

Chapter 1 Hospitalizations

Introduction

Hospital discharge data are an important source of information for monitoring morbidity trends of diabetes and assessing the burden of the disease on the health care system. This chapter gives an overview on hospital discharges in Colorado where diabetes was listed as a discharge diagnosis. It presents numbers of hospital discharge records and hospital discharge rates for diabetes by age, gender, county, and region between 1993 and 1995. Numbers of hospital discharge records are presented for diabetes by race/ethnicity. Descriptive statistics are presented on length-of-stay, age at discharge, and discharge disposition. Sections of this study will compare data for 1993–1995 to an earlier study of data from 1989–1991.¹

Methods

Hospital discharge data for 1993–1995 were obtained from the Colorado Health and Hospital Association (CHA). In 1985, CHA established its DATABANK program to collect utilization and financial data from its member hospitals. Data are reported and verified monthly by participating hospitals and re-verified at the end of the year. Virtually all private and public general service hospitals in Colorado participate in the DATABANK program, as do several of the State's rehabilitation, psychiatric and specialty hospitals. CHA does not collect data from military hospitals, federal hospitals (e.g., Veterans' Administration) or nursing homes.

CHA released hospital discharge data files quarterly through 1996. Since then, CHA has transitioned to monthly releases of data to the public. Health professionals use the data for health planning, cost analysis, research, and other purposes. The hospital discharge data includes all cases in which care at the hospital was completed, including death and cases in which the patient was transferred to another facility. Each data record on file represents a hospital discharge and contains various information on the patient (e.g., birth date, gender, zip code of residence), the hospitalization (e.g., admission and discharge dates, discharge disposition, expected payment source and charges), and discharging hospital (e.g., hospital identifier). Personal identifiers (e.g., name, address, social security number) and information on socioeconomic status (e.g., income level, education level) are not included on data records available to the program. Because discharge records prior to 1993 did not contain information on the patient's race/ethnicity, no temporal trends can be analyzed on race. As of 1993, each record lists up to 15 discharge diagnoses and 15 procedures coded by rules of the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)². Prior to 1993 only five discharge diagnoses and 5 procedures were coded. The comparisons of rates between 1989–1991 and 1993–1995 are based upon 5 diagnoses. Thus, 1993-1995 rates in the temporal sections should be used for comparison purposes only.

The 1993-1995 hospital discharge files were used to examine discharge records where diabetes was listed as **any diagnosis** or as the **primary**

diagnosis. Analysis was restricted to Colorado residents, using zip code of residence as the selection criterion. Diabetes was identified as a discharge diagnosis if it was coded to ICD-9-CM rubric 250 (see Appendix 4). A data record was counted only once in the numbers and discharge rates, even if it had more than one diabetes diagnosis coded on it (e.g., ICD-9-CM 250.7 and ICD-9-CM 250.9 coded on the same record).

The Colorado discharge rates for 1993-1995 were computed with two different types of numerators. The first type was the yearly count of hospital discharge records. The second type of numerator was the yearly number of hospitalized persons. Thus, persons who had multiple hospital discharges with diabetes as any listed diagnosis (or as the primary diagnosis, depending on the analysis) in a given calendar year were counted only once for that year. Because the discharge records did not contain personal identifiers, a procedure was developed to uniquely identify patients in each calendar year of data using the hospital identifier and patient's birth date, gender, and zip code of residence. While the procedure does not allow one to identify persons uniquely with 100% assurance, it may provide a useful estimate of the number of persons who had at least one hospitalization in a given year where diabetes was mentioned.

Numbers and rates of discharges were calculated both for diabetes listed as **any diagnosis** and diabetes listed as the **primary diagnosis** for each year between 1993 and 1995. These data also were summarized as an average of the three years. The rates were presented by age, gender, and county of residence (based on zip code of residence) and were expressed per 1,000 Colorado population with diabetes and per 10,000 general population of Colorado. The denominators for the 1993-1995 rates per 1,000 Colorado population with diabetes were calculated using the methods described in Appendix 1. Due to lack of county level race/ethnicity population data for the study years which is required to estimate the diabetic population, county level rates are presented only per 10,000 general population. The Demography Section, Colorado Division of Local Government, provided the denominators for discharge rates per 10,000 Colorado residents.

Hospital discharge rates were age-adjusted using the direct method of standardization and 95% confidence intervals were calculated for the age-adjusted rates.³ The estimated 1980 U.S. population with diabetes was the standard population used to age-adjust the discharge rates per 1,000 diabetic residents of Colorado. The 1980 U.S. resident population was the standard to age-adjust rates per 10,000 general resident population of Colorado. Both of these two national populations were used as standard populations in the Centers for Disease Control and Prevention report, Diabetes Surveillance, 1997⁴ and the previous Colorado Department of Public Health and Environment report¹.

This chapter presents descriptive statistics on age at discharge, length of stay, and discharge disposition for hospitalizations with diabetes coded as **any diagnosis** or as the **primary diagnosis**. Length of stay, determined from dates of admission and discharge, was computed for all 1993-1995 hospital discharge records that listed diabetes as **any diagnosis** or as the **primary diagnosis**. The distribution of the discharge disposition was determined using all hospital

discharge records in 1993-1995 that listed diabetes as **any diagnosis** or as the **primary diagnosis**.

Since 1993, Colorado hospital discharge records have included information on ethnicity of patients. Race unknown and race other entries comprise 22% of all records for 1993-1995. Until more refined distinction among the race categories is done, only cursory analysis are possible. On the national level, the National Health Data Survey reported a race ethnicity of “race unknown” or “race not specified” rate of 20% in 1990⁵.

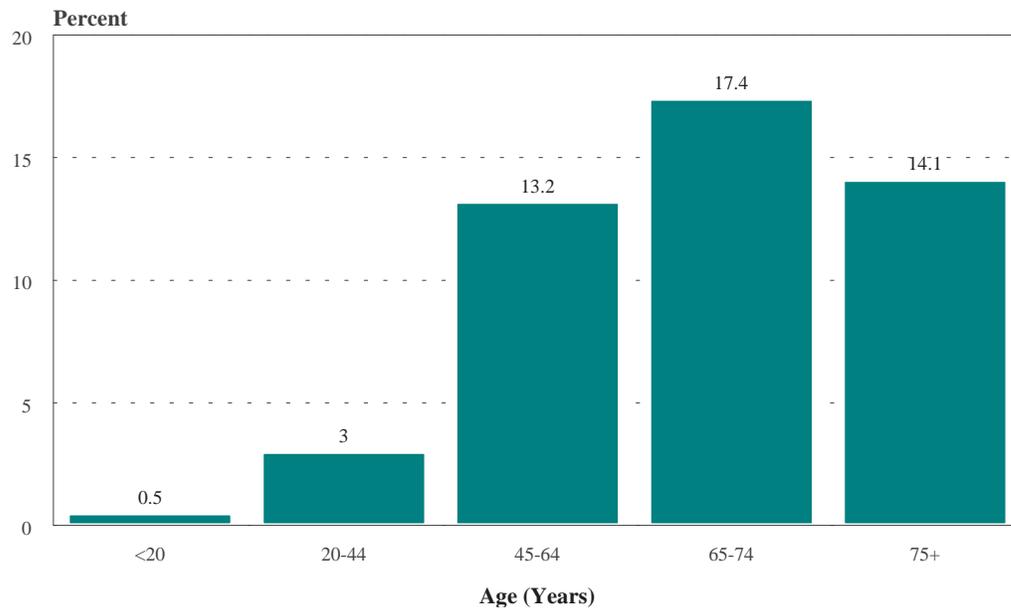
Results

A. Number of Hospital Discharge Records

1. Diabetes as any Listed Diagnosis

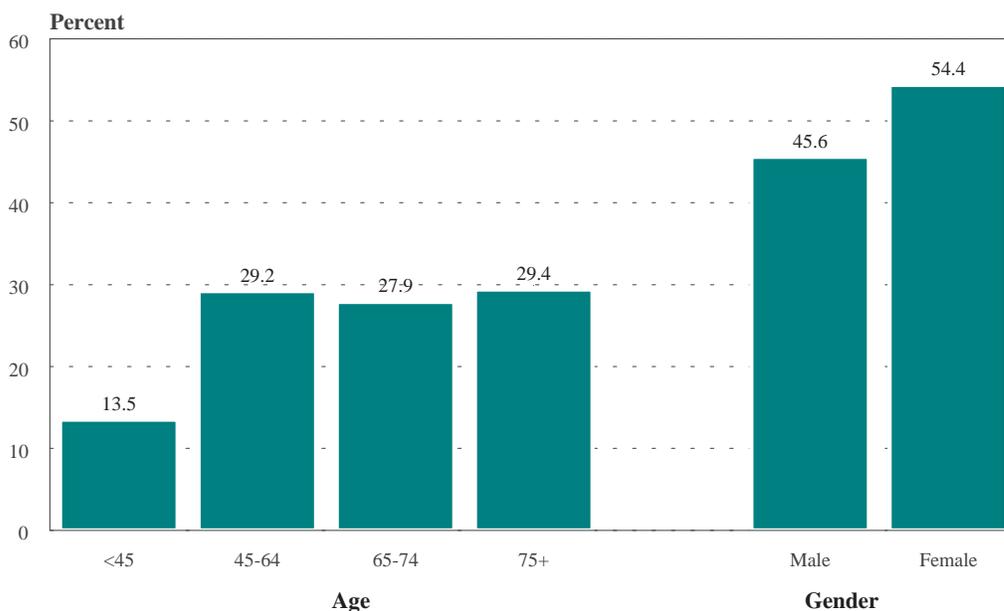
Between 1993 and 1995, the Colorado Health and Hospital Association collected 1,099,454 hospital discharge records for Colorado residents (yearly average, 366,485 records). Diabetes was coded as **any discharge diagnosis** on 7.7% (n=84,661), of the records. For ages <20 years, one percent of all discharge records mentioned a diabetes diagnosis. A diabetes diagnosis was listed on 17% of discharge records for ages 65-74 years (Figure 1a).

Figure 1a. Percent of all Hospital Discharge Records that listed Diabetes as Any Diagnosis by Age: Colorado Residents, 1993-1995.



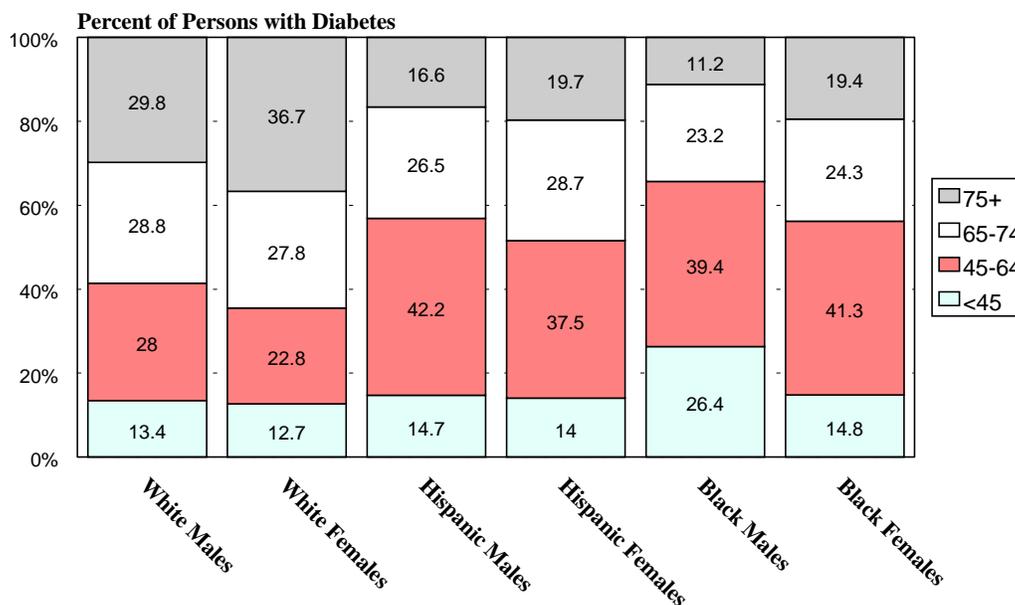
The age and gender distribution of the 84,661 (three-year annual average, 28,220) records that mentioned **any diabetes diagnosis** is shown in Figure 1b. All but 14% of hospitalizations in 1993-1995 occurred in persons aged 45 years or older (Figure 1b; Table 1.1). The percent of hospitalizations varied slightly among the three oldest age groups (28%-29%). A smaller percent of the hospitalizations were for males than females (46% vs. 54%, respectively). (Figure 1b, Table 1.1)

Figure 1b. Percent of all Hospital Discharge Records that Listed Diabetes as Any Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



Sixty percent of discharge records with diabetes as any listed diagnosis were among the white population, 13% among the Hispanic population and 5% among the black population. As previously mentioned, 22% were categorized as race unknown and race other. Both the percentages among white females and white males increased with age. In contrast, the number of discharges among the Hispanic population and the black population are highest among the 45-64 age group and trended down in subsequent age groups. (Figure 1c, Table 1.2)

Figure 1c. Percent of all Hospital Discharge Records that Listed Diabetes as Any Diagnosis, by Age, Race/Ethnicity, and Gender: Colorado Residents, 1993-1995 Average.

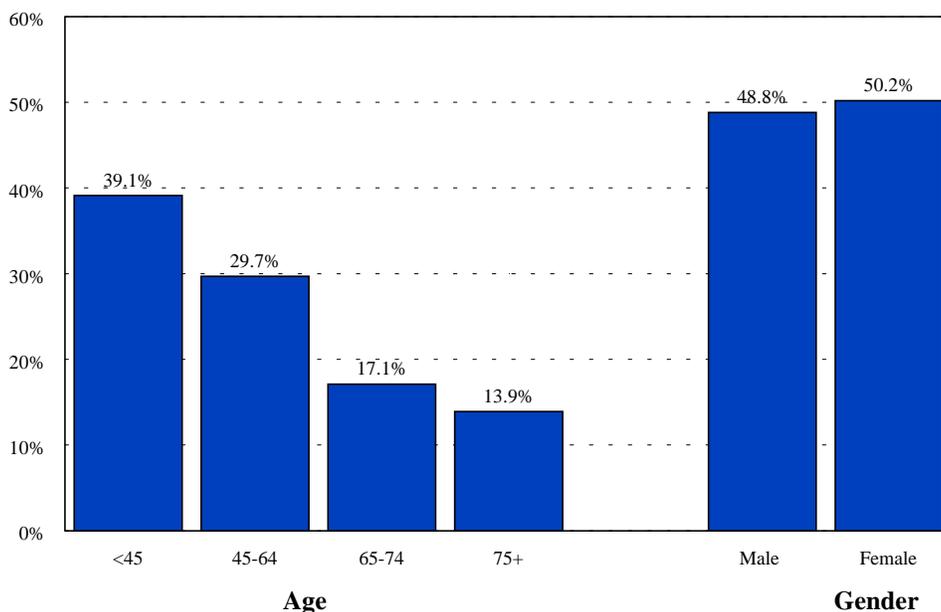


2. Diabetes as Primary Diagnosis Diseases of the cardiovascular system (ICD-9-CM 390-448) and diabetes were the most commonly coded primary diagnoses among the 84,661 records with **any diabetes coded as any diagnosis** (27% [n=23,193] and 11% [n=9,531], respectively) (Table 1.3). Among the 9,531 hospital discharge records that listed diabetes as the **primary diagnosis**, diabetic ketoacidosis (ICD-9-CM 250.1) and diabetes with other specified manifestations (ICD-9-CM 250.8) were the most frequently coded primary diagnoses (30% and 15%, respectively) (Table 1.4).

Figure 1d shows the age and gender distribution for the 9,531 hospitalizations in 1993-1995 with diabetes as the **primary diagnosis** (Table 1.5). It indicates that the percent of discharge records listing diabetes as the **primary diagnosis** was nearly equal among males and females. The age distribution of the hospitalizations with diabetes as the **primary diagnosis** differed greatly from that for diabetes as **any listed diagnosis** (Figures 1a,b,d; Tables 1.1, 1.5). Over 39% (n=3,745; three-year average n=1,248) of the discharge records with diabetes as the **primary diagnosis** were among persons <45 years old (Figure 1d; Table 1.5). In comparison, only 14% of the hospitalizations with any mention of diabetes were among persons aged <45 years (Figure 1b; Table 1.1). These findings suggest that while persons <45 years old comprise a small percent of the hospitalizations with any mention of diabetes, when diabetes is mentioned as a discharge diagnosis, it is more likely

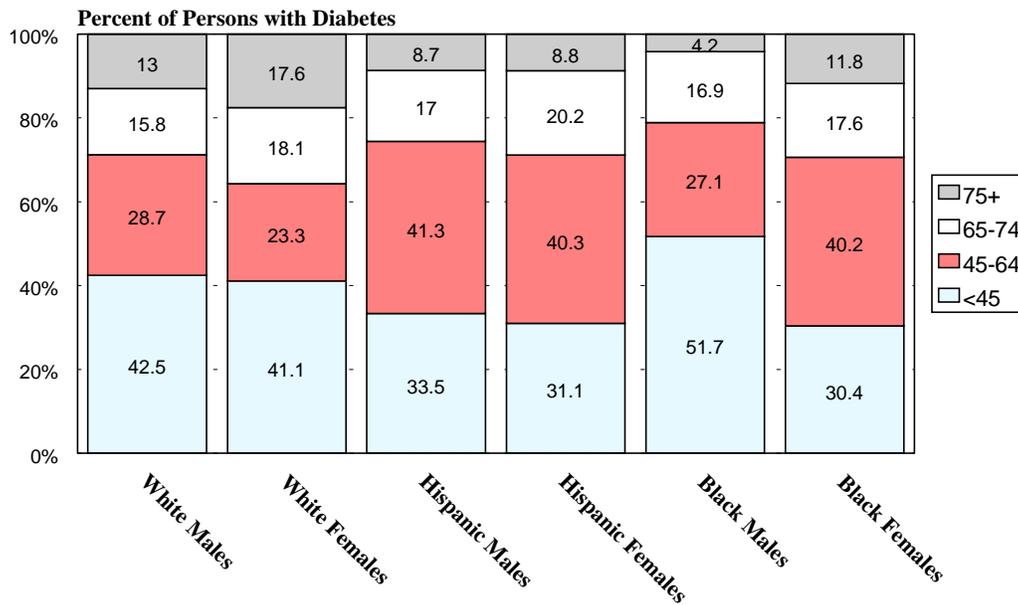
to be the primary diagnosis in that age group than in the older age groups (Tables 1.1, 1.5). Co-morbid conditions, such as cardiovascular disease, are more likely to be coded as the primary diagnosis in diabetic persons aged 45 years or older (data not shown).

Figure 1d. Percent of all Hospital Discharge Records that listed Diabetes as Primary Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



Fifty-eight percent of discharge records with diabetes as the primary diagnosis were among the white population, 14% among the Hispanic population and 7% among the black population. The race distribution for diabetes as the primary diagnosis shows black males have the highest percentage distribution (52%) for the <45 years of age group and the lowest (4%) in the 75+ years of age group. White men parallel this distribution, but range from 43% in the <45 years of age group to 13% in the 75+ years of age group. White women descend from 41% in the <45 group to 23% in the 45-64, then stabilize in the 65-74 and 75+ groups at 18%. Hispanic males, Hispanic females and black females parallel each other, as they increase from about 31% in the <45 years of age group to about 40% in the 45-64 years of age group, then decrease to 17-20% and 9-12% in the 65-74 and 75+ years of age groups, respectively (Figure 1e, Table 1.6).

Figure 1e. Percent of Records for Diabetes as Primary Diagnosis, by Age, Race/Ethnicity, and Gender: Colorado Residents, 1993-1995.



B. Three-Year Average Annual Hospital Discharge Rates per 1,000 Colorado Residents with Diabetes, 1993-1995.

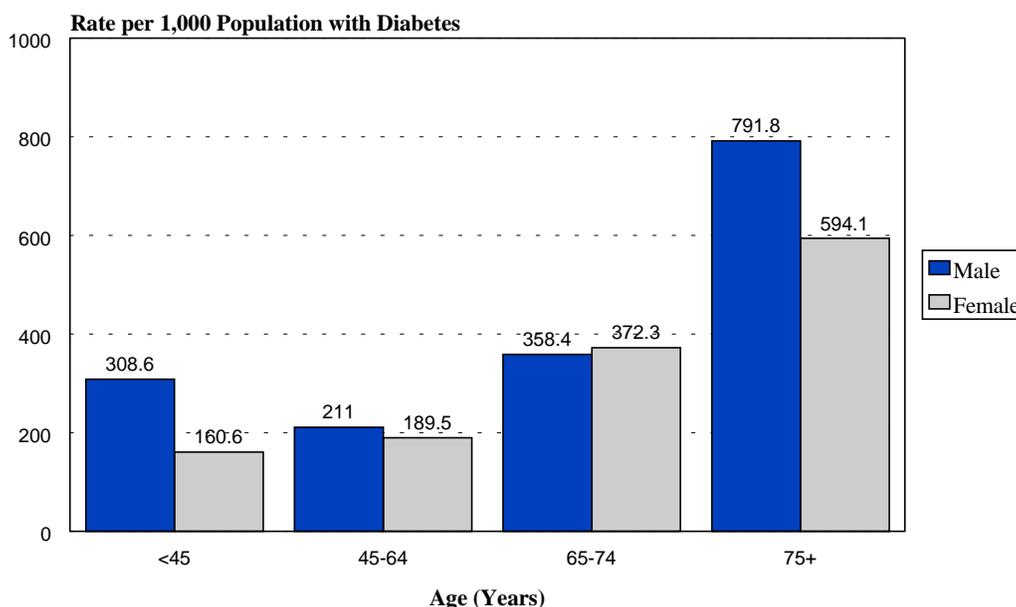
1. Diabetes as Any Listed Diagnosis

The Colorado three-year average annual age-adjusted hospital discharge rate in 1993–1995 for diabetes as **any diagnosis** was 314 per 1,000 persons with diabetes (Table 1.1). This is about 26% lower than the age-adjusted discharge rate reported for the U.S. in 1994 (427 per 1,000).⁴

In Colorado, the 1993-1995 average annual hospital discharge age-specific rate per 1,000 diabetic population for diabetes listed as **any diagnosis** decreased slightly from ages <45 to 45-64 years (208 and 200 per 1,000 diabetic population, respectively). The rate almost doubled between ages 45-64 and ages 65-74 (366 per 1,000) and again almost doubled in the 75+ years category (662 per 1,000) (Table 1.1). In comparison, the 1994 national discharge rate for diabetes listed as **any diagnosis** increased slightly between ages <45 to 45-64 years, from 283 to 322 per 1,000 diabetic population, and then climbed to 699 per 1,000 diabetic persons aged 75+.⁴ Overall, the 1993-1995 discharge rates for Colorado were 13–29% lower than national discharge rates.

Figure 1f shows the distribution of the three-year average annual age-specific hospital discharge rates by gender for diabetes listed as **any diagnosis** (Table 1.1). Diabetic males had a higher age-adjusted hospital discharge rate of diabetes compared with diabetic females (353 vs. 293 per 1,000, respectively). This gender difference was statistically significant (Table 1.1). Nationally, females had a slightly higher age-adjusted hospital discharge rate than males (433 vs. 422, respectively.)

Figure 1f. Hospital Discharge Age-Specific Rates for Diabetes Listed as Any Diagnosis, by Age, and Gender: Colorado Residents with Diabetes, 1993-1995.



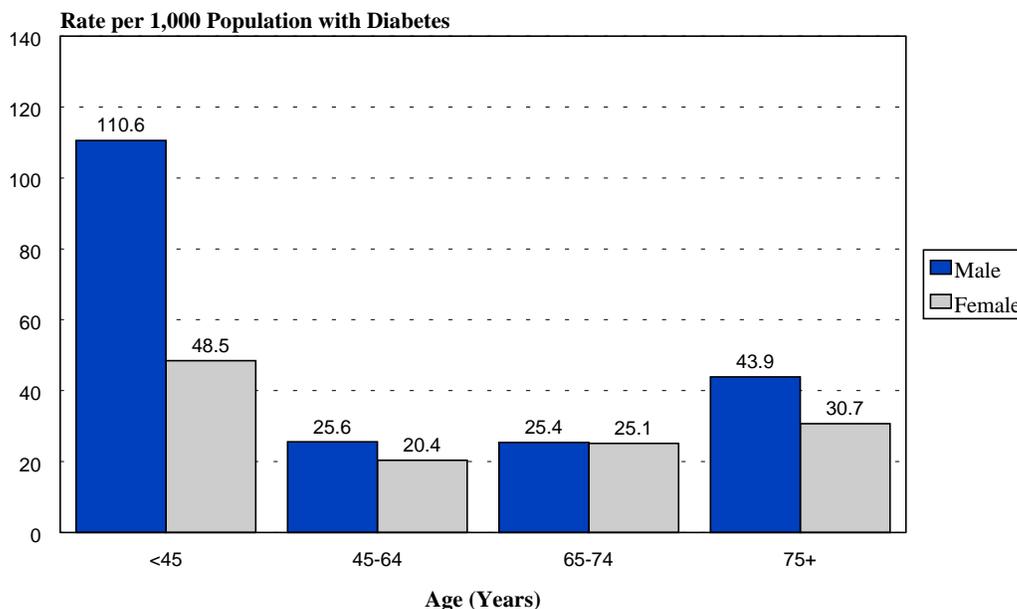
Discharge rates for diabetic females increased slightly between ages <45 years and 45–64 years (161 and 190 per 1,000, respectively); a larger increase in the discharge rates was observed between the 45–64 and 65–74 and the 75+ years of age groups (190, 372 and 594 per 1,000 respectively) (Figure 1f; Table 1.1). The age-specific discharge rates per 1,000 population with diabetes suggested a J-shaped distribution for diabetic males (Figure 1f; Table 1.1). Diabetic males had a higher discharge rate for diabetes listed as **any diagnosis** compared with diabetic females in the <45 years and 75+ years age groups (Figure 1f; Table 1.1). However, discharge rates were comparable for both sexes in the 45-64 and 65-74 years age groups.

2. Diabetes as Primary Diagnosis

In Colorado, the distribution of the 1993-1995 average annual age-specific rates for diabetes as the **primary diagnosis** per 1,000 diabetic population indicated that the discharge rates were substantially higher in diabetic persons aged <45 years (68 per 1,000) compared with the other age groups (Table 1.5). The 1994 national discharge rates for diabetes as the **primary diagnosis** showed a similar pattern by age, although Colorado average annual age-specific discharge rates were 34–55% lower than the 1994 national rates.⁴

Figure 1g shows the 1993-1995 average annual age-specific Colorado hospital discharge rates by gender for diabetes listed as the **primary diagnosis** per 1,000 diabetic population. The age-specific discharge rates for diabetic males suggested a backward J-shaped distribution (Figure 1g; Table 1.5). The discharge rate for diabetes as the **primary diagnosis** was 2.3 times higher in diabetic males <45 years compared with diabetic females aged <45 years (111 vs. 49 per 1,000, respectively). However, the discharge rates were fairly comparable for diabetic males and diabetic females in the 45-64, 65-74, and 75+ years age groups.

Figure 1g. Hospital Discharge Age-Specific Rate for Diabetes Listed as Primary Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993-1995.



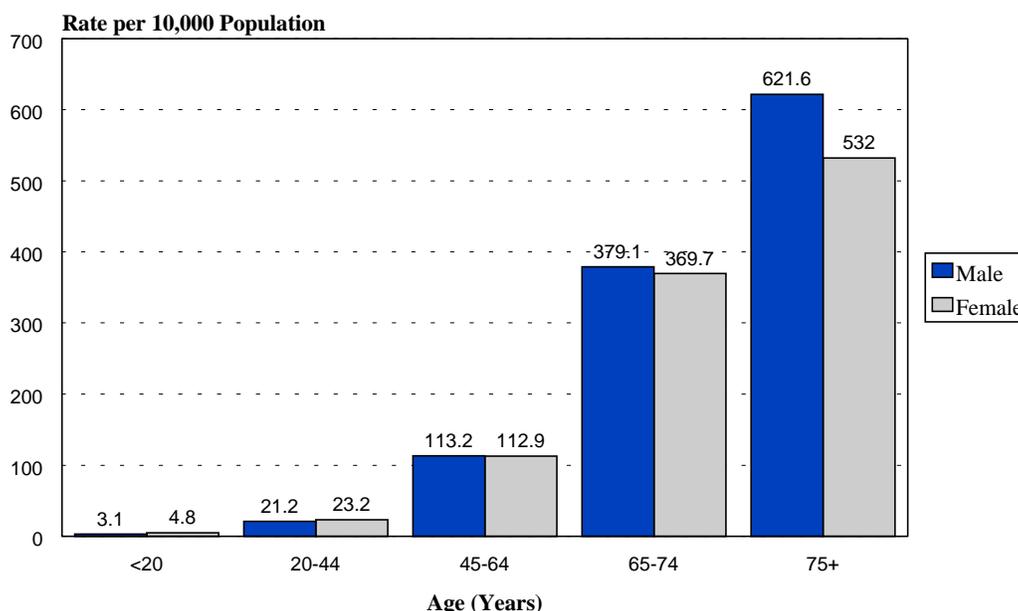
When the discharge rates were age-adjusted, the average annual hospital discharge rate for diabetes as **primary diagnosis** in 1993-1995 was 33 per 1,000 persons with diabetes (Table 1.5), compared to the national age-adjusted rate of 61 per 1,000 in 1994⁴. Colorado males with diabetes had a higher age-adjusted discharge rate for diabetes as the **primary diagnosis** than their female counterparts (43 vs. 28 per 1,000, respectively) (Table 1.5). This gender difference was statistically significant (Table 1.5).

C. Three-Year Average Annual Hospital Discharge Rates per 10,000 Population of Colorado, 1993-1995.

1. Diabetes as Any Listed Diagnosis

A different distribution in age-specific discharge rates for diabetes as **any listed diagnosis** is shown when Colorado's general population served as the reference population rather than the state's diabetic population. With the general population of Colorado as the reference population, the three-year average annual hospital discharge rates increased dramatically with age (Table 1.7). The discharge rate jumped from 4 per 10,000 Coloradans aged <20 years to 565 per 10,000 Coloradans aged 75+ years. Males and females had similar age-specific discharge rates per 10,000 general population (Figure 1h; Table 1.7).

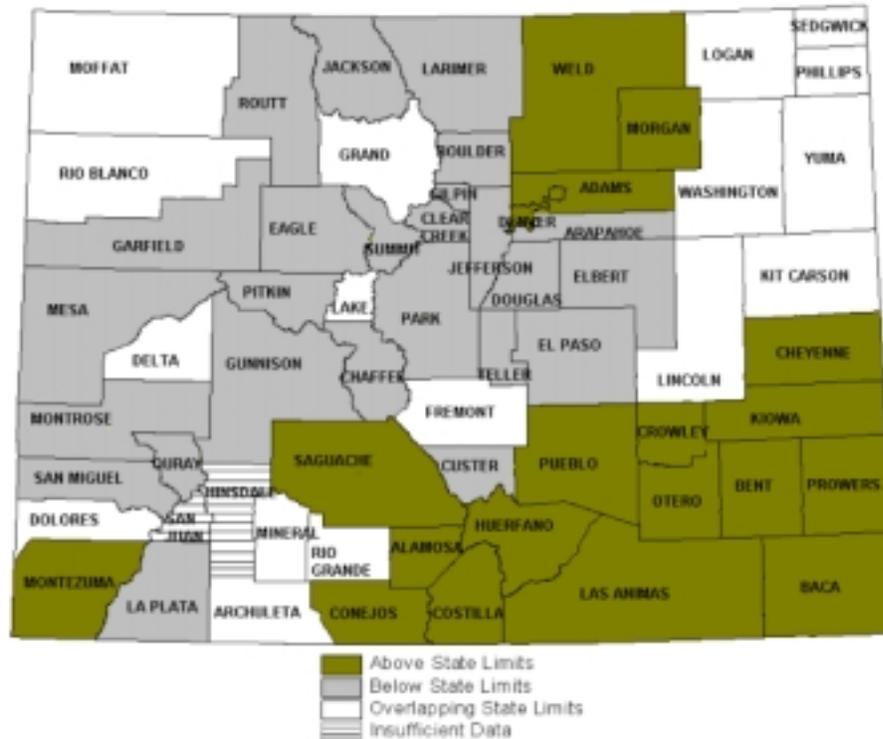
Figure 1h. Hospital Discharge Rates for Diabetes Listed as Any Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



The three-year average annual age-adjusted hospital discharge rate for diabetes listed as **any listed diagnosis** in 1993-1995 was 82 per 10,000 general population of Colorado (Table 1.7), which is 34% lower than the age-adjusted discharge rate reported from 1994 national surveillance data⁴. There was little difference (although it did achieve statistical significance, due to large sample size) in the Colorado discharge rates by gender (85 per 10,000 males vs. 81 per 10,000 females, respectively) (Table 1.7). The reasons why Colorado has a much lower discharge rate for **any mention** of diabetes are unknown. However, the lower rates are consistent with other published data⁴⁻⁶, which indicate that hospital discharge rates in Colorado and the West are generally lower than the rest of the U.S. Differences in medical and reimbursement practices, general health status or practice of healthy lifestyle habits also are potential factors that may explain the lower discharge rates for diabetes listed as **any diagnosis** in Colorado compared with the U.S.

Map 1a indicates that 19 counties had a significantly higher age-adjusted discharge rate for diabetes as **any diagnosis** per 10,000 general population compared to the state rate—Adams, Alamosa, Baca, Bent, Cheyenne, Conejos, Costilla, Crowley, Denver, Huerfano, Kiowa, Las Animas, Montezuma, Morgan, Otero, Prowers, Pueblo, Saguache, and Weld counties (Table 1.8). There were 25 counties with age-adjusted discharge rates significantly lower than the state rate and were located primarily in central, north-central, and west-central Colorado (Map 1a; Table 1.8).

Map 1a. Age-Adjusted Hospital Discharge Rate for Diabetes Listed as Any Diagnosis, by County: Colorado Residents, 1993-1995.

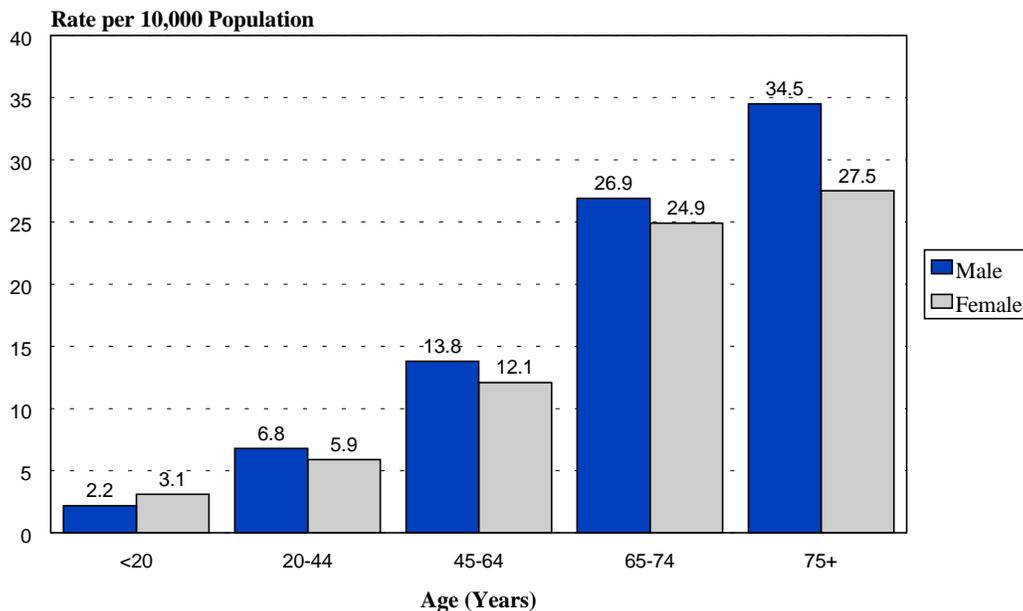


NOTE: Rates are per 10,000 general population and are age-adjusted to the 1980 U.S. standard population.

