

Diabetic Ketoacidosis



Diabetic ketoacidosis (DKA) is an acute metabolic complication of diabetes that is related to a deficiency in insulin (24). DKA may require hospitalization for treatment and increases the use of health care services and the cost of diabetes. This report finds that DKA continues to be more problematic for blacks than for whites.

Inpatient hospital care.

In 1994, DKA was the primary diagnosis for 89,000 hospital discharges and a listed diagnosis for 113,000 hospital discharges (Figure 7.1; Tables 7.1, 7.4). The average length of stay for a primary diagnosis of DKA increased with age (Figure 7.2), decreased more than 40% between 1980 and 1994, and averaged 4.5 days in 1994 (Figure 7.2; Table 7.1).

Age-adjusted rates of hospital discharge for DKA as the primary diagnosis and as a listed diagnosis per 1,000 persons with diabetes increased from 1980 to 1984 and decreased thereafter (Figure 7.4, Tables 7.13, 7.16). Hospital discharge rates for DKA decreased with age (Figure 7.5; Table 7.13, 7.16). In 1994, the hospital discharge rate for DKA as the primary diagnosis was more than 20 times higher for persons aged <45 years than for persons aged >65 years.

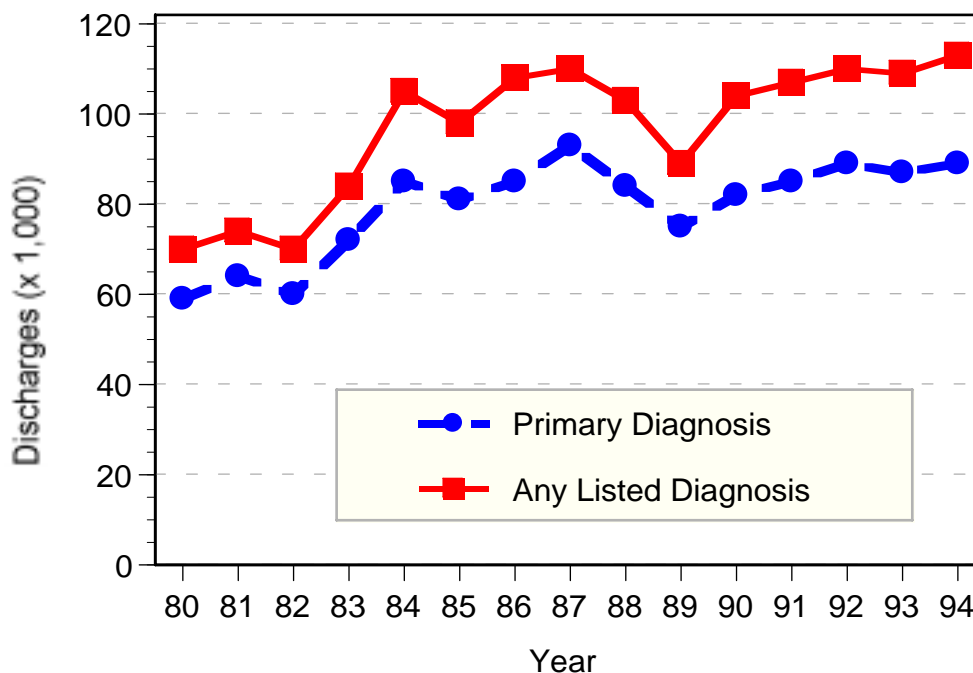


Figure 7.1: Number of Hospital Discharges with Diabetic Ketoacidosis (DKA) as First-Listed Diagnosis and as Any Listed Diagnosis, United States, 1980-1994

Hospital discharge rates for DKA were similar for males and females (Figure 7.6; Table 7.14, 7.17) but higher for blacks than for whites (Figure 7.7; Tables 7.15, 7.18). In 1994, the age-adjusted rates of hospital discharge for DKA as the primary diagnosis among blacks was 2.3 times that of whites (15.7 vs 6.8 per 1,000 diabetic population). Trends over time also differed, with blacks having higher rates in 1994 than in 1980 and whites having lower rates in 1994 than in 1980.

Mortality.

The number of deaths with DKA as the underlying (DKA deaths) and any listed cause of death (DKA-related deaths) varied little between 1980 and 1994 (Figure 7.8; Tables 7.19, 7.26). Age-adjusted death rates per 100,000 diabetic population for DKA and DKA-related deaths declined between 1980 and 1987, increased in 1988 and 1989, and then began decreasing once more in 1990 (Figure 7.10; Table 7.33, 7.40). Overall, both the age-adjusted DKA death rate and the DKA-related death rate were 34% lower in 1994 than in 1980.

The highest DKA death rates were among persons aged >75 years, followed by persons aged <45 years (Figure 7.11; Table 7.33). Among the four race-sex groups examined, DKA death rates were highest among black males, followed by black females and then by whites (Figure 7.12; Tables 7.36-39). In 1994, the age-adjusted DKA death rate for black males was almost twice that for white males (37.9 vs 20.3 per 100,000 diabetic population). Similar trends are seen in DKA related death rates (Tables 7.43-7.46).

