Lower elevated blood cholesterol and triglycerides and increase HDL cholesterol to target levels.
- Reduce blood sugar and HbA1c levels towards normal.
- Take enteric-coated, low dose aspirin daily, if no contraindications exist.
- Add other preventive measures as indicated by controlled intervention trial data in people with diabetes.

The Diabetes Initiative of south Carolina and the Diabetes Control Program, SC DHEC, will continue to work with all people and organizations in a full-scale effort to achieve these goals and objectives. The result will be an increased quality of life for all people affected by diabetes mellitus.

Attachment
Cross-reference of Data to Goals of the Diabetes Initiative of South Carolina

In its 10-year (1998-2008) plan, the Diabetes Initiative of South Carolina (DSC) defined nine long range goals for its mission. This report, as part of the joint effort between the DSC and SCDCP to assess the burden of diabetes, prepares data for monitoring the progress of achieving these goals. Because the report is formatted in a way different from that of the goals, we prepared the following cross-reference of the data presented in this report to correspond with the goals of the DSC.

Goal I. Improve knowledge of diabetes, quality of life and access to prevention and intervention services

- See Figure 1 - Figure 5 in *Chapter 1 Risk Factors, Part I,* and Figure 55 - Figure 58 in *Chapter 1 Burden of Diabetes by County, Part II* for lifestyles: nutrition, exercise, weight control, cigarette smoking;
- See Figure 6 - Figure 10 in *Chapter 1 Risk Factors* for Risk factors awareness, self-management, and prevention of complications;
- See Figure 11 in *Chapter 1 Risk Factors* for access to preventive services, screening and ongoing care

Goal II. Increase utilization of short-term (surrogate) measures and actions (yearly)

- See Figure 6 - Figure 10 in *Chapter 1 Risk Factors, Part I* for blood glucose, HbA1c, eye examination and foot examination.

Goal III. Increase Services and Education in Health Professional Shortage Areas

- See Figure 51 - Figure 53 and Table 1 - Table 2 in *Chapter 4 Resources, Part I* for health professional shortage areas and health professional shortages;
- See Diabetes Programs and Research in *Chapter 4 Resources, Part I* for education programs.

Goal IV. Reduce Morbidity and Disability

- See Figure 14 - Figure 34 in *Chapter 2 Morbidity, Part I* and Figure 60 in *Chapter 1 Burden of Diabetes by County, Part II,* for hospitalizations, length of hospital stay, hospital charges, and complications, as well as geographic distribution
- See Figure 35 - Figure 38 in *Chapter 2 Morbidity, Part I* for gestational diabetes and its impact on outcome of pregnancy.

Goal V. Reduce (Age-Adjusted) Mortality rates

- See Figure 46 - Figure 50 in *Chapter 3 Mortality, Part I,* and Figure 62 *Chapter 1 Burden of Diabetes by County, Part II* for mortality, YPLL, and geographic distribution.

Goal VI. Target High Risk Groups

- See Figure 1 - Figure 4 in *Chapter 1 Risk Factors, Part I* for Race-sex disparities in lifestyles;
- See Figure 5 in *Chapter 1 Risk Factors, Part I* for age disparities in lifestyles;
- See Figure 6, 8, 10 and 11 in *Chapter 1 Risk Factors, Part I* for Race-sex disparities in Risk factors awareness, self-management, and prevention of complications;

- See Figure 14, 20, 26, 27, 28, 29,31, 32, 33, and 34 in *Chapter 2 Morbidity, Part I* for race and sex disparities in hospitalizations, length of hospital stay, hospital charges, and complications;
- See Figure 27, 29, 32, and 34 in *Chapter 2 Morbidity, Part I* for age disparities in hospitalizations, length of hospital stay, hospital charges, and complications;
- See Figure 39 and 44 in *Chapter 2 Morbidity, Part I* for race and sex disparities in ER visits;
- See Figure 40 in *Chapter 2 Morbidity, Part I* for age disparities in ER visits;
- See Figure 47 and 49 in *Chapter 3 Mortality* for race-sex disparities in mortality and YPLL;
- See Figure 48 in *Chapter 3 Mortality* for age disparities in mortality;