2. Diabetes Listed as the Primary Diagnosis

The 1993-1995 average annual hospital discharge rate for diabetes as the primary diagnosis per 10,000 population of Colorado increased with age, from 3 per 10,000 residents aged <20 years to 30 per 10,000 residents aged 75+ years (Table 1.9). Males and females had comparable age-specific discharge rates (Figure 1i; Table 1.9).

Figure 1i. Age Specific Hospital Discharge Rate for Diabetes Listed as Primary Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



In Colorado, the three-year average annual age-adjusted discharge rate in 1993-1995 for diabetes as the **primary diagnosis** was 8.9 per 10,000 general population (Table 1.9), which was 52% lower than the same rate for the U.S. in 1994 (18.4 per 10,000)⁴. Colorado females had only a slightly lower age-adjusted rate for diabetes as the **primary diagnosis** than males (8.5 vs. 9.3 per 10,000) (Table 1.9). This difference was not statistically significant.

Map 1b shows that six counties—Adams, Baca, Conejos, Denver, Kiowa, and Pueblo—had a significantly higher discharge rate for diabetes as the **primary diagnosis** per 10,000 general population compared to the state (Table 1.10). Nine counties—Arapahoe, Boulder, Douglas, Eagle, Elbert, Jefferson, Larimer, Park, and Summit—had a significantly lower discharge rate for diabetes as the **primary diagnosis** than the state rate (Map 1b; Table 1.10).

Map 1b. Age-Adjusted Hospital Discharge Rate for Diabetes Listed as Primary Diagnosis, by County: Colorado Residents, 1993-1995.



NOTE: Rates are per 10,000 general population and are age-adjusted to the 1980 U.S. standard population.

Rates for diabetes listed as any diagnosis are much higher than those for diabetes listed as the primary diagnosis. Comparison of the age-specific discharge rates per 10,000 population for diabetes listed as **any diagnosis** to those for diabetes listed as the **primary diagnosis** shows that both types of rates were fairly comparable for persons aged <20 years (4 vs. 3 per 10,000 general population, respectively) but diverged considerably as age increased—for example, at ages 75+ years, the discharge rate for diabetes as **any diagnosis** was 565 per 10,000 population vs. 30 per 10,000 for diabetes as the **primary diagnosis** (Tables 1.7, 1.9). Comparison of the age specific discharge rates per 1,000 Colorado residents with diabetes listed as any diagnosis to those for diabetes listed as the primary diagnosis shows the rates are higher among the <45 year age group for the primary diagnosis and higher for the 75+ years age group for any diagnosis. As mentioned earlier in this chapter, the main

reason for this is that diabetes was much more frequently coded as the **primary diagnosis** in the younger than the older groups.

D. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Diabetes as Any Listed Diagnosis or as the Primary Diagnosis, 1993-1995.

Tables 1.11–1.14 provide numbers and rates of Coloradans with at least one hospital discharge record in a given year during 1993-1995 that listed diabetes as **any diagnosis** or as the **primary diagnosis**. The tables present the Colorado discharge rates per 1,000 population with diabetes (Tables 1.11, 1.12) and per 10,000 general population of Colorado (Tables 1.13, 1.14).

Between 1993 and 1995, an average of 17,947 Coloradans each year had 28,220 hospitalizations with **any mention** of diabetes, or about 1.6 hospitalizations per person (Tables 1.1, 1.11). Thus, about 36% of the hospitalizations in a given year for 1993-1995 that mentioned diabetes were re-admissions.

An estimated 93,652 Colorado residents had diagnosed diabetes in 1994. During the same year, an estimated 17,698 residents with diabetes were hospitalized (Table 1.11). Thus, about 19% (17,698/93,652) of the estimated Colorado population with diabetes was hospitalized at least once in 1994. Although this chapter does not compare hospital discharge rates for persons with diabetes to the general or non-diabetic population, other studies indicate that the hospitalization rate for adults with diabetes is three times greater than that for adults without diabetes, with the difference in the rates being even greater in children and young adults⁶.

E. Age at Discharge

In Colorado, the average age at discharge for patients with a hospitalization in 1993-1995 where **any diabetes diagnosis** was mentioned was 63.8 years (median, 67.0 years). On average, females were discharged at age 64.6 years vs. 62.8 years for males.

When diabetes was coded as the **primary diagnosis** on the discharge record, the average age at discharge was 51.2 years (median, 53.0 years). On average, females were slightly older than males at the time of discharge (52.4 years vs. 49.9 years, respectively).

F. Length of Stay

During 1993-1995, the average length of stay for a hospitalization with **any mention** of diabetes was 6.2 days (median, 4.0 days). If diabetes was listed as the **primary diagnosis**, the average length of stay was slightly less—5.3 days (median, 3.0 days). Males and females had comparable average lengths of stay for discharge records with **any mention** of diabetes (6.1 vs. 6.3 days, respectively) and with diabetes coded as the **primary diagnosis** (5.2 vs. 5.4 days, respectively).

G. Discharge Disposition

Tables 1.15 and 1.16 show the percent distribution of the discharge disposition by age for 1993-1995 hospital discharge records where diabetes was listed as **any diagnosis** or the **primary diagnosis**. The tables indicate that the discharge disposition of "died" or transferred to any other type of facility was coded more frequently with increasing age. A routine discharge to home or self-care was less common with increasing age.

H. Expected Cost of Hospitalization

Cost of hospitalizations with diabetes as any listed diagnosis in 1995 had a mean of \$13,125 per discharge; median of \$7,756, minimum \$76, and maximum of \$674,882. For diabetes as primary diagnosis, the mean was \$10,606, median \$5,884, minimum \$76, and maximum \$312,315.

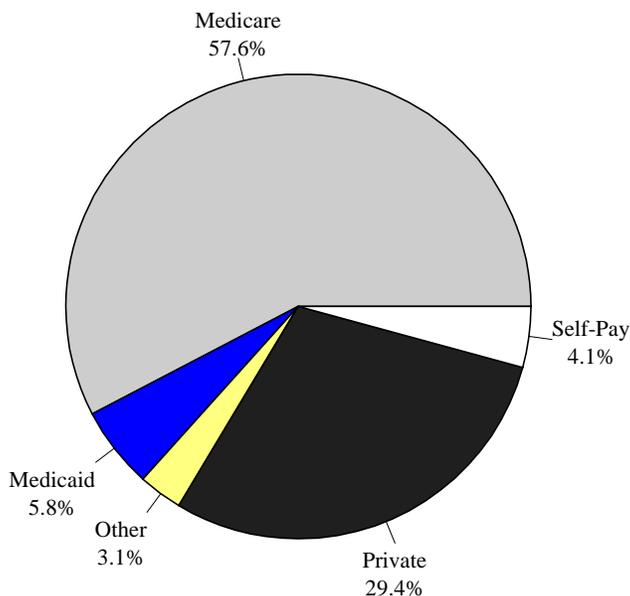
It should be noted that the expected cost of hospitalization refers to the amount that the hospital expects to be reimbursed at the time of discharge, not necessarily how much they actually receive.

I. Expected Source of Payment

In 1995, over half (58%) of the discharge records list the expected source of payment as Medicare. Health Maintenance Organizations account for 20% of the expected sources of payment and private insurance accounts for 9% (Table 1.17, Figure 1j).

It should be noted that the expected source of payment refers to the source that the hospital expects at the time of discharge, not necessarily the source from which the hospital is actually paid.

Figure 1j. Expected Source of Payment for Diabetes Related Hospital Discharges; Colorado 1995.

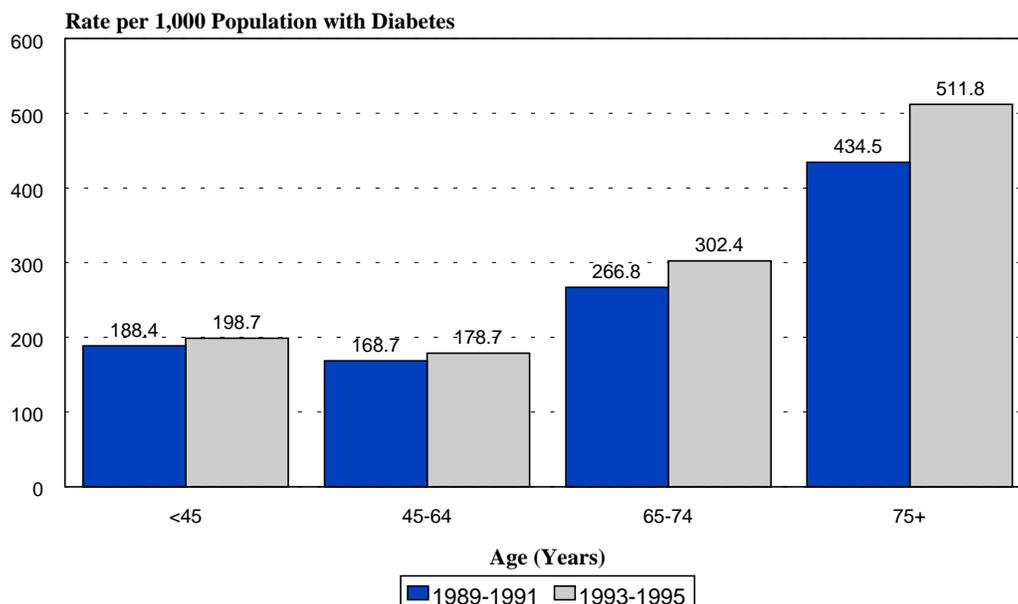


J. Temporal Trends

The report, “Diabetes Prevalence and Morbidity in Colorado Residents, 1980–1991” includes hospitalization discharge numbers and rates based on 5 diagnoses for diabetes any mention. In an effort to compare consistent data through time, we used only 5 diagnoses for 1993-1995 data for the following analysis. Please note that we present data based upon 15 diagnoses in all other parts of this report unless specifically stated otherwise.

Rates for diabetes **any mention** among Colorado residents with diabetes for 1993-1995 show an across the board increase over those for 1989–1991. The smallest percentage increase was for the <45 years of age group, which showed an increase of 5.4%. The greatest percentage increase was for the 75+ years of age group, which experienced a 17.8% increase (Figure 1k; data not shown for 5 diagnoses; 1989–1991 data from reference 1).

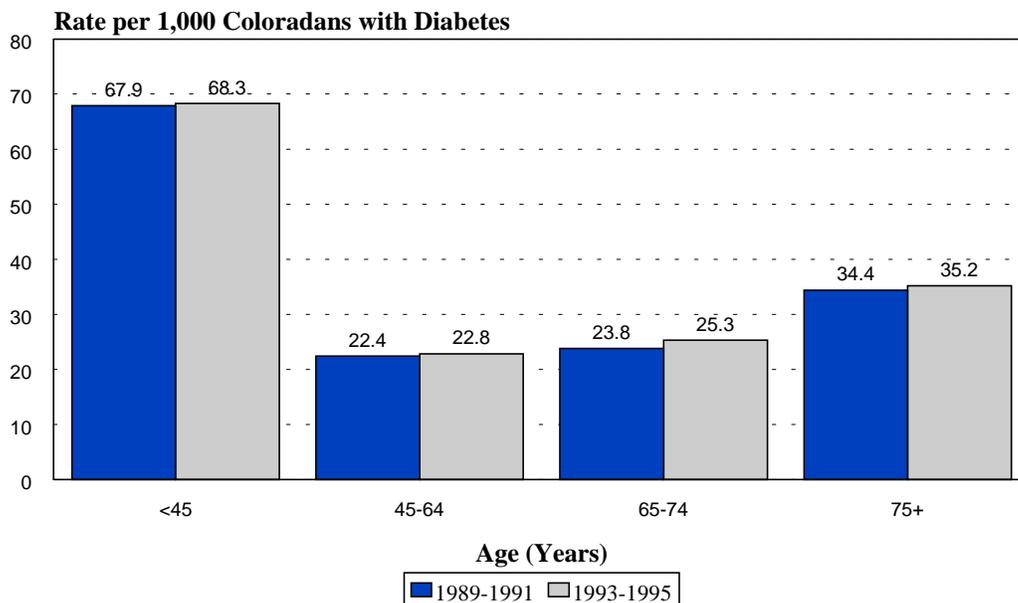
Figure 1k. Age-Specific Hospital Discharge Rate for Diabetes listed as Any Diagnosis (5 diagnoses): Colorado Residents with Diabetes, 1989-1991 vs. 1993-1995.



Diabetes **any mention** discharge rates for the general population increased similarly, from a low of virtually no change among the <20 years of age group to an increase of 17.8% for the 75+ years of age group.

In 1989-1991, the three year average annual age-adjusted hospital discharge rate for diabetes as any diagnosis (5 diagnoses) was reported as 238 per 1,000 persons with diabetes¹. This increased to 264 per 1,000 persons with diabetes for the years 1993-1995. While the national trend in the age-adjusted rates of diabetes as any diagnosis have leveled off in the 1990's⁴, the age-adjusted rates of diabetes as any diagnosis in Colorado have shown a gradual increase.

Discharge rates for diabetes as the **primary diagnosis** per 1,000 Coloradans with diabetes remained virtually unchanged from 1989-1991 (Figure 1l). When the discharge rates were age-adjusted, the average annual hospital discharge rate for diabetes as the primary diagnosis also remained unchanged from 1989-1991 at 33 per 1,000 persons with diabetes. During the 1990's, the national age-adjusted rate for diabetes as the primary diagnosis also remained relatively stable with rates between 58.5 and 61.5 per 1,000 persons⁴.

Figure 11. Age-Specific Hospital Discharge Rate for Diabetes Listed as Primary Diagnosis

Discussion

Hospital discharge data were used to describe hospitalization patterns in Coloradans with diabetes. This data source was chosen for analysis because 1) the discharge data are easily accessible on computer files, 2) the data are released to the public in a timely fashion, 3) nearly all hospitals in Colorado include discharge data on the files, and 4) several years of data were available.

The hospital discharge data indicate that diabetes is a major contributor to disease morbidity in Colorado. In 1994, nearly one out of every five residents with diagnosed diabetes was hospitalized at least once that year. Furthermore, while 2.6% of Colorado's population is estimated to have diagnosed diabetes, around 7.7% of hospitalizations in 1993-1995 listed diabetes as a diagnosis.

This chapter presented hospital discharge rates in several ways. First, rates were calculated for hospital discharge records and for persons with at least one hospital record where diabetes was a discharge diagnosis. The rates based on counts of hospital discharge records were emphasized in this chapter because other state and federal publications report hospital discharge data in this manner. The discharge rates based on counts of individual hospitalized persons are useful to obtain an estimate on the number of individual persons being hospitalized each year. They also assist in identifying hospitalizations with diabetes mentioned that were re-admissions.

Second, discharge rates were expressed in terms of Colorado's population with diabetes and its general population. Both rates are influenced by the severity of diabetes, presence of co-morbid conditions, and health care utilization.⁴ However, only the rates per general population are influenced by prevalence of diabetes in the population or subpopulations. The 1993-1995 hospital discharge data indicated that diabetic males had a higher age-adjusted hospital discharge rate for diabetes as any listed diagnosis compared with

diabetic females. However, only a slight (though statistically significant) difference was observed by gender when age-adjusted rates were computed for the general Colorado population. This is because, in Colorado, males have a lower prevalence of diabetes than females.

Third, rates were expressed with respect to diabetes listed as any diagnosis or the primary diagnosis. The distribution in the age-specific rates per 1,000 residents with diabetes varied considerably if diabetes was listed as any diagnosis or as the primary diagnosis. For the former, the rates were highest in the 75+ years age group; for the latter, they were highest in the <45 years age group. This difference occurred because diabetes was more often coded as the primary diagnosis in hospitalizations for diabetic persons <45 years and is more frequently a secondary diagnosis in hospitalizations for older diabetic persons.

CHA discharge records have included race/ethnicity data since 1993. Although the percent of records with race/ethnicity unknown and race/ethnicity other averaged 22% from 1993-1995, the rate of race/ethnicity indeterminate records has decreased from 28% in 1993 to 21% in 1994 and 1995. Although no systematic biases in race/ethnicity non-reporting were evident, the race/ethnicity data presented must be interpreted with caution.

The percent of hospital discharges among blacks and Hispanics for diabetes as any listed diagnosis peaked in the 45-64 years of age group, then decreased through the 65-74 and 75+ years of age groups. This contrasts with the distribution among the white population, whose percentages climb steadily with age, peaking in the 75+ years of age group. This might be explained by the younger age at death among blacks and Hispanics. Or, it may be suggestive of more effective preventive care among the white population than among the Hispanic and black populations.

In 1993, hospital discharge records included 15 co-diagnoses, up from 5 diagnoses that had been reported previously. Including 15 diagnoses slightly changed the distribution of discharges by age. Using 5 diagnoses, the 1993-1995 distribution is nearly identical to the 1989-1991 distribution. Using 15 diagnoses, increased the rate attributed to the 75+ years of age group from 305 per 1,000 population with diabetes to 356 per 1,000 population, while the percent in <45 years of age group decreased (123 per 1,000 to 14 per 1,000). This is reasonable, since most discharges among the younger age groups have diabetes as primary diagnosis, whereas for the eldest group, diabetes is likely to be a concurrent condition.

A limitation of the discharge data is that hospitalizations from military and federal hospitals are not represented on the data files. Thus, the number and rates of diabetes-related hospitalizations are probably underestimated in this chapter.

Finally, the denominators for the rates per residents with diabetes were derived from national estimates and represent persons with known diabetes. It is estimated that about half of all persons with diabetes are unaware that they have the disease⁷. Despite the limitations of these data, they are a useful indicator to

help assess the morbidity and public health burden related to the disease in the state.

Table 1.1 Number of Hospital Discharge Records with Diabetes as Any Listed Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45 Years	3,625	201.8	3,862	211.0	3,908	210.6	3,798	207.9
45-64 Years	7,940	202.3	8,047	194.7	8,759	201.7	8,249	199.6
65-74 Years	7,403	353.7	7,760	361.1	8,446	381.8	7,870	365.8
75+ Years	7,415	607.0	8,185	653.0	9,310	722.7	8,303	661.9
Total	26,384	292.0	27,854	297.4	30,423	313.7	28,220	301.3
Age-Adjusted Rate*		302.3		309.6		328.3		313.6
(95% Confidence Interval)		(299.5, 305.2)		(306.8, 312.4)		(325.5, 331.0)		(310.8, 316.5)
Male								
<45 Years	1,769	308.9	1,783	305.0	1,851	311.7	1,801	308.6
45-64 Years	3,808	208.4	4,008	207.9	4,388	216.5	4,068	211.0
65-74 Years	3,348	343.9	3,510	350.3	3,918	379.8	3,592	358.4
75+ Years	2,953	719.9	3,493	809.7	3,783	840.2	3,410	791.8
Total	11,878	313.9	12,794	324.3	13,940	339.8	12,871	326.3
Age-Adjusted Rate*		337.8		352.0		369.0		353.3
(95% Confidence Interval)		(333.2, 342.3)		(347.63, 356.34)		(364.7, 373.3)		(348.9, 357.7)
Female								
<45 Years	1,856	151.7	2,079	166.9	2,056	163.0	1,997	160.6
45-64 Years	4,132	197.1	4,039	183.2	4,371	188.8	4,181	189.5
65-74 Years	4,055	362.2	4,250	370.6	4,528	383.6	4,278	372.3
75+ Years	4,462	549.9	4,692	570.8	5,527	659.6	4,894	594.1
Total	14,506	276.3	15,060	277.9	16,482	294.6	15,349	283.1
Age-Adjusted Rate*		285.2		287.4		305.7		292.8
(95% Confidence Interval)		(281.4, 288.9)		(283.67, 291.08)		(302.0, 309.3)		(289.1, 296.5)

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetes defined as ICD-9-CM 250. Sums may not add to total due to cases with age or gender unknown.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 1.2 Number of Discharge Records with Diabetes as Any Listed Diagnosis, by Gender, Age and Race/Ethnicity: Colorado Residents, 1993-1995 Annual Average.

	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
ALL RACES*						
< 45	3798	13.5	1801	14.0	1997	13.0
45-64	8249	29.2	4068	31.6	4181	27.2
65-74	7870	27.9	3592	27.9	4278	27.9
75+	8303	29.4	3410	26.5	4894	31.9
TOTAL	28220	100.0	12871	100.0	15349	100.0
WHITE						
< 45	2199	13.0	1049	13.4	1149	12.7
45-64	4261	25.2	2199	28.0	2062	22.8
65-74	4770	28.2	2257	28.8	2513	27.8
75+	5665	33.5	2341	29.8	3324	36.7
TOTAL	16895	100.0	7846	100.0	9049	100.0
HISPANIC						
< 45	551	14.3	243	14.7	308	14.0
45-64	1520	39.5	696	42.2	824	37.5
65-74	1066	27.7	437	26.5	630	28.7
75+	707	18.4	274	16.6	433	19.7
TOTAL	3845	100.0	1649	100.0	2196	100.0
BLACK						
< 45	265	19.6	147	26.4	118	14.8
45-64	547	40.4	219	39.4	329	41.3
65-74	323	23.9	129	23.2	194	24.3
75+	217	16.0	62	11.2	155	19.4
TOTAL	1353	100.0	556	100.0	797	100.0

*All Races includes race/ethnicity "other" and "unknown"

Table 1.3 Number and Percent Distribution of Primary Diagnoses among All Hospital Discharges with Diabetes as Any Listed Diagnosis, by Gender: Colorado Residents, 1993-1995 Total.

Primary Diagnosis (ICD-9-CM Codes)	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
Total	84,661	100.0	38,612	100.0	46,048	100.0
Diseases of the Circulatory System (390-459)	23,193	27.4	11,353	29.4	11,839	25.7
Diabetes (250)	9,531	11.3	4,751	12.3	4,780	10.4
Diseases of the Digestive System (520-579)	7,624	9.0	3,436	8.9	4,188	9.1
Injury and Poisoning (800-999)	6,937	8.2	3,116	8.1	3,821	8.3
Diseases of the Respiratory System (460-519)	7,638	9.0	3,487	9.0	4,151	9.0
Diseases of the Genitourinary System (580-629)	3,729	4.4	1,524	3.9	2,205	4.8
Diseases of the Musculoskeletal System and Connective Tissue (710-739)	3,986	4.7	1,704	4.4	2,282	5.0
Neoplasms (140-239)	3,201	3.8	1,480	3.8	1,721	3.7
Other Endocrine, Nutritional, and Metabolic Diseases and Immunity Disorders (240-279, not 250)	1,957	2.3	764	2.0	1,193	2.6
Diseases of the Skin and Subcutaneous Tissue (680-709)	1,900	2.2	911	2.4	989	2.1
Mental Disorders (290-319)	2,348	2.8	1,110	2.9	1,238	2.7
Diseases of the Nervous System and Sense Organs (320-389)	1,084	1.3	473	1.2	611	1.3
Infectious and Parasitic Diseases (001-139)	2,126	2.5	872	2.3	1,254	2.7
Complications of Pregnancy, Childbirth and Puerperium (630-676)	760	0.9	0	0.0	760	1.7
Other	8,647	10.2	3,631	9.4	5,016	10.9

Table 1.4 Number and Percent Distribution of Primary Diagnoses among All Hospital Discharges with Diabetes as Primary Diagnosis, by Gender: Colorado Residents, 1993-1995.

Primary Diagnosis (ICD-9-CM Code)	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
Total	9,531	100.0	4,751	100.0	4,780	100.0
Diabetes Mellitus without Mention of Complication (250.0)	1,282	13.5	636	13.4	646	13.5
Diabetic Ketoacidosis Without Mention of Coma (250.1)	2,851	29.9	1,369	28.8	1,482	31.0
Hyperosmolar Non-Ketotic Coma (250.2)	261	2.7	138	2.9	123	2.6
Diabetic Ketoacidosis With Mention of Coma (250.3)	165	1.7	86	1.8	79	1.7
Diabetes with Renal Manifestations (250.4)	1,055	11.1	580	12.2	475	9.9
Diabetes with Ophthalmic Manifestations (250.5)	130	1.4	61	1.3	69	1.4
Diabetes with Neurological Manifestations (250.6)	828	8.7	341	7.2	487	10.2
Diabetes with Peripheral Circulatory Disorders (250.7)	903	9.5	495	10.4	408	8.5
Diabetes with Other Specified Manifestations (250.8)	1,393	14.6	749	15.8	644	13.5
Diabetes with Unspecified Complications (250.9)	663	7.0	296	6.2	367	7.7

Table 1.5 Number of Hospital Discharge Records with Diabetes as Primary Diagnosis and Hospital Dis Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45 Years	1,220	67.9	1,282	70.0	1,243	67.0	1,248	68.3
45-64 Years	1,003	25.6	912	22.4	915	21.1	943	22.8
65-74 Years	510	24.4	533	24.8	587	26.5	543	25.3
75+ Years	366	30.0	478	38.1	482	37.4	442	35.2
Total	3,099	34.3	3,205	34.2	3,227	33.3	3,177	33.9
Age-Adjusted Rate*		33.3		33.6		33.0		33.3
(95% Confidence Interval)		(32.1, 34.5)		(32.4, 34.7)		(31.8, 34.1)		(32.1, 34.4)
Male								
<45 Years	664	115.9	620	106.1	653	110.0	646	110.6
45-64 Years	480	26.3	505	26.2	497	24.5	494	25.6
65-74 Years	241	24.8	245	24.5	279	27.0	255	25.4
75+ Years	152	37.1	203	47.1	212	47.1	189	43.9
Total	1,537	40.6	1,573	39.9	1,641	40.0	1,584	40.2
Age-Adjusted Rate*		43.1		42.8		43.5		43.1
(95% Confidence Interval)		(41.0, 45.2)		(40.7, 44.9)		(41.4, 45.5)		(41.1, 45.2)
Female								
<45 Years	556	45.4	662	53.1	590	46.8	603	48.5
45-64 Years	523	24.9	407	18.5	418	18.1	449	20.4
65-74 Years	269	24.0	288	25.1	308	26.1	288	25.1
75+ Years	214	26.4	275	33.5	270	32.2	253	30.7
Total	1,562	29.7	1,632	30.1	1,586	28.3	1,593	29.4
Age-Adjusted Rate*		28.5		28.5		27.3		28.1
(95% Confidence Interval)		(27.1, 29.9)		(27.1, 29.9)		(26.0, 28.6)		(26.7, 29.4)

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 1.6 Number of Discharge Records with Diabetes as Primary Diagnosis, by Race, Gender and Age: Colorado Residents, 1993-1995 Annual Average.

	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
ALL RACES*						
<45	1241	39.1	646	40.8	602	37.8
45-64	943	29.7	494	31.2	449	28.2
65-74	543	17.1	255	16.1	288	18.1
75+	442	13.9	189	11.9	253	15.9
TOTAL	3177	100.0	1584	100.0	1593	100.0
WHITE						
<45	777	41.8	392	42.5	385	41.1
45-64	483	26.0	265	28.7	218	23.3
65-74	315	16.9	146	15.8	169	18.1
75+	285	15.3	120	13.0	165	17.6
TOTAL	1859	100.0	923	100.0	936	100.0
HISPANIC						
<45	146	31.9	73	33.5	74	31.1
45-64	186	40.7	90	41.3	96	40.3
65-74	85	18.6	37	17.0	48	20.2
75+	40	8.8	19	8.7	21	8.8
TOTAL	457	100.0	218	100.0	238	100.0
BLACK						
<45	92	41.6	61	51.7	31	30.4
45-64	73	33.0	32	27.1	41	40.2
65-74	38	17.2	20	16.9	18	17.6
75+	17	7.7	5	4.2	12	11.8
TOTAL	221	100.0	118	100.0	102	100.0

*All Races includes race/ethnicity "other" and "unknown"

Table 1.7 Number of Hospital Discharge Records with Diabetes as Any Listed Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<20 Years	396	3.9	431	4.1	405	3.8	411	3.9
20-44 Years	3,229	21.4	3,431	22.5	3,503	22.7	3,388	22.2
45-64 Years	7,940	115.2	8,047	110.3	8,759	113.8	8,249	113.1
65-74 Years	7,403	360.3	7,760	369.3	8,446	391.3	7,870	373.9
75+ Years	7,415	518.9	8,185	557.8	9,310	617.0	8,303	565.4
Total	26,384	74.0	27,854	76.0	30,423	81.2	28,220	77.1
Age-Adjusted Rate*		79.6		81.4		86.2		82.4
(95% Confidence Interval)		(78.6, 80.5)		(80.4, 82.3)		(85.2, 87.1)		(81.5, 83.4)
Male								
<20 Years	163	3.1	150	2.8	186	3.4	166	3.1
20-44 Years	1,606	21.2	1,633	21.2	1,665	21.4	1,635	21.2
45-64 Years	3,808	112.2	4,008	111.5	4,388	115.8	4,068	113.2
65-74 Years	3,348	362.4	3,510	370.9	3,918	402.9	3,592	379.1
75+ Years	2,953	565.2	3,493	635.6	3,783	659.6	3,410	621.6
Total	11,878	67.2	12,794	70.4	13,940	75.0	12,871	70.9
Age-Adjusted Rate*		80.8		84.3		88.6		84.7
(95% Confidence Interval)		(79.4, 82.3)		(82.8, 85.7)		(87.2, 90.1)		(83.2, 86.1)
Female								
<20 Years	233	4.7	281	5.5	218	4.2	244	4.8
20-44 Years	1,623	21.7	1,798	23.7	1,838	24.0	1,753	23.2
45-64 Years	4,132	118.1	4,039	109.1	4,371	111.9	4,181	112.9
65-74 Years	4,055	358.6	4,250	368.1	4,528	381.8	4,278	369.7
75+ Years	4,462	492.3	4,692	511.1	5,527	590.8	4,894	532.0
Total	14,506	80.6	15,060	81.6	16,482	87.3	15,349	83.2
Age-Adjusted Rate*		79.2		79.9		84.6		81.3
(95% Confidence Interval)		(77.9, 80.5)		(78.7, 81.2)		(83.3, 85.9)		(80.0, 82.5)

NOTES: Rates are per 10,000 Colorado residents. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

**Table 1.8 Number of Hospital Discharge Records for Diabetes
Listed as Any Diagnosis and Hospital Discharge Rate, by County of Residence:
Colorado Residents, 1993-1995.**

County	Number of Records	Crude Rate	Adjusted* Rate	Adjusted Rate*: 95% Confidence Limits		
				Lower	Upper	
COLORADO	28,220	77.1	82.4	81.5	83.4	
Adams	2,597	89.6	111.9	107.6	116.2	higher
Alamosa	147	101.9	116.0	97.6	134.5	higher
Arapahoe	2,154	49.4	58.3	55.8	60.8	lower
Archuleta	48	73.0	68.2	48.9	87.4	
Baca	414	947.7	650.5	588.8	712.1	higher
Bent	112	203.5	151.3	123.5	179.2	higher
Boulder	1,279	51.0	65.2	61.6	68.8	lower
Chaffee	117	82.1	63.0	51.7	74.4	lower
Cheyenne	47	199.3	159.4	114.1	204.7	higher
Clear Creek	24	28.8	36.9	21.7	52.0	lower
Conejos	142	186.2	166.3	139.2	193.3	higher
Costilla	69	207.2	165.1	126.7	203.4	higher
Crowley	58	137.4	120.4	89.4	151.4	higher
Custer	11	45.1	39.1	16.1	62.1	lower
Delta	279	115.5	77.3	67.8	86.7	
Denver	6,266	127.4	120.8	117.9	123.8	higher
Dolores	16	107.8	87.4	45.3	129.6	
Douglas	228	24.4	49.0	41.8	56.2	lower
Eagle	64	23.4	41.5	29.3	53.6	lower
El Paso	2,453	54.6	66.8	64.1	69.4	lower
Elbert	37	28.6	36.0	24.2	47.8	lower
Fremont	416	109.0	85.3	77.0	93.6	
Garfield	191	56.1	60.1	51.6	68.5	lower
Gilpin	6	17.1	21.8	2.8	40.8	lower
Grand	49	55.8	63.8	45.7	81.8	
Gunnison	25	21.7	31.9	19.1	44.7	lower
Hinsdale	***	***	***	***	***	***
Huerfano	157	232.9	165.5	139.3	191.6	higher
Jackson	4	21.3	20.4	0.0	41.3	lower
Jefferson	2,518	52.3	59.4	57.0	61.7	lower
Kiowa	144	831.3	586.6	497.3	675.8	higher
Kit Carson	64	89.0	72.7	54.6	90.9	
La Plata	248	66.6	71.9	63.1	80.8	lower
Lake	51	74.7	90.4	65.4	115.4	
Larimer	1,136	54.1	60.6	57.1	64.1	lower
Las Animas	223	148.7	107.8	93.4	122.3	higher
Lincoln	50	81.3	68.4	49.5	87.4	
Logan	171	95.2	79.8	67.7	91.9	
Mesa	795	77.4	66.2	61.6	70.8	lower
Mineral	6	103.9	75.4	16.8	134.0	

Table 1.9 Number of Hospital Discharge Records with Diabetes as Primary Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<20	269	2.6	288	2.7	275	2.6	277	2.6
20-44	951	6.3	994	6.5	968	6.3	971	6.4
45-64	1,003	14.6	912	12.5	915	11.9	943	12.9
65-74	510	24.8	533	25.4	587	27.2	543	25.8
75+	366	25.6	478	32.6	482	31.9	442	30.1
Total	3,099	8.7	3,205	8.8	3,227	8.6	3,177	8.7
Age-Adjusted Rate*		8.9		8.9		8.8		8.9
(95% Confidence Interval)		(8.6, 9.2)		(8.6, 9.3)		(8.5, 9.1)		(8.6, 9.2)
Male								
<20	124	2.4	107	2.0	126	2.3	119	2.2
20-44	540	7.1	513	6.7	527	6.8	527	6.8
45-64	480	14.1	505	14.1	497	13.1	494	13.8
65-74	241	26.1	245	25.9	279	28.7	255	26.9
75+	152	29.1	203	36.9	212	37.0	189	34.5
Total	1,537	8.7	1,573	8.7	1,641	8.8	1,584	8.7
Age-Adjusted Rate*		9.3		9.3		9.4		9.3
(95% Confidence Interval)		(8.8, 9.7)		(8.8, 9.8)		(9.0, 9.9)		(8.9, 9.8)
Female								
<20	145	2.9	181	3.5	149	2.9	158	3.1
20-44	411	5.5	481	6.3	441	5.8	444	5.9
45-64	523	14.9	407	11.0	418	10.7	449	12.1
65-74	269	23.8	288	24.9	308	26.0	288	24.9
75+	214	23.6	275	30.0	270	28.9	253	27.5
Total	1,562	8.7	1,632	8.8	1,586	8.4	1,593	8.6
Age-Adjusted Rate*		8.6		8.7		8.2		8.5
(95% Confidence Interval)		(8.2, 9.0)		(8.3, 9.1)		(7.8, 8.6)		(8.1, 8.9)

NOTES: Rates are per 10,000 Colorado residents. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 1.10 Average Annual Number of Hospital Discharge Records for Diabetes Listed as the Primary Diagnosis and Hospital Discharge Rate, by County of Residence: Colorado Residents, 1993-1995.