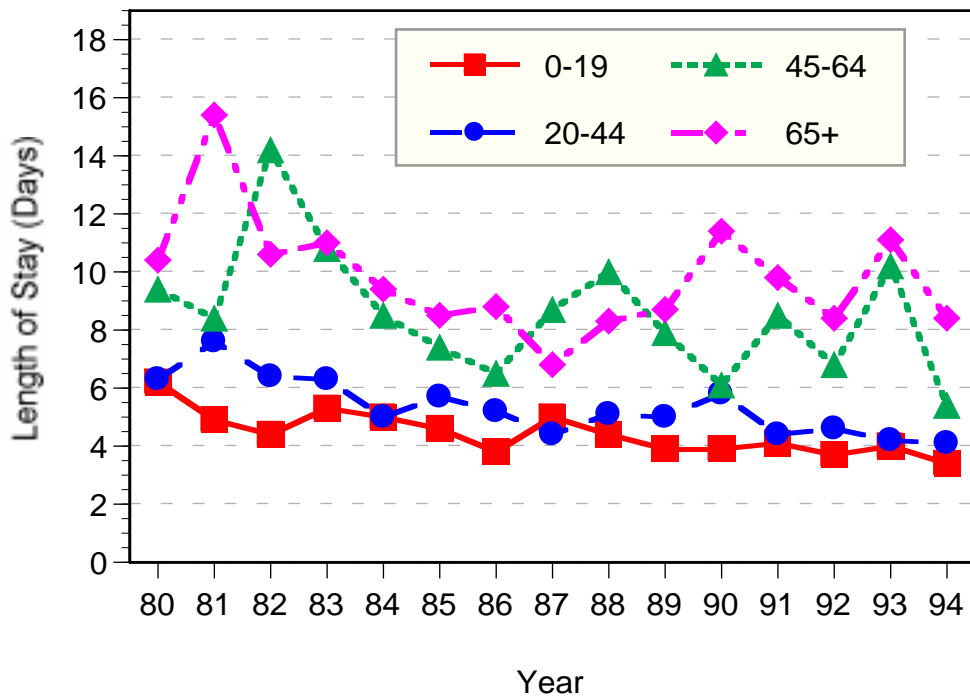


Figure 7.2: Average Length of Stay (LOS) of Hospital Discharges with Diabetic Ketoacidosis as First-Listed Diagnosis, by Age, United States, 1980-1994

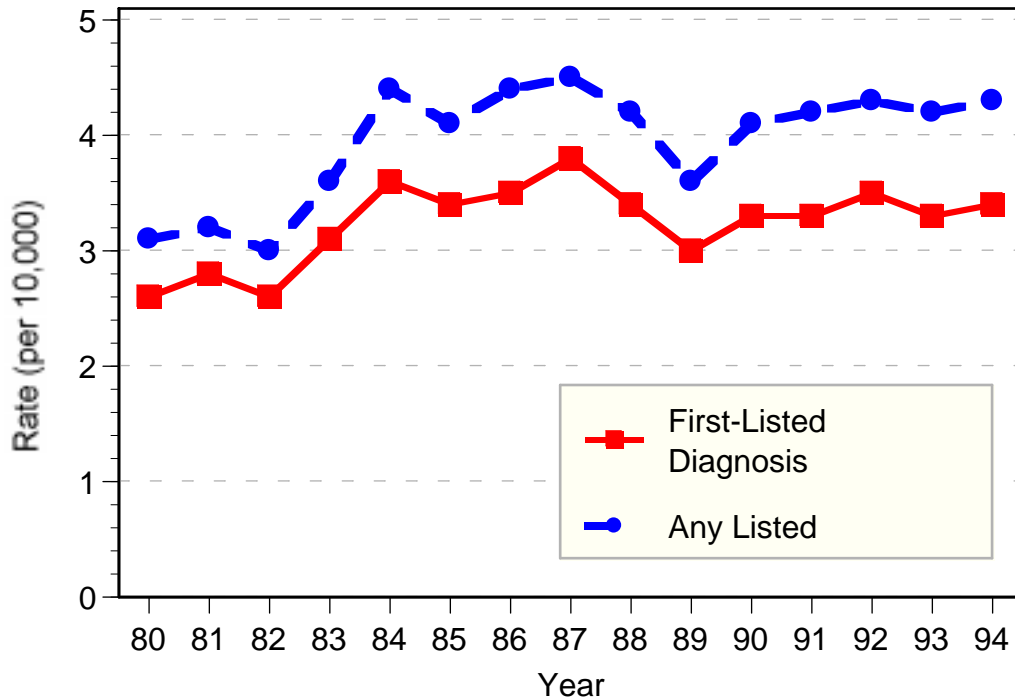


Figure 7.3: Age-standardized Rates of Hospital Discharge for DKA as First-Listed Diagnosis and as Any Listed Diagnosis per 10,000 Population, United States, 1980-1994.