Goal VII. Decrease Preventable Hospital Admissions and Charges

- See Figure 14 - Figure 34 in *Chapter 2 Morbidity, Part I* and Figure 60 in *Chapter 1 Burden of Diabetes by County, Part II,* for hospitalizations, length of hospital stay, hospital charges, and complications, as well as geographic distribution

Goal VIII. Decrease Preventable Emergency Room Visits

-See Figure 39 - Figure 45 in *Chapter 2 Morbidity, Part I* and Figure 61 in *Chapter 1 Burden of Diabetes by County, Part II,* for ER visits, charges, and complications, as well as geographic distribution

Goal IX. Improve Statistical Basis for Estimating Prevalence of Diabetes and Diabetes Complications

-See Figure 12 and 13 in *Chapter 2 Morbidity, Part I* and Figure 59 in *Chapter 1 Burden of Diabetes by County, Part II,* for prevalence of diabetes;

See Diabetes Programs and Research in *Chapter 4 Resources, Part I* for surveillance and population-based studies.

Part II
Burden of Diabetes at the County Level

The data on diabetes at a county level are presented in two sections. Chapter 1 presents the geographic distribution of risk factors for diabetes, prevalence, as well as the morbidity, and mortality of diabetes, by county, with maps. Chapter 2 presents data for each of South Carolina's 46 counties. Because of the small number of events and survey respondents at the county level, these analyses can not be performed the same way as those analyses at state level, for example, to stratify by race-sex. Readers are advised to interpret data at the county level carefully for two reasons. First, although the hospital discharge data, ER visits data, and mortality data are enumerated data for every event occurring, the number might be very small, and random fluctuations might lead to misinterpretation of the data. Second, the BRFSS data are drawn from a random sample telephone survey designed for estimate for state-level prevalence. Special efforts have been made to estimate information at the county level from BRFSS by combining data from adjacent areas or data in several years. The estimates for each of the counties are less precise than the statewide estimate.

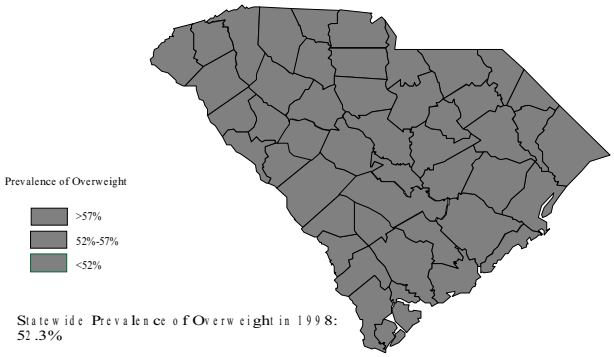
Chapter One
Burden of Diabetes at the County Level

Prevalence of risk factors

Overweight

According to the 1998 BRFSS survey, the statewide prevalence rate of overweight (Body mass index greater than 25) was about 52%. The prevalence varied between 49% to 63% from county to county. The counties in coastal areas had lower prevalence, and three clusters of counties in the Pee Dee, Upper Savannah, and Lower Savannah areas had higher prevalence than the state average.

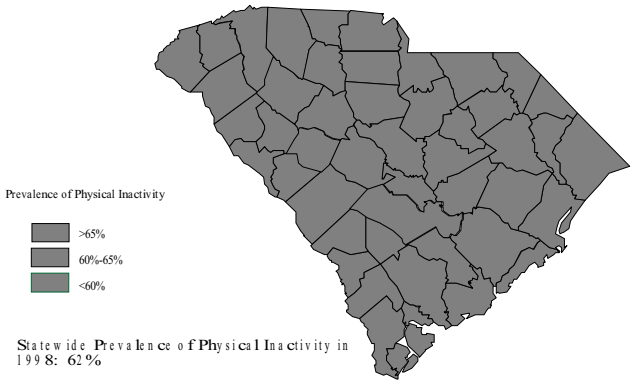
Figure 55. Prevalence of Overweight among Adult South Carolinians, 1998



Physical inactivity

Approximately 62% of adults were not physically active in 1998. County prevalence rates varied between 58% and 68%. Figure 56 shows a similar pattern of geographic distribution of physical inactivity (Figure 55), with these exceptions: several counties in the Midlands area, several counties in the coastal area had lower prevalence, and three clusters of counties had higher prevalence than the state average.