County	Number of Records	Crude Rate	Adjusted* Rate	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
COLORADO	3,177	8.7	8.9	8.6	9.2
Adams	331	11.4	12.8	11.3	14.2 higher
Alamosa	13	9.2	10.1	4.7	15.6
Arapahoe	268	6.1	6.5	5.7	7.3 lower
Archuleta	3	5.0	5.0	0.0	10.4
Baca	45	102.9	92.2	64.0	120.5 higher
Bent	10	18.1	15.7	5.8	25.6
Boulder	146	5.8	6.7	5.5	7.8 lower
Chaffee	14	10.1	8.1	3.9	12.3
Cheyenne	5	22.8	19.7	2.6	36.8
Clear Creek	***	***	***	***	*** ***
Conejos	15	20.2	19.2	9.4	28.9 higher
Costilla	7	20.1	16.9	3.9	29.9
Crowley	4	8.7	8.6	0.0	17.6
Custer	***	***	***	***	*** ***
Delta	32	13.1	10.8	6.8	14.7
Denver	718	14.6	14.2	13.2	15.2 higher
Dolores	***	***	***	***	*** ***
Douglas	32	3.4	4.5	2.6	6.4 lower
Eagle	11	4.2	4.9	1.3	8.4 lower
El Paso	327	7.3	7.6	7.0	8.7
Elbert	4	3.1	3.3	0.0	6.5 lower
Fremont	36	9.3	8.5	5.6	11.4
Garfield	25	7.5	7.8	4.8	10.9
Gilpin	***	***	***	***	*** ***
Grand	6	6.8	7.7	1.4	14.1
Gunnison	6	4.9	6.5	0.9	12.1
Hinsdale	***	***	***	***	*** ***
Huerfano	10	14.3	13.5	4.7	22.2
Jackson	***	***	***	***	*** ***
Jefferson	275	5.7	5.9	5.2	6.6 lower
Kiowa	18	101.8	85.3	44.1	126.4 higher
Kit Carson	10	13.4	12.3	4.4	20.3
La Plata	25	6.6	6.7	4.0	9.3
Lake	10	14.8	15.9	5.8	25.9
Larimer	114	5.4	5.7	4.6	6.7 lower
Las Animas	17	11.1	9.2	4.6	13.7
Lincoln	4	7.0	6.8	0.3	13.2
Logan	21	11.5	10.9	6.1	15.7
Mesa	84	8.2	7.8	6.1	9.4
Mineral	***	***	***	***	*** ***

Table 1.11 Number and Rate of Persons with At Least One Hospital Discharge Record for Diabetes as Any Listed Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	2,412	134.3	2,564	140.1	2,546	137.2	2,507	137.2
45-64	5,130	130.7	5,211	126.1	5,559	128.0	5,300	128.2
65-74	4,669	223.0	4,833	224.9	5,216	235.8	4,906	228.0
75+	4,810	393.8	5,090	406.1	5,802	450.4	5,234	417.3
Total	17,021	188.4	17,698	189.0	19,123	197.2	17,947	191.6
Age-Adjusted Rate*		194.8		196.3		206.0		199.1
(95% Confidence Interval)		(192.3, 197.4)		(193.7, 198.8)		(203.5, 208.5)		(196.6, 201.6)
Male								
<45	1,180	206.0	1,231	210.6	1,198	201.7	1,203	206.1
45-64	2,539	138.9	2,634	136.6	2,811	138.7	2,661	138.1
65-74	2,166	222.5	2,245	224.1	2,461	238.6	2,291	228.5
75+	1,925	469.3	2,141	496.3	2,364	525.0	2,143	497.7
Total	7,810	206.4	8,251	209.1	8,834	215.3	8,298	210.4
Age-Adjusted Rate*		221.8		226.1		233.5		227.3
(95% Confidence Interval)		(217.6, 226.0)		(222.0, 230.2)		(229.5, 237.6)		(223.2, 231.4)
Female								
<45	1,232	100.7	1,333	107.0	1,348	106.9	1,304	104.9
45-64	2,591	123.6	2,577	116.9	2,748	118.7	2,639	119.6
65-74	2,503	223.6	2,588	225.7	2,755	233.4	2,615	227.6
75+	2,885	355.6	2,949	358.8	3,438	410.3	3,091	375.2
Total	9,211	175.4	9,447	174.3	10,289	183.9	9,649	178.0
Age-Adjusted Rate*		180.5		179.8		190.2		183.5
(95% Confidence Interval)		(177.2, 183.7)		(176.6, 183.0)		(187.0, 193.5)		(180.3, 186.8)

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 1.12 Number and Rate of Persons with At Least one Hospital Discharge Record for Diabetes as Primary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	996	55.4	1,025	56.0	969	52.2	997	54.5
45-64	789	20.1	746	18.1	766	17.6	767	18.6
65-74	418	20.0	449	20.9	492	22.2	453	21.1
75+	325	26.6	410	32.7	420	32.6	385	30.7
Total	2,528	28.0	2,630	28.1	2,647	27.3	2,602	27.8
Age-Adjusted Rate*		27.2		27.6		27.1		27.3
(95% Confidence Interval)		(26.2, 28.3)		(26.6, 28.7)		(26.1, 28.1)		(26.3, 28.4)
Male								
<45	550	96.0	527	90.2	531	89.4	536	91.8
45-64	390	21.3	411	21.3	407	20.1	403	20.9
65-74	195	20.0	202	20.2	240	23.3	212	21.2
75+	134	32.7	173	40.1	179	39.8	162	37.6
Total	1,269	33.5	1,313	33.3	1,357	33.1	1,313	33.3
Age-Adjusted Rate*		35.7		35.8		36.0		35.9
(95% Confidence Interval)		(33.8, 37.7)		(33.9, 37.8)		(34.1, 37.8)		(33.49, 37.8)
Female								
<45	446	36.4	498	40.0	438	34.7	461	37.0
45-64	399	19.0	335	15.2	359	15.5	364	16.5
65-74	223	19.9	247	21.5	252	21.3	241	20.9
75+	191	23.5	237	28.8	241	28.8	223	27.1
Total	1,259	24.0	1,317	24.3	1,290	23.1	1,289	23.8
Age-Adjusted Rate*		23.0		23.2		22.4		22.8
(95% Confidence Interval)		(21.7, 24.3)		(22.0, 24.5)		(21.2, 23.6)		(21.6, 24.1)

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 1.13 Number and Rate of Persons with At Least One Hospital Discharge Record for Diabetes as Any Listed Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<20	303	3.0	322	3.1	302	2.8	309	3.0
20-44	2,109	14.0	2,242	14.7	2,244	14.5	2,198	14.4
45-64	5,130	74.4	5,211	71.4	5,559	72.2	5,300	72.7
65-74	4,669	227.2	4,833	230.0	5,216	241.7	4,906	233.1
75+	4,810	336.6	5,090	346.9	5,802	384.5	5,234	356.4
Total	17,021	47.7	17,698	48.3	19,123	51.0	17,947	49.0
Age-Adjusted Rate*		51.3		51.6		54.1		52.4
(95% Confidence Interval)		(50.5, 52.0)		(50.9, 52.4)		(53.3, 54.9)		(51.6, 53.1)
Male								
<20	139	2.6	123	2.3	136	2.5	133	2.5
20-44	1,041	13.7	1,108	14.4	1,062	13.6	1,070	13.9
45-64	2,539	74.8	2,634	73.3	2,811	74.2	2,661	74.1
65-74	2,166	234.4	2,245	237.2	2,461	253.1	2,291	241.7
75+	1,925	368.4	2,141	389.6	2,364	412.2	2,143	390.7
Total	7,810	44.2	8,251	45.4	8,834	47.5	8,298	45.4
Age-Adjusted Rate*		53.1		54.0		56.1		54.4
(95% Confidence Interval)		(51.9, 54.2)		(52.8, 55.2)		(54.9, 57.2)		(53.2, 55.6)
Female								
<20	164	3.3	199	3.9	166	3.2	176	3.5
20-44	1,068	14.3	1,134	15.0	1,182	15.4	1,128	14.9
45-64	2,591	74.0	2,577	69.6	2,748	70.3	2,639	71.3
65-74	2,503	221.4	2,588	224.1	2,755	232.3	2,615	226.0
75+	2,885	318.3	2,949	321.3	3,438	367.5	3,091	339.0
Total	9,211	51.2	9,447	51.2	10,289	54.5	9,649	52.3
Age-Adjusted Rate*		50.2		50.1		52.8		51.0
(95% Confidence Interval)		(49.2, 51.2)		(49.1, 51.1)		(51.8, 53.8)		(50.0, 52.1)

NOTES: Rates are per 10,000 Colorado residents. Diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 1.14 Number and Rate of Persons with At Least One Hospital Discharge Record for Diabetes as Primary Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<20 Years	225	2.2	236	2.3	230	2.2	230	2.2
20-44 Years	771	5.1	789	5.2	739	4.8	766	5.0
45-64 Years	789	11.4	746	10.2	766	10.0	767	10.5
65-74 Years	418	20.3	449	21.4	492	22.8	453	21.5
75+ Years	325	22.7	410	27.9	420	27.8	385	26.2
Total	2,528	7.1	2,630	7.2	2,647	7.1	2,602	7.1
Age-Adjusted Rate*		7.3		7.4		7.2		7.3
(95% Confidence Interval)		(7.0, 7.5)		(7.1, 7.6)		(6.9, 7.5)		(7.0, 7.6)
Male								
<20 Years	114	2.2	94	1.8	106	1.9	105	2.0
20-44 Years	436	5.7	433	5.6	425	5.5	431	5.6
45-64 Years	390	11.5	411	11.4	407	10.7	403	11.2
65-74 Years	195	21.1	202	21.3	240	24.7	212	22.4
75+ Years	134	25.6	173	31.5	179	31.2	162	29.5
Total	1,269	7.2	1,313	7.2	1,357	7.3	1,313	7.2
Age-Adjusted Rate*		7.7		7.8		7.8		7.8
(95% Confidence Interval)		(7.2, 8.1)		(7.3, 8.2)		(7.4, 8.3)		(7.3, 8.2)
Female								
<20 Years	111	2.2	142	2.8	124	2.4	126	2.5
20-44 Years	335	4.5	356	4.7	314	4.1	335	4.4
45-64 Years	399	11.4	335	9.1	359	9.2	364	9.8
65-74 Years	223	19.7	247	21.4	252	21.2	241	20.8
75+ Years	191	21.1	237	25.8	241	25.8	223	24.2
Total	1,259	7.0	1,317	7.1	1,290	6.8	1,289	7.0
Age-Adjusted Rate*		6.9		7.0		6.7		6.9
(95% Confidence Interval)		(6.5, 7.3)		(6.6, 7.4)		(6.3, 7.1)		(6.5, 7.2)

NOTES: Rates are per 10,000 Colorado residents. Diabetes defined as ICD-9-CM 250. Patients" refers to individual persons with 1+ hospitalizations during a given calendar year for the discharge diagnosis of interest.
 * Age-adjusted to the 1980 U.S. resident population.

Table 1.15 Discharge Status of Hospital Discharge Records for Diabetes Listed as Any Diagnosis, by Age: Colorado, 1993-1995 Total.

Age Group (Years)	Total (N=84,661) Percent	<20 (N=1,232) Percent	20-44 (N=8,568) Percent	45-64 (N=24,746) Percent	65-74 (N=23,609) Percent	75+ (N=24,910) Percent
Total	100.0	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	63.0	91.1	84.3	75.6	60.7	42.4
Transferred to Another Acute Care Facility	2.9	1.5	2.0	3.3	3.5	2.5
Transferred to Skilled Nursing Facility	10.2	0.4	1.2	3.9	9.6	21.2
Transferred to Intermediate Care Facility	1.9	0.0	0.3	0.7	1.6	4.0
Transferred to Another Type of Institution for Inpatient Care	5.4	2.5	3.1	4.0	6.1	7.3
Transferred to Home Health Care	12.6	2.6	6.4	9.5	14.5	16.8
Left Facility Against Medical Advice	0.4	1.5	1.5	0.5	0.2	0.1
Home IV Service	0.2	0.2	0.2	0.2	0.1	0.1
Died	3.5	0.2	1.0	2.3	3.7	5.5

NOTE: Diabetes defined as ICD-9-CM 250.

Table 1.16 Discharge Status of Hospital Discharge Records for Diabetes Listed as Primary Diagnosis, by Age: Colorado, 1993-1995 Total.

Age Group (Years)	Total (N=9,531) Percent	<20 (N=832) Percent	20-44 (N=2,913) Percent	45-64 (N=2,830) Percent	65-74 (N=1,630) Percent	75+ (N=1,326) Percent
Discharge Status	Percent	Percent	Percent	Percent	Percent	Percent
Total	100.0	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	71.7	93.5	86.5	74.6	54.9	39.6
Transferred to Another Acute Care Facility	1.3	1.1	0.8	1.2	1.9	1.7
Transferred to Skilled Nursing Facility	7.3	0.2	1.1	4.5	13.9	23.5
Transferred to Intermediate Care Facility	1.0	0.0	0.3	0.5	1.2	4.4
Transferred to Another Type of Institution for Inpatient Care	4.3	1.8	2.5	4.2	6.3	7.6
Transferred to Home Health Care	12.1	1.8	6.5	12.9	19.3	20.6
Left Facility Against Medical Advice	0.8	1.3	1.6	0.4	0.1	0.2
Home IV Service	0.1	0.0	0.2	0.1	0.2	0.2
Died	1.3	0.2	0.5	1.5	2.3	2.2

NOTE: Diabetes defined as ICD-9-CM 250.

Table 1.17 Number and Percent Distribution of Hospital Discharge Records with Diabetes Listed as Any Diagnosis, by Primary Source of Payment: Colorado Residents, 1990 and 1995.

Primary Source of Payment	1995	
	Records	Percent
Medicare	17,481	57.5
Medicaid	1,774	5.8
Other Government*	261	0.8
Blue Cross/Blue Shield, Commercial Insurers	2,848	9.4
Health Maintenance Organizations	6,098	20.0
Self-pay	1,237	4.1
Other**	724	2.4
Total	30,423	100.0

* Includes Title V and other federal, state and local programs

** Includes workers compensation, no charge, other non-government programs, and all other sources not already listed above

Chapter 2

Cardiovascular Disease

Introduction

Cardiovascular disease (CVD) is the leading cause of mortality in persons with diabetes.¹ CVD is a broadly inclusive term that includes conditions such as rheumatic heart disease, ischemic heart disease (i.e., heart attack, angina, coronary atherosclerosis, aneurysm), cerebrovascular disease (i.e. stroke), hypertension, and peripheral vascular disease. Nationally, forty-four percent of deaths among people with diabetes are caused by CVDⁱⁱ. In 1994, CVD was associated with 1,144,000 hospitalizations and 80,271 deaths among persons with diabetes in the U.S., the majority of whom were aged 75+ years.² Of the deaths in the U.S. attributed to CVD among persons with diabetes in 1994, 59% (n=47,379) were caused by ischemic heart disease (IHD) and 15% (n=11,873) were caused by stroke.² Persons with diabetes have a 2-4 times increased risk of cerebrovascular disease³ and at least four times increased risk of peripheral vascular disease than persons without diabetes.³ Furthermore, heart disease is reported 2-4 times more frequently in persons with diabetes than the rest of the population.³ The greatest excess risk of heart disease in the diabetic population compared with the non-diabetic population is among persons aged less than 45 years.³

Risk factors for CVD or accelerated atherosclerosis include high cholesterol, high blood pressure, cigarette smoking, male gender and obesity. These risk factors are more common in persons with diabetes compared with the rest of the population. This may partially explain the increased occurrence of cardiovascular disease in persons with diabetes.⁴⁻⁶ Evidence also suggests that diabetes itself is a major, independent risk factor for cardiovascular disease.⁴⁻⁶

This chapter presents 1993-1995 hospital discharge data on all cause CVD, ischemic heart disease (IHD), and stroke among Colorado residents with diabetes. It provides descriptive statistics on age at discharge, length-of-stay, and discharge disposition for each of these three CVD events. The three years of hospital discharge data are compared to our baseline data from an earlier study that utilized 1989-1991 data.⁷

Methods

The 1993-1995 hospital discharge data from the Colorado Health and Hospital Association (CHA) were used to conduct surveillance activities on cardiovascular disease in Colorado residents with diabetes. Detailed information on the hospital discharge data is provided in Chapter 1. Separate analyses were conducted for major CVD (ICD-9-CM 390-448), IHD (ICD-9-CM 410-414), or stroke (ICD-9-CM 430-434, 436-438) listed as the primary diagnosis and diabetes (ICD-9-CM 250) listed as a secondary diagnosis (co-diagnosis). These definitions are the same ones used in the Centers for Disease Control and Prevention (CDC) report, Diabetes Surveillance, 1997². For the sake of brevity, the rest of this chapter will refer to these three CVD events as “major CVD as the primary diagnosis” (or “major CVD”), “IHD as the primary diagnosis” (or “IHD”), and “stroke as the primary diagnosis” (or “stroke”); the co-diagnosis of diabetes will be implied.

Statistical analyses were restricted to Colorado residents and were based on the methodology described in Chapter 1. Discharge rates were calculated separately for each of the three CVD events by age and gender per 1,000 population with diabetes and age, gender

and geographic location per 10,000 general population of Colorado. Three-year average annual numbers and rates of discharges for major CVD per 10,000 general population of Colorado were reported by county of residence. Planning and Management Region of residence (see Appendix 2) was used to report discharge rates by geographic location for IHD and stroke because relatively few discharges for these two conditions were available by county of residence. However, the chapter does provide information on the three-year average annual number of discharges in 1993-1995 for both IHD and stroke by county. Due to lack of county level race/ethnicity data for the study years which is required to estimate the diabetic population, county level rates are presented only per 10,000 general population.

Age-specific and gender-specific rates were expressed in terms of hospital discharge records and in terms of persons with at least one hospital discharge record in a given year for the CVD event of interest (see Chapter 1 for methods). All discharge rates were age-adjusted using the direct method of standardization and 95% confidence intervals were calculated for the age-adjusted rates.⁸ The estimated 1980 U.S. diabetic population was used as the standard to age-adjust rates per 1,000 diabetic residents of Colorado and the 1980 U.S. resident population was the standard to age-adjust rates per 10,000 general resident population of Colorado (see Appendix 3). These were the same two standard populations used to age-adjust discharge rates in the CDC report, Diabetes Surveillance, 1997,² and the previous Colorado report.⁹ Statistics on age at discharge, length of stay, and hospital discharge disposition for major CVD, IHD, or stroke as the primary diagnosis were calculated using the methods described in Chapter 1.

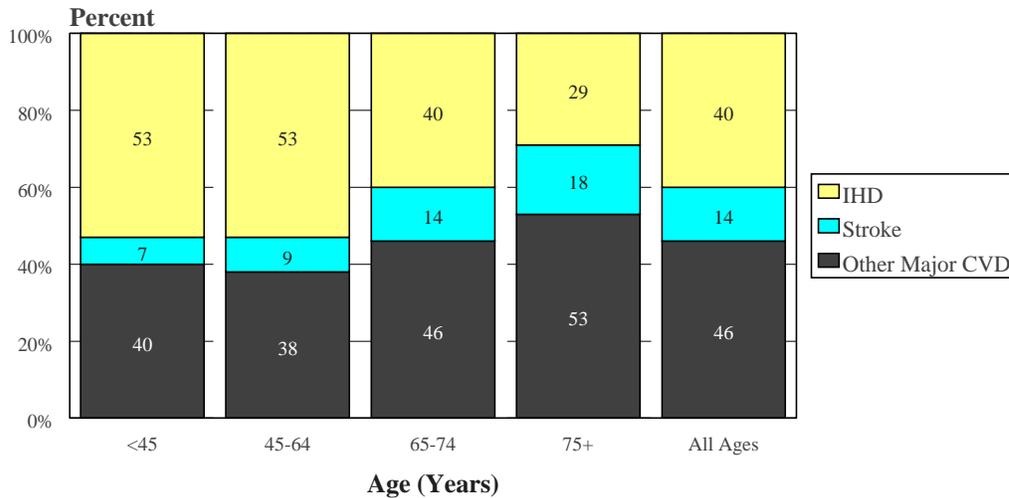
Since 1993, Colorado hospital discharge records have included information on race/ethnicity of patients. However, about 22% of all records with major CVD as primary diagnosis and diabetes as a co-diagnosis listed race/ethnicity as other or unknown. Thus, we do not present race/ethnicity rates; rather, we present age/sex discharge percentage distribution by race/ethnicity. Hopefully in the future, the proportion of race/ethnicity unknown records will decrease enough to enable the effective presentation of race/ethnicity specific rates.

Results

A. Number of Hospital Discharge Records

Between 1993 and 1995, there were 75,130 hospitalizations which mentioned diabetes as a **secondary diagnosis** (yearly average, 25,043). Of these, 29% listed major CVD as the primary discharge diagnosis (n=22,074; yearly average, 7,358) (Table 2.1). Among the discharge records that listed major CVD as the primary diagnosis, 41% (n=8,941; yearly average, 2,980) listed IHD and 14% (n=3,062; yearly average, 1,021) listed stroke as the primary diagnosis. The remaining 45% of the discharge records listed other types of cardiovascular disease as the primary diagnosis (Figure 2a, Tables 2.2, 2.3).

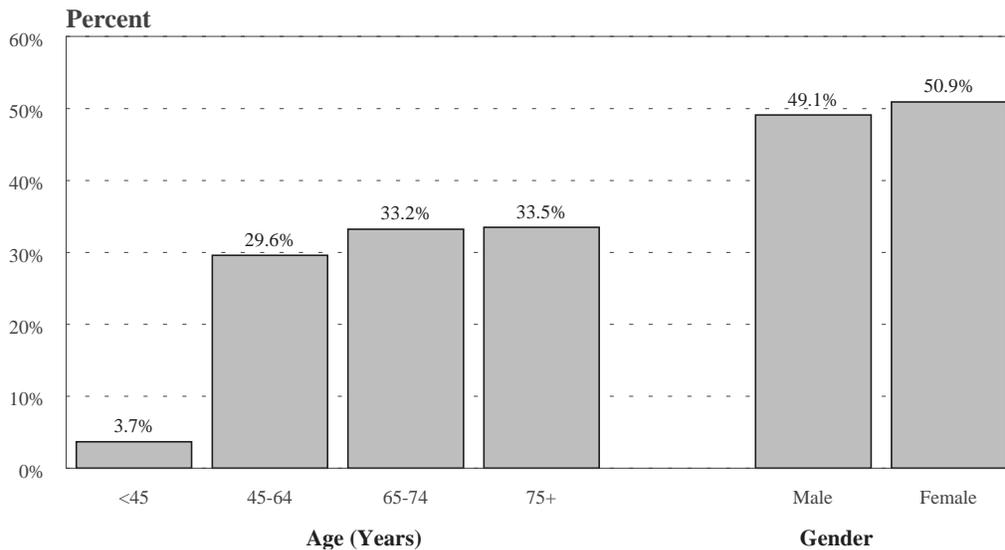
Figure 2a. Percent of Hospital Discharge Records for Major Cardiovascular Disease (CVD) as Primary Diagnosis, by Type of Primary Diagnosis and Age: Colorado Residents with Diabetes, 1993-1995.



NOTE: Other Major Cardiovascular disease defined as ICD-9-CM 390-409, 415-429, 435, and 439-448.

Figure 2b shows the age and gender distribution of the 22,074 discharge records that listed major CVD as a primary diagnosis. All but 4% of the discharge records were among persons 45 years and older (Figure 2b; Table 2.1). The percent of discharge records was fairly evenly distributed among the 45-64, 65-74, and 75+ years age groups. Forty-nine percent of the discharge records were for males and 51% were for females (Table 2.1).

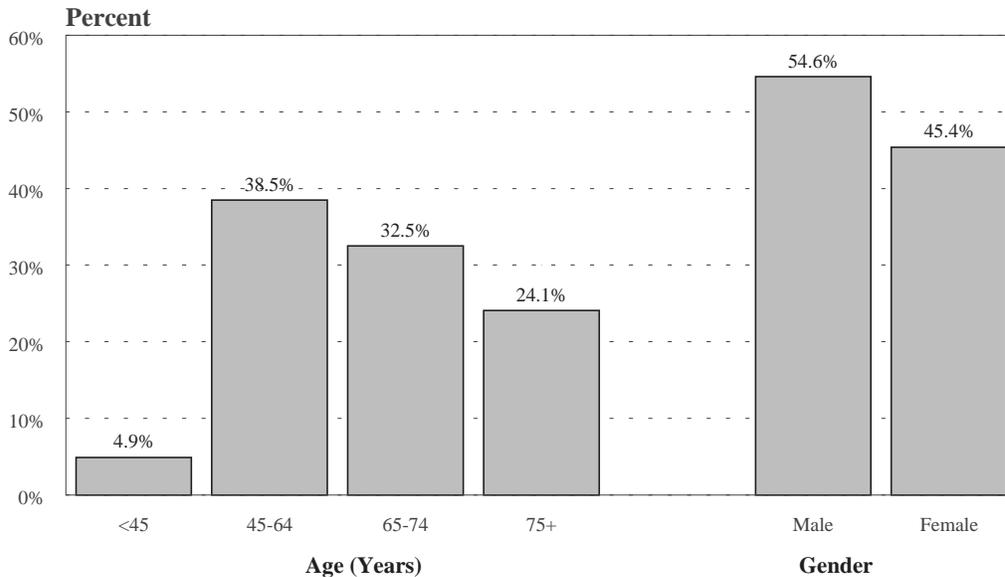
Figure 2b. Percent of Hospital Discharge Records for Any Major Cardiovascular Disease as Primary Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993-1995.



NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; diabetes defined as ICD-9-CM 250

Only 5% of the discharge records for IHD as the primary diagnosis were among persons <45 years old, while 39% were among persons 45-64 years, 33% among persons aged 65-74 years and 24% among those aged 75+ years (Figure 2c; Table 2.2). A larger percent of the discharge records for IHD were for males (55%) than females (45%) (Figure 2c; Table 2.2).

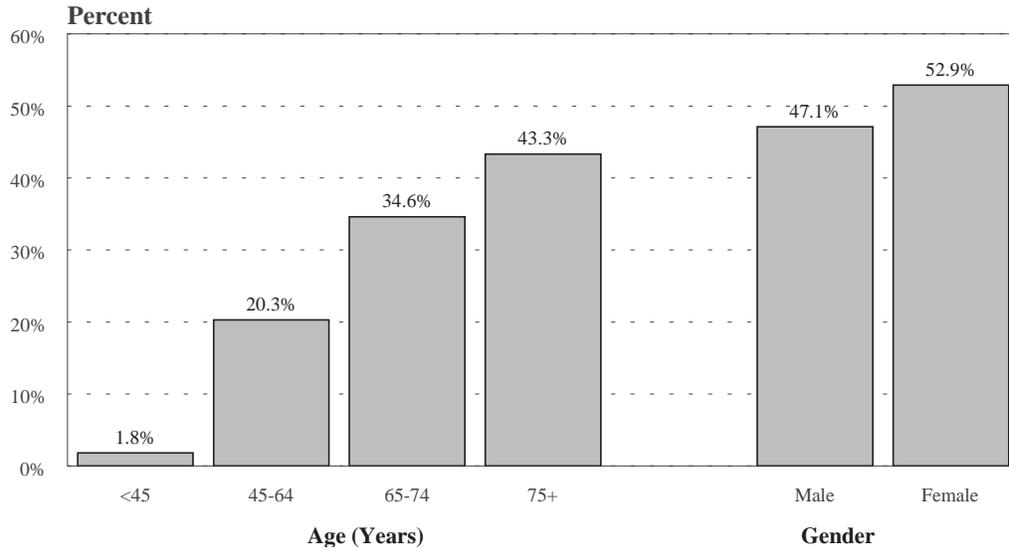
Figure 2c. Percent of Hospital Discharge Records for Ischemic Heart Disease as Primary Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993-1995.



NOTE: Ischemic heart disease defined as ICD-9-CM 410-414; diabetes defined as ICD-9-CM 250.

The age distribution of the discharge records for stroke as the primary diagnosis also varied substantially by age (Figure 2d; Table 2.3). Less than 2% of the discharge records were in persons <45 years. The percent increased with age. A larger percent of the hospitalizations for stroke as the primary diagnosis were for females than males (53% vs. 47%, respectively) (Figure 2d; Table 2.3).

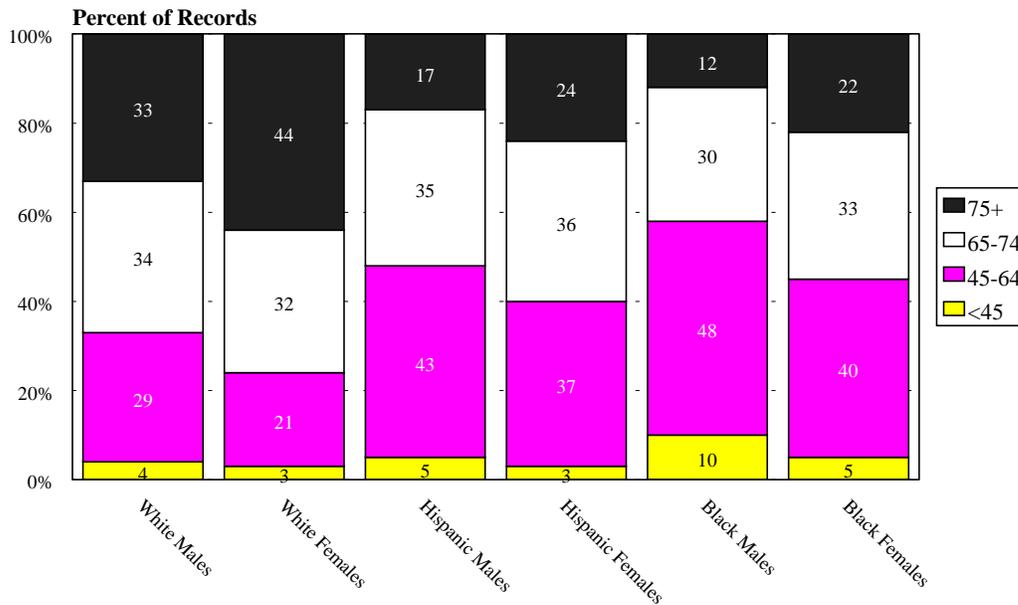
Figure 2d. Percent of Hospital Discharge Records for Stroke as Primary Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993-1995.



NOTE: Stroke is defined as ICD-9-CM 430-434, 436-438; diabetes defined as ICD-9-CM 250.

Sixty percent of the discharge records with major CVD and diabetes as a co-diagnosis are among whites, 12% among Hispanics, 4.2% among blacks and 22% race other or unknown. More than half (58%) of discharge records attributed to black males and almost half (48%) of discharge records attributed to Hispanic males with major CVD listed as the primary diagnosis and diabetes any mention are less than 65 years of age. The percentage of records for both black and Hispanic males decrease with age from 65 years on. In contrast, the percentage of records for white males and white females with major CVD as primary and diabetes any mention tends to increase with age. (Figure 2e, Table 2.4)

Figure 2e. Percent of Records with Major CVD as Primary Diagnosis, Diabetes Any Mention, By Age, Race/Ethnicity and Gender: Colorado Residents with Diabetes, 1993-1995.

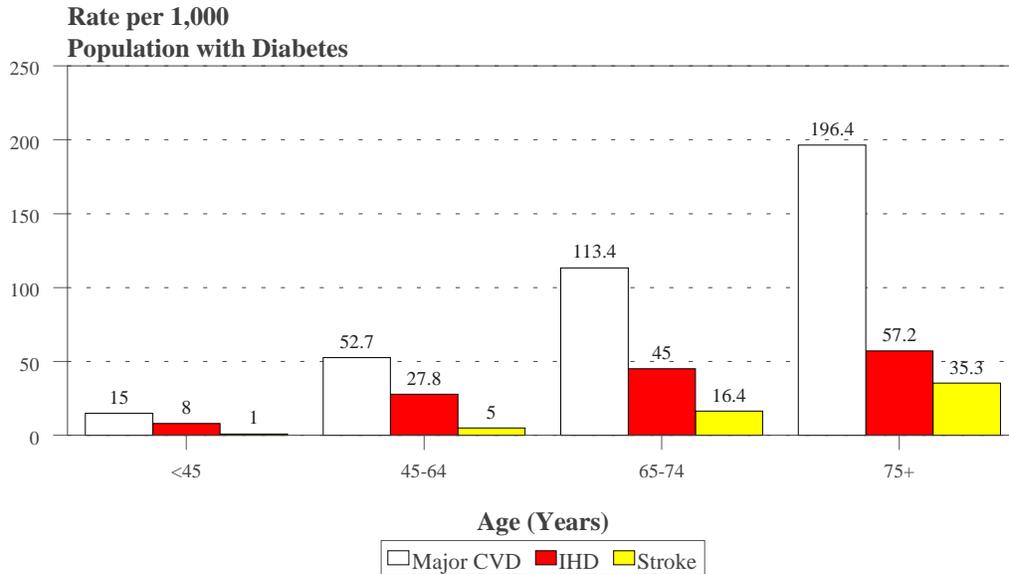


Tables 2.5-2.7 present information on the average yearly number of Colorado hospitalizations in 1993-1995 for major CVD, IHD, and stroke as the primary diagnosis, respectively, by county of residence.

B. Three-Year Average Annual Hospital Discharge Rates per 1,000 Colorado Residents with Diabetes, 1993-1995

Figure 2f shows that the three-year average annual age-specific hospital discharge rate in 1993-1995 for major CVD, IHD, and stroke increased with age. The three-year average annual discharge rate for major CVD as a primary diagnosis climbed from 15 per 1,000 Coloradans with diabetes aged <45 years to 196 per 1,000 aged 75+ years (Figure 2f; Table 2.1). The discharge rate for IHD as the primary diagnosis increased, from 8 per 1,000 persons in persons with diabetes aged <45 years to 57 per 1,000 in those aged 75+ years (Figure 2f; Table 2.2). Likewise, a substantial increase with age was observed in the discharge rate for stroke as the primary diagnosis—from 1 per 1,000 aged <45 years to 35 per 1,000 in those 75+ years (Figure 2f; Table 2.3). National surveillance data for 1994 also indicate an increase with age in discharge rates per 1,000 persons with diabetes for major CVD, IHD, and stroke². However, the 1994 national age-specific discharge rates ranged 7%–115% higher than the 1993-1995 average annual discharge rates reported for Colorado.