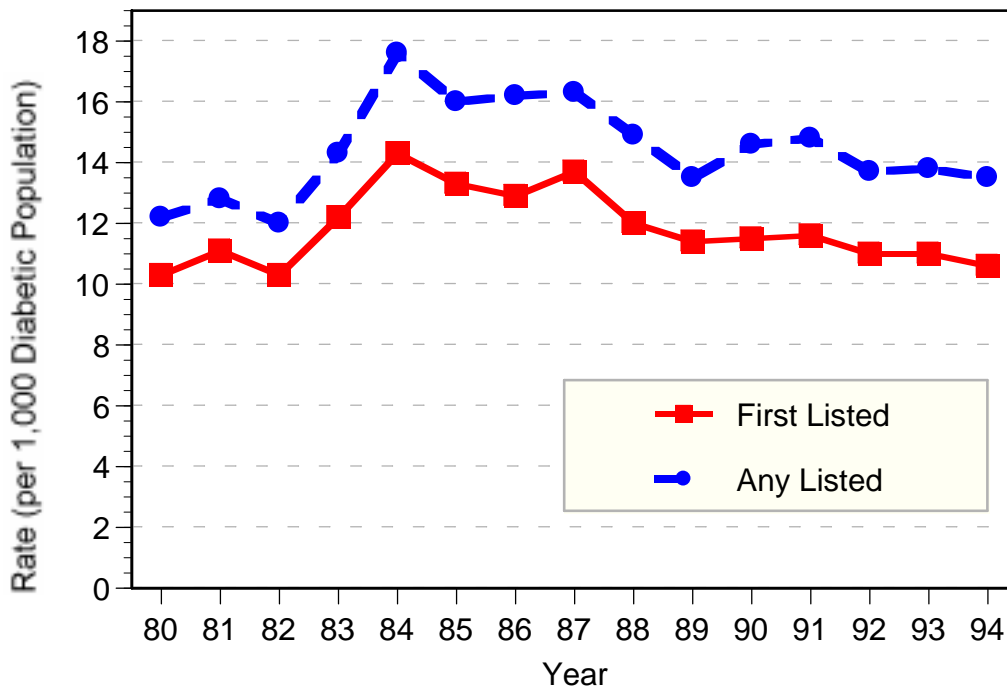


Figure 7.4: Age-standardized Rates of Hospital Discharge for DKA as First-Listed Diagnosis and as Any Listed Diagnosis per 1,000 Diabetic Population, United States, 1980-1994.

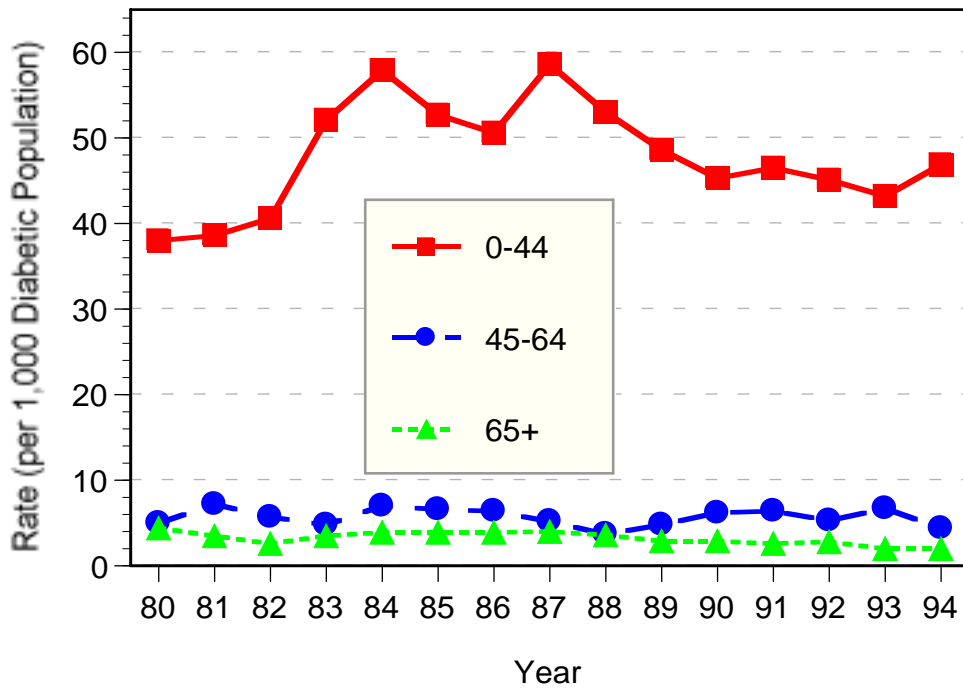


Figure 7.5: Hospital Discharge Rate for Diabetic Ketoacidosis as a Primary Diagnosis per 1,000 Diabetic Population, by Age, United States, 1980-1994.