Figure 56. Prevalence of Physical Inactivity among Adult South Carolinians, 1998



5-a-day

The state average prevalence rate of consuming fruits and vegetables less than 5-a-day was 80%. The estimates of county rates were very close to the state average and ranged from 72% to 85%. Thirteen counties in the middle and eastern parts of the state had a slightly lower prevalence rate and three counties in other areas had a higher prevalence rate than the state average.

Cigarette Smoking

Cigarette smoking is a risk factor for diabetes-related complications, such as heart disease and lower extremity amputation. The state average prevalence rate of current cigarette smoking among adults was approximately 25% in 1998. There were 13 counties, predominately in the Pee Dee area and at the state line junction with North Carolina with higher prevalence rates.

Figure 57. Prevalence of Consuming Fruits and Vegetables Less Than 5-A-Day among Adult South Carolinians, 1998

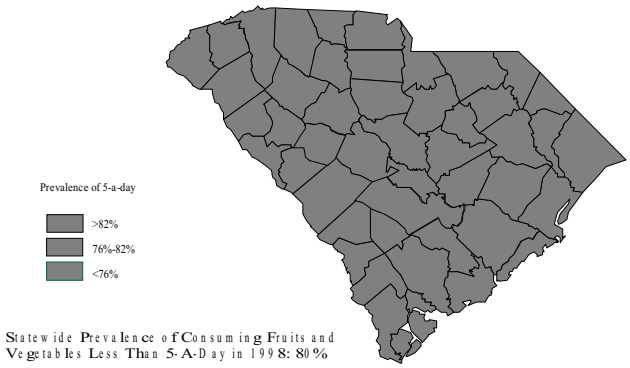
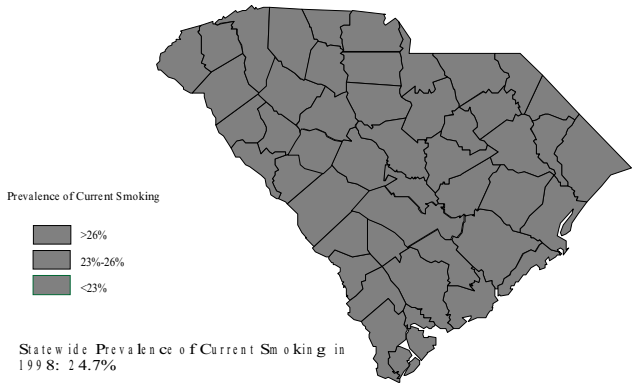


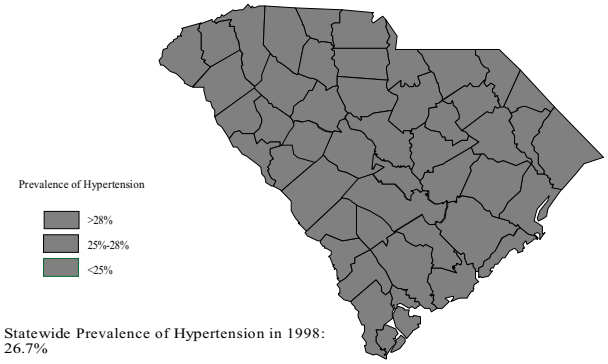
Figure 58. Prevalence of Current Cigarette Smoking among Adult South Carolinians, 1998



Hypertension

Hypertension is a risk factor of diabetes complications, such as heart disease and kidney disease. The statewide prevalence of self reported hypertension was 26.7% among adult South Carolinians in 1997. Ten counties had a prevalence of hypertension greater than the state average. Six of these counties are in the PeeDee area (Figure 59).