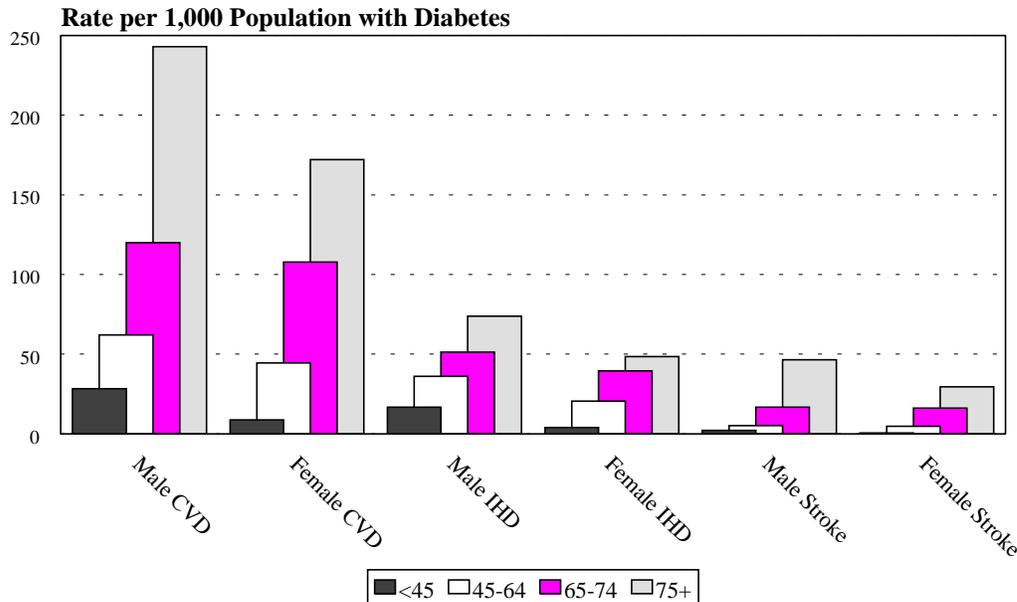
Figure 2f. Age-Specific Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), or Stroke as Primary Diagnosis, by Age: Colorado Residents with Diabetes, 1993-1995.



NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; Ischemic heart disease defined as ICD-9-CM 410-414; Stroke is defined as ICD-9-CM 430-434, 436-438; diabetes defined as ICD-9-CM 250

Figure 2g shows the 1993-1995 average annual age-specific rates of major CVD, IHD, and stroke per 1,000 Colorado diabetic population by age and gender. Results indicate that Colorado diabetic males had a higher average annual age-specific discharge rate for major CVD in 1993-1995 than their female counterparts (Figure 2g; Table 2.1). The distribution in the age-specific rates for diabetic females, however, paralleled those for diabetic males. Similar findings were observed for IHD as a primary diagnosis (Figure 2g; Table 2.2). There was little variation by gender in the age-specific discharge rates per population with diabetes for stroke, except for the 75+ group in which males are higher than females (Figure 2g; Table 2.3).

Figure 2g. Age-Specific Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), or Stroke as Primary Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993-1995.

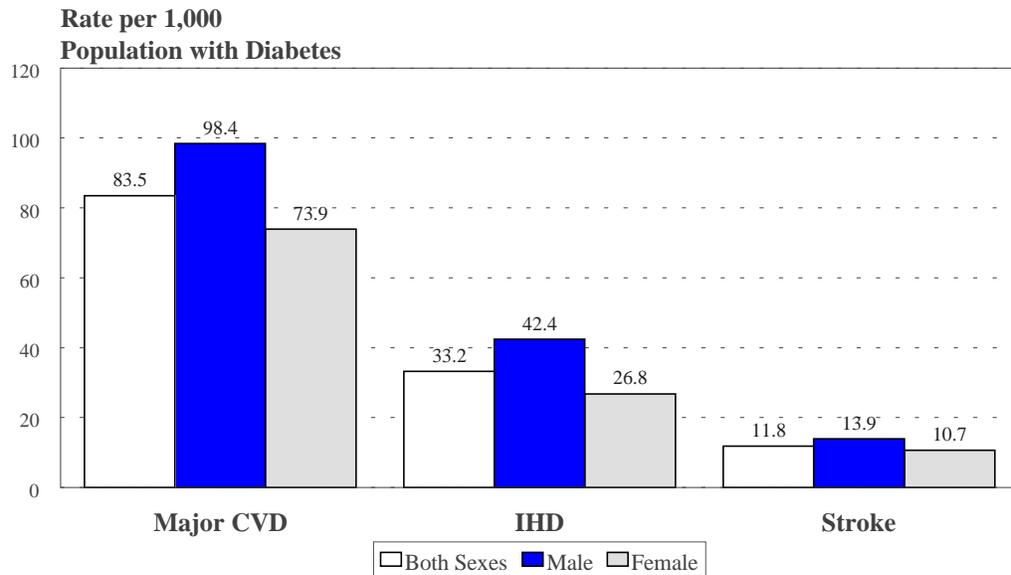


NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; Ischemic heart disease defined as ICD-9-CM 410-414; Stroke is defined as ICD-9-CM 430-434, 436-438; diabetes defined as ICD-9-CM 250

Figure 2h shows 1993-1995 average annual age-adjusted discharge rates by gender for major CVD, IHD, or stroke as the primary diagnosis for Colorado residents with diabetes. The age-adjusted rate was 84 per 1,000 population with diabetes for major CVD, 33 per 1,000 for IHD, and 12 per 1,000 for stroke as the primary diagnosis (Tables 2.1-2.3). National age-adjusted discharge rates for major CVD, IHD, and stroke as the primary diagnosis in 1994 were 51%-68% higher than the 1993-1995 annual average rates for Colorado².

Figure 2h also indicates that, in Colorado, diabetic males had a higher age-adjusted discharge rate per diabetic population than diabetic females for major CVD or IHD as the primary diagnosis in 1993-1995 (Tables 2.1, 2.2). These gender differences were statistically significant. However, the three-year average annual discharge rates for stroke as a primary diagnosis indicated little difference between diabetic males and diabetic females (Figure 2h; Table 2.3).

Figure 2h. Age-Adjusted Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), and Stroke, by Gender: Colorado Residents with Diabetes, 1993-1995.

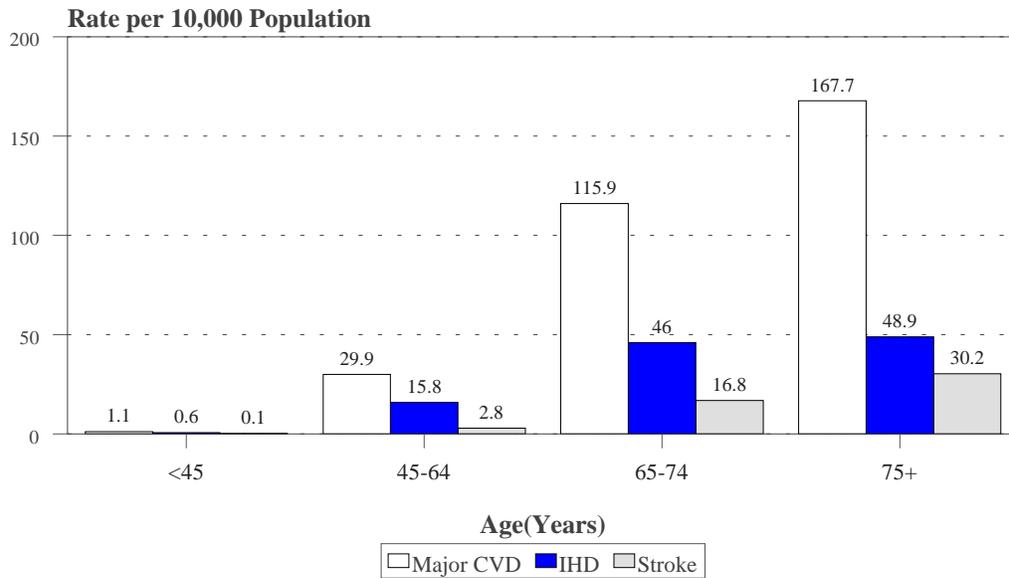


NOTE: Age Adjusted to 1980 U.S. population with diabetes.

C. Three-Year Average Annual Hospital Discharge Rates per 10,000 General Population of Colorado, 1993–1995

When the denominator was the general population of Colorado, the distribution in the discharge rates for major CVD, IHD, or stroke as the primary diagnosis showed an increase with age, which also was observed when the denominator was Colorado's population with diabetes (Figures 2f, 2i; Tables 2.1-2.3, 2.8-2.10).

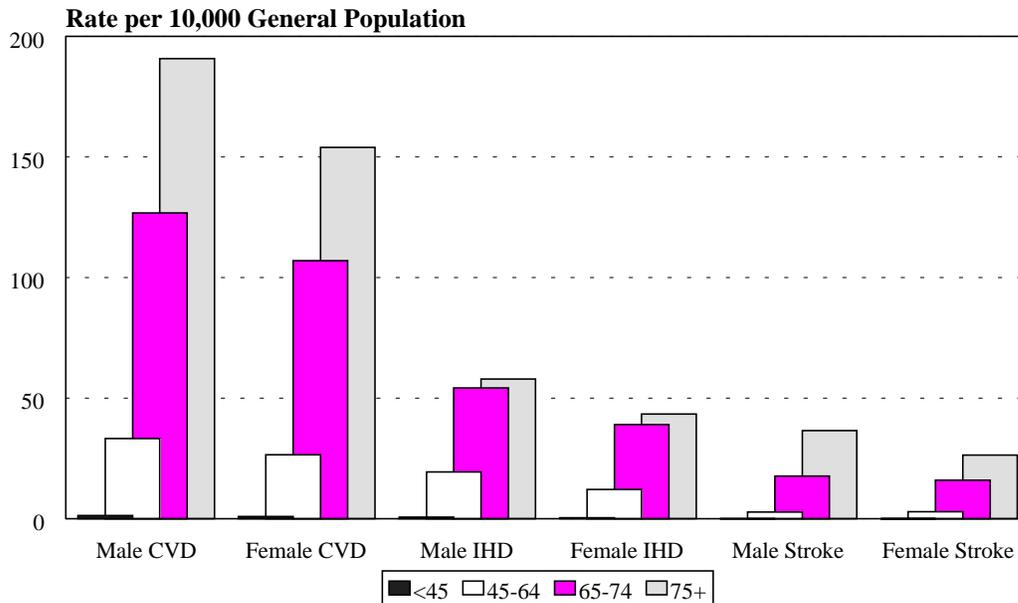
Figure 2i. Age-Specific Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), or Stroke as Primary Diagnosis, by Age: Colorado Residents, 1993-1995.



NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; Ischemic heart disease defined as ICD-9-CM 410-414; Stroke is defined as ICD-9-CM 430-434, 436-438; diabetes defined as ICD-9-CM 250

Figure 2j shows the three-year average annual age-specific discharge rates in 1993-1995 for major CVD, IHD, or stroke as the primary diagnosis per 10,000 general population of Colorado by gender. For major CVD, the three-year average annual age-specific discharge rates per 10,000 were somewhat lower for females than males (Figure 2j; Table 2.8); however, the distribution in the age-specific rates for females paralleled those for the males. Males had higher age-specific discharge rates for IHD than females (Figure 2j; Table 2.9). The hospitalization rate for IHD increased with age for both males and females. Males and females had similar age-specific discharge rates per general Colorado population for stroke as the primary diagnosis, and diabetes as a secondary diagnosis, with males slightly higher in the 75+ years of age group (Figure 2j; Table 2.10).

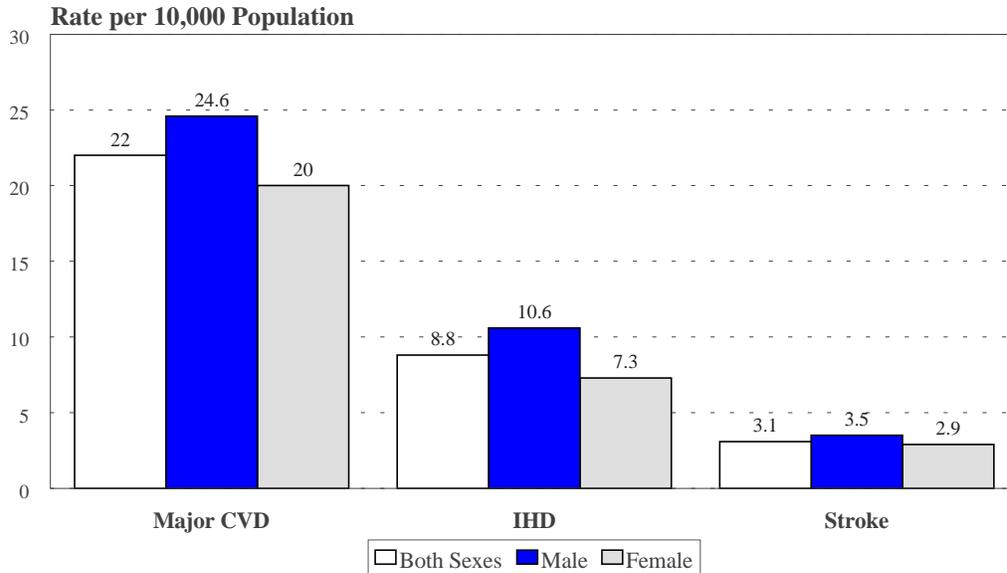
Figure 2j. Age-Specific Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), or Stroke as Primary Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; Ischemic heart disease defined as ICD-9-CM 410-414; Stroke is defined as ICD-9-CM 430-434, 436-438; diabetes defined as ICD-9-CM 250

Figure 2k shows the average annual age-adjusted discharge rate by gender for major CVD, IHD, or stroke as the primary diagnosis per general population of Colorado for 1993-1995. Males had a significantly higher age-adjusted discharge rate than females for major CVD, IHD and stroke as the primary diagnosis; however, the gender difference in stroke is marginally significant (Tables 2.8, 2.9, 2.10).

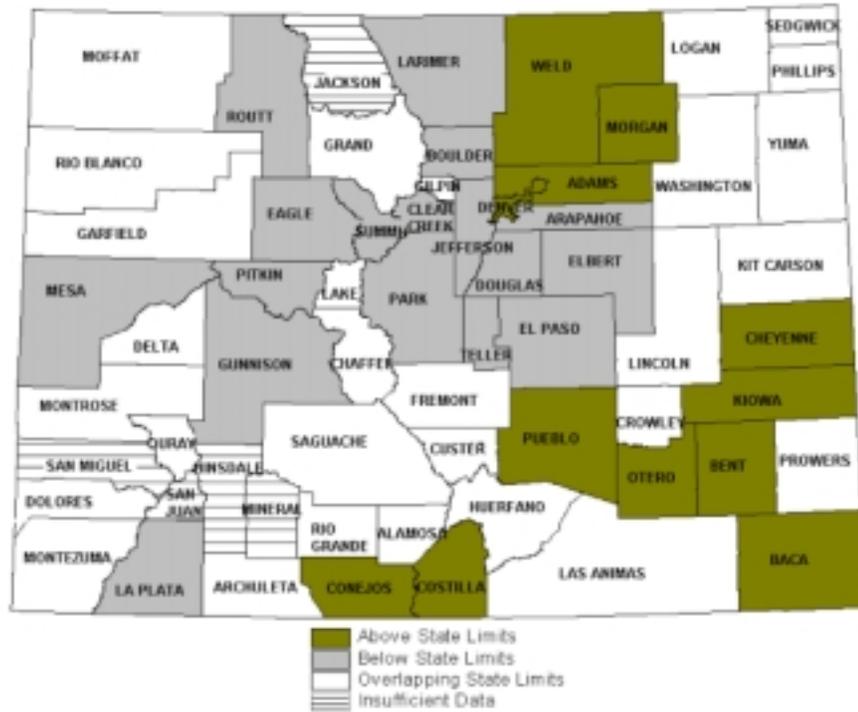
Figure 2k. Age-Adjusted Hospital Discharge Rates for Major Cardiovascular Disease (CVD), Ischemic Heart Disease (IHD), and Stroke, by Gender: Colorado Residents, 1993-1995.



NOTE: Age Adjusted to 1980 U.S. resident population.

Map 2a indicates that 12 counties had significantly higher three-year average annual age-adjusted discharge rates in 1993-1995 compared with the state as a whole for major CVD per 10,000 general population: Adams, Baca, Bent, Cheyenne, Conejos, Costilla, Denver, Kiowa, Morgan, Otero, Pueblo and Weld. Arapahoe, Boulder, Clear Creek, Douglas, Eagle, Elbert, El Paso, Gunnison, Jackson, Jefferson, La Plata, Larimer, Mesa, Park, Pitkin, Routt, Summit and Teller counties had discharge rates significantly lower than the overall state discharge rate (Map 2a, Table 2.5).

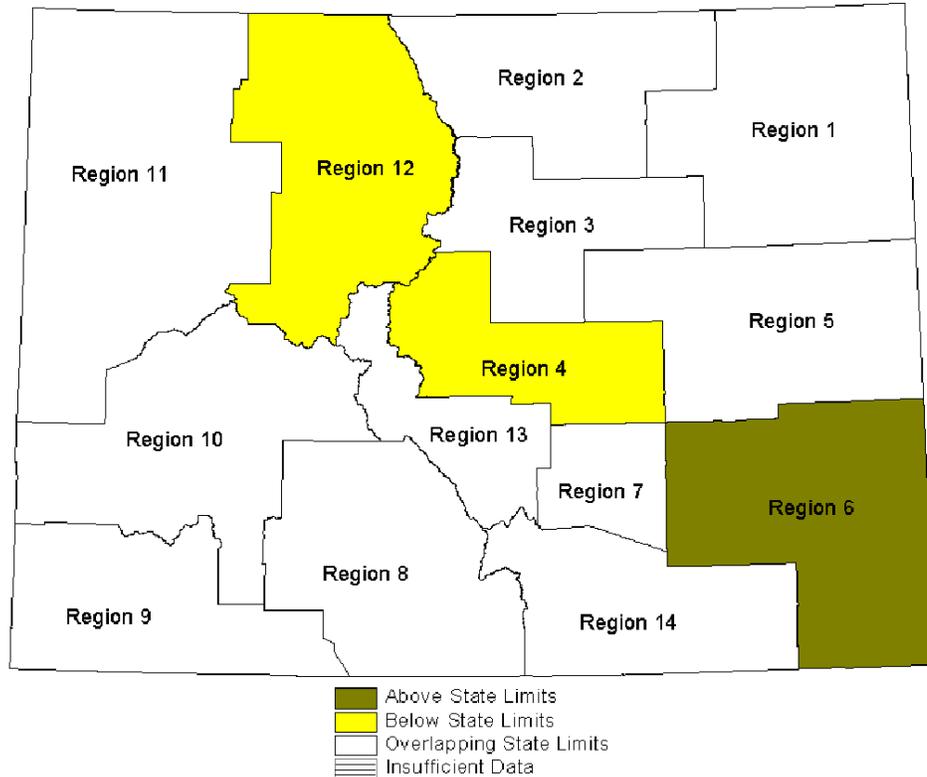
Map 2a. Age-Adjusted Hospital Discharge Rates for Major Cardiovascular Disease as Primary Diagnosis, by County, Three-Year Annual Average: Colorado Residents, 1993-1995.



NOTE: Rates are per 10,000 general population and are age-adjusted to the 1980 U.S. standard population.

Map 2b shows that Planning and Management Region 6 (located in the southeast corner of Colorado) had a significantly higher age-adjusted discharge rate than the overall Colorado discharge rate for IHD per 10,000 general population (Table 2.11). Regions 4 and 12 (located in central and north-central Colorado) both had an age-adjusted discharge rate for IHD per 10,000 general population significantly lower than that for the state as a whole.

Map 2b. Age-Adjusted Hospital Discharge Rates for Ischemic Heart Disease as Primary Diagnosis, by Region, Three-Year Annual Average: Colorado Residents, 1993-1995.



NOTE: Rates are per 10,000 general population and are age-adjusted to the estimated 1980 U.S. standard population. Region is defined as Planning and Management Region (see Appendix 2).

As with IHD, Table 2.12 indicates that Region 6 (southeast Colorado), had a statistically higher three-year average annual age-adjusted discharge rate in 1993-1995 for stroke compared with the overall state rate. Region 12 (north-central Colorado) had a significantly lower age-adjusted discharge rate.

D. Numbers and Rates of Persons with At Least One Hospital Discharge Record in a Given Year for Major CVD, IHD, or Stroke Listed as the Primary Diagnosis and Diabetes as a Co-Diagnosis, 1993-1995.

Tables 2.13–2.18 provide information on Colorado residents with diabetes who had at least one hospital discharge record in a given year between 1993 and 1995 for major CVD, IHD, or stroke as the primary diagnosis. Tables 2.13–2.15 present the discharge rates for each of the CVD outcomes per 1,000 population with diabetes and Tables 2.16–2.18 present them per 10,000 general population of Colorado.

Between 1993 and 1995, an average of 5,510 individuals had 7,358 hospitalizations for major CVD each year (1.3 major CVD hospitalizations per person) (Tables 2.1, 2.13). Thus, in the average calendar year during 1993-1995, 25% of the hospitalizations for major CVD were

re-admissions. The average yearly percent of hospitalizations that were re-admissions did not appear to vary by age group or gender.

For IHD, there were an average of 2,980 hospital discharges among 2,320 individuals with diabetes each year in 1993-1995 (1.3 IHD episodes per hospitalized individual) (Tables 2.2, 2.14). Thus, in the average calendar year during 1993-1995, 22% of hospitalizations for IHD were re-admissions.

The results show that there was an average of 1,021 hospitalizations each year for stroke in 893 individuals with diabetes in 1993-1995 (1.1 stroke episodes per hospitalized individual), indicating that in the average calendar year between 1993 and 1995, only 12.5% of hospitalizations for stroke were re-admissions (Tables 2.3, 2.15). Thus, relatively fewer re-admissions occurred for stroke in comparison with IHD.

E. Age at Discharge

In 1993-1995, the average age at discharge for a Colorado resident hospitalized for major CVD as the primary diagnosis was 68.5 years; the median was 70.0 years. The average age at discharge for major CVD was 66.9 years for males and 70.1 years for females.

For IHD coded as the primary diagnosis, the average age at discharge in 1993-1995 was 65.7 years; the median was 67.0 years. The average age at discharge for IHD as the primary diagnosis was 64.0 years for males and 67.9 years for females.

In 1993-1995, 71.7 years was the average age a Colorado resident was discharged from the hospital for stroke as the primary diagnosis; the median was 73.0 years. The average age at discharge for stroke was 70.8 years in males and 72.5 years in females.

F. Length of Stay

In 1993-1995, the average length of a hospitalization for Colorado residents with major CVD as the primary diagnosis was 5.8 days, with a range from 1 to 164 days; the median was 4.0 days. The average length of stay for major CVD was 5.7 days in males and 6.0 days in females.

For IHD, the average length of a hospitalization among Colorado residents was 5.4 days in 1993-1995, with a range from 1 to 70 days; the median was 4.0 days. The average length of stay was the same for both males and females.

When stroke was the primary diagnosis, the average length of a hospitalization was 6.8 days for Colorado residents, with a range from 1 to 101 days; the median was 5.0 days. The average length of stay for stroke was 6.6 days in males and 7.0 days in females.

G. Discharge Disposition

Tables 2.19–2.21 provide information on the discharge disposition for all hospital discharges in 1993-1995 that listed major CVD, IHD, or stroke as the primary diagnosis and diabetes as a co-diagnosis.

In 1993-1995, 5% of the hospitalizations with major CVD coded as the primary diagnosis had a discharge disposition of “died” (Table 2.19). A routine discharge was coded less frequently as age increased. Transfer to another health care facility following the hospitalization for major CVD was more common as the patient's age increased, except for acute care which decreased with age.

Between 1993 and 1995, in-patient deaths for IHD as the primary diagnosis increased in frequency with age, from 2.7% in persons <45 years old to 8.7% in persons 75+ years old (Table 2.20). The percentage of records for IHD that listed a routine discharge decreased as the patient's age increased. As with CVD, the frequency of transfers to another health care facility following hospitalization increased with age.

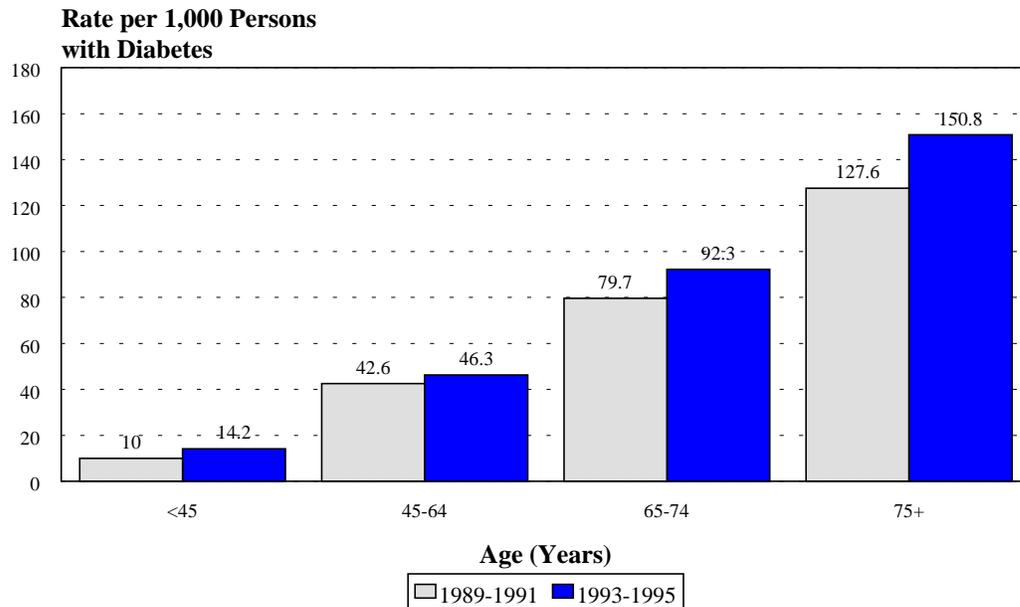
Between 1993 and 1995, 7.7% of Colorado resident hospitalizations for stroke as the primary diagnosis listed “died” as the discharge disposition (Table 2.21). The frequency of in-patient deaths for stroke was greatest in persons 75+ years old (8.9%).

H. Temporal Trends

The report, “Diabetes Prevalence and Morbidity in Colorado Residents, 1980–1991” includes hospitalization discharge numbers and data based on 5 diagnoses for major CVD, IHD and stroke. To remain consistent through time, we used only 5 diagnoses for 1993-1995 data for the following temporal analyses.

Discharge rates for major CVD among persons with diabetes (5 diagnoses) have increased for all age groups, the increase being greater with the older age groups (Figure 2.I). When the discharge rates were adjusted for age, the average annual discharge rate for CVD as the primary diagnosis and diabetes as a co-diagnosis increased from 59 per 1,000 population with diabetes in 1989-1991 to 68 per 1,000 population with diabetes in 1993-1995.

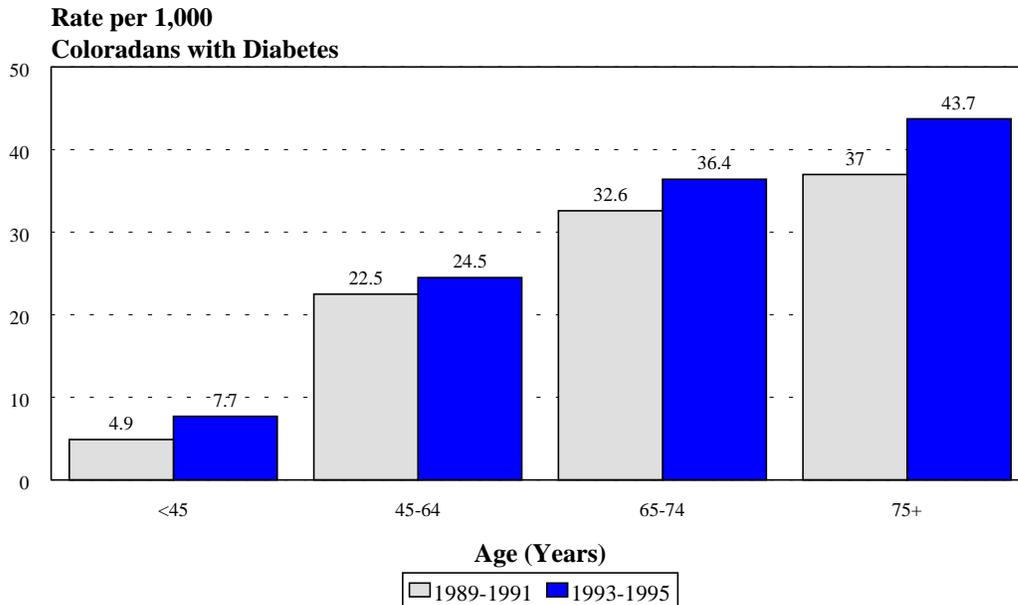
Figure 2l. Age-Specific Hospital Discharge Rates for Major CVD as the Primary Diagnosis, and Diabetes Any Mention (5 diagnoses): Colorado Residents with Diabetes, 1989-1991 vs. 1993-1995.



NOTE: Major Cardiovascular disease defined as ICD-9-CM 390-448; diabetes defined as ICD-9-CM 250

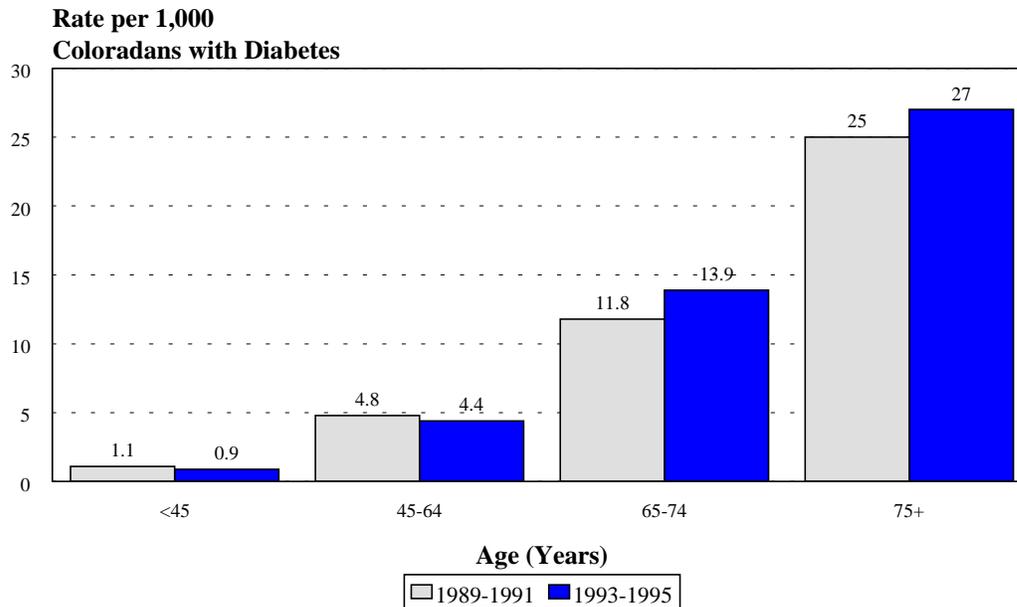
Discharge rates for IHD per 1,000 persons with diabetes have increased from 1989-1991 vs. 1993-1995 similarly to the rates for major CVD. Increases over time become greater with increasing age (Figure 2m). The age-adjusted rates for IHD increased over time from 24 per 1,000 to 28 per 1,000 in 1993-1995.

Figure 2m. Age-Specific Hospital Discharge Rates for IHD as the Primary Diagnosis, and Diabetes Any Mention (5 diagnoses): Colorado Residents with Diabetes, 1989-1991 vs. 1993-1995.



Similarly to major CVD and IHD, rates for stroke increased over time, especially with an increase in older age groups. Likewise, the age-adjusted average annual discharge rate for stroke as the primary diagnosis and diabetes as a co-diagnosis increased from 9 per 1,000 population with diabetes in 1989-1991 to 10 per 1,000 population with diabetes in 1993-1995.

Figure 2n. Age-Specific Hospital Discharge Rates for Stroke as the Primary Diagnosis, and Diabetes Any Mention (5 diagnoses): Colorado Residents with Diabetes, 1989-1991 vs. 1993-1995.



National trends in age-adjusted rates of hospital discharge for CVD, IHD and stroke as the primary diagnosis among persons with diabetes, are similar to those observed in Colorado. The age-adjusted rates increased over time with CVD having the largest increase².

Discussion

Surveillance of major CVD, IHD, and stroke among Colorado residents with diabetes was conducted using 1993-1995 Colorado hospital discharge data. The major strengths and limitations of this source of data are discussed in Chapter 1.

The data reported in this chapter provide information only on hospitalized CVD. The true burden of CVD among persons with diabetes is probably considerably underestimated using only the discharge data because they do not capture those CVD episodes that do not require hospital care, resulted in death prior to admission (e.g., dead on arrival), or were misclassified.

The percent of discharge records for major CVD and diabetes among blacks and Hispanics peaked in the 45–64 years of age group, then decreased through the 65–74 and 75+ years of age groups. In contrast, percent of discharges for major CVD and diabetes among whites climb from the 45–64 years of age group to the 65–74 group, and, in the case of white females, peaks in the 75+ years of age group. As mentioned in Chapter 1, this may be indicative of quality of and/or access to care issues.

Comparison of the 1993-1995 average annual discharge rates from Colorado with 1994 national discharge rates indicated that Colorado had a much lower discharge rate per 1,000 population with diabetes and per 10,000 general population for major CVD, IHD, and stroke than the U.S. The reasons for lower discharge rates are unknown. However, various data

indicate that hospital discharge rates for Colorado and the West are generally lower than the rest of the U.S. Other potential factors to explore may include reporting artifacts, lower health care utilization, or better health care access or general health status in Coloradans with diabetes compared with the rest of diabetic population in the U.S.

Although Colorado has lower discharge rates for CVD than the nation, CVD remains a serious problem in the state's diabetic population. In Colorado, between 1989 and 1993, heart disease was listed as the underlying cause of death on 35% of death certificates that mentioned diabetes.⁹ Furthermore, results from this chapter indicate that about 1 out of every 20 Colorado residents with diabetes was hospitalized at least once per year in 1993-1995 for a major CVD-associated condition. Among persons with diabetes, hospital utilization due to major CVD was greater in elderly persons with diabetes and males with diabetes. In addition, the results suggested that Adams, Baca, Bent, Cheyenne, Conejos, Costilla, Denver, Kiowa, Morgan, Otero, Pueblo, and Weld counties had a significantly higher age-adjusted discharge rate for major CVD in 1993-1995 compared to the overall state discharge rate.

Potential prevention strategies to reduce cardiovascular disease in persons with diabetes include smoking cessation, blood pressure and blood cholesterol control, improved glycemic control, weight loss, increased physical activity, and aspirin therapy.⁴ The Colorado Diabetes Advisory Council has proposed several recommendations to reduce the occurrence of chronic complications, such as CVD, IHD, or stroke, in the state's diabetic population.¹⁰ The recommendations involve 1) patient and professional education about the prevention, early detection, and management of chronic complications of diabetes, 2) increasing screening for chronic complications of diabetes, and 3) maintaining a surveillance system to monitor chronic complications in the state. Although Colorado's hospital discharge data have several limitations, they are useful in a surveillance system for diabetes and may assist health care professionals in targeting intervention activities or prevention strategies related to CVD and other chronic complications of diabetes.