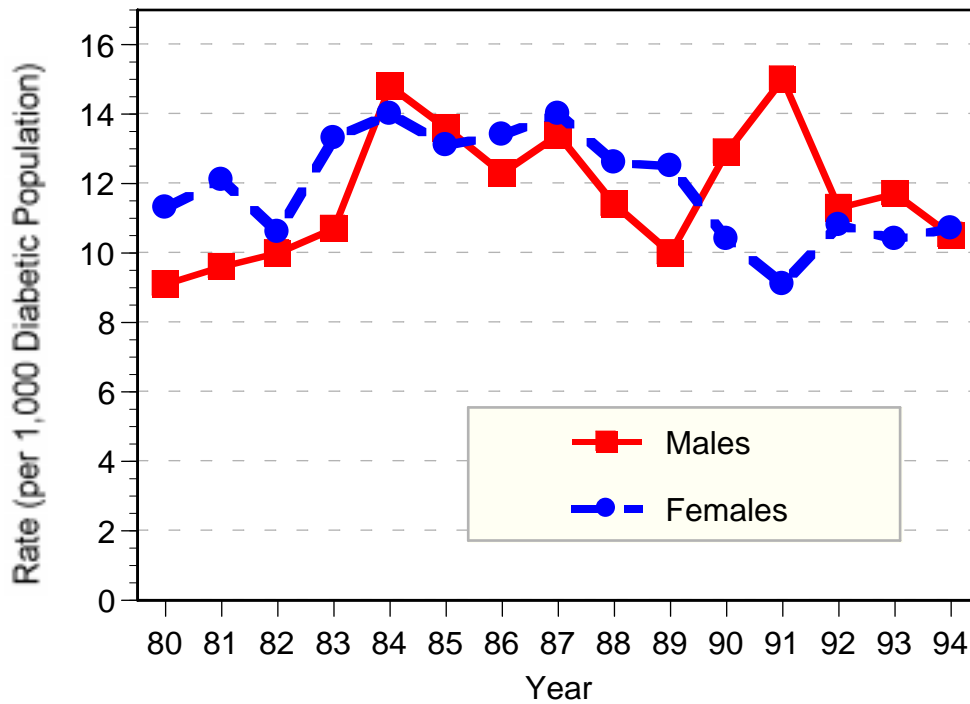


Figure 7.6: Age-standardized Hospital Discharge Rate for Diabetic Ketoacidosis as a Primary Diagnosis per 1,000 Diabetic Population, by Sex, United States, 1980-1994.

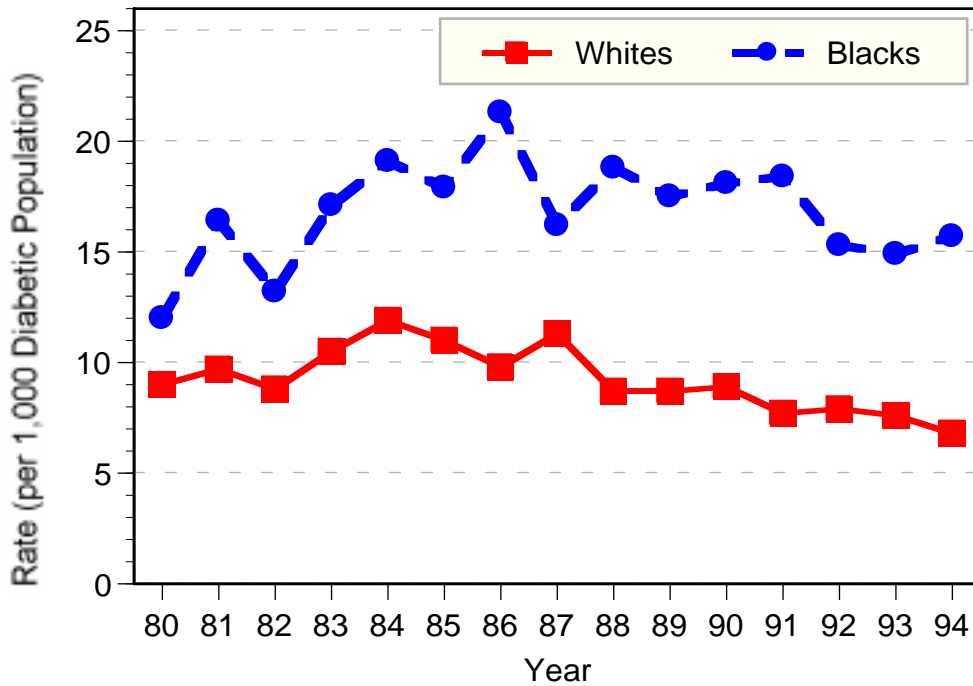


Figure 7.7: Age-standardized Hospital Discharge Rate for Diabetic Ketoacidosis as First-Listed Diagnosis per 1,000 Diabetic Population, by Race, United States, 1980-1994.

