Kansas

Firearm-Related Deaths
Kansas, 1992-2001

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Introduction

The purpose of this report is to provide information on firearm-related deaths among Kansas residents for 1992-2001. Firearm-related deaths include those resulting from unintentional or intentional discharge of firearms or due to unknown intent. Even though trend data in this report shows us that firearm-related deaths during this decade have declined for both the United States and Kansas, they continue to be a public health concern. Firearm-related deaths accounted for approximately one-fifth of all injury deaths in the U.S during this decade and are the second leading cause of injury deaths. (WISQARS Injury Mortality Report, Online) In 2000, the latest year for which U.S. data are available, Kansas had a higher firearm-related death rate (11.0 per 100,000 population) than the nation (10.4). (National Vital Statistics Report, Vol. 50, No. 15, 2002) (Table 3)

This report reviews trends in overall firearm-related deaths over the past decade, as well as firearm-related data on fatal accidents, suicide, homicide, deaths as a result of legal intervention, and deaths where the injury was undetermined as to whether it was accidentally or purposely inflicted. Worth mentioning is the fact that firearm-related suicide and homicide account for the majority of the firearm-related deaths. (Table 6 and Figure 6)

Firearm-related deaths are defined by a variety of characteristics including race and Hispanic origin of decedent, age at death, sex, intent of injury, and years of potential life lost. A comparison of rates for two 5-year periods (1992-1996, 1997-2001) is presented by selected characteristics. (Table 1)

Because of wide differences in the firearm-related death rates of race/ethnicity, age, and gender groups, the rates are specific or adjusted for those factors. Kansas is now calculating age-adjusted death rates using the 2000 U.S. standard population. This will eliminate confusion and misunderstanding created by the use of various population standards.

This report provides a statistical overview of deaths whose underlying cause of death was reported as being firearm-related as documented by death certificates filed with the Office of Vital Statistics, Center for Health and Environmental Statistics. Underlying causes of firearm-related deaths for 1999-2001 are classified using the International Classification of Disease, 10th Revision (ICD-10). Prior to 1999, Kansas used ICD-9 to report mortality statistics. The comparability between classification schemes for this particular cause of death is high (.9973), meaning that the change should have little or no impact on the comparisons of mortality statistics over time. (Health, United States, 2002 and National Vital