Table 2.1. Number of Hospital Discharge Records for Major Cardiovascular Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	247	13.7	277	15.1	301	16.2	275	15.0
45-64	1,950	49.7	2,147	51.9	2,440	56.2	2,179	52.7
65-74	2,162	103.3	2,460	114.5	2,699	122.0	2,440	113.4
75+	2,161	176.9	2,421	193.2	2,808	218.0	2,463	196.4
Total	6,520	72.2	7,305	78.0	8,248	85.0	7,358	78.6
Age-Adjusted Rate*	76.5		83.0		90.6		83.5	
(95% Confidence Interval)	(74.7, 78.2)		(81.2, 84.8)		(88.8, 92.5)		(81.7, 85.3)	
Male								
<45	147	25.7	169	28.9	181	30.5	166	28.4
45-64	1,026	56.1	1,168	60.6	1,399	69.0	1,198	62.1
65-74	1,078	110.7	1,186	118.4	1,342	130.1	1,202	119.9
75+	897	218.7	1,079	250.1	1,163	258.3	1,046	243.0
Total	3,148	83.2	3,602	91.3	4,085	99.6	3,612	91.6
Age-Adjusted Rate*	89.4		98.5		106.6		98.4	
(95% Confidence Interval)	(86.4, 92.3)		(95.5, 101.5)		(103.5, 109.6)		(95.4, 101.4)	
Female								
<45	100	8.2	108	8.7	119	9.4	109	8.8
45-64	924	44.1	979	44.4	1,041	45.0	981	44.5
65-74	1,084	96.8	1,274	111.1	1,357	115.0	1,238	107.8
75+	1,264	155.8	1,342	163.3	1,645	196.3	1,417	172.0
Total	3,373	64.2	3,703	68.3	4,162	74.4	3,746	69.1
Age-Adjusted Rate*	68.3		73.4		79.7		73.9	
(95% Confidence Interval)	(66.1, 70.5)		(71.2, 75.7)		(77.4, 82.0)		(71.7, 76.2)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Major cardiovascular disease defined as ICD-9-CM 390-448 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.2. Number of Hospital Discharge Records for Ischemic Heart Disease as Primary Diagnosis and Diabetes as a Co- Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	119	6.6	159	8.7	159	8.6	146	8.0
45-64	1,028	26.2	1,129	27.3	1,290	29.7	1,149	27.8
65-74	832	39.7	953	44.4	1,119	50.6	968	45.0
75+	617	50.5	710	56.6	826	64.1	718	57.2
Total	2,596	28.7	2,951	31.5	3,394	35.0	2,980	31.8
Age-Adjusted Rate*	30.0		32.9		36.6		33.2	
(95% Confidence Interval)	(28.8, 31.1)		(31.8, 34.1)		(35.4, 37.8)		(32.1, 34.4)	
Male								
<45	82	14.3	102	17.5	108	18.2	97	16.7
45-64	595	32.6	680	35.3	812	40.1	696	36.1
65-74	452	46.4	496	49.5	597	57.9	515	51.4
75+	294	71.7	330	76.5	331	73.5	318	73.9
Total	1,423	37.6	1,608	40.8	1,848	45.0	1,626	41.2
Age-Adjusted Rate*	38.8		42.1		45.9		42.4	
(95% Confidence Interval)	(36.8, 40.9)		(40.0, 44.1)		(43.8, 48.0)		(40.3, 44.4)	
Female								
<45	37	3.0	57	4.6	51	4.0	48	3.9
45-64	433	20.7	449	20.4	478	20.6	453	20.6
65-74	380	33.9	457	39.8	522	44.2	453	39.4
75+	323	39.8	380	46.2	495	59.1	399	48.5
Total	1,173	22.3	1,343	24.8	1,546	27.6	1,354	25.0
Age-Adjusted Rate*	23.9		26.6		29.7		26.8	
(95% Confidence Interval)	(22.6, 25.3)		(25.2, 28.0)		(28.2, 31.1)		(25.4, 28.2)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Ischemic heart disease defined as ICD-9-CM 410-414 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. population with diabetes.

Table 2.3. Number of Hospital Discharge Records for Stroke as Primary Diagnosis and Diabetes as a Co-Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	22	1.2	19	1.0	13	0.7	18	1.0
45-64	179	4.6	213	5.2	228	5.3	207	5.0
65-74	288	13.8	375	17.5	395	17.9	353	16.4
75+	380	31.1	458	36.5	492	38.2	443	35.3
Total	869	9.6	1,065	11.4	1,128	11.6	1,021	10.9
Age-Adjusted Rate*	10.4		12.4		12.7		11.8	
(95% Confidence Interval)	(9.7, 11.0)		(11.6, 13.1)		(12.0, 13.4)		(11.1, 12.5)	
Male								
<45	18	3.1	11	1.9	8	1.3	12	2.1
45-64	80	4.4	107	5.6	113	5.6	100	5.2
65-74	137	14.1	172	17.2	194	18.8	168	16.7
75+	175	42.7	222	51.5	205	45.5	201	46.6
Total	410	10.8	512	13.0	520	12.7	481	12.2
Age-Adjusted Rate*	12.4		14.8		14.3		13.9	
(95% Confidence Interval)	(11.2, 13.6)		(13.5, 16.1)		(13.0, 15.5)		(12.6, 15.1)	
Female								
<45	4	0.3	8	0.6	5	0.4	6	0.5
45-64	99	4.7	106	4.8	115	5.0	107	4.8
65-74	151	13.5	203	17.7	201	17.0	185	16.1
75+	205	25.3	236	28.7	287	34.2	243	29.5
Total	459	8.7	553	10.2	608	10.9	540	10.0
Age-Adjusted Rate*	9.3		11.0		11.7		10.7	
(95% Confidence Interval)	(8.5, 10.2)		(10.1, 12.0)		(10.8, 12.6)		(9.8, 11.6)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Stroke defined as ICD-9-CM 430-434,436-438 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.4 Number and Percent of Discharge Records with Major Cardiovascular Disease, Diabetes as a Co-Diagnosis, by Gender, Age and Race/Ethnicity: Colorado , 1993-1995 Annual Average.

	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
ALL RACES*						
< 45	275	3.7	166	4.6	109	2.9
45-64	2179	29.6	1198	33.2	981	26.2
65-74	2440	33.2	1202	33.3	1238	33.0
75+	2463	33.5	1046	29.0	1417	37.8
TOTAL	7358	100.0	3612	100.0	3746	100.0
WHITE						
< 45	154	3.4	92	4.1	62	2.8
45-64	1137	25.3	655	29.0	482	21.5
65-74	1487	33.1	771	34.2	717	32.1
75+	1715	38.2	738	32.7	977	43.7
TOTAL	4493	100.0	2256	100.0	2237	100.0
HISPANIC						
< 45	32	3.5	19	4.7	13	2.6
45-64	363	40.2	176	43.2	186	37.4
65-74	320	35.4	142	34.9	178	35.8
75+	190	21.0	70	17.2	120	24.1
TOTAL	904	100.0	407	100.0	497	100.0
BLACK						
< 45	21	6.8	11	9.6	10	5.1
45-64	135	43.5	56	48.7	79	40.5
65-74	99	31.9	34	29.6	64	32.8
75+	56	18.1	14	12.2	42	21.5
TOTAL	310	100.0	115	100.0	195	100.0

*All Races includes race/ethnicity unknown

Table 2.5 Number of Hospital Discharge Records, Crude Rate, and Age-Adjusted Rate with 95% Confidence Limits, for Major Cardiovascular Disease as Primary Diagnosis and Diabetes Listed as a Co-Diagnosis, Three-Year Annual Average, by County of Residence: Colorado Residents 1993-1995.

County	Number of Records	Crude Rate	Adjusted* Rate	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
COLORADO	7,358	20.1	22.0	21.5	22.5
Adams	660	22.8	29.3	27.1	31.6 higher
Alamosa	40	27.4	31.7	21.9	41.6
Arapahoe	554	12.7	15.7	14.3	17.0 lower
Archuleta	15	22.8	20.3	10.0	30.7
Baca	121	276.0	180.6	148.0	213.2 higher
Bent	34	61.2	42.6	28.2	57.0 higher
Boulder	348	13.9	18.6	16.6	20.5 lower
Chaffee	35	24.6	18.6	12.4	24.7
Cheyenne	15	65.5	51.5	25.2	77.8 higher
Clear Creek	8	9.2	12.4	3.4	21.4 lower
Conejos	36	47.3	40.0	27.0	53.1 higher
Costilla	21	63.4	49.0	28.2	69.8 higher
Crowley	16	38.7	33.3	16.9	49.6
Custer	4	15.9	13.7	0.3	27.2
Delta	77	31.9	19.7	15.1	24.3
Denver	1,519	30.9	29.5	28.0	30.9 higher
Dolores	5	30.8	24.7	2.3	47.2
Douglas	59	6.4	14.8	10.7	18.9 lower
Eagle	14	5.0	9.8	3.8	15.9 lower
El Paso	639	14.2	18.1	16.7	19.5 lower
Elbert	9	7.2	8.1	2.7	13.5 lower
Fremont	120	31.6	24.3	20.0	28.7
Garfield	53	15.5	17.0	12.4	21.5
Gilpin	***	***	***	***	***
Grand	17	19.0	22.8	11.7	33.9
Gunnison	5	4.6	8.1	1.3	15.0 lower
Hinsdale	***	***	***	***	***
Huerfano	32	48.0	31.8	20.7	42.8
Jackson	***	***	***	***	***
Jefferson	713	14.8	17.4	16.1	18.7 lower
Kiowa	36	207.3	141.7	95.8	187.5 higher
Kit Carson	13	18.0	13.9	6.2	21.6
La Plata	56	15.0	16.8	12.4	21.2 lower
Lake	11	16.7	22.8	9.5	36.0
Larimer	298	14.2	16.3	14.5	18.2 lower
Las Animas	59	39.2	27.5	20.3	34.7
Lincoln	16	25.5	20.7	10.5	31.0
Logan	44	24.7	19.8	13.9	25.7
Mesa	235	22.9	18.9	16.5	21.4 lower

Table 2.5 Number of Hospital Discharge Records, Crude Rate, and Age-Adjusted Rate with 95% Confidence Limits, for Major Cardiovascular Disease as Primary Diagnosis and Diabetes Listed as a Co-Diagnosis, Three-Year Annual Average, by County of Residence: Colorado Residents 1993-1995.

County	Number of Records	Crude Rate	Adjusted* Rate	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
Mineral	***	***	***	***	***
Moffat	28	23.3	28.0	17.6	38.4
Montezuma	51	24.0	22.2	16.1	28.2
Montrose	67	23.8	18.0	13.7	22.3
Morgan	85	34.4	30.0	23.6	36.3 higher
Otero	138	66.2	51.9	43.2	60.7 higher
Ouray	4	14.1	14.6	0.2	29.0
Park	8	8.7	8.7	2.4	15.0 lower
Phillips	18	40.5	22.5	11.8	33.3
Pitkin	4	2.6	4.5	0.0	9.5 lower
Prowers	37	27.7	24.8	16.8	32.7
Pueblo	455	35.7	28.6	25.9	31.2 higher
Rio Blanco	12	17.3	19.5	8.3	30.8
Rio Grande	28	24.8	21.2	13.4	29.0
Routt	9	5.6	9.0	2.8	15.1 lower
Saguache	17	33.3	32.7	17.4	47.0
San Juan	***	***	***	***	***
San Miguel	***	***	***	***	***
Sedgwick	17	63.1	33.0	16.1	49.9
Summit	5	3.1	7.6	0.0	16.4 lower
Teller	18	11.2	13.9	7.3	20.6 lower
Washington	24	45.5	32.9	19.8	46.1
Weld	365	25.4	28.0	25.2	30.1 higher
Yuma	22	23.5	18.2	10.5	26.0

NOTES: Rates are per 10,000 general population.

Major cardiovascular disease defined as ICD-9-CM 390-448 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

*** Number of cases is too small (<3) to compute meaningful rate.

Table 2.6 Number of Hospital Discharge Records for Ischemic Heart Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis, by County of Residence: Colorado Residents, 1993-1995 Three Year Annual Average.

County	Number of Records
COLORADO	2980
Adams	266
Alamosa	14
Arapahoe	235
Archuleta	4
Baca	59
Bent	15
Boulder	129
Chaffee	18
Cheyenne	8
Clear Creek	4
Conejos	10
Costilla	6
Crowley	6
Custer	***
Delta	33
Denver	592
Dolores	***
Douglas	28
Eagle	8
El Paso	236

County	Number of Records
Elbert	4
Fremont	52
Garfield	27
Gilpin	***
Grand	8
Gunnison	***
Hinsdale	***
Huerfano	12
Jackson	***
Jefferson	326
Kiowa	16
Kit Carson	5
La Plata	21
Lake	4
Larimer	118
Las Animas	24
Lincoln	10
Logan	19
Mesa	95
Mineral	***
Moffat	14
Montezuma	19

County	Number of Records
Montrose	28
Morgan	38
Otero	77
Ouray	3
Park	5
Phillips	5
Pitkin	***
Prowers	10
Pueblo	157
Rio Blanco	5
Rio Grande	11
Routt	4
Saguache	8
San Juan	***
San Miguel	***
Sedgwick	6
Summit	3
Teller	6
Washington	14
Weld	136
Yuma	8

NOTE: Ischemic heart disease defined as ICD-9-CM 410-414 and diabetes defined as ICD-9-CM 250.

*** Number is less than three.

Table 2.7 Number of Hospital Discharge Records for Stroke as Primary Diagnosis and Diabetes Listed as a Co-Diagnosis, by County of Residence: Colorado Residents, 1993-1995.

County	Number of Records	County	Number of Records	County	Number of Records
COLORADO	1021	Elbert	***	Montrose	8
Adams	93	Fremont	20	Morgan	8
Alamosa	7	Garfield	6	Otero	13
Arapahoe	76	Gilpin	***	Ouray	***
Archuleta	***	Grand	***	Park	***
Baca	19	Gunnison	***	Phillips	***
Bent	6	Hinsdale	***	Pitkin	***
Boulder	54	Huerfano	5	Prowers	4
Chaffee	3	Jackson	***	Pueblo	67
Cheyenne	***	Jefferson	103	Rio Blanco	***
Clear Creek	***	Kiowa	5	Rio Grande	3
Conejos	5	Kit Carson	***	Routt	***
Costilla	3	La Plata	7	Saguache	***
Crowley	***	Lake	***	San Juan	***
Custer	***	Larimer	47	San Miguel	***
Delta	11	Las Animas	9	Sedgwick	***
Denver	207	Lincoln	***	Summit	***
Dolores	***	Logan	5	Teller	3
Douglas	6	Mesa	38	Washington	***
Eagle	***	Mineral	***	Weld	41
El Paso	96	Moffat	5	Yuma	***
		Montezuma	6		

NOTE: Stroke defined as ICD-9-CM 430-434,436-438 and diabetes defined as ICD-9-CM 250.

*** Number is less than three.

Table 2.8. Number of Hospital Discharge Records for Major Cardiovascular Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	247	1.0	277	1.1	301	1.2	275	1.1
45-64	1,950	28.3	2,147	29.4	2,440	31.7	2,179	29.9
65-74	2,162	105.2	2,460	117.1	2,699	125.0	2,440	115.9
75+	2,161	151.2	2,421	165.0	2,808	186.1	2,463	167.7
Total	6,521	18.3	7,305	19.9	8,248	22.0	7,358	20.1
Age-Adjusted Rate*	20.2		21.9		23.9		22.0	
(95% Confidence Interval)	(19.7, 20.6)		(21.4, 22.4)		(23.3, 24.4)		(21.5, 22.5)	
Male								
<45	147	1.1	169	1.3	181	1.4	166	1.3
45-64	1,026	30.2	1,168	32.5	1,399	36.9	1,198	33.3
65-74	1,078	116.7	1,186	125.3	1,342	138.0	1,202	126.8
75+	897	171.7	1,079	196.3	1,163	202.8	1,046	190.8
Total	3,148	17.8	3,602	19.8	4,085	22.0	3,612	19.9
Age-Adjusted Rate*	22.3		24.6		26.6		24.6	
(95% Confidence Interval)	(21.6, 23.1)		(23.8, 25.4)		(25.8, 27.5)		(23.8, 25.4)	
Female								
<45	100	0.8	108	0.9	119	0.9	109	0.9
45-64	924	26.4	979	26.4	1,041	26.6	981	26.5
65-74	1,084	95.9	1,274	110.3	1,357	114.4	1,238	107.0
75+	1,264	139.5	1,342	146.2	1,645	175.9	1,417	154.0
Total	3,373	18.7	3,703	20.1	4,162	22.0	3,746	20.3
Age-Adjusted Rate*	18.5		19.8		21.5		20.0	
(95% Confidence Interval)	(17.9, 19.1)		(19.2, 20.5)		(20.9, 22.2)		(19.3, 20.6)	

NOTES: Rates are per 10,000 general population. Major cardiovascular defined as defined as ICD-9-CM 390-448 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. population with diabetes.

Table 2.9. Number of Hospital Discharge Records for Ischemic Heart Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	119	0.5	159	0.6	159	0.6	146	0.6
45-64	1,028	14.9	1,129	15.5	1,290	16.8	1,149	15.8
65-74	832	40.5	953	45.4	1,119	51.8	968	46.0
75+	617	43.2	710	48.4	826	54.7	718	48.9
Total	2,596	7.3	2,951	8.1	3,394	9.1	2,980	8.1
Age-Adjusted Rate*		7.9		8.7		9.7		8.8
(95% Confidence Interval)		(7.6, 8.3)		(8.4, 9.0)		(9.4, 10.0)		(8.5, 9.1)
Male								
<45	82	0.6	102	0.8	108	0.8	97	0.7
45-64	595	17.5	680	18.9	812	21.4	696	19.4
65-74	452	48.9	496	52.4	597	61.4	515	54.3
75+	294	56.3	330	60.1	331	57.7	318	58.0
Total	1,423	8.0	1,608	8.9	1,848	9.9	1,626	9.0
Age-Adjusted Rate*		9.7		10.5		11.5		10.6
(95% Confidence Interval)		(9.2, 10.3)		(10.0, 11.0)		(11.0, 12.1)		(10.1, 11.1)
Female								
<45	37	0.3	57	0.4	51	0.4	48	0.4
45-64	433	12.4	449	12.1	478	12.2	453	12.2
65-74	380	33.6	457	39.6	522	44.0	453	39.1
75+	323	35.6	380	41.4	495	52.9	399	43.4
Total	1,173	6.5	1,343	7.3	1,546	8.2	1,354	7.3
Age-Adjusted Rate*		6.5		7.2		8.0		7.3
(95% Confidence Interval)		(6.2, 6.9)		(6.9, 7.6)		(7.6, 8.4)		(6.9, 7.7)

NOTES: Rates are per 10,000 Colorado residents. Ischemic heart disease defined as ICD-9-CM 410-414 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. population with diabetes.

Table 2.10. Number of Hospital Discharge Records for Stroke as Primary Diagnosis and Diabetes as a Co-Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	22	0.1	19	0.1	13	0.0	18	0.1
45-64	179	2.6	213	2.9	228	3.0	207	2.8
65-74	288	14.0	375	17.8	395	18.3	353	16.8
75+	380	26.6	458	31.2	492	32.6	443	30.2
Total	869	2.4	1,065	2.9	1,128	3.0	1,021	2.8
Age-Adjusted Rate*		2.7		3.2		3.3		3.1
(95% Confidence Interval)		(2.5, 2.9)		(3.0, 3.4)		(3.1, 3.5)		(2.9, 3.3)
Male								
<45	18	0.1	11	0.1	8	0.1	12	0.1
45-64	80	2.4	107	3.0	113	3.0	100	2.8
65-74	137	14.8	172	18.2	194	20.0	168	17.7
75+	175	33.5	222	40.4	205	35.7	201	36.6
Total	410	2.3	512	2.8	520	2.8	481	2.6
Age-Adjusted Rate*		3.1		3.7		3.6		3.5
(95% Confidence Interval)		(2.8, 3.4)		(3.4, 4.0)		(3.3, 3.9)		(3.1, 3.8)
Female								
<45	4	0.0	8	0.1	5	0.0	6	0.0
45-64	99	2.8	106	2.9	115	2.9	107	2.9
65-74	151	13.4	203	17.6	201	16.9	185	16.0
75+	205	22.6	236	25.7	287	30.7	243	26.4
Total	459	2.6	553	3.0	608	3.2	540	2.9
Age-Adjusted Rate*		2.5		3.0		3.1		2.9
(95% Confidence Interval)		(2.3, 2.7)		(2.7, 3.2)		(2.9, 3.4)		(2.6, 3.1)

NOTES: Rates are per 10,000 Colorado residents. Stroke defined as ICD-9-CM 430-434,436-438 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.11. Number of Hospital Discharge Records, Crude Rate, and Age-Adjusted Rate with 95% Confidence Limits, for Ischemic Heart Disease as Primary Diagnosis and Diabetes Listed as a Co-Diagnosis, By Region of Residence, Three-Year Annual Average: Colorado Residents, 1993-1995.

PMR	Number of Records	Crude Rate	Adjusted Rate*	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
COLORADO	2,980	8.1	8.8	8.5	9.1
Region 1	90	13.9	11.3	8.9	13.6
Region 2	254	7.2	8.1	7.1	9.1
Region 3	1,580	7.7	8.6	8.2	9.1
Region 4	247	5.2	6.4	5.6	7.2 lower
Region 5	27	9.3	8.6	5.3	11.9
Region 6	183	36.5	30.2	25.8	34.6 higher
Region 7	157	12.3	10.2	8.6	11.9
Region 8	50	11.8	11.3	8.1	14.4
Region 9	46	6.9	6.9	4.9	8.8
Region 10	65	9.0	7.3	5.6	9.1
Region 11	141	9.1	8.3	7.0	9.7
Region 12	26	3.1	4.8	2.8	6.8 lower
Region 13	76	12.3	9.9	7.7	12.2
Region 14	36	16.6	12.5	8.3	16.6

NOTES: Rates are per 10,000 general population. Ischemic heart disease defined as ICD-9-CM 410-414; diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 2.12. Number of Hospital Discharge Records, Crude Rate, and Age-Adjusted Rate with 95% Confidence Limits, for Stroke as Primary Diagnosis and Diabetes Listed as a Co-Diagnosis, By Region of Residence, Three-Year Annual Average: Colorado Residents, 1993-1995.

PMR	Number of Records	Crude Rate	Adjusted Rate*	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
COLORADO	1,021	2.8	3.1	2.9	3.3
Region 1	18	2.8	2.0	1.1	2.9
Region 2	88	2.5	2.8	2.2	3.4
Region 3	540	2.6	3.1	2.8	3.4
Region 4	100	2.1	2.8	2.2	3.3
Region 5	6	2.0	1.8	0.3	3.3
Region 6	49	9.8	7.1	5.1	9.2 higher
Region 7	67	5.2	4.1	3.1	5.1
Region 8	20	4.7	4.4	2.5	6.3
Region 9	15	2.2	2.3	1.1	3.4
Region 10	21	2.9	2.2	1.2	3.2
Region 11	52	3.3	2.9	2.1	3.7
Region 12	5	0.6	1.2	0.1	2.3 lower
Region 13	25	4.1	3.1	1.9	4.4
Region 14	14	6.6	4.2	2.0	6.4

NOTES: Rates are per 10,000 general population. Stroke defined as ICD-9-CM 430-434,436-438; diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 2.13. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Major Cardiovascular Disease as Primary Diagnosis and Diabetes as a Secondary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	181	10.1	209	11.4	215	11.6	202	11.0
45-64	1,466	37.4	1,613	39.0	1,801	41.5	1,627	39.4
65-74	1,615	77.2	1,818	84.6	1,981	89.6	1,805	83.9
75+	1,677	137.3	1,809	144.3	2,144	166.4	1,877	149.6
Total	4,939	54.7	5,449	58.2	6,141	63.3	5,510	58.8
Age-Adjusted Rate*	58.0		61.9		67.5		62.6	
(95% Confidence Interval)	(56.4, 59.5)		(60.3, 63.5)		(65.9, 69.1)		(61.0, 64.1)	
Male								
<45	110	19.2	134	22.9	128	21.6	124	21.2
45-64	810	44.3	911	47.3	1,046	51.6	922	47.9
65-74	808	83.0	883	88.1	1,003	97.2	898	89.6
75+	694	169.2	803	186.1	916	203.4	804	186.8
Total	2,422	64.0	2,731	69.2	3,093	75.4	2,749	69.7
Age-Adjusted Rate*	68.7		74.5		81.0		74.9	
(95% Confidence Interval)	(66.1, 71.3)		(71.8, 77.1)		(78.3, 83.7)		(72.2, 77.6)	
Female								
<45	71	5.8	75	6.0	87	6.9	78	6.2
45-64	656	31.3	702	31.8	755	32.6	704	31.9
65-74	807	72.1	935	81.5	978	82.9	907	78.9
75+	983	121.2	1,006	122.4	1,228	146.5	1,072	130.2
Total	2,517	47.9	2,718	50.2	3,048	54.5	2,761	50.9
Age-Adjusted Rate*	51.0		53.9		58.3		54.4	
(95% Confidence Interval)	(49.0, 52.9)		(51.9, 55.9)		(56.3, 60.3)		(52.5, 56.4)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Major cardiovascular disease defined as ICD-9-CM 390-448 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.14. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Ischemic Heart Disease as Primary Diagnosis and Diabetes as Secondary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	87	4.8	116	6.3	114	6.1	106	5.8
45-64	783	20.0	870	21.1	983	22.6	879	21.3
65-74	666	31.8	740	34.4	853	38.6	753	35.0
75+	508	41.6	573	45.7	666	51.7	582	46.4
Total	2,044	22.6	2,299	24.5	2,616	27.0	2,320	24.8
Age-Adjusted Rate*	23.7		25.7		28.3		25.9	
(95% Confidence Interval)	(22.6, 24.7)		(24.6, 26.7)		(27.2, 29.3)		(24.9, 27.0)	
Male								
<45	62	10.8	79	13.5	75	12.6	72	12.3
45-64	489	26.8	542	28.1	631	31.1	554	28.7
65-74	363	37.3	387	38.6	463	44.9	404	40.3
75+	234	57.0	264	61.2	277	61.5	258	60.0
Total	1,148	30.3	1,272	32.2	1,446	35.2	1,289	32.7
Age-Adjusted Rate*	31.3		33.3		36.0		33.6	
(95% Confidence Interval)	(29.5, 33.1)		(31.4, 35.1)		(34.2, 37.9)		(31.8, 35.4)	
Female								
<45	25	2.0	37	3.0	39	3.1	34	2.7
45-64	294	14.0	328	14.9	352	15.2	325	14.7
65-74	303	27.1	353	30.8	390	33.0	349	30.3
75+	274	33.8	309	37.6	389	46.4	324	39.3
Total	896	17.1	1,027	18.9	1,170	20.9	1,031	19.0
Age-Adjusted Rate*	18.3		20.4		22.4		20.4	
(95% Confidence Interval)	(17.1, 19.5)		(19.1, 21.6)		(21.2, 23.7)		(19.2, 21.6)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Ischemic heart disease defined as ICD-9-CM 410-414 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.15. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Stroke as Primary Diagnosis and Diabetes as a Secondary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	17	0.9	18	1.0	10	0.5	15	0.8
45-64	157	4.0	194	4.7	205	4.7	185	4.5
65-74	269	12.9	320	14.9	333	15.1	307	14.3
75+	324	26.5	392	31.3	440	34.2	385	30.7
Total	767	8.5	924	9.9	988	10.2	893	9.5
Age-Adjusted Rate*	9.2		10.7		11.1		10.3	
(95% Confidence Interval)	(8.5, 9.8)		(10.0, 11.4)		(10.4, 11.8)		(9.7, 11.0)	
Male								
<45	13	2.3	10	1.7	6	1.0	10	1.7
45-64	72	3.9	95	4.9	105	5.2	91	4.7
65-74	129	13.2	148	14.8	167	16.2	148	14.8
75+	147	35.8	184	42.7	180	40.0	170	39.6
Total	361	9.5	437	11.1	458	11.2	419	10.6
Age-Adjusted Rate*	10.9		12.6		12.5		12.0	
(95% Confidence Interval)	(9.7, 12.0)		(11.4, 13.8)		(11.4, 13.7)		(10.9, 13.2)	
Female								
<45	4	0.3	8	0.6	4	0.3	5	0.4
45-64	85	4.1	99	4.5	100	4.3	95	4.3
65-74	140	12.5	172	15.0	166	14.1	159	13.9
75+	177	21.8	208	25.3	260	31.0	215	26.1
Total	406	7.7	487	9.0	530	9.5	474	8.7
Age-Adjusted Rate*	8.3		9.7		10.2		9.4	
(95% Confidence Interval)	(7.5, 9.1)		(8.8, 10.5)		(9.3, 11.0)		(8.5, 10.2)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Stroke defined as ICD-9-CM 430-434,436-438 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.16. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Major Cardiovascular Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	181	0.7	209	0.8	215	0.8	202	0.8
45-64	1,466	21.3	1,613	22.1	1,801	23.4	1,627	22.3
65-74	1,615	78.6	1,818	86.5	1,981	91.8	1,805	88.7
75+	1,677	117.4	1,809	123.3	2,144	142.1	1,877	127.8
Total	4,939	13.8	5,449	14.9	6,141	16.4	5,510	15.1
Age-Adjusted Rate*	15.3		16.3		17.8		16.5	
(95% Confidence Interval)	(14.8, 15.7)		(15.9, 16.7)		(17.3, 18.2)		(16.0, 16.9)	
Male								
<45	110	0.9	134	1.0	128	1.0	124	0.9
45-64	810	23.9	911	25.4	1,046	27.6	922	25.7
65-74	808	87.5	883	93.3	1,003	103.2	898	94.8
75+	694	132.8	803	146.1	916	159.7	804	146.6
Total	2,422	13.7	2,731	15.0	3,093	16.6	2,749	15.1
Age-Adjusted Rate*	17.2		18.6		20.2		18.7	
(95% Confidence Interval)	(16.5, 17.9)		(17.9, 19.3)		(19.5, 21.0)		(18.0, 19.4)	
Female								
<45	71	0.6	75	0.6	87	0.7	78	0.6
45-64	656	18.7	702	19.0	755	19.3	704	19.0
65-74	807	71.4	935	81.0	978	82.5	907	78.4
75+	983	108.5	1,006	109.6	1,228	131.3	1,072	116.6
Total	2,517	14.0	2,718	14.7	3,048	16.1	2,761	15.1
Age-Adjusted Rate*	13.8		14.6		15.7		14.7	
(95% Confidence Interval)	(13.2, 14.3)		(14.0, 15.1)		(15.2, 16.3)		(14.2, 15.3)	

NOTES: Rates are per 10,000 Colorado residents. Major cardiovascular disease defined as ICD-9-CM 390-448 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 2.17. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Ischemic Heart Disease as Primary Diagnosis and Diabetes as a Co-Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	87	0.3	116	0.5	114	0.4	106	0.4
45-64	783	11.4	870	11.9	983	12.8	879	12.0
65-74	666	32.4	740	35.2	853	39.5	753	35.8
75+	508	35.6	573	39.0	666	44.1	582	39.7
Total	2,044	5.7	2,299	6.3	2,616	7.0	2,320	6.3
Age-Adjusted Rate*	6.3		6.8		7.5		6.9	
(95% Confidence Interval)	(6.0, 6.5)		(6.5, 7.1)		(7.2, 7.8)		(6.6, 7.1)	
Male								
<45	62	0.5	79	0.6	75	0.6	72	0.6
45-64	489	14.4	542	15.1	631	16.6	554	15.4
65-74	363	39.3	387	40.9	463	47.6	404	42.7
75+	234	44.8	264	48.0	277	48.3	258	47.1
Total	1,148	6.5	1,272	7.0	1,446	7.8	1,289	7.1
Age-Adjusted Rate*	7.8		8.3		9.1		8.4	
(95% Confidence Interval)	(7.4, 8.3)		(7.9, 8.8)		(8.6, 9.5)		(8.0, 8.9)	
Female								
<45	25	0.2	37	0.3	39	0.3	34	0.3
45-64	294	8.4	328	8.9	352	9.0	325	8.8
65-74	303	26.8	353	30.6	390	32.9	349	30.1
75+	274	30.2	309	33.7	389	41.6	324	35.2
Total	896	5.0	1,027	5.6	1,170	6.2	1,031	5.6
Age-Adjusted Rate*	5.0		5.5		6.1		5.5	
(95% Confidence Interval)	(4.6, 5.3)		(5.2, 5.9)		(5.7, 6.4)		(5.2, 5.9)	

NOTES: Rates are per 10,000 Colorado residents. Ischemic heart disease defined as ICD-9-CM 410-414 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 2.18. Number and Rate of Persons with At Least One Hospital Discharge Record for Stroke as Primary Diagnosis and Diabetes as a Co-Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	17	0.1	18	0.1	10	0.0	15	0.1
45-64	157	2.3	194	2.7	205	2.7	185	2.5
65-74	269	13.1	320	15.2	333	15.4	307	14.6
75+	324	22.7	392	26.7	440	29.2	385	26.2
Total	767	2.1	924	2.5	988	2.6	893	2.4
Age-Adjusted Rate*	2.4		2.8		2.9		2.7	
(95% Confidence Interval)	(2.2, 2.6)		(2.6, 3.0)		(2.7, 3.1)		(2.5, 2.9)	
Male								
<45	13	0.1	10	0.1	6	0.0	10	0.1
45-64	72	2.1	95	2.6	105	2.8	91	2.5
65-74	129	14.0	148	15.6	167	17.2	148	15.6
75+	147	28.1	184	33.5	180	31.4	170	31.1
Total	361	2.0	437	2.4	458	2.5	419	2.3
Age-Adjusted Rate*	2.7		3.1		3.1		3.0	
(95% Confidence Interval)	(2.4, 3.0)		(2.8, 3.4)		(2.9, 3.4)		(2.7, 3.3)	
Female								
<45	4	0.0	8	0.1	4	0.0	5	0.0
45-64	85	2.4	99	2.7	100	2.6	95	2.6
65-74	140	12.4	172	14.9	166	14.0	159	13.8
75+	177	19.5	208	22.7	260	27.8	215	23.4
Total	406	2.3	487	2.6	530	2.8	474	2.6
Age-Adjusted Rate*	2.2		2.6		2.7		2.5	
(95% Confidence Interval)	(2.0, 2.4)		(2.4, 2.8)		(2.5, 3.0)		(2.3, 2.7)	

NOTES: Rates are per 10,000 Colorado residents. Stroke defined as ICD-9-CM 430-434,436-438 and diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 2.19 Discharge Status of Hospital Discharge Records for Major Cardiovascular Disease as Primary Diagnosis, Diabetes as a Co-Diagnosis, by Age: Colorado, 1993-1995.

Age Group (Years)	Total (N=22,074)	<45 (N=825)	45-64 (N=6,537)	65-74 (N=7,321)	75+ (N=7,390)
Discharge Status	Percent	Percent	Percent	Percent	Percent
Total	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	62.1	79.6	75.5	63.6	46.8
Transferred to Another Acute Care Facility	5.4	7.8	7.0	5.7	3.2
Transferred to Skilled Nursing Facility	8.8	1.1	2.6	7.0	16.8
Transferred to Intermediate Care Facility	1.4	0.1	0.4	1.1	2.8
Transferred to Another Type of Institution for Inpatient Care	5.5	2.5	3.9	5.4	7.2
Transferred to Home Health Care	11.5	4.5	6.9	12.2	15.7
Left Facility Against Medical Advice	0.3	1.5	0.5	0.2	0.1
Home IV Service	0.0	1.0	0.1	0.0	0.0
Died	5.0	2.8	3.1	4.7	7.3

NOTE: Diabetes defined as ICD-9-CM 250.

*** Percent based on less than three cases.

Table 2.20 Discharge Status of Hospital Discharge Records for Ischemic Heart Disease as Primary Diagnosis, Diabetes as a Co-Diagnosis, by Age: Colorado, 1993-1995.