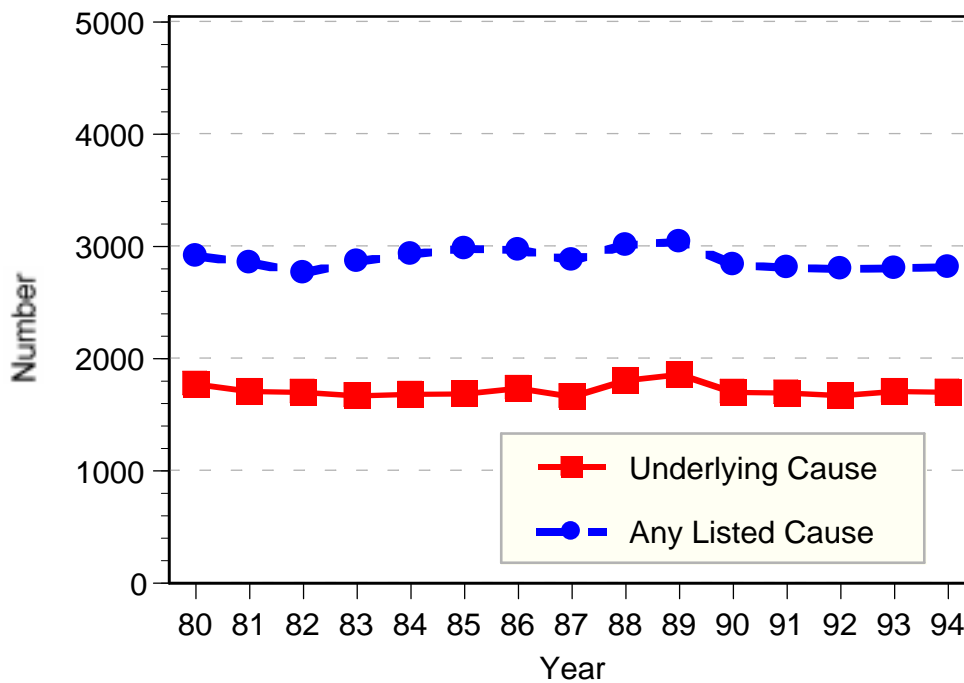


Figure 7.8: Number of Deaths with Diabetic Ketoacidosis as Underlying and Any Listed Cause of Death, United States, 1980-1994.

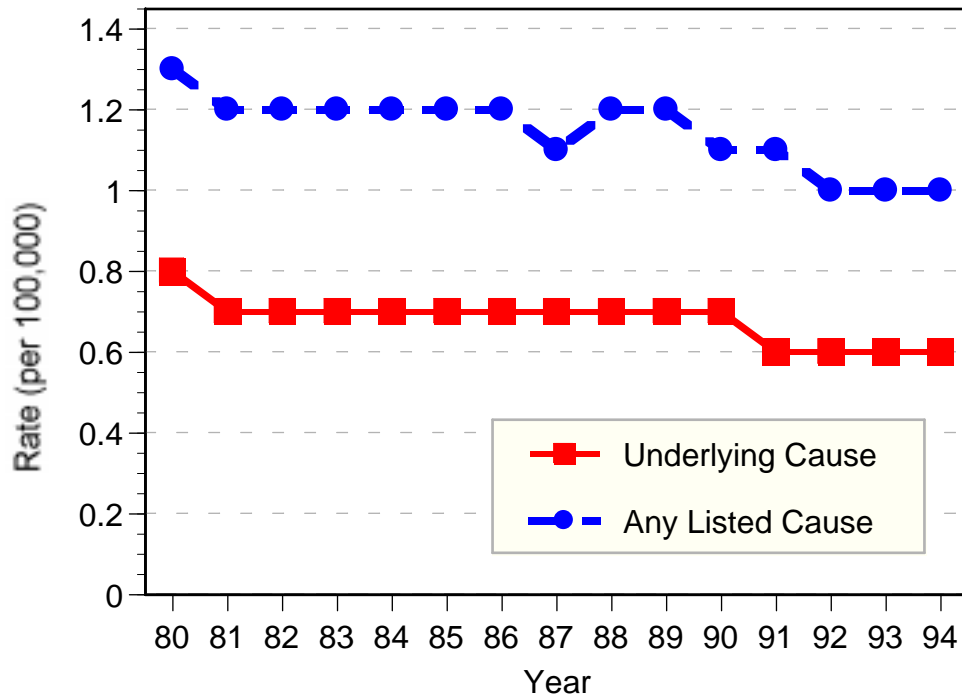


Figure 7.9: Age-standardized Death Rates for Diabetic Ketoacidosis as Underlying and Any Listed Cause of Death per 100,000 Population, United States, 1980-1994.