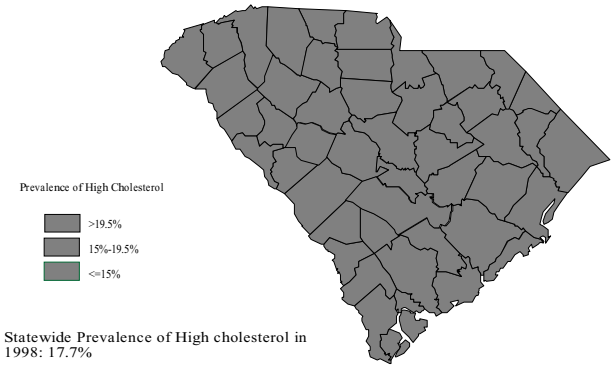
Figure 59. Prevalence of Hypertension among Adult South Carolinians, 1997



High Cholesterol

High cholesterol is another risk factor for diabetes-related complications and diseases. In 1997, approximately 17.7% of adult South Carolinians were told that they had high cholesterol. Eight counties in the Upstate region and one county in the Midlands had a prevalence of high cholesterol greater than the state average. Twelve counties in two clusters had a prevalence lower than the state average (Figure 60).

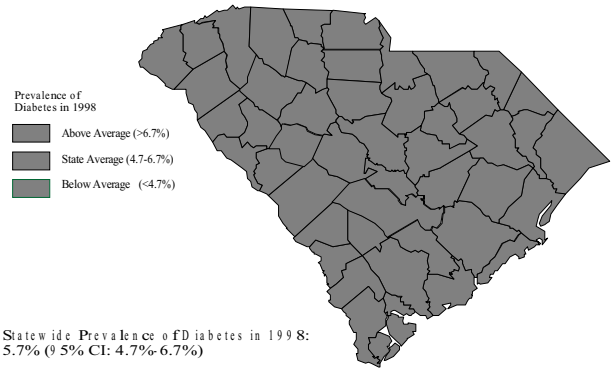
Figure 60. Prevalence of High Cholesterol among Adult South Carolinians, 1997



Prevalence of diabetes

The statewide prevalence of diabetes was 5.7% in 1998. There were 7 counties with prevalence greater than state average. Most of these counties are in the north-eastern part of the state. Fourteen counties that had a prevalence less than the state average are in the western portion of the state (Figure 61). A cluster of counties with high prevalence of diabetes in the PeeDee area also had high prevalence of overweight, physical inactivity, and high rate of hospitalization, ER visits and mortality rates.

Figure 61. Prevalence of Diabetes among Adult South Carolinians, 1998



Rates of Hospitalization and ER Visit

Figure 62 shows clusters of high rates of hospitalization in eastern portions of the state for 1997. On the other hand, the rate of most of counties in the west was relatively lower. Figure 63 reveals a similar pattern of rates of ER visits — most counties in the eastern part of the state had higher rate than counties in the other areas.

Mortality Rates

Thirteen counties had a mortality rate greater than the state average in 1997. Most of the counties that had higher mortality rates are located in clusters in the Pee Dee and Low Country area (Figure 64). This is a pattern consistent with that for risk factors, prevalence of diabetes, hospitalizations, and ER visits, especially in a cluster of counties in the Pee Dee I district and Waccamaw district.