Age Group (Years)	Total (N=8,941) Percent	<45 (N=437) Percent	45-64 (N=3,447) Percent	65-74 (N=2,904) Percent	75+ (N=2,153) Percent
Discharge Status	Percent	Percent	Percent	Percent	Percent
Total	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	70.8	80.3	79.5	70.2	55.6
Transferred to Another Acute Care Facility	9.2	10.1	10.8	9.8	5.9
Transferred to Skilled Nursing Facility	3.5	0.9	0.7	3.0	9.2
Transferred to Intermediate Care Facility	0.6	0.0	0.2	0.6	1.6
Transferred to Another Type of Institution for Inpatient Care	2.6	2.3	1.9	2.4	3.9
Transferred to Home Health Care	8.1	2.1	3.9	9.0	14.8
Left Facility Against Medical Advice	0.5	1.6	0.7	0.3	0.2
Home IV Service	0.0	0.0	0.0	0.0	0.0
Died	4.7	2.7	2.4	4.6	8.7

NOTE: Diabetes defined as ICD-9-CM 250.

*** Percent based on less than three cases.

Table 2.21 Discharge Status of Hospital Discharge Records for Stroke as Primary Diagnosis, Diabetes as a Co-Diagnosis, by Age: Colorado, 1993-1995.

Age Group (Years)	Total (N=3,062) Percent	<45 (N=54) Percent	45-64 (N=620) Percent	65-74 (N=1,058) Percent	75+ (N=1,330) Percent
Discharge Status					
Total	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	35.9	53.7	46.1	40.1	27.1
Transferred to Another Acute Care Facility	3.2	9.3	3.7	3.0	2.8
Transferred to Skilled Nursing Facility	19.0	3.7	9.7	15.7	26.7
Transferred to Intermediate Care Facility	2.9	1.9	2.4	2.4	3.7
Transferred to Another Type of Institution for Inpatient Care	20.1	14.8	20.5	20.4	19.9
Transferred to Home Health Care	11.0	9.3	9.7	12.2	10.7
Left Facility Against Medical Advice	0.2	0.0	0.5	0.0	0.2
Home IV Service	0.0	0.0	0.0	0.0	0.0
Died	7.7	7.4	7.4	6.2	8.9

NOTE: Diabetes defined as ICD-9-CM 250.

*** Percent based on less than three cases.

Chapter 3

Lower Extremity Amputations

Introduction

Diabetes is responsible for more than half of all non-traumatic lower extremity amputations (LEAs) in the U.S.¹, while persons with diabetes comprise 5.9% of the total population². There were about 54,000 diabetic individuals who underwent one or more nontraumatic LEAs in 1990¹. Lower-level amputations (toe, foot, and ankle) were more common in individuals with diabetes than without diabetes, while the more disabling above-knee amputations were performed with greater frequency in nondiabetic individuals¹. Peripheral vascular disease, peripheral neuropathy, and infection are three major contributors to the increased risk of LEA among persons with diabetes^{3,4}. Other risk factors for LEA in persons with diabetes include increasing age, male gender, non-white race/ethnicity, increasing duration of diabetes, cigarette smoking and previous LEA and foot lesions¹.

This chapter presents information from 1993 to 1995 on the numbers and rates of hospital discharges for non-traumatic LEA by age, gender, and region among Colorado residents with diabetes. Limited information on race/ethnicity is provided. Although the Colorado Health and Hospital Association (CHA) dataset has included race/ethnicity since 1993, about one-fourth of the records have race/ethnicity other or unknown. Descriptive statistics on age at discharge, length-of-stay, and discharge disposition are also provided. Results from this study will be compared to baseline data established in a study for years 1989-1991⁵.

Methods

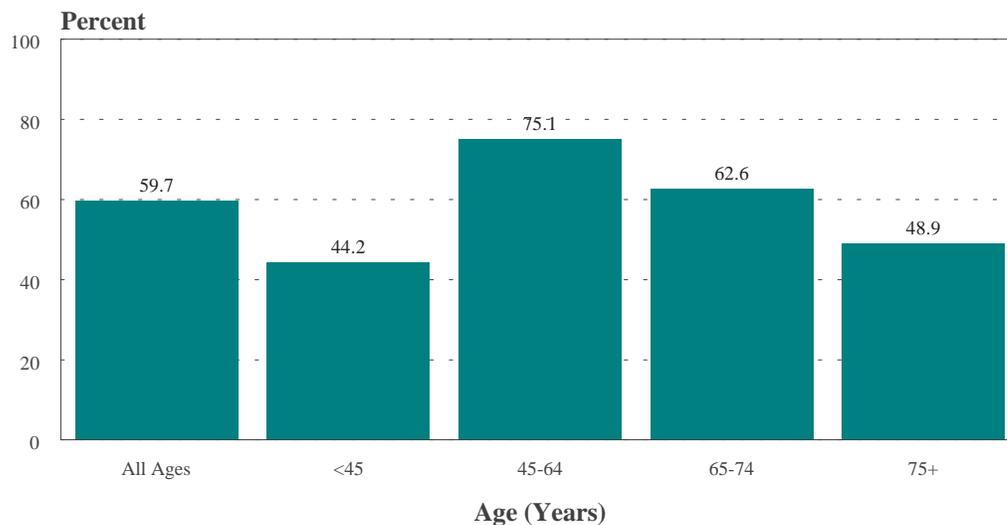
The 1993–1995 hospital discharge data from the CHA were used to conduct surveillance on non-traumatic LEAs in Coloradans with diabetes. Detailed information on the hospital discharge data is provided in Chapter 1. Hospital discharge records were selected for Colorado residents if the records listed a non-traumatic amputation (procedure ICD-9-CM 84.10-84.19—see Appendix 5) with any mention of a diabetes diagnosis (ICD-9-CM 250—see Appendix 5). Records were excluded from analysis if any of the discharge diagnoses were coded to ICD-9-CM 895-897 (traumatic amputation of the toe, foot, or leg). The Centers for Disease Control and Prevention (CDC) report, Diabetes Surveillance, 1997⁶ and the previous Colorado report⁵ used this same definition for non-traumatic LEA related to diabetes.

Hospital discharge rates for non-traumatic LEA related to diabetes were calculated by age, and gender. Rates per 10,000 general population of Colorado were also calculated for Planning and Management Region of residence (see Appendix 2). The chapter also presents the average annual number of diabetes-related LEAs in 1993–1995 by county of residence. Age-specific and gender-specific rates were expressed in terms of hospital discharge records and in terms of persons with at least one hospitalization in a given year for a non-traumatic LEA related to diabetes (see Chapter 1 for methods). Discharge rates were age-adjusted using the direct method of standardization and 95% confidence intervals were calculated for the age-adjusted discharge rates. The estimated 1980 U.S. diabetic population was used as the standard to age-adjust discharge rates per 1,000 diabetic residents of Colorado (see Appendix 3). The 1980 U.S. resident population was the standard to age-adjust rates per 10,000 general resident population of Colorado (see Appendix 3). Both of these two national populations were used as standard populations in CDC’s Diabetes Surveillance, 1997⁶ and the previous Colorado report⁵. Statistics on age at discharge, length of stay, and hospital discharge disposition for diabetes-related non-traumatic LEA hospitalizations were calculated using the methods described in Chapter 1.

Results

A. Number of Hospital Discharge Records

Figure 3a. Percent of All Non-Traumatic Lower Extremity Amputations (LEA) Listing Diabetes as a Discharge Diagnosis, by Age: Colorado Residents, 1993-1995.

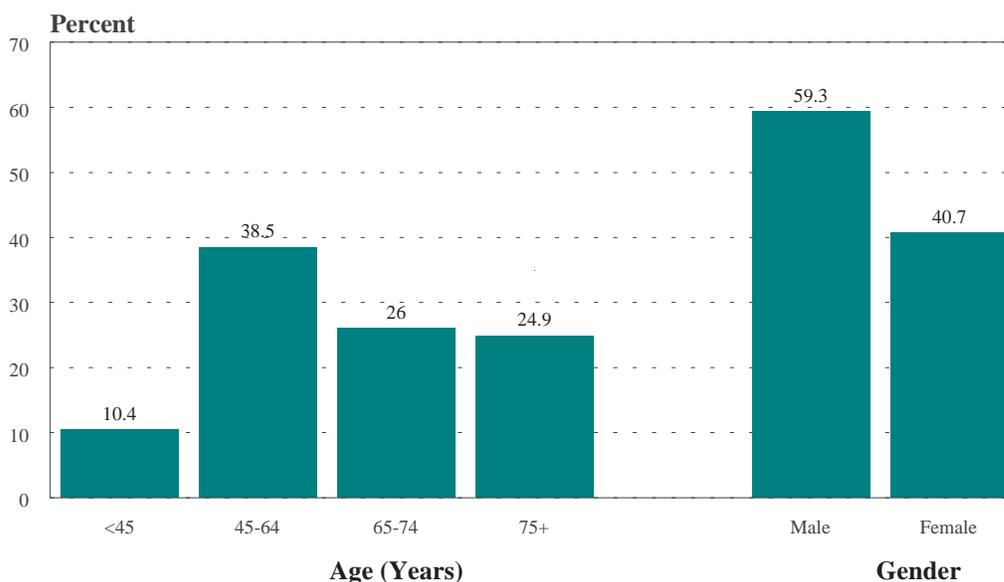


There were 2,323 Colorado resident hospitalizations in 1993–1995 that mentioned a non-traumatic LEA (yearly average, 774). Sixty percent (n=1,386) of these hospitalizations mentioned diabetes as a discharge diagnosis (Figure 3a). Coding of diabetes on the discharge record for a non-traumatic LEA varied with age: diabetes was coded on about 75% of the discharge records for a non-traumatic LEA among persons

aged 45-64 years vs. about 44-49% among persons <45 years or 75+ years and 63% for ages 65-74 years (Figure 3a).

In 1993–1995, about 10% (n=145) of the hospitalizations for diabetes-related LEA were among Coloradans aged <45 years and more than one-third (n=535) were among those aged 45-64 years (Figure 3b; Table 3.1). Figure 3b indicates that more than half of the hospitalizations for diabetes-related LEA were among persons aged 65+ years (n=706) and among males (n=822) (Table 3.1).

Figure 3b. Percent of Hospital Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Age and Gender: Colorado Residents, 1993–1995.

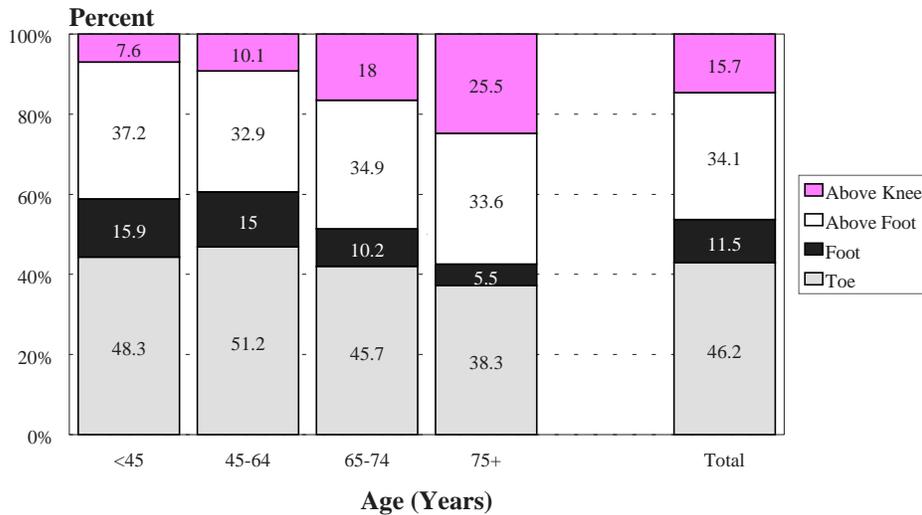


NOTE: Lower Extremity Amputation defined as ICD-9-CM 84.10-84.19

Table 3.2 shows that residents of Denver County had the highest average yearly number of diabetes-related LEAs in 1993–1995 (n=98), followed by residents of Adams (n=47), Arapahoe (n=42), El Paso (n=39), Jefferson (n=34) and Pueblo (n=34) counties.

In 1993–1995, toe amputation (ICD-9-CM 84.11--see Appendix 5) accounted for almost half of the non-traumatic LEAs related to diabetes (Figure 3c; Table 3.3). The proportion of amputation procedure types differed by age (Figure 3c; Table 3.3). Toe amputation comprised 48% of the non-traumatic LEAs in persons with diabetes <45 years but made up only 38% of LEAs in those 75+ years old. More severe amputation procedures, i.e. above-knee amputation, were more common in diabetic persons aged 75+ compared to those <45 years (26% vs. 8%, respectively).

Figure 3c. Amputation Types as a Percent of Total Non-Traumatic Lower Extremity Amputations with Diabetes as Any Listed Diagnosis, by Age: Colorado Residents, 1993–1995.



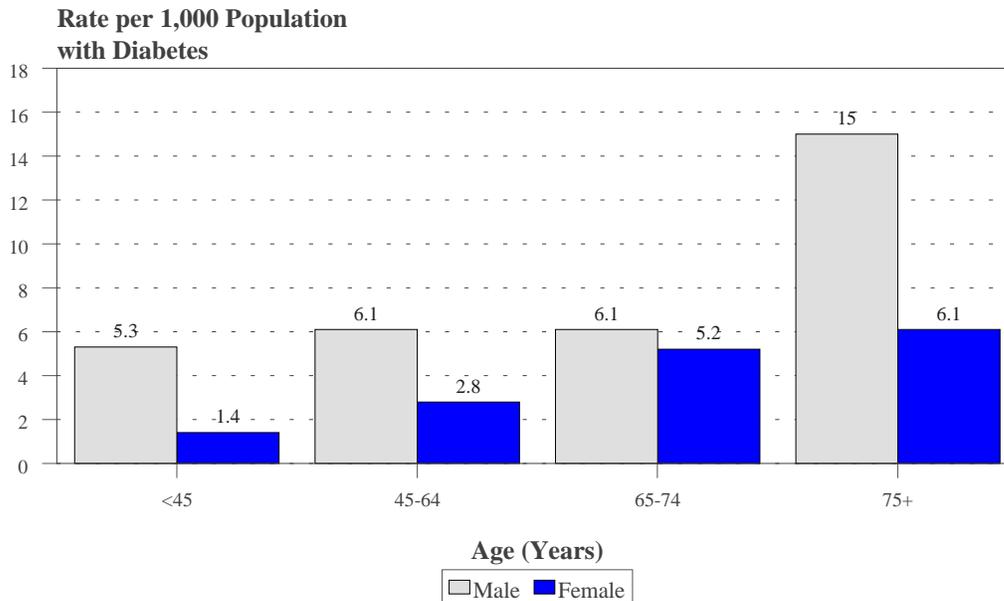
NOTES: Non-Traumatic lower extremity amputation defined as follows: Toe=ICD-9-CM 84.11; Foot=ICD-9-CM 84.12; Above foot-at/below knee=ICD-9-CM 84.13-84.16; Above knee=ICD-9-CM 84.17-84.19.

Fifty-seven percent of discharge records for non-traumatic LEA with diabetes as any listed diagnosis were among the white population, 17% among the Hispanic population and 5% among the black population. As previously mentioned, 22% were categorized as race unknown and race other. The proportion of discharge records per age group differs by race. (Table 3.4) Whereas non-traumatic LEA related to diabetes is fairly evenly distributed by age in the black population, the distribution varies greatly with age in the Hispanic population. Among Hispanics, there is a low percentage of diabetic persons with non-traumatic LEA within the <45 year age group (6.3%), a very high percentage among the 45-64 year age group (52%) and a very low percentage among the 75+ age group (13%). The white population is similar to the Hispanic population with a low percentage of records among the <45 year age group (12%) and a slightly higher percentage among the 45-64 year age group (34%).

B. Three-Year Average Annual Hospital Discharge Rates per 1,000 Colorado Residents with Diabetes, 1993–1995.

Non-traumatic LEA attributed to diabetes occurs more frequently with increasing age³. In Colorado, 1993–1995 discharge data suggested an increasing trend in diabetes-related LEA with age: the three-year average annual hospital discharge rates increased from 2.6 per 1,000 diabetic persons aged <45 years to 9.2 per 1,000 diabetic persons aged 75+ years (Table 3.1). The CDC report shows similar trend with age⁶.

Figure 3d. Age-Specific Hospital Discharge Rates for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993–1995.



Colorado hospital discharge data also indicated that the three-year average annual age-specific rates in 1993–1995 ranged from 17% to 279% higher for diabetic males than rates for diabetic females (Figure 3d; Table 3.1). The discharge rates generally increased with age in diabetic females (Figure 3d; Table 3.1). Hospitalization for LEA related to diabetes among diabetic males also increased with age, except between ages <45 years and 45-64 years where the discharge rate stabilized at 6.1 per 1,000 diabetic males (Figure 3d; Table 3.1).

The three-year average annual age-adjusted discharge rate for diabetes-related LEA in 1993–1995 was 5.1 per 1,000 Colorado residents with diabetes (Table 3.1). In comparison, the 1994 national age-adjusted rate was 8.2 per 1,000⁴. Diabetic males of Colorado had a significantly higher three-year average annual age-adjusted discharge rate for non-traumatic LEA compared with their female counterparts (7.3 vs 3.7 per 1,000, respectively) (Table 3.1), which is consistent with other diabetes surveillance and epidemiologic data^{3,4,6}.

C. Three-Year Average Annual Hospital Discharge Rates per 10,000 Population of Colorado, 1993–1995.

Using the general resident population of Colorado as the denominator yielded similar results as the Colorado diabetic population when age-specific, crude and age-adjusted rates were calculated (Tables 3.1,3.5). The 1993–1995 discharge rates per 10,000 general population of Colorado for diabetes-related non-traumatic LEA showed an increase with age and indicated that males had a significantly higher discharge rate than females.

The 1993–1995 annual average Colorado age-adjusted discharge rate for LEA per 10,000 general population was lower than the 1994 national rate (1.3 and 2.4 respectively). As indicated in Chapter 1, Colorado has one of the lowest hospital admission rates in the nation.

Table 3.6 indicates that Region 6 has a statistically higher age-adjusted discharge rate for diabetes-related LEA than the state rate. All other regions did not vary significantly from the state as a whole.

D. Number and Rate of Persons with At Least One Hospital Discharge Record in a Given Year for Non-Traumatic Lower Extremity Amputation, 1993–1995.

Tables 3.7-3.8 provide information on the number and discharge rate of Coloradans who had at least one hospital discharge record in a given year between 1993 and 1995 for non-traumatic lower extremity amputation. Table 3.7 presents rates per 1,000 population with diabetes and Table 3.8 presents them per 10,000 general population.

Between 1993 and 1995, an average of 384 individuals had 462 hospitalizations for non-traumatic LEA related to diabetes per year (1.2 LEAs per person) (Tables 3.1,3.7). Thus, an average of 17% of hospitalizations in a calendar year were re-admissions for LEA. The average yearly percent of hospitalizations for diabetes-related LEA that were re-admissions varied little by age group or gender (Tables 3.1,3.5,3.7,3.8).

E. Age at Discharge

The average age of a patient discharged for a non-traumatic LEA related to diabetes was 64.2 years, with a range of 18 to 97 years; the median age was 65.0 years. The average age at discharge for a diabetes-related LEA was 63.1 years in males and 65.7 years in females.

F. Length of Stay

In 1993–1995, the average length of hospital stay for a non-traumatic LEA related to diabetes was 12.3 days with a range from 1 to 122 days; the median was 8.0 days. The average length of stay was 12.0 days for males and 12.8 days for females-

G. Hospital Discharge Disposition

In Colorado, 32% of the patients were discharged home, 24% discharged to skilled nursing facilities, 19% discharged to another type of inpatient care and, 18% discharged to home health care. About 4% of the hospitalizations for diabetes-related non-traumatic LEA resulted in an in-patient death in 1993–1995 (Table 3.9). The frequency of non-traumatic LEA related to diabetes listed "died" as the discharge disposition varied slightly with age: 3% of the hospitalizations among persons aged <45 or 45-64 years compared to 4% of the hospitalizations among those aged 75+ years

(Table 3.9). Transfer to a skilled nursing facility after the amputation procedure increased from 4% for <45 to 43% for 75+ years of age. (Table 3.9). Routine discharge

home or to self-care decreased with age, 51% among the <45 year age group to 15% among the 75+ year age group.

H. Temporal Trends

Rates were similar in 1989-1991 as in 1993-1995. The age-adjusted average rate in 1989-1991 for LEA with diabetes listed as any listed diagnosis among 5 diagnoses was 4.8 compared to 4.7 in 1993-1995. The national age-adjusted rate of hospital discharge was also relatively stable during the 1990's⁶. The distribution of procedures types also remained comparable. The rates by region were slightly different. In 1989-1991, there were no regions which were significantly different from the state rate. In 1993-1995, region 6 was significantly higher.

Discussion

Ascertainment of LEAs from hospital discharge records should be very high because the procedure nearly always occurs in an in-patient setting. For this reason and other reasons stated in Chapter 1 (accessibility, completeness of discharge records, etc.), the hospital discharge data may be useful for monitoring LEA related to diabetes in Colorado.

It must be noted, however, that the discharge data do not capture all LEAs. First, data are not available for LEAs for residents conducted outside the state. Second, the Colorado discharge data also do not include LEAs performed in federal and military hospitals. In 1990, Veterans' Hospitals performed 93 LEAs in patients with diabetes in Colorado⁷, which would account for approximately 17% of the LEAs in the state that year. Third, the analyses were restricted to the ICD-9-CM 84.1 non-traumatic LEA procedure codes. More complete ascertainment of non-traumatic LEAs may require the inclusion of the ICD-9-CM 84.3 procedure code (amputation revision).

Another limitation of these data is that the discharge records did not contain information on the patient's race/ethnicity prior to 1993 and data from 1993-1995 had almost one-quarter of the records with missing/unknown race/ethnicity data. Rates were not able to be calculated by race/ethnicity for Colorado due to the missing race/ethnicity data. National surveillance data from 1994 report somewhat higher age-adjusted discharge rates for non-traumatic LEA among blacks compared with whites when the denominator was the diabetic population (10.2 vs 5.7 per 1,000 diabetic population)⁶. When the denominator was the general population, U.S. blacks had substantially higher age-adjusted discharge rates than U.S. whites (4.7 vs. 1.6 per 10,000, respectively). As discussed earlier, the main difference between the rates per diabetic population vs. those per general population is that the latter is influenced by the prevalence of diabetes in the population (both are affected by disease severity and health care access/utilization). The higher discharge rates of LEA in minorities than

whites per general resident population is influenced largely by the higher prevalence of diabetes in minority groups.

Results from the analyses of the 1993-1995 Colorado hospital discharge data indicate the following: 1) the majority of non-traumatic LEAs related to diabetes were toe amputations, 2) the severity of the amputation increased with age, 3) the majority and more severe of the non-traumatic LEAs related to diabetes were among Coloradans aged 65+ years, 4) hospital discharge rates for diabetes-related LEA increased with increasing age (for both the rates per 1,000 diabetic population and per 10,000 general population), and 5) age-adjusted hospitalization rates for diabetes-related LEA were significantly higher in males with diabetes than females with diabetes. All of these results are consistent with findings from other studies^{1,3,4,6}.

Non-traumatic LEA related to diabetes causes a major health, social and financial burden in persons with diabetes, their families, and society. It may be possible, however, to prevent at least 50% of all non-traumatic LEAs in the diabetic population with effective control of blood pressure and blood glucose, smoking cessation, and proper foot care². In an effort to reduce non-traumatic LEA related to diabetes in Colorado, the State Diabetes Control Program provides educational materials to persons with diabetes, health care professionals and the interested public that stress the importance of proper management of diabetes in order to avoid complications of diabetes, such as LEA. Furthermore, the Colorado Diabetes Control Program fosters collaboration among health-related organizations through the Colorado Diabetes Advisory Council, which addresses access to health care and other issues related to diabetes.

Table 3.1. Number of Hospital Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes Listed as Any Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	56	3.1	45	2.5	44	2.4	48	2.6
45-64	158	4.0	201	4.9	176	4.1	178	4.3
65-74	114	5.4	123	5.7	124	5.6	120	5.6
75+	99	8.1	112	8.9	134	10.4	115	9.2
Total	427	4.7	481	5.1	478	4.9	462	4.9
Age-Adjusted Rate*	4.9		5.3		5.1		5.1	
(95% Confidence Interval)	(4.4, 5.3)		(4.8, 5.8)		(4.7, 5.6)		(4.6, 5.6)	
Male								
<45	34	5.9	29	5.0	30	5.1	31	5.3
45-64	105	5.7	131	6.8	117	5.8	118	6.1
65-74	59	6.1	62	6.2	61	5.9	61	6.1
75+	45	11.0	69	16.0	80	17.8	65	15.0
Total	243	6.4	291	7.4	288	7.0	274	6.9
Age-Adjusted Rate*	6.6		7.7		7.5		7.3	
(95% Confidence Interval)	(5.8, 7.5)		(6.8, 8.6)		(6.6, 8.4)		(6.4, 8.2)	
Female								
<45	22	1.8	16	1.3	14	1.1	17	1.4
45-64	53	2.5	70	3.2	59	2.5	61	2.8
65-74	55	4.9	61	5.3	63	5.3	60	5.2
75+	54	6.7	43	5.2	54	6.4	50	6.1
Total	185	3.5	190	3.5	190	3.4	188	3.5
Age-Adjusted Rate*	3.6		3.7		3.6		3.7	
(95% Confidence Interval)	(3.1, 4.2)		(3.2, 4.3)		(3.1, 4.1)		(3.1, 4.2)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Non-traumatic lower extremity amputation procedure defined as ICD-9-CM 84.1, excluding any mention of traumatic amputation diagnosis (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 3.2 Average Annual Number of Hospital Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes Listed as Any Diagnosis, by County: Colorado, 1993-1995.

County	Number of Records	County	Number of Records	County	Number of Records
COLORADO	462	Elbert	***	Montrose	***
Adams	47	Fremont	7	Morgan	5
Alamosa	***	Garfield	***	Otero	6
Arapahoe	42	Gilpin	***	Ouray	***
Archuleta	***	Grand	***	Park	***
Baca	5	Gunnison	***	Phillips	***
Bent	***	Hinsdale	***	Pitkin	***
Boulder	22	Huerfano	***	Prowers	***
Chaffee	4	Jackson	***	Pueblo	34
Cheyenne	***	Jefferson	34	Rio Blanco	***
Clear Creek	***	Kiowa	3	Rio Grande	***
Conejos	***	Kit Carson	***	Routt	***
Costilla	***	La Plata	4	Saguache	***
Crowley	***	Lake	***	San Juan	***
Custer	***	Larimer	17	San Miguel	***
Delta	7	Las Animas	4	Sedgwick	***
Denver	98	Lincoln	***	Summit	***
Dolores	***	Logan	6	Teller	5
Douglas	6	Mesa	13	Washington	***
Eagle	***	Mineral	***	Weld	21
El Paso	39	Moffat	***	Yuma	***
		Montezuma	3		

NOTE: Non-traumatic lower extremity amputation procedure defined as ICD-9-CM 84.1, excluding any mention of traumatic amputation diagnosis (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

*** Number is less than three.

Table 3.3. Number and Percent Distribution of Hospital Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Age and Type of Procedure: Colorado Residents, 1993-1995.

Type of Procedure (ICD-9-CM Code)	Age (Years)								Total	
	<45		45-64		65-74		75+		Number	Percent
Lower Limb Amputation, Not Otherwise Specified (84.10)	***	--	***	--	***	--	***	--	***	--
Amputation of Toe (84.11)	70	48.3	274	51.2	165	45.7	132	38.3	641	46.2
Amputation Through Foot (84.12)	23	15.9	80	15.0	37	10.2	19	5.5	159	11.5
Disarticulation of Ankle (84.13)/ Amputation of Ankle Through Malleoli of Tibia and Fibula (84.14)	11	7.6	21	3.9	7	1.9	4	1.2	43	3.1
Other Amputation Below Knee (84.15)/Disarticulation of Knee (84.16)	43	29.7	155	29.0	119	33.0	112	32.5	429	31.0
Amputation Above Knee (84.17)/ Disarticulation of Hip (84.18)/ Abdominopelvic Amputation (84.19)	11	7.6	54	10.1	65	18.0	88	25.5	218	15.7
Total (84.1X)	145	100.0	535	100.0	361	100.0	345	100.0	1,386	100.0

NOTES: Sums may not add to total because more than one amputation procedure may have been coded on a hospital discharge record. Non-traumatic lower extremity amputation procedure defined ICD-9-CM 84.1, excluding any mention of traumatic amputation (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250. of traumatic amputation (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

*** Number of cases less than three.

Table 3.4 Number of Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Gender, Age and Race/Ethnicity: Colorado Residents, 1993-1995 Annual Average.

	Both Genders		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
ALL RACES*						
< 45	48	10.4	31	11.3	17	9.0
45-64	178	38.5	118	43.1	61	32.4
65-74	120	26.0	61	22.3	60	31.9
75	115	24.9	65	23.7	50	26.6
TOTAL **	462	100.0	274	100.0	188	100.0
WHITE						
< 45	32	12.1	22	14.5	10	8.8
45-64	91	34.3	56	36.8	35	30.7
65-74	66	24.9	32	21.1	34	29.8
75	77	29.1	41	27.0	35	30.7
TOTAL **	265	100.0	152	100.0	114	100.0
HISPANIC						
< 45	5	6.3	3	5.8	2	7.4
45-64	41	51.9	28	53.8	13	48.1
65-74	23	29.1	13	25.0	9	33.3
75	10	12.7	7	13.5	3	11.1
TOTAL **	79	100.0	52	100.0	27	100.0
BLACK						
< 45	5	20.8	2	18.2	3	23.1
45-64	7	29.2	4	36.4	3	23.1
65-74	5	20.8	2	18.2	3	23.1
75	7	29.2	2	18.2	5	38.5
TOTAL **	24	100.0	11	100.0	13	100.0

*All Races includes race/ethnicity unknown

**May not add to total due to rounding

Table 3.5. Number and Rate of Persons with At Least One Hospital Discharge Record for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	39	0.2	42	0.2	38	0.1	40	0.2
45-64	135	2.0	169	2.3	133	1.7	146	2.0
65-74	92	4.5	104	4.9	100	4.6	99	4.7
75+	89	6.2	98	6.7	114	7.6	100	6.8
Total	355	1.0	413	1.1	385	1.0	384	1.1
Age-Adjusted Rate*		1.1		1.2		1.1		1.1
(95% Confidence Interval)		(1.0, 1.2)		(1.1,1.3)		(1.0,1.2)		(1.0,1.2)
Male								
<45	23	0.2	26	0.2	27	0.2	25	0.2
45-64	88	2.6	109	3.0	88	2.3	95	2.6
65-74	47	5.1	52	5.5	51	5.2	50	5.3
75+	39	7.5	57	10.4	67	11.7	54	9.9
Total	197	1.1	244	1.3	233	1.3	225	1.2
Age-Adjusted Rate*		1.3		1.6		1.5		1.5
(95% Confidence Interval)		(1.1, 1.5)		(1.4, 1.8)		(1.3, 1.7)		(1.3, 1.7)
Female								
<45	16	0.1	16	0.1	11	0.1	14	0.1
45-64	47	1.3	60	1.6	45	1.2	51	1.4
65-74	45	4.0	52	4.5	49	4.1	49	4.2
75+	50	5.5	41	4.5	47	5.0	46	5.0
Total	158	0.9	169	0.9	152	0.8	160	0.9
Age-Adjusted Rate*		0.9		0.9		0.8		0.9
(95% Confidence Interval)		(0.7, 1.0)		(0.8, 1.1)		(0.7,0.9)		(0.7,1.0)

NOTES: Rates are per 10,000 Colorado residents. Non-traumatic lower extremity amputation procedure defined as ICD-9-CM 84.1, excluding any mention of traumatic amputation diagnosis (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 3.6 Average Annual Number of Hospital Discharge Records and Hospital Discharge Rate for Non-Traumatic Lower Extremity Amputation with Diabetes Listed as Any Diagnosis, by Planning and Management Region (PMR) of Residence: Colorado Residents, 1993-1995.

PMR	Number of Records	Crude rate	Adjusted Rate*	Adjusted Rate*: 95% Confidence Limits	
				Lower	Upper
COLORADO	462	1.3	1.4	1.2	1.5
Region 1	15	2.4	1.9	0.9	2.9
Region 2	38	1.1	1.2	0.8	1.6
Region 3	248	1.2	1.3	1.2	1.5
Region 4	44	0.9	1.2	0.8	1.5
Region 5	***	***	***	***	***
Region 6	18	3.7	3.1	1.7	4.6 higher
Region 7	34	2.7	2.3	1.5	3.0
Region 8	8	1.8	1.7	0.5	3.0
Region 9	8	1.2	1.2	0.4	2.0
Region 10	11	1.5	1.1	0.5	1.8
Region 11	16	1.0	0.9	0.5	1.4
Region 12	3	0.3	0.5	0.0	1.2
Region 13	11	1.7	1.5	0.6	2.4
Region 14	5	2.5	1.7	0.2	3.2

NOTES: Rates are per 10,000 general population. Non-traumatic amputation defined as ICD-9-CM procedure code 84.1, excluding traumatic lower extremity amputations (ICD-9-CM diagnosis codes 895-897); diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

*** Number of cases too small (<3) to calculate meaningful rate.

Table 3.7 Number and Rate of Persons with At Least One Hospital Discharge Record for Non-Traumatic Lower Extremity Amputation with Diabetes as Any Listed Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	39	2.2	42	2.3	38	2.0	40	2.2
45-64	135	3.4	169	4.1	133	3.1	146	3.5
65-74	92	4.4	104	4.8	100	4.5	99	4.6
75+	89	7.3	98	7.8	114	8.8	100	8.0
Total	355	3.9	413	4.4	385	4.0	384	4.1
Age-Adjusted Rate*	4.0		4.5		4.1		4.2	
(95% Confidence Interval)	(3.6, 4.5)		(4.1, 5.0)		(3.7, 4.5)		(3.8, 4.7)	
Male								
<45	23	4.0	26	4.4	27	4.5	25	4.3
45-64	88	4.8	109	5.7	88	4.3	95	4.9
65-74	47	4.8	52	5.2	51	4.9	50	5.0
75+	39	9.5	57	13.2	67	14.9	54	12.6
Total	197	5.2	244	6.2	233	5.7	225	5.7
Age-Adjusted Rate*	5.4		6.5		6.1		6.0	
(95% Confidence Interval)	(4.6, 6.1)		(5.6, 7.3)		(5.3, 6.9)		(5.2, 6.8)	
Female								
<45	16	1.3	16	1.3	11	0.9	14	1.2
45-64	47	2.2	60	2.7	45	1.9	51	2.3
65-74	45	4.0	52	4.5	49	4.2	49	4.2
75+	50	6.2	41	5.0	47	5.6	46	5.6
Total	158	3.0	169	3.1	152	2.7	160	2.9
Age-Adjusted Rate*	3.1		3.3		2.9		3.1	
(95% Confidence Interval)	(2.6, 3.6)		(2.8, 3.8)		(2.4, 3.3)		(2.6, 3.6)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Non-traumatic lower extremity amputation procedure defined as ICD-9-CM 84.1, excluding any mention of traumatic amputation diagnosis (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 3.8. Number of Hospital Discharge Records for Non-Traumatic Lower Extremity Amputation with Diabetes Listed as Any Diagnosis and Hospital Discharge Rate, 15 Diagnoses, by Gender and Age: Colorado Residents, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	56	0.2	45	0.2	44	0.2	48	0.2
45-64	158	2.3	201	2.8	176	2.3	178	2.4
65-74	114	5.5	123	5.9	124	5.7	120	5.7
75+	99	6.9	112	7.6	134	8.9	115	7.8
Total	427	1.2	481	1.3	478	1.3	462	1.3
Age-Adjusted Rate*		1.3		1.4		1.4		1.4
(95% Confidence Interval)		(1.17,1.41)		(1.28,1.53)		(1.23,1.47)		(1.23,1.47)
Male								
<45	34	0.3	29	0.2	30	0.2	31	0.2
45-64	105	3.1	131	3.6	117	3.1	118	3.3
65-74	59	6.4	62	6.6	61	6.3	61	6.4
75+	45	8.6	69	12.6	80	13.9	65	11.8
Total	243	1.4	291	1.6	288	1.5	274	1.5
Age-Adjusted Rate*		1.6		1.9		1.8		1.8
(95% Confidence Interval)		(1.40,1.82)		(1.66,2.09)		(1.60,2.02)		(1.56,1.98)
Female								
<45	22	0.2	16	0.1	14	0.1	17	0.1
45-64	53	1.5	70	1.9	59	1.5	61	1.6
65-74	55	4.9	61	5.3	63	5.3	60	5.2
75+	54	6.0	43	4.7	54	5.8	50	5.5
Total	184	1.0	190	1.0	190	1.0	188	1.0
Age-Adjusted Rate*		1.0		1.0		1.0		1.0
(95% Confidence Interval)		(0.87,1.16)		(0.88,1.18)		(0.85,1.13)		(0.87,1.16)

NOTES: Rates are per 10,000 Colorado residents. Non-traumatic lower extremity amputation procedure defined as ICD-9-CM 84.1, excluding any mention of traumatic amputation diagnosis (ICD-9-CM 895-897); diabetes defined as ICD-9-CM 250.