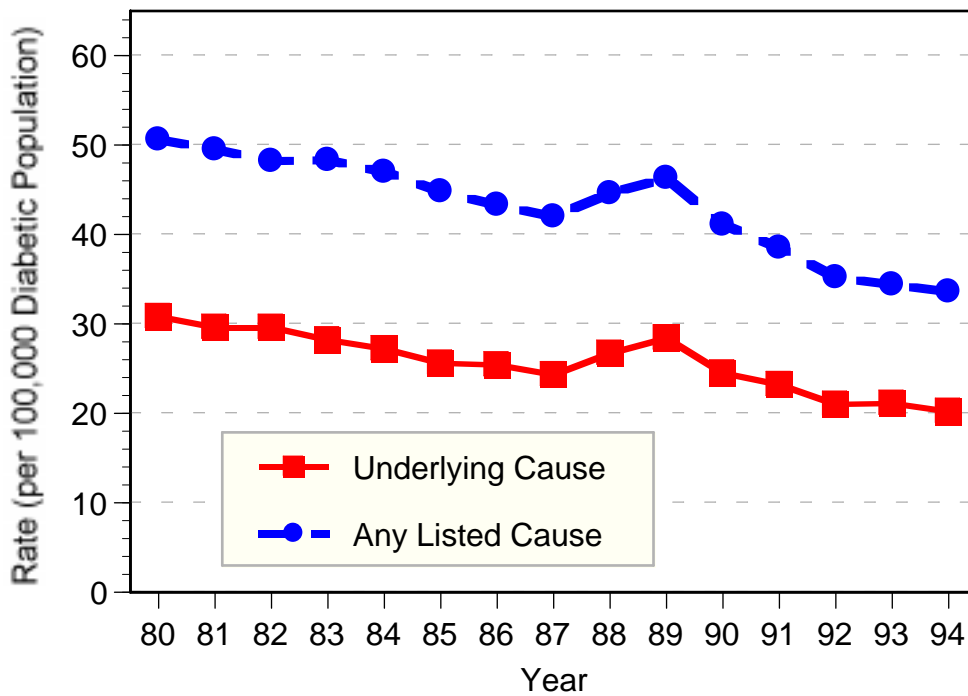


Figure 7.10: Age-standardized Death Rates per 100,000 Diabetic Population for Diabetic Ketoacidosis as Underlying and Any Listed Cause of Death, United States, 1980-1994.

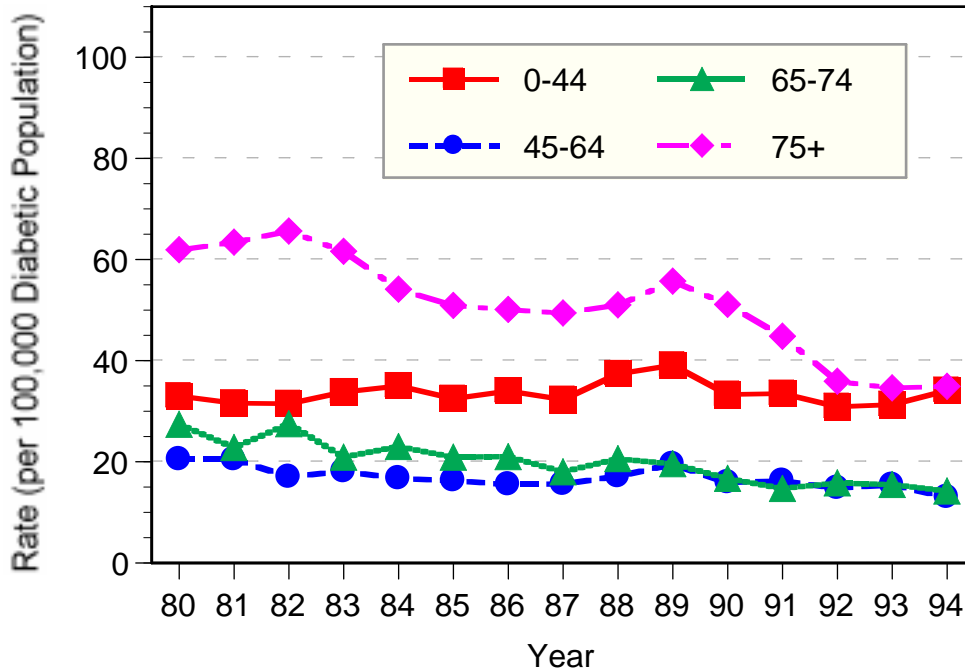


Figure 7.11: Age-Specific Death Rates for Diabetic Ketoacidosis as Underlying Cause of Death Among Persons with Diabetes, United States, 1980-1994.