Figure 62. Rate of Hospitalizations for Diabetes, SC, 1997

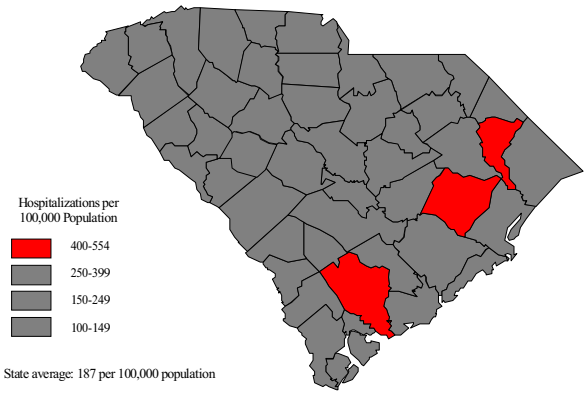


Figure 64. Age Adjusted Mortality of Diabetes, South Carolina, 1997

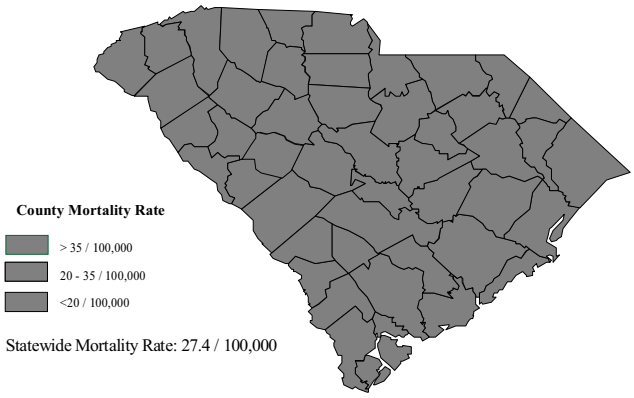
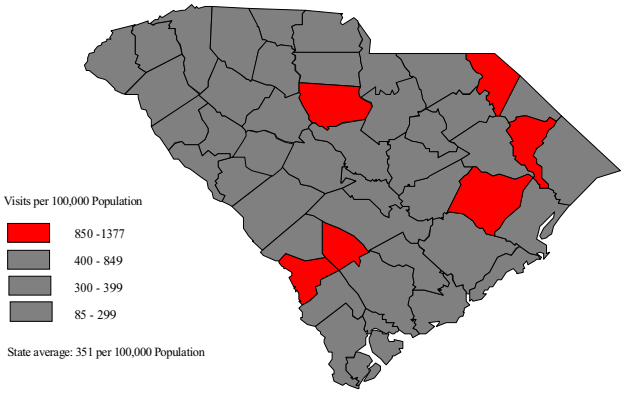


Figure 63. Rate of ER Visits for Diabetes, SC, 1997



Chapter Two
County-Specific Burden of Diabetes

A concise version of the burden of diabetes at the county level, which includes mortality, hospitalizations, complications, emergency room visits, risk factors for diabetes, and resources for diabetes prevention and education, is available for each of the following counties.

For the report of Burden of Diabetes for one or more of the following counties, please contact:

Yaw Boateng, MS, MPH, RD
Diabetes Control Program
Division of Community Health
SC DHEC
2600 Bull Street, PO Box 101106,
Columbia, SC 29201
(803) 898-0537

1. ABBEVILLE
2. AIKEN
3. ALLENDALE
4. ANDERSON
5. BAMBERG
6. BARNWELL
7. BEAUFORT
8. BERKELEY
9. CALHOUN
10. CHARLESTON
11. CHEROKEE
12. CHESTER
13. CHESTERFIELD
14. CLARENDON
15. COLLETON
16. DARLINGTON
17. DILLON
18. DORCHESTER
19. EDGEFIELD
20. FAIRFIELD
21. FLORENCE
22. GEORGETOWN
23. GREENVILLE
24. GREENWOOD
25. HAMPTON
26. HORRY
27. JASPER
28. KERSHAW
29. LANCASTER
30. LAURENS
31. LEE
32. LEXINGTON
33. MCCORMICK
34. MARION
35. MARLBORO
36. NEWBERRY
37. OCONEE
38. ORANGEBURG
39. PICKENS
40. RICHLAND
41. SALUDA
42. SPARTANBURG
43. SUMTER
44. UNION
45. WILLIAMSBURG
46. YORK