* Age-adjusted to the 1980 U.S. resident population.

Table 3.9 Discharge Status of Hospital Discharge Records for Non-traumatic Lower Extremity Amputation, Diabetes any Mention, by Age: Colorado, 1993-1995.

Age Group (Years)	Total (N=1,386) Percent	<45 (N=145) Percent	45-64 (N=535) Percent	65-74 (N=361) Percent	75+ (N=345) Percent
Discharge Status	Percent	Percent	Percent	Percent	Percent
Total	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	31.5	51.0	42.1	23.5	15.1
Transferred to Another Acute Care Facility	1.7	2.1	0.4	1.9	3.5
Transferred to Skilled Nursing Facility	24.1	4.1	14.0	29.1	42.9
Transferred to Intermediate Care Facility	1.9	0.0	0.9	2.5	3.8
Transferred to Another Type of Institution for Inpatient Care	18.8	15.9	17.2	23.3	17.7
Transferred to Home Health Care	17.7	24.1	21.5	15.0	11.9
Left Facility Against Medical Advice	0.1	0.0	0.4	0.0	0.0
Home IV Service	0.4	0.0	0.2	0.3	0.9
Died	3.8	2.8	3.4	4.4	4.3

NOTE: Diabetes defined as ICD-9-CM 250.

*** Percent based on less than three cases.

Chapter 4

Acute Metabolic Complications of Diabetes

Introduction

Episodes of hyperglycemia (high blood glucose) and hypoglycemia (low blood glucose) are common in persons with diabetes. They occur when there is an imbalance between blood glucose and insulin availability in the body. Hyperglycemia and hypoglycemia are progressive conditions. Their progression can be stopped, however, if symptoms are recognized and treated early. Persons with diabetes usually can self-treat mild or moderate episodes of hyperglycemia or hypoglycemia. More severe episodes may be treated by emergency medical personnel either on an out-patient or emergency room basis. The most severe episodes can result in hospitalization or death.

This chapter presents 1993–1995 hospital discharge data on acute metabolic complications of diabetes related to hyperglycemia. Thus, only those episodes that were severe enough to require hospitalization or that developed during hospitalization are available for analysis. Information is provided for the following acute conditions: 1) diabetic ketoacidosis without coma (DKA), 2) DKA with coma, and 3) hyperosmolar non-ketotic coma. These conditions are related to hyperglycemia. All three conditions are described in more detail below. Data on hospital discharge for hypoglycemia are no longer available due to a coding change which grouped hypoglycemia episodes with other metabolic conditions. The three years of hospital discharge data are compared to our baseline data from an earlier study that used 1989-1991 data¹.

DKA accounts for the majority of the hospitalizations and deaths associated with acute metabolic complications of diabetes². The symptoms of DKA include high blood glucose levels and ketoacidosis. DKA primarily occurs in persons with Type 1 diabetes mellitus, and may manifest itself as the first symptom in new cases (20-30% of cases)²⁻⁴. It also frequently occurs during concurrent illnesses or when treatment regimens need adjustment or are not being complied with. DKA occurs infrequently in persons with Type 2 diabetes mellitus but may develop during times of severe acute stress. Coma can result if treatment for DKA is not initiated early. Even though severe episodes of DKA are preventable with early treatment, DKA was responsible for 84,000 hospitalizations and 1,800 deaths in 1988 in the U.S., the majority of which were among persons <45 years old⁵.

Hyperglycemic hyperosmolar non-ketotic syndrome (HHNKS) is a diabetic acute complication that primarily occurs in persons aged 60+ years who have Type 2 diabetes³. The condition is marked by severely high blood glucose levels, dehydration, and decreased level of consciousness in the absence of ketoacidosis. Older persons with Type 2 diabetes are at special risk for HHNKS if they are in poor health, are dehydrated, have concurrent illnesses, are taking specific drugs such as steroids or diuretics, or are recuperating from an acute hospitalization or surgery^{3,5,6}. HHNKS may progress to a comatose condition, called hyperosmolar non-ketotic coma (HNKC), if not recognized or appropriately treated in time. The case-fatality rate of HNKC ranges from 14-42%⁶.

Methods

Hospital discharge data from the Colorado Health and Hospital Association (see Chapter 1) were used to examine hospitalizations for the following acute metabolic complications of diabetes from 1993–1995:

- 1) DKA without mention of coma (ICD-9-CM 250.1),
- 2) DKA with coma (ICD-9-CM 250.3),
- 3) HNKC (ICD-9-CM 250.2)

Hospital discharge rates for these acute conditions of diabetes (as either any listed diagnosis or the primary diagnosis) were calculated by age and gender per 1,000 diabetic population of Colorado using the methods described in Chapter 1. Age-specific and gender-specific rates were expressed in terms of hospital discharge records and in terms of persons with at least one hospitalization in a given year for an acute diabetic complication (see Chapter 1 for methods). Discharge rates are not presented per 10,000 general population of Colorado because only persons with diabetes are at risk for these acute conditions. The chapter presents the three-year average annual number of discharge records by county of residence. County rates are not available because relatively few discharges for these conditions were available by county of residence.

All discharge rates were age-adjusted using the direct method of standardization and 95% confidence intervals were calculated for the age-adjusted rates⁷. The estimated 1980 U.S. diabetic population was used as the standard population to age-adjust rates per 1,000 diabetic residents of Colorado (see Appendix 3). This was the same standard population used to age-adjust the discharge rates per diabetic population in the Centers for Disease Control and Prevention report, Diabetes Surveillance, 1991⁸ and the previous Colorado report.¹ Statistics on age at discharge, length of stay, and hospital discharge disposition for each of the three acute diabetic complications were calculated using the methods described in Chapter 1.

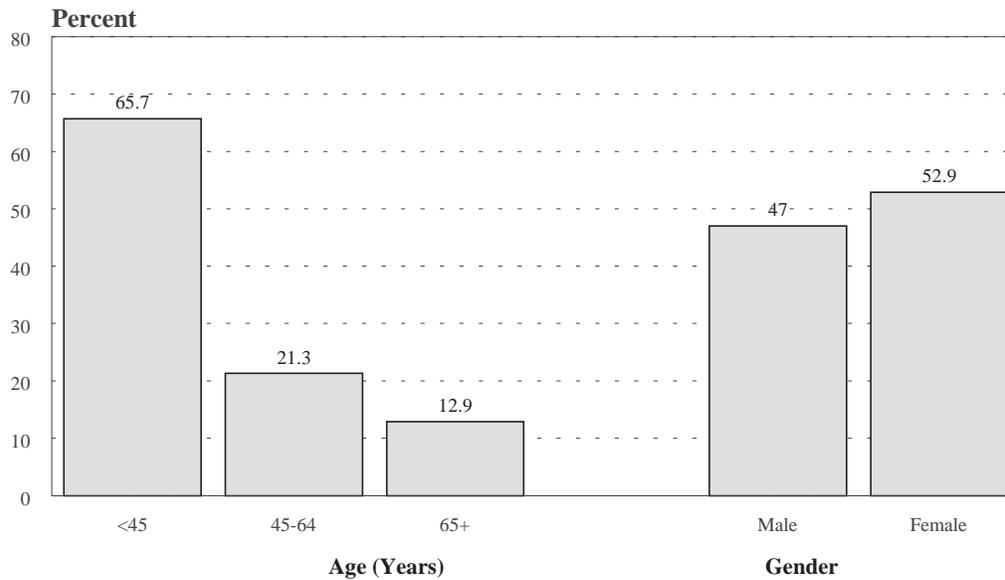
Results

I. Diabetic Ketoacidosis Without Mention of Coma (ICD-9-CM 250.1)

A. Number of Hospital Discharge Records

There were a total of 3,684 hospitalizations in 1993–1995 with any mention of DKA without coma (yearly average, 1,228) (Table 4.1). Thus, DKA without coma made up about 4% of the 1993–1995 hospitalizations that listed diabetes as any diagnosis (3,684/84,661).

Figure 4a. Percent of Hospital Discharge Records for Diabetic Ketoacidosis without Coma Listed as Any Diagnosis, by Age and Gender: Colorado Residents, 1993–1995.

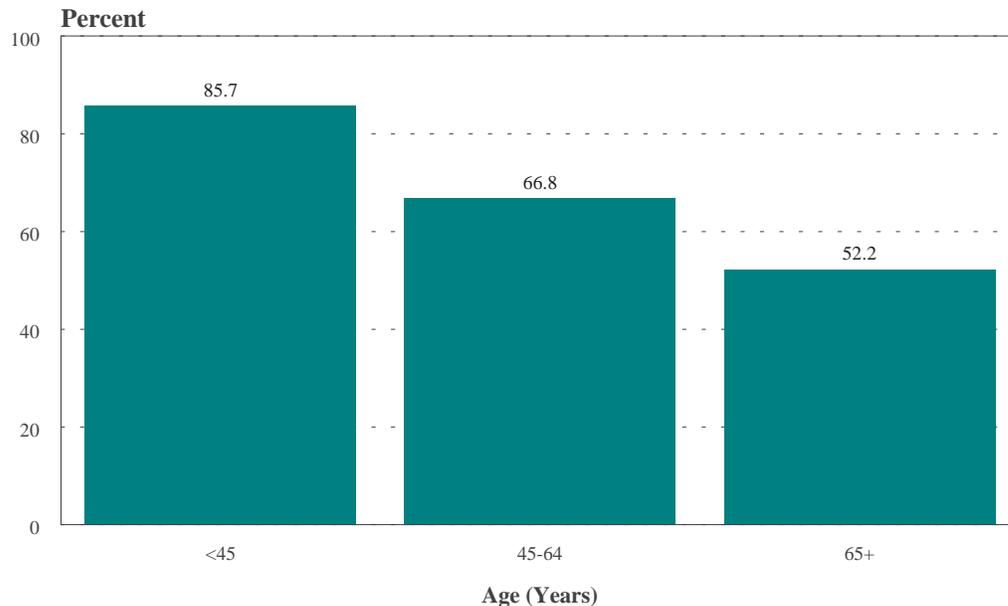


NOTE: DKA without coma defined as ICD-9-CM 250.1

The distribution of hospitalizations that listed DKA without coma varied considerably with age (Figure 4a). Sixty-six percent of the hospitalizations for DKA without coma were among persons aged <45 years (Figure 4a; Table 4.1). The percent declined with age. Fifty-three percent of the hospitalizations for DKA without coma as any listed diagnosis were among females (Figure 4a; Table 4.1).

DKA without coma was coded as the primary diagnosis on 77% (N=2,851; yearly average, 950) of the discharge records where the condition was listed as any diagnosis (Tables 4.1,4.2). The condition was more frequently coded as the primary discharge diagnosis in the <45 years age group compared with the older age groups (Figure 4b; Tables 4.1,4.2).

Figure 4b. Percent of Hospital Discharge Records for Diabetic Ketoacidosis without Coma Listed as Primary Diagnosis, by Age: Colorado Residents, 1993–1995.



NOTE: DKA (diabetic ketoacidosis) without coma defined as ICD-9-CM 250.1.

Figure 4c shows that the percent of hospitalizations that listed diabetes and involved DKA without coma also differed by age. Seventy-three percent of all diabetes primary diagnosis hospitalizations listed DKA without coma as the primary diagnosis among persons aged <45 years (Figure 4c; Tables 1.3,1.4,4.1,4.2). This percent decreased with age. A similar trend with age was observed where diabetes was listed as any diagnosis.

Figure 4c. Percent of Diabetes Discharge Records with Diabetic Ketoacidosis (DKA) without Coma Listed as Diagnosis, by Age: Colorado Residents, 1993–1995.

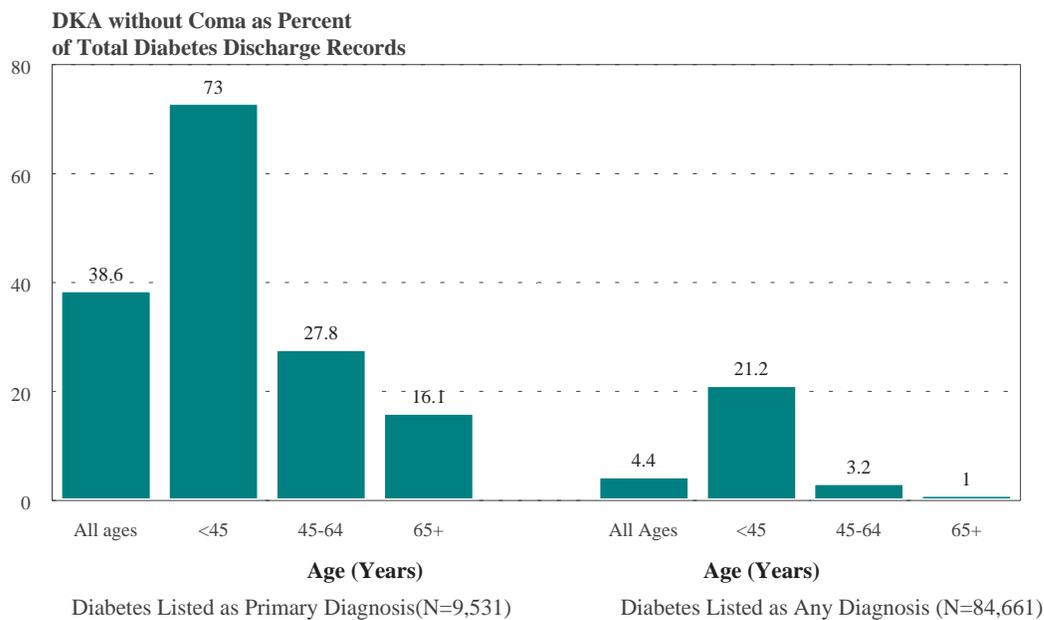


Table 4.3 indicates that residents of Denver County had the largest three-year average annual number of hospitalizations with any mention of DKA without coma in 1993–1995 (n=281), followed by residents of El Paso (n=150), Jefferson (n=125), Adams (n=110), Arapahoe (n=104) and Pueblo (n=64) counties. Likewise, these counties also had the largest three-year average annual number of hospitalizations in 1993-1995 with DKA without coma as the primary diagnosis (Table 4.4).

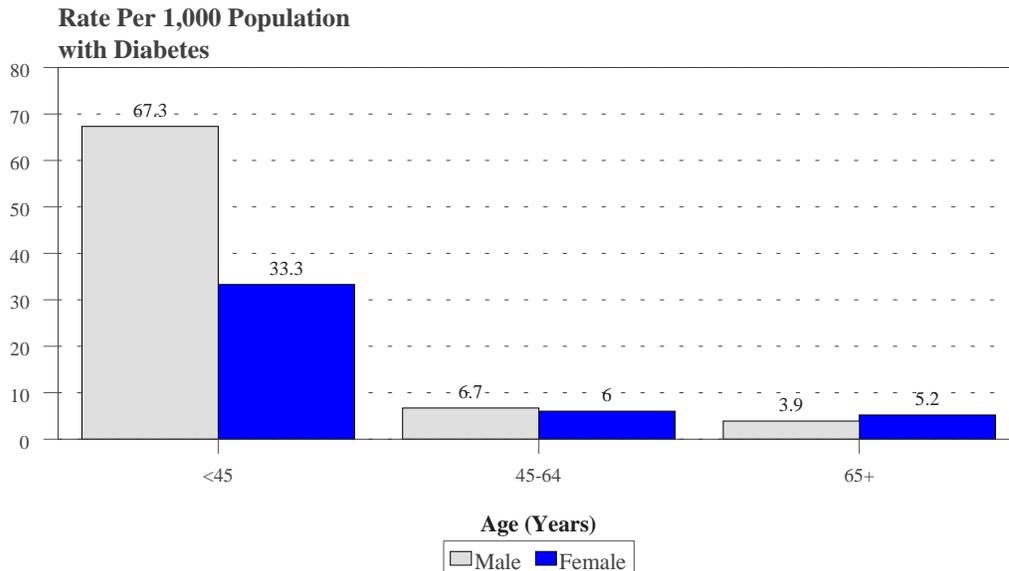
B. Three-Year Average Annual Hospital Discharge Rates, per 1,000 population with Diabetes, 1993–1995.

1. DKA without Coma as Any Listed Diagnosis

Diabetic persons younger than 45 years had the highest three-year average annual hospital discharge rate for DKA without coma in 1993–1995 (44 per 1,000 diabetic population) among age groups (Table 4.1). The discharge rate decreased with age to 5 per 1,000 diabetic persons aged 65+ years. National and other state surveillance data also support a similar decreasing trend with age^{8,9}. The national discharge rates in 1994 for persons with diabetes ages 45-64 years was 7.1 per 1,000 diabetic population and was 4.6 per 1,000 diabetic population for 65+ age group⁸.

Figure 4d shows three-year average annual age-specific discharge rates in 1993–1995 for DKA without coma per 1,000 persons with diabetes by gender. The discharge rate among diabetic males aged <45 was more than double the rate for diabetic females aged <45 years (67 vs. 33, respectively). Diabetic males and diabetic females, however, had fairly comparable discharge rates for any mention of DKA without coma in the 45-64 years and 65+ years age groups (Figure 4d; Table 4.1).

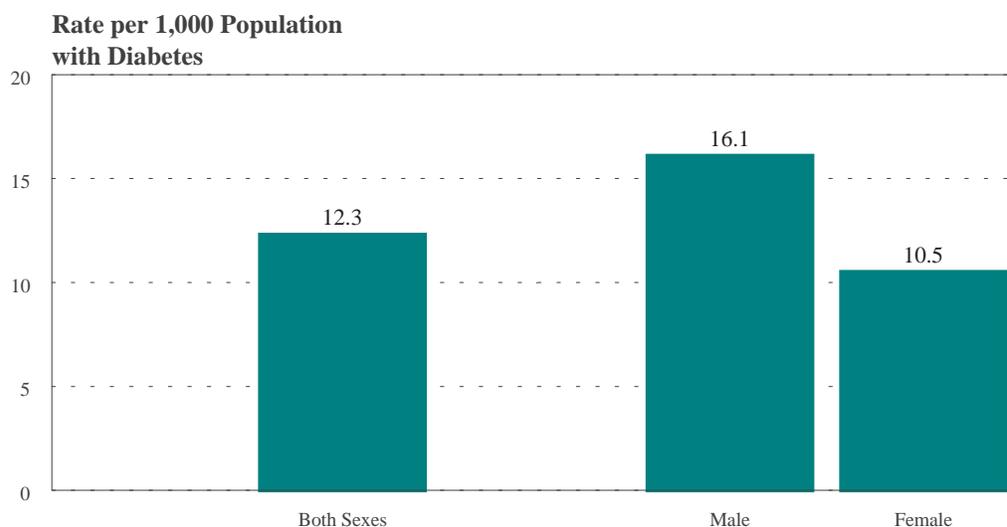
Figure 4d. Age-Specific Hospital Discharge Rates for Diabetic Ketoacidosis without Coma Listed as Any Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993–1995.



NOTE: DKA without coma defined as ICD-9-CM 250.1

The three-year average annual age-adjusted discharge rate of DKA without coma as any diagnosis in 1993–1995 was 12 per 1,000 persons with diabetes (Figure 4e; Table 4.1). Diabetic males had a higher age-adjusted hospital discharge rate than diabetic females (16 vs. 10 per 1,000, respectively) (Figure 4e; Table 4.1). This gender difference was statistically significant (Table 4.1).

Figure 4e. Age-Adjusted Hospital Discharge Rates for Diabetic Ketoacidosis without Coma as Any Listed Diagnosis, by Gender, Three-Year Annual Average: Colorado Residents with Diabetes, 1993–1995.



NOTE: Rates are age-adjusted to the estimated 1980 U.S. population with diabetes.

National trends in age-adjusted rates of hospital discharge for DKA show higher rates for males than females, however in 1994 the CDC reported discharge rates in 1994 of 12.8 population with diabetes for males and 14.2 population with diabetes for females⁸. The higher discharge rate of DKA in diabetic males is inconsistent with other studies. For example, diabetic females had substantially higher rates of DKA than diabetic males in Rhode Island and Washington State^{4,9}.

2. DKA Without Coma as Primary Diagnosis

As stated earlier, 77% of the discharge records for DKA without coma listed it as the primary discharge diagnosis. Three-year average annual age-specific and age-adjusted hospital discharge rates in 1993–1995 for DKA without coma as the primary diagnosis were similar to, though somewhat lower than, those for the condition as any listed discharge diagnosis (Tables 4.1,4.2). Trends with age and differences by gender were similar for DKA as the primary diagnosis and DKA as any listed diagnosis (Tables 4.1,4.2).

C. Three-Year Average Annual Number and Rate of Persons with at Least One Hospital Discharge Record in a Given Year for DKA Without Coma, 1993–1995.

Tables 4.5 and 4.6 provide information on the annual number and discharge rate for Colorado diabetic residents who had at least one hospital discharge record in a given year in 1993–1995 for DKA without coma. Table 4.5 presents data for DKA without coma as any listed diagnosis and Table 4.6 presents similar data for the condition as the primary diagnosis. The discharge rates in both tables are presented per 1,000 population with diabetes.

Between 1993 and 1995, an average of 1,031 persons with diabetes had 1,228 hospitalizations for DKA without coma each year (average of 1.2 DKA episodes per person) (Tables 4.1,4.5). The data indicate that 16% of hospitalizations for DKA without coma in a calendar year were repeat admissions. Repeat admissions for DKA without coma were more common in the youngest age group. Each year an average of 18% of hospitalizations among

diabetic persons aged <45 years were re-admissions, compared with 12% and 11% among diabetic persons aged 45-64 and 65+ years, respectively. Eighteen percent of the hospitalizations for DKA without coma among females were re-admissions and 13% among males.

D. Age at Discharge

In 1993–1995, the average age at discharge was 39.3 years for a patient hospitalized with any mention of DKA without coma; the median age was 37.0 years. On average, males were slightly younger than females at the time of discharge (38.4 vs. 40.2 years, respectively).

Among the discharge records with DKA without coma as the primary diagnosis, the average age at discharge in 1993–1995 was 35.8 years; the median age was 34.0 years. The average age at the time of discharge was 35.7 years for males and 35.9 years for females.

E. Length of Stay

In 1993–1995, the average length of a hospital stay that mentioned DKA without coma was 4.5 days, with a range from 1 to 84 days; the median was 2.0 days. Males and females had comparable lengths of stay (an average of 4.4 vs. 4.6 days, respectively).

When DKA without coma was listed as the primary diagnosis, the average length of stay in the hospital during 1993–1995 was 3.7 days (median, 2.0 days). Males had an average length of stay of 3.6 days, females had an average of 3.8 days.

F. Discharge Disposition

Tables 4.7 and 4.8 provide information on the discharge disposition for hospital discharge records that listed DKA without coma as any diagnosis or as the primary diagnosis, respectively. About 2% of hospitalizations for DKA without coma in 1989-1991 listed "died" as the discharge disposition (Table 4.7). The frequency of in-patient deaths increased with increasing age. Only 0.2% of in-patient deaths resulted from DKA without coma among persons with diabetes aged <20 years; however, death resulted in 11% of the hospitalizations among those aged 75+ years. Transfer to a skilled nursing or intermediate care facility after the DKA hospitalization occurred more often in the 75+ years age group than the other age groups (Table 4.7).

G. Temporal Trends

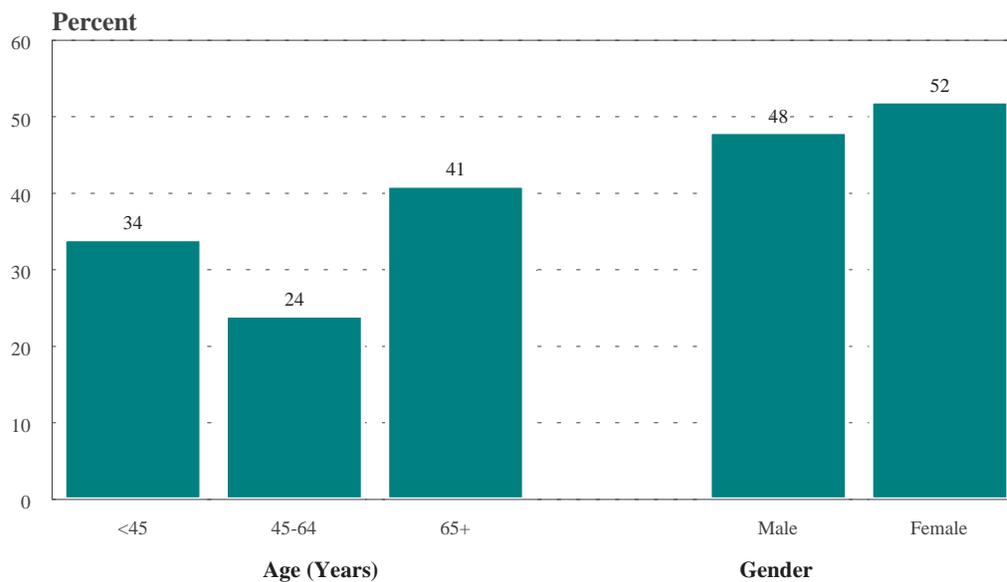
Age-adjusted rates for DKA without coma among Colorado residents with diabetes as any listed diagnosis among 5 diagnoses have increased slightly between 1989-1991 and 1993-1995 from 11.0 to 12.0. As well, the age-adjusted rates for DKA without coma among Colorado residents with diabetes as the primary diagnosis increased from 8.8 to 9.4.

II. Diabetic Ketoacidosis With Mention of Coma (ICD-9-CM 250.3)

A. Number of Hospital Discharge Records

There were a total of 247 hospitalizations in 1993–1995 with any mention of DKA with coma (yearly average, 82) (Table 4.9). Thus, DKA with coma made up about 0.3% of the 1993–1995 hospitalizations that listed diabetes as any diagnosis (247/84,661).

Figure 4f. Distribution of Hospital Discharge Records for Diabetic Ketoacidosis with Coma as Any Listed Diagnosis, by Age and Gender: Colorado Residents, 1993–1995.



The distribution of hospitalizations that listed DKA with coma varied considerably with age (Figure 4f). Forty-one percent of the hospitalizations for DKA with coma were among persons aged 65+ years (Figure 4f; Table 4.9). Fifty-three percent of the hospitalizations for DKA with coma as any listed diagnosis were among females (Figure 4f; Table 4.9).

DKA with coma was coded as the primary diagnosis on 67% (N=165) of the discharge records where the condition was listed as any diagnosis (Tables 4.9,4.10). There was little difference in the frequency of DKA with coma being coded as the primary discharge diagnosis between the age groups. In the <45 year age group DKA with coma was coded as the primary diagnosis on 68% of the discharge records, while in the older age groups, (45-64 years and 65+ years) DKA with coma was coded as the primary diagnosis on 65% of the discharge records (Tables 4.9,4.10).

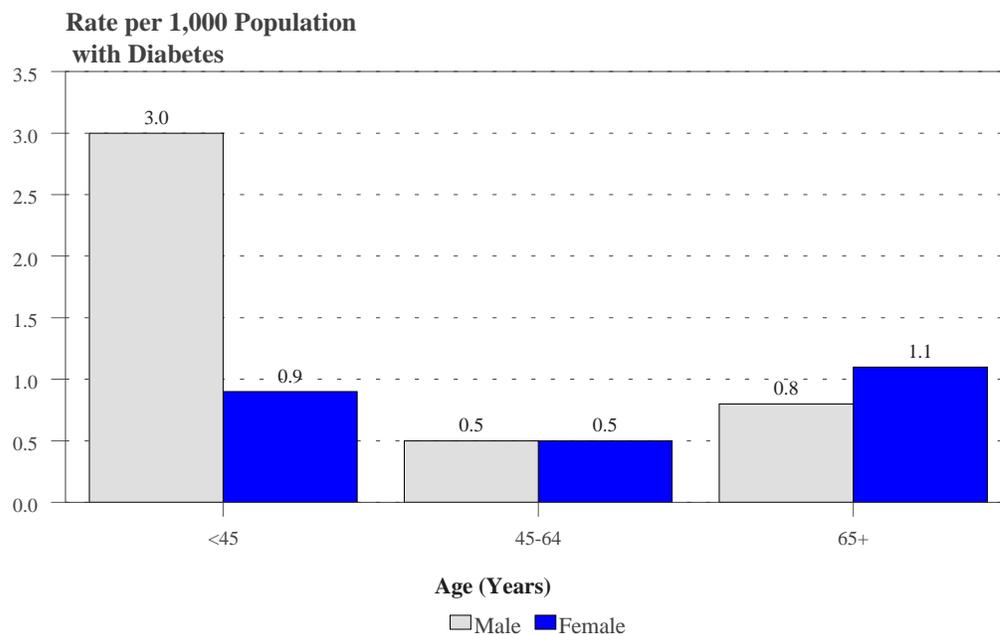
B. Three-Year Average Annual Hospital Discharge Rates, per 1,000 Colorado population with Diabetes, 1993–1995.

1. DKA with Coma as Any Listed Diagnosis

Diabetic persons <45 years had the highest three-year average annual hospital discharge rate for DKA with coma in 1993–1995 (1.6 per 1,000 diabetic population) (Table 4.9). The discharge rate was lowest among the 45-64 year age group, 0.5 per 1000 diabetic persons.

Figure 4g shows three-year average annual age-specific discharge rates in 1993–1995 for DKA with coma per 1,000 persons with diabetes by gender. The discharge rate among diabetic males aged <45 was almost three times the rate for diabetic females aged <45 years (3.0 vs. 0.9, respectively). Diabetic males and diabetic females, however, had fairly comparable discharge rates for any mention of DKA with coma in the other age groups (Figure 4g; Table 4.9).

Figure 4g. Age-Adjusted Hospital Discharge Rates for Diabetic Ketoacidosis with Coma as Any Listed Diagnosis, by Gender: Colorado Residents with Diabetes, 1993–1995.



NOTE: Rates are age-adjusted to the estimated 1980 U.S. population with diabetes.

2. DKA With Coma as Primary Diagnosis

Sixty-seven percent of the discharge records for DKA with coma listed it as the primary discharge diagnosis. Three-year average annual age-specific and age-adjusted hospital discharge rates in 1993–1995 for DKA with coma as the primary diagnosis were similar to, though slightly lower than, those for the condition as any listed discharge diagnosis (Tables 4.9, 4.10). Again males <45 years had much higher rates than females <45 years of age.

C. Age at Discharge

In 1993–1995, the average age at discharge was 55.5 years for a patient hospitalized with any mention of DKA with coma; the median age was 56 years. On average, males were younger than females at the time of discharge (51.5 vs. 59.1 years, respectively).

Among the discharge records with DKA with coma as the primary diagnosis, the average age at discharge in 1993–1995 was 55.1 years; the median age was 56.0 years. The average age at the time of discharge was 51.7 years for males and 58.8 years for females.

D. Length of Stay

In 1993–1995, the average length of a hospital stay that mentioned DKA with coma was 7.1 days, with a range from 1 to 144 days; the median was 4.0 days. Males and females had comparable lengths of stay (an average of 7.2 vs. 7.0 days, respectively).

When DKA with coma was listed as the primary diagnosis, the average length of stay in the hospital during 1993–1995 was 7.0 days (median, 3.5 days). Males had an average length of stay of 7.6 days, females had an average of 6.4 days.

E. Discharge Disposition

Table 4.11 provides information on the discharge disposition for hospital discharge records that listed DKA with coma as any diagnosis and as the primary diagnosis, respectively. Fourteen percent of hospitalizations for DKA with coma listed as any diagnosis in 1989-1991 listed "died" as the discharge disposition (Table 4.11). Fifty percent were transferred home or to self-care, 11% were sent to Home Health care and 11% were discharged to Skilled Nursing Facilities. When DKA with coma was listed as the primary diagnosis, 8% died, 56% were sent home, 11% were sent to Home Health care and 13% were sent to Skilled Nursing Facilities.

F. Temporal Trends

The age-adjusted average rate for DKA with coma as any listed diagnosis among 5 diagnoses per 1,000 residents with diabetes was 0.5 in 1989-1991¹ vs 0.8 in 1993-1995.

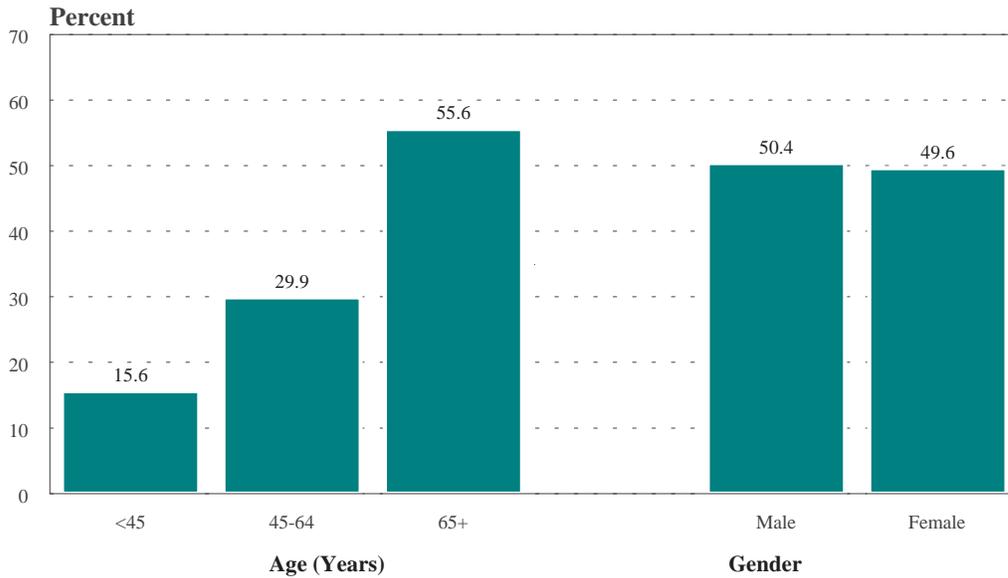
III. Hyperosmolar Non-Ketotic Coma (HNKC) (ICD-9-CM 250.2)

A. Number of Hospital Discharge Records

In 1993–1995, there were 404 hospitalizations with any mention of HNKC (yearly average, 135) (Table 4.12). Sixteen percent of the hospitalizations occurred in persons aged <45 years, 29% in persons aged 45-64 years, and 56% in persons aged 65+ years (Figure 4h;

Table 4.12). Colorado hospitalizations that listed HNKC in 1993–1995 were split evenly between females and males (Figure 4h; Table 4.12).

Figure 4h. Distribution of Hospital Discharge Records for Hyperosmolar Non-Ketotic Coma as Any Listed Diagnosis, by Age and Gender: Colorado Residents, 1993-1995.



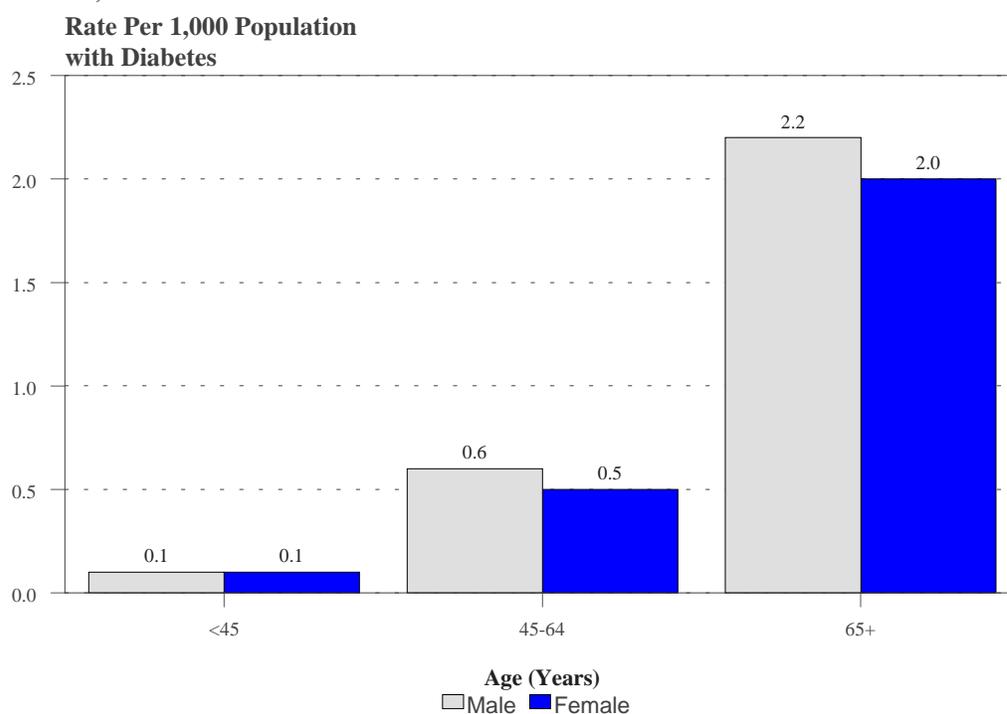
HNKC was listed as the primary discharge diagnosis on 65% (n=261; yearly average, 87) of the 404 hospital discharge records with any mention of HNKC (Tables 4.12,4.13).

B. Three-Year Average Annual Hospital Discharge Rates, 1993–1995.

1. HNKC as Any Listed Diagnosis

The highest three-year average annual discharge rate for HNKC per 1,000 persons with diabetes in 1993–1995 was among persons aged 65+ years (2.1 per 1,000 persons with diabetes) (Table 4.12). Age-specific discharge rates were fairly similar for males and females, except in the <45 years age group, where the rate was 2.3 per 1,000 for diabetic males and was 0.6 per 1,000 for diabetic females (Figure 4i; Table 4.12). The three-year average annual age-adjusted discharge rate in 1993–1995 for HNKC was 1.5 per 1,000 diabetic persons. The age-adjusted rate did not differ significantly by gender (Table 4.12).

Figure 4i. Age-Specific Hospital Discharge Rates for Hyperosmolar Non-Ketotic Coma as Any Listed Diagnosis, by Age and Gender: Colorado Residents with Diabetes, 1993–1995.



2. HNKC as Primary Diagnosis

The 1993–1995 average annual age-specific and age-adjusted hospital discharge rates for HNKC as the primary diagnosis were similarly distributed, though lower than, those for HNKC as any listed discharge diagnosis (Tables 4.12, 4.13).

C. Three-Year Average Annual Number and Rate of Persons with at Least One Hospital Discharge Record in a Given Year for HNKC, 1993-1995.

Tables 4.14 and 4.15 present information on the yearly number and rate of Coloradans in 1993-1995 who had at least one hospital discharge record in a given year for HNKC. Table 4.14 provides information on HNKC as any listed diagnosis and Table 4.15 provides similar data for HNKC as the primary diagnosis. The discharge rates in both tables are presented per 1,000 population with diabetes.

There were few re-admissions for HNKC in a given year between 1993 and 1995 in Colorado. During the three-year period, a yearly average of 87 hospitalizations for HNKC occurred in 84 persons (average of 1.0 episodes per hospitalized individual) (Tables 4.12, 4.14). Thus, on average, only 3.6% of the hospitalizations each year for HNKC were re-admissions.

D. Age at Discharge

In 1993–1995, the average age at discharge was 64.2 years for a hospitalization with any mention of HNKC, with a range of 1 to 99 years; the median was 68.0 years. On average, males were younger at the time of discharge than females (59.9 vs. 68.8 years, respectively).

When HNKC was coded as the primary diagnosis, the average age at discharge in 1993–1995 was 62.1 years; the median was 63.0 years. Again, on average, males were younger at the time of discharge compared with females (58.3 vs. 66.4 years, respectively).

E. Length of Stay

In 1993–1995, the average length of hospitalization with any mention of HNKC was 7.3 days, with a range from 1 to 52 days; the median was 5.0 days. On average, males had a longer length of stay than females (8.0 vs. 6.6, respectfully).

When HNKC was coded as the primary diagnosis, the average length of stay in 1993–1995 was 6.2 days; the median was 5.0 days. On average, males had a slightly longer stay in the hospital than females for HNKC as the primary diagnosis (an average of 6.9 vs. 5.4 days, respectively).

F. Discharge Disposition

Table 4.11 presents the distribution of the hospital discharge disposition for HNKC as any listed and as the primary diagnosis. Eight percent of the hospitalizations with any mention of HNKC listed "died" as the discharge disposition.

G. Temporal Trends

The 1989-1991 age-adjusted average rate for HNKC as any listed diagnosis among 5 diagnoses, per 1,000 residents with diabetes was 1.1 vs 1.4 in 1993-1995. Again, the rates were higher among males in the <45 year age group, but similar between males and females in the other age categories.

Discussion

Colorado hospital discharge data were used to conduct surveillance activities on DKA, and HNKC during 1993-1995. The major strengths and limitations of this source of data are discussed in Chapter 1.

This chapter describes hospitalized episodes of acute diabetic complications, i.e., the most severe cases. It should be noted that hospitalized cases may differ with those cases that were self-treated or were treated by a health care provider in an office, emergency room or a health care setting other than a hospital by demographic characteristic, severity of diabetes, etc. Furthermore, misclassification of acute complications of diabetes may occur on hospital discharge records. For example, an evaluation of Rhode Island hospital discharge data indicated that, based on a set of diagnostic criteria, 23% of records that met the criteria for DKA were actually coded with another diagnosis, while 33% of the records coded with DKA should have been coded, in fact, to another condition².

In addition, as mentioned in Chapter 1, discharge rates could not be analyzed by the patient's race/ethnicity because the Colorado hospital discharge records did not contain this information prior to 1993. National surveillance data, however, indicate that blacks had higher age-adjusted discharge rates for DKA without coma in 1994 (19.2 per 1,000 persons with diabetes), followed by whites (9.2 per 1,000)⁸.

Despite the several limitations of the hospital discharge data, the data indicated that DKA without coma accounted for the majority of hospitalizations in Colorado in 1993-1995 that involved acute complications of diabetes and that it was a significant contributor to morbidity in persons <45 years old. These results are consistent with other epidemiologic data^{2,4,9}. However, the finding that diabetic males aged <45 years old had a higher hospitalization rate for DKA without coma than diabetic females <45 years old conflicts with other studies^{2,4,9}. Further study is needed to determine potential factors which explain the higher hospital discharge rates in Colorado males aged <45 years.

Results of the analyses also indicated that, in 1993-1995, DKA progressed to coma in an average of 82 Coloradans with diabetes per year. Again, rates were highest in persons with diabetes aged <45 years, particularly in males. No difference was observed by gender in the age-adjusted hospital discharge rates of DKA with coma.

The majority of the hospitalizations for HNKC occurred in Colorado among diabetic persons aged 65+ years, with the discharge rates also highest in this age group. A higher age-adjusted rate of HNKC was observed in diabetic males aged <45 years compared with their female counterparts. However, there was no difference by gender in the overall discharge rate of HNKC per 1,000 diabetic population.

Progression of acute complications of diabetes often can be prevented with early recognition of symptoms and timely treatment. But, in Colorado, there were over 1,400 hospitalizations for acute metabolic complications of diabetes each year, making up at least 5% of all hospitalizations in 1993-1995 where diabetes was listed as any discharge diagnosis.

Acute Complications

Prevention of acute metabolic complications of diabetes involves a team effort between the person with diabetes and his/her health care team¹¹⁻¹³. Proposed recommendations by the Colorado Diabetes Advisory Council to reduce the morbidity associated with the acute complications of diabetes address three main areas¹⁴. First, the health care community and the public need to be more sensitive to and aware of the symptoms and treatment recommendations for acute diabetic complications. Second, persons with diabetes need to be better educated about acute metabolic complications of diabetes to help them prevent, recognize and treat the conditions. Finally, other sources of data besides hospital discharge and mortality data (e.g., ambulance records) need to be utilized to obtain a more comprehensive picture of the occurrence of acute diabetic complications in Colorado. Although the hospital discharge data only provide information on the most serious episodes of acute diabetic complications, they do serve as a useful indicator of morbidity for Colorado's diabetes surveillance system.

Figure 4f. Distribution of Hospital Discharge Records for Diabetic Ketoacidosis with Coma as Any Listed Diagnosis, by Age and Gender: Colorado Residents, 1993–1995.

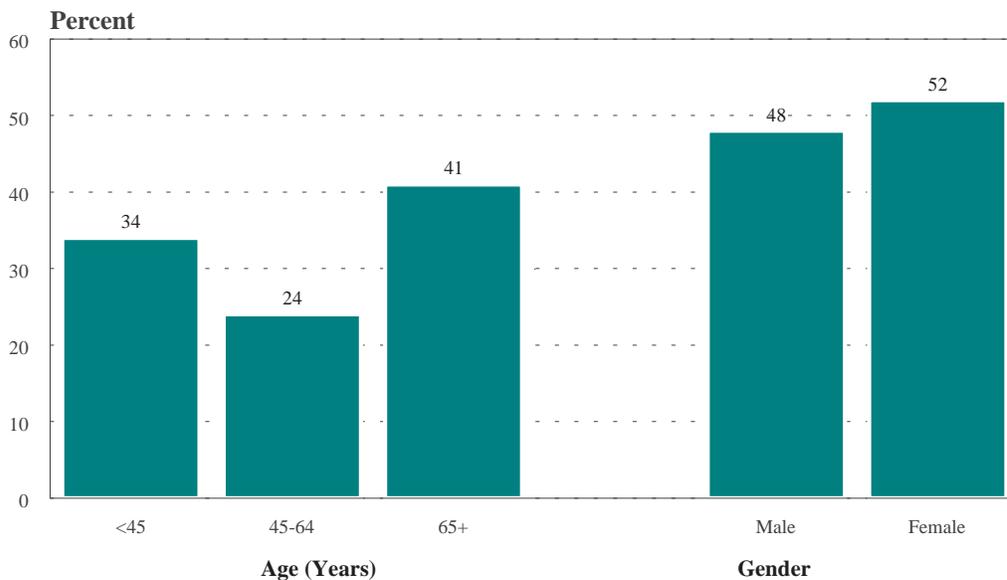


Table 4.1. Number of Hospital Discharge Records with Diabetic Ketoacidosis without Coma as Any Listed Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	765	42.6	831	45.4	826	44.5	807	44.2
45-64	260	6.6	271	6.6	254	5.8	262	6.3
65+	145	4.4	171	5.0	161	4.6	159	4.7
Total	1,170	12.9	1,273	13.6	1,241	12.8	1,228	13.1
Age-Adjusted Rate*		12.0		12.7		12.1		12.3
(95% Confidence Interval)		(11.3, 12.7)		(12.0, 13.4)		(11.4, 12.8)		(11.6, 12.9)
Male								
<45	379	66.2	391	66.9	409	68.9	393	67.3
45-64	126	6.9	136	7.1	124	6.1	129	6.7
65+	51	3.7	55	3.8	62	4.2	56	3.9
Total	556	14.7	582	14.8	595	14.5	578	14.6
Age-Adjusted Rate*		15.9		16.2		16.3		16.1
(95% Confidence Interval)		(14.6, 17.2)		(14.9, 17.5)		(15.0, 17.6)		(14.8, 17.4)
Female								
<45	386	31.5	440	35.3	417	33.1	414	33.3
45-64	134	6.4	135	6.1	130	5.6	133	6.0
65+	94	4.9	116	5.9	99	4.9	103	5.2
Total	614	11.7	691	12.7	646	11.5	650	12.0
Age-Adjusted Rate*		10.2		11.1		10.1		10.5
(95% Confidence Interval)		(9.3, 11.0)		(10.3, 12.0)		(9.3, 10.9)		(9.7, 11.3)

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis defined as ICD-9-CM 250.1.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.2. Number of Hospital Discharge Records with Diabetic Ketoacidosis without Coma as Primary Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	662	36.9	715	39.1	699	37.7	692	37.9
45-64	185	4.7	178	4.3	162	3.7	175	4.2
65+	78	2.4	103	3.0	69	2.0	83	2.4
Total	925	10.2	996	10.6	930	9.6	950	10.1
Age-Adjusted Rate*	9.4		9.9		8.9		9.4	
(95% Confidence Interval)	(8.8, 10.0)		(9.3, 10.5)		(8.4, 9.5)		(8.8, 10.0)	
Male								
<45	334	58.3	333	57.0	348	58.6	338	58.0
45-64	88	4.8	87	4.5	81	4.0	85	4.4
65+	35	2.5	34	2.4	29	2.0	33	2.3
Total	457	12.1	454	11.5	458	11.2	456	11.6
Age-Adjusted Rate*	13.2		12.8		12.7		12.9	
(95% Confidence Interval)	(12.0, 14.4)		(11.6, 14.0)		(11.6, 13.8)		(11.7, 14.1)	
Female								
<45	328	26.8	382	30.7	351	27.8	354	28.4
45-64	97	4.6	91	4.1	81	3.5	90	4.1
65+	43	2.2	69	3.5	40	2.0	51	2.6
Total	468	8.9	542	10.0	472	8.4	494	9.1
Age-Adjusted Rate*	7.5		8.5		7.1		7.7	
(95% Confidence Interval)	(6.8, 8.2)		(7.8, 9.2)		(6.5, 7.8)		(7.0, 8.4)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis defined as ICD-9-CM 250.1.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.3. Average Annual Number of Hospital Discharge Records for Diabetic Ketoacidosis without Coma listed as any Diagnosis, by County: Colorado Residents with Diabetes, 1993-1995.

County	Number of Records	County	Number of Records	County	Number of Records
COLORADO	1228	Elbert	150	Montrose	8
Adams	110	Fremont	18	Morgan	8
Alamosa	***	Garfield	8	Otero	16
Arapahoe	104	Gilpin	***	Ouray	***
Archuleta	***	Grand	***	Park	***
Baca	11	Gunnison	***	Phillips	***
Bent	3	Hinsdale	***	Pitkin	***
Boulder	53	Huerfano	5	Prowers	9
Chaffee	4	Jackson	***	Pueblo	64
Cheyenne	3	Jefferson	125	Rio Blanco	***
Clear Creek	***	Kiowa	***	Rio Grande	4
Conejos	3	Kit Carson	***	Routt	***
Costilla	***	La Plata	***	Saguache	***
Crowley	***	Lake	14	San Juan	***
Custer	***	Larimer	47	San Miguel	***
Delta	9	Las Animas	6	Sedgwick	***
Denver	281	Lincoln	***	Summit	3
Dolores	***	Logan	5	Teller	5
Douglas	13	Mesa	32	Washington	4
Eagle	7	Mineral	***	Weld	50
El Paso	3	Moffat	4	Yuma	***
		Montezuma	9		

NOTE: Diabetic ketoacidosis defined as ICD-9-CM 250.1.

*** Number is less than three.

Table 4.4. Number of Hospital Discharge Records for Diabetic Ketoacidosis without Coma listed as Primary Diagnosis, by County: Colorado Residents with Diabetes, 1993-1995.

County	Number of Records	County	Number of Records	County	Number of Records
COLORADO	950	Elbert	3	Montrose	7
Adams	86	Fremont	14	Morgan	6
Alamosa	***	Garfield	6	Otero	12
Arapahoe	80	Gilpin	***	Ouray	***
Archuleta	***	Grand	***	Park	***
Baca	8	Gunnison	***	Phillips	***
Bent	3	Hinsdale	***	Pitkin	***
Boulder	42	Huerfano	4	Prowers	7
Chaffee	***	Jackson	***	Pueblo	49
Cheyenne	***	Jefferson	94	Rio Blanco	***
Clear Creek	***	Kiowa	***	Rio Grande	***
Conejos	***	Kit Carson	***	Routt	***
Costilla	***	La Plata	***	Saguache	***
Crowley	***	Lake	10	San Juan	***
Custer	***	Larimer	38	San Miguel	***
Delta	7	Las Animas	4	Sedgwick	***
Denver	214	Lincoln	***	Summit	3
Dolores	***	Logan	4	Teller	3
Douglas	10	Mesa	26	Washington	3
Eagle	6	Mineral	***	Weld	38
El Paso	121	Moffat	3	Yuma	***
		Montezuma	7		

NOTE: Diabetic ketoacidosis defined as ICD-9-CM 250.1.

*** Number is less than three.

Table 4.5. Number and Rate of Persons with At Least One Hospital Discharge Record for Diabetic Ketoacidosis without Coma as Any Listed Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	632	35.2	674	36.8	671	36.2	659	36.1
45-64	223	5.7	238	5.8	228	5.3	230	5.6
65+	137	4.1	147	4.3	142	4.1	142	4.2
Total	992	11.0	1,059	11.3	1,041	10.7	1,031	11.0
Age-Adjusted Rate*	10.2		10.6		10.2		10.3	
(95% Confidence Interval)	(9.6, 10.8)		(10.0, 11.2)		(9.6, 10.8)		(9.7, 10.9)	
Male								
<45	324	56.6	344	58.9	341	57.4	336	57.6
45-64	111	6.1	121	6.3	107	5.3	113	5.9
65+	48	3.5	49	3.4	57	3.8	51	3.6
Total	483	12.8	514	13.0	505	12.3	501	12.7
Age-Adjusted Rate*	13.8		14.3		13.8		14.0	
(95% Confidence Interval)	(12.6, 15.0)		(13.1, 15.5)		(12.6, 15.0)		(12.8, 15.2)	
Female								
<45	308	25.2	330	26.5	330	26.2	323	25.9
45-64	112	5.3	117	5.3	121	5.2	117	5.3
65+	89	4.6	98	5.0	85	4.2	91	4.6
Total	509	9.7	545	10.1	536	9.6	530	9.8
Age-Adjusted Rate*	8.5		8.9		8.5		8.6	
(95% Confidence Interval)	(7.8, 9.3)		(8.1, 9.6)		(7.7, 9.2)		(7.9, 9.4)	

NOTE: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis defined as ICD-9-CM 250.1.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.6. Number and Rate of Persons with At Least One Hospital Discharge Record for Diabetic Ketoacidosis without Coma as Primary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	558	31.1	590	32.2	566	30.5	571	31.3
45-64	159	4.1	155	3.8	147	3.4	154	3.7
65+	74	2.2	87	2.6	64	1.8	75	2.2
Total	791	8.8	832	8.9	777	8.0	800	8.5
Age-Adjusted Rate*	8.0		8.2		7.5		7.9	
(95% Confidence Interval)	(7.5, 8.6)		(7.7, 8.8)		(7.0, 8.0)		(7.4, 8.5)	
Male								
<45	291	50.8	297	50.8	291	49.0	293	50.2
45-64	80	4.4	77	4.0	71	3.5	76	3.9
65+	32	2.3	30	2.1	27	1.8	30	2.1
Total	403	10.6	404	10.2	389	9.5	399	10.1
Age-Adjusted Rate*	11.6		11.4		10.8		11.3	
(95% Confidence Interval)	(10.5, 12.8)		(10.3, 12.5)		(9.7, 11.8)		(10.2, 12.3)	
Female								
<45	267	21.8	293	23.5	275	21.8	278	22.4
45-64	79	3.8	78	3.5	76	3.3	78	3.5
65+	42	2.2	57	2.9	37	1.8	45	2.3
Total	388	7.4	428	7.9	388	6.9	401	7.4
Age-Adjusted Rate*	6.3		6.8		5.9		6.3	
(95% Confidence Interval)	(5.6, 6.9)		(6.1, 7.4)		(5.3, 6.5)		(5.7, 6.9)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis defined as ICD-9-CM 250.1.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.7. Discharge Status of Hospital Discharge Records for DKA without Coma Listed as any Diagnosis, by Age: Colorado, 1993-1995.

Age Group (Years)	Total (N=3,684)	<20 (N=651)	20-44 (N=1,771)	45-64 (N=785)	65-74 (N=273)	75+ (N=204)
Discharge Status						
Percent						
Total	100.0	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	82.0	93.0	88.0	78.0	54.0	35.0
Transferred to Another Acute Care Facility	2.0	1.0	1.0	2.0	3.0	2.0
Transferred to Skilled Nursing Facility	3.0	0.0	1.0	3.0	9.0	23.0
Transferred to Intermediate Care Facility	1.0	0.0	0.0	1.0	2.0	4.0
Transferred to Another Type of Institution for Inpatient Care	3.0	2.0	2.0	4.0	4.0	6.0
Transferred to Home Health Care	6.0	1.0	4.0	9.0	19.0	18.0
Left Facility Against Medical Advice	1.0	2.0	2.0	1.0	0.0	0.0
Home IV Service	0.0	0.0	0.0	0.0	0.0	0.0
Died	2.0	0.0	1.0	3.0	8.0	11.0

NOTE: Diabetes defined as ICD-9-CM 250.

Table 4.8 Discharge Status of Hospital Discharge Records for DKA Listed as Primary Diagnosis, by Age: Colorado, 1993-1995.

Age Group (Years)	Total	<20	20-44	45-64	65-74	75+
Discharge Status	(N=2,480)	(N=609)	(N=1,467)	(N=525)	(N=145)	(N=105)
Percent						
Total	100.0	100.0	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	87.0	94.0	91.0	84.0	62.0	44.0
Transferred to Another Acute Care Facility	1.0	0.0	1.0	2.0	3.0	0.0
Transferred to Skilled Nursing Facility	2.0	0.0	0.0	2.0	6.0	17.0
Transferred to Intermediate Care Facility	0.0	0.0	0.0	0.0	2.0	4.0
Transferred to Another Type of Institution for Inpatient Care	2.0	2.0	2.0	3.0	2.0	6.0
Transferred to Home Health Care	6.0	1.0	4.0	8.0	21.0	29.0
Left Facility Against Medical Advice	1.0	2.0	2.0	1.0	0.0	0.0
Home IV Service	0.0	0.0	0.0	0.0	0.0	0.0
Died	1.0	0.0	0.0	1.0	4.0	1.0

NOTE: Diabetes defined as ICD-9-CM 250.

Table 4.9 Number of Hospital Discharge Records with Diabetic Ketoacidosis with Coma as Any Listed Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	15	0.8	37	2.0	33	1.8	28	1.6
45-64	19	0.5	22	0.5	20	0.5	20	0.5
65+	20	0.6	42	1.2	39	1.1	34	1.0
Total	54	0.6	101	1.1	92	0.9	82	0.9
Age-Adjusted Rate*	0.6		1.1		1.0		0.9	
(95% Confidence Interval)	(0.4, 0.8)		(0.9, 1.3)		(0.8, 1.2)		(0.7, 1.1)	
Male								
<45	8	1.4	25	4.3	20	3.4	18	3.0
45-64	6	0.3	12	0.6	10	0.5	9	0.5
65+	9	0.7	16	1.1	11	0.7	12	0.8
Total	23	0.6	53	1.3	41	1.0	39	1.0
Age-Adjusted Rate*	0.7		1.5		1.1		1.1	
(95% Confidence Interval)	(0.4, 0.9)		(1.1, 1.9)		(0.8, 1.4)		(0.7, 1.4)	
Female								
<45	7	0.6	12	1.0	13	1.0	11	0.9
45-64	13	0.6	10	0.5	10	0.4	11	0.5
65+	11	0.6	26	1.3	28	1.4	22	1.1
Total	31	0.6	48	0.9	51	0.9	43	0.8
Age-Adjusted Rate*	0.6		0.9		0.9		0.8	
(95% Confidence Interval)	(0.4, 0.8)		(0.6, 1.2)		(0.7, 1.2)		(0.6, 1.1)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis with coma defined as ICD-9-CM 250.3.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

*** Number of cases too small (<3) to calculate meaningful rate.

Table 4.10. Number of Hospital Discharge Records with Diabetic Ketoacidosis with Coma as Primary Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	10	0.6	25	1.4	23	1.2	19	1.1
45-64	12	0.3	13	0.3	15	0.3	13	0.3
65+	14	0.4	30	0.9	23	0.7	22	0.7
Total	36	0.4	68	0.7	61	0.6	55	0.6
Age-Adjusted Rate*	0.4		0.7		0.6		0.6	
(95% Confidence Interval)	(0.3, 0.5)		(0.6, 0.9)		(0.5, 0.8)		(0.4, 0.7)	
Male								
<45	7	1.2	17	2.9	14	2.4	13	2.2
45-64	4	0.2	8	0.4	9	0.4	7	0.4
65+	7	0.5	14	1.0	6	0.4	9	0.6
Total	18	0.5	39	1.0	29	0.7	29	0.7
Age-Adjusted Rate*	0.5		1.1		0.8		0.8	
(95% Confidence Interval)	(0.3, 0.8)		(0.7, 1.4)		(0.5, 1.0)		(0.5, 1.1)	
Female								
<45	3	0.2	8	0.6	9	0.7	7	0.5
45-64	8	0.4	5	0.2	6	0.3	6	0.3
65+	7	0.4	16	0.8	17	0.8	13	0.7
Total	18	0.3	29	0.5	32	0.6	26	0.5
Age-Adjusted Rate*	0.4		0.5		0.6		0.5	
(95% Confidence Interval)	(0.2, 0.5)		(0.3, 0.7)		(0.4, 0.8)		(0.3, 0.7)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Diabetic ketoacidosis with coma defined as ICD-9-CM 250.3.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

*** Number of cases too small (<3) to calculate meaningful rate.

Table 4.11 Discharge Status of Hospital Discharge Records for DKA and HNKC : Colorado, 1993-1995.

Discharge Status	DKA with Coma		HNKC	
	Any Diagnosis (N=247)	Primary Diagnosis (N=165)	Any Diagnosis (N=404)	Primary Diagnosis (N=261)
Percent				
Total	100.0	100.0	100.0	100.0
Routine Discharge to Home or Self Care	50.0	56.0	43.0	48.0
Transferred to Another				
Acute Care Facility	5.0	5.0	4.0	3.0
Transferred to Skilled Nursing Facility	11.0	13.0	20.0	16.0
Transferred to Immediate Care Facility	2.0	2.0	3.0	3.0
Transferred to Another Type of Institution for Inpatient Care	4.0	3.0	6.0	5.0
Transferred to Home Health Care	11.0	11.0	15.0	18.0
Left Facility Against Medical Advice	1.0	2.0	1.0	0.0
Home IV Service	0.0	0.0	0.0	0.0
Died	14.0	8.0	8.0	6.0

NOTE: Diabetes defined as ICD-9-CM 250.

*** Percent based on less than three cases.

Table 4.12. Number of Hospital Discharge Records with Hyperosmolar Non-Ketotic Coma as Any Listed Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Sexes								
<45	16	0.1	19	0.1	27	0.1	21	0.1
45-64	23	0.3	46	0.6	47	0.6	39	0.5
65+	60	1.7	73	2.0	93	2.5	75	2.1
Total	99	1.3	138	0.4	167	0.4	135	0.4
Age-Adjusted Rate*	0.30		0.41		0.48		0.40	
(95% Confidence Interval)	(0.24,0.36)		(0.34,0.47)		(0.41,0.55)		(0.33,0.47)	
Male								
<45	11	0.1	13	0.1	17	0.1	14	0.1
45-64	10	0.3	23	0.6	30	0.8	21	0.6
65+	27	1.9	34	2.3	39	2.5	33	2.2
Total	48	0.3	70	0.4	86	0.5	68	0.4
Age-Adjusted Rate*	0.33		0.45		0.53		0.44	
(95% Confidence Interval)	(0.23,0.42)		(0.34,0.56)		(0.42,0.64)		(0.33,0.54)	
Female								
<45	5	0.0	6	0.0	10	0.1	7	0.1
45-64	13	0.4	23	0.6	17	0.4	18	0.5
65+	33	1.6	39	1.9	54	2.5	42	2.0
Total	51	0.3	68	0.4	81	0.4	67	0.4
Age-Adjusted Rate*	0.28		0.37		0.43		0.36	
(95% Confidence Interval)	(0.21, 0.36)		(0.28,0.45)		(0.33,0.52)		(0.27,0.45)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Hyperosmolar non-ketotic coma defined as ICD-9-CM 250.2.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.13. Number of Hospital Discharge Records with Hyperosmolar Non-Ketotic Coma as Primary Diagnosis and Hospital Discharge Rate, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	13	0.1	10	0.0	20	0.1	14	0.1
45-64	19	0.3	36	0.5	34	0.4	30	0.4
65+	28	0.8	49	1.4	52	1.4	43	1.2
Total	60	0.2	95	0.3	106	0.3	87	0.2
Age-Adjusted Rate*	0.18		0.28		0.30		0.25	
(95% Confidence Interval)	(0.13,0.23)		(0.22,0.34)		(0.24,0.36)		(0.2,0.31)	
Male								
<45	10	0.1	6	0.0	12	0.1	9	0.1
45-64	9	0.3	21	0.6	20	0.5	17	0.5
65+	14	1.0	19	1.3	27	1.7	20	1.3
Total	33	0.2	46	0.3	59	0.3	46	0.3
Age-Adjusted Rate*	0.22		0.29		0.36		0.29	
(95% Confidence Interval)	(0.14,0.29)		(0.20,0.37)		(0.27,0.46)		(0.21,0.38)	
Female								
<45	3	0.0	4	0.0	8	0.1	5	0.0
45-64	10	0.3	15	0.4	14	0.4	13	0.4
65+	14	0.7	30	1.4	25	1.2	23	1.1
Total	27	0.2	49	0.3	47	0.2	41	0.2
Age-Adjusted Rate*	0.15		0.26		0.25		0.22	
(95% Confidence Interval)	(0.09,0.21)		(0.19,0.34)		(0.18, 0.32)		(0.15,0.29)	

NOTES: Rates are per 1,000 Colorado residents with diabetes. Hyperosmolar non-ketotic coma defined as ICD-9-CM 250.2.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.14 Number and Rate of Persons with At Least One Hospital Discharge Record for Hyperosmolar Non-Ketotic Coma as Any Listed Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	14	0.8	19	1.0	25	1.3	19	1.1
45-64	23	0.6	42	1.0	43	1.0	36	0.9
65+	56	1.7	67	2.0	90	2.6	71	2.1
Total	93	1.0	128	1.4	158	1.6	126	1.3
Age-Adjusted Rate*	1.1		1.4		1.7		1.4	
(95% Confidence Interval)	(0.9, 1.3)		(1.2, 1.7)		(1.4, 2.0)		(1.2, 1.7)	
Male								
<45	10	1.7	13	2.2	16	2.7	13	2.2
45-64	10	0.5	23	1.2	28	1.4	20	1.1
65+	25	1.8	30	2.1	39	2.6	31	2.2
Total	45	1.2	66	1.7	83	2.0	65	1.6
Age-Adjusted Rate*	1.3		1.7		2.1		1.7	
(95% Confidence Interval)	(0.9, 1.7)		(1.3, 2.2)		(1.7, 2.6)		(1.3, 2.2)	
Female								
<45	4	0.3	6	0.5	9	0.7	6	0.5
45-64	13	0.6	19	0.9	15	0.6	16	0.7
65+	31	1.6	37	1.9	51	2.5	40	2.0
Total	48	0.9	62	1.1	75	1.3	62	1.1
Age-Adjusted Rate*	1.0		1.2		1.4		1.2	
(95% Confidence Interval)	(.0.7, 1.3)		(0.9, 1.5)		(1.1, 1.8)		(0.9, 1.5)	

NOTES: Rates are per 1,000 Colorado residents with diabetes.

Hyperosmolar non-ketotic coma defined as ICD-9-CM 250.2.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.

Table 4.15 Number and Rate of Persons with At Least One Hospital Discharge Record for Hyperosmolar Non-Ketotic Coma as Primary Diagnosis, by Gender and Age: Colorado Residents with Diabetes, 1993-1995.

Gender/Age	1993		1994		1995		1993-1995 (Average)	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Both Genders								
<45	13	0.7	10	0.5	20	1.1	14	0.8
45-64	19	0.5	35	0.8	31	0.7	28	0.7
65+	26	0.8	46	1.4	52	1.5	41	1.2
Total	58	0.6	91	1.0	103	1.1	84	0.9
Age-Adjusted Rate*	0.7		1.0		1.1		0.9	
(95% Confidence Interval)	(0.5, 0.8)		(0.8, 1.2)		(0.9, 1.3)		(0.7, 1.1)	
Male								
<45	10	1.7	6	1.0	12	2.0	9	1.6
45-64	9	0.5	21	1.1	19	0.9	16	0.8
65+	13	0.9	18	1.3	27	1.8	19	1.3
Total	32	0.8	45	1.1	58	1.4	45	1.1
Age-Adjusted Rate*	0.9		1.2		1.5		1.2	
(95% Confidence Interval)	(0.6, 1.2)		(0.8, 1.5)		(1.1, 1.9)		(0.8, 1.5)	
Female								
<45	3	0.2	4	0.3	8	0.6	5	0.4
45-64	10	0.5	14	0.6	12	0.5	12	0.5
65+	13	0.7	28	1.4	25	1.2	22	1.1
Total	26	0.5	46	0.8	45	0.8	39	0.7
Age-Adjusted Rate*	0.5		0.9		0.8		0.8	
(95% Confidence Interval)	(0.3, 0.7)		(0.6, 1.2)		(0.6, 1.1)		(0.5,1.0)	

NOTES: Rates are per 1,000 Colorado residents with diabetes.

Hyperosmolar non-ketotic coma defined as ICD-9-CM 250.2.

* Age-adjusted to the estimated 1980 U.S. resident population with diabetes.