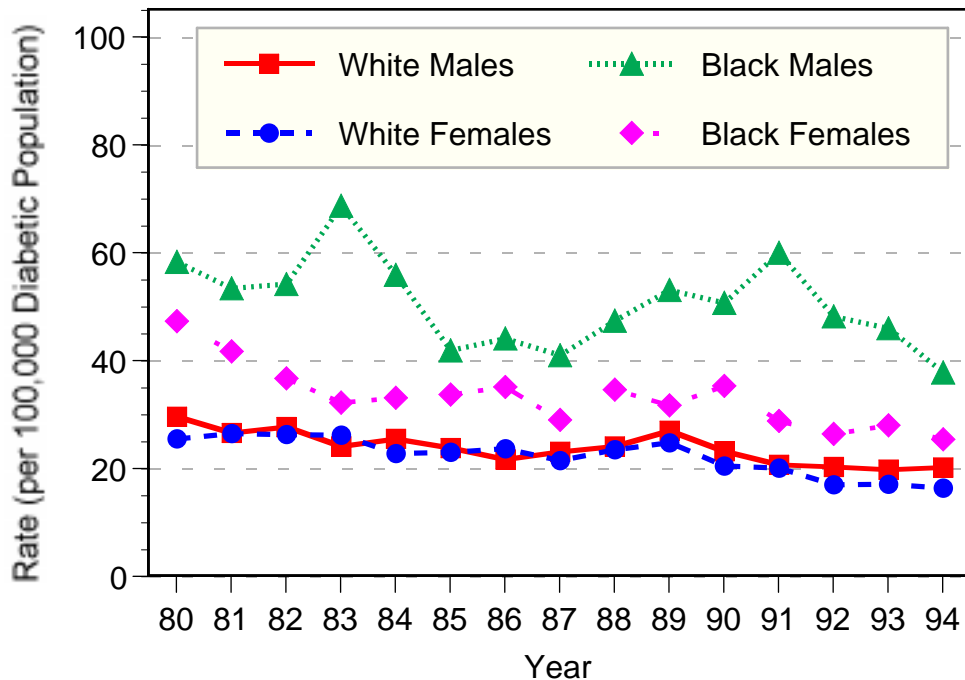


Figure 7.12: Age-standardized Death Rates per 100,000 Diabetic Population for Diabetic Ketoacidosis as Underlying Cause of Death, By Race and Sex, United States, 1980-1994.

Table 7.1: Number of Hospital Discharges^a with Diabetic Ketoacidosis as Primary Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Age, United States, 1980-1994.

Year		Age Group				Total
		0-19	20-44	45-64	65+	
1980	Discharges	16	21	12	10	59
	Days	99	132	116	106	452
	Average LOS	6.2	6.3	9.4	10.4	7.6
1981	Discharges	15	23	18	8	64
	Days	72	177	152	127	528
	Average LOS	4.9	7.6	8.4	15.4	8.2
1982	Discharges	16	24	15	6	60
	Days	71	151	206	63	492
	Average LOS	4.4	6.4	14.2	10.6	8.2
1983	Discharges	20	31	12	9	72
	Days	109	197	126	94	526
	Average LOS	5.3	6.3	10.8	11.0	7.3
1984	Discharges	21	37	16	10	85
	Days	105	188	140	97	530
	Average LOS	5.0	5.0	8.5	9.4	6.2
1985	Discharges	21	32	16	11	81
	Days	98	184	119	95	496
	Average LOS	4.6	5.7	7.4	8.5	6.1
1986	Discharges	21	37	16	11	85
	Days	80	192	105	100	477
	Average LOS	3.8	5.2	6.5	8.8	5.6
1987	Discharges	29	39	13	11	93
	Days	144	174	116	77	511
	Average LOS	5.0	4.4	8.7	6.8	5.5
1988	Discharges	25	39	9	10	84
	Days	111	199	93	82	485
	Average LOS	4.4	5.1	10.0	8.3	5.8
1989	Discharges	21	35	12	8	75
	Days	82	173	93	71	418
	Average LOS	3.9	5.0	7.9	8.7	5.6
1990	Discharges	20	39	16	8	82
	Days	76	222	97	96	491
	Average LOS	3.9	5.8	6.1	11.4	6.0
1991	Discharges	19	42	16	8	85
	Days	78	184	137	80	479
	Average LOS	4.1	4.4	8.5	9.8	5.6
1992	Discharges	22	43	15	9	89
	Days	81	196	101	79	457
	Average LOS	3.7	4.6	6.8	8.4	5.1
1993	Discharges	14	47	20	7	87
	Days	56	194	204	76	530
	Average LOS	4.0	4.2	10.2	11.1	11.1
1994	Discharges	21	48	14	7	89
	Days	70	198	75	57	400
	Average LOS	3.4	4.1	5.4	8.4	4.5

^a In thousands

Table 7.2: Number of Hospital Discharges^a with Diabetic Ketoacidosis as Primary Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Sex, United States, 1980-1994.

Year	Males			Females		
	Discharges	Days	Average LOS	Discharges	Days	Average LOS
1980	23	165	7.3	37	288	7.8
1981	24	175	7.1	40	353	8.9
1982	26	240	9.1	34	252	7.5
1983	27	162	6.1	45	363	8.1
1984	38	224	5.9	47	306	6.5
1985	34	188	5.5	47	308	6.6
1986	37	214	5.7	48	264	5.5
1987	43	218	5.0	49	293	5.9
1988	38	205	5.4	46	280	6.1
1989	31	182	6.0	45	236	5.3
1990	40	234	5.8	42	257	6.1
1991	48	252	5.3	37	227	6.1
1992	42	200	4.8	48	258	5.4
1993	43	207	4.8	44	323	7.3
1994	43	187	4.4	47	213	4.5

^a In thousands.

Table 7.3: Number of Hospital Discharges^a with Diabetic Ketoacidosis as Primary Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Race, United States, 1980-1994.

Year	Whites			Blacks		
	Discharges	Days	Average LOS	Discharges	Days	Average LOS
1980	43	318	7.5	12	107	8.8
1981	46	404	8.7	16	115	7.2
1982	42	343	8.1	12	97	7.9
1983	51	367	7.2	16	104	6.4
1984	58	335	5.8	19	148	7.7
1985	56	341	6.1	17	119	6.9
1986	54	267	4.9	22	163	7.5
1987	62	320	5.2	18	136	7.4
1988	49	264	5.4	23	158	6.8
1989	45	266	5.9	21	109	5.2
1990	51	300	5.9	21	135	6.6
1991	45	246	5.4	21	124	5.8
1992	52	252	4.9	20	115	5.7
1993	47	215	4.6	21	128	6.0
1994	44	188	4.3	25	130	5.2

^a In thousands.

Table 7.4: Number of Hospital Discharges^a with Diabetic Ketoacidosis as a Listed Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Age, United States, 1980-1994.

Year		Age Group				Total
		0-19	20-44	45-64	65+	
1980	Discharges	17	24	15	15	70
	Days	105	162	136	163	565
	Average LOS	6.1	6.7	9.3	11.2	8.0
1981	Discharges	16	26	21	11	74
	Days	77	196	213	150	637
	Average LOS	4.9	7.5	10.1	13.4	8.6
1982	Discharges	17	25	18	9	70
	Days	77	167	250	110	604
	Average LOS	4.4	6.6	13.9	11.7	8.6
1983	Discharges	22	35	14	12	84
	Days	116	228	148	123	615
	Average LOS	5.3	6.5	10.2	9.9	7.4
1984	Discharges	23	42	22	18	105
	Days	110	216	196	191	713
	Average LOS	4.9	5.1	9.0	10.5	6.8
1985	Discharges	22	38	20	18	98
	Days	100	233	184	157	674
	Average LOS	4.6	6.2	9.0	8.8	6.9
1986	Discharges	22	44	22	19	108
	Days	88	241	165	168	662
	Average LOS	4.0	5.4	7.6	8.6	6.1
1987	Discharges	29	45	19	17	110
	Days	144	233	169	161	707
	Average LOS	5.0	5.2	8.8	9.3	6.4
1988	Discharges	26	43	17	17	103
	Days	115	237	168	172	693
	Average LOS	4.4	5.5	10.0	10.3	6.7
1989	Discharges	22	41	15	12	89
	Days	86	237	120	109	552
	Average LOS	4.0	5.8	8.0	9.4	6.2
1990	Discharges	20	46	21	17	104
	Days	79	264	171	169	683
	Average LOS	3.9	5.7	8.2	10.1	6.6
1991	Discharges	19	49	25	14	107
	Days	82	237	326	149	794
	Average LOS	4.2	4.8	13.0	11.0	7.4
1992	Discharges	22	50	21	17	110
	Days	85	248	173	173	679
	Average LOS	3.8	5.0	8.1	10.2	6.2
1993	Discharges	14	55	27	13	109
	Days	56	340	284	132	812
	Average LOS	3.9	6.2	10.3	10.1	7.4
1994	Discharges	22	53	23	15	113
	Days	74	253	154	158	638
	Average LOS	3.4	4.7	6.8	10.2	5.6

^a In thousands

Table 7.5: Number of Hospital Discharges^a with Diabetic Ketoacidosis as a Listed Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Sex, United States, 1980-1994.

Year	Males			Females		
	Discharges	Days	Average LOS	Discharges	Days	Average LOS
1980	27	194	7.3	44	371	8.5
1981	27	229	8.4	47	408	8.7
1982	31	305	9.7	39	299	7.7
1983	32	200	6.3	52	415	8.0
1984	45	288	6.4	59	425	7.1
1985	42	276	6.6	56	399	7.1
1986	48	295	6.2	60	366	6.1
1987	50	290	5.7	59	418	7.0
1988	45	279	6.1	58	413	7.2
1989	37	251	6.7	51	300	5.8
1990	51	316	6.2	53	366	6.9
1991	56	331	5.9	51	463	9.0
1992	53	306	5.8	57	373	6.5
1993	54	402	7.5	56	410	7.4
1994	51	272	5.3	62	365	5.9

^aIn thousands

Table 7.6: Number of Hospital Discharges^a with Diabetic Ketoacidosis as a Listed Diagnosis, Number of Days^a of Hospital Stay, and Length of Stay (LOS), By Race, United States, 1980-1994.

Year	Whites			Blacks		
	Discharges	Days	Average LOS	Discharges	Days	Average LOS
1980	50	383	7.6	15	135	9.3
1981	55	506	9.2	17	123	7.1
1982	49	427	8.7	14	115	8.2
1983	59	422	7.2	18	120	6.6
1984	73	484	6.6	20	158	7.7
1985	68	460	6.7	20	145	7.4
1986	71	403	5.7	24	186	7.8
1987	72	443	6.1	22	177	7.9
1988	61	377	6.2	28	241	8.5
1989	54	341	6.3	24	148	6.2
1990	68	428	6.3	23	168	7.5
1991	62	501	8.0	23	147	6.3
1992	65	387	5.9	23	167	7.2
1993	61	329	5.4	27	267	9.9
1994	59	348	5.9	29	174	5.9

^aIn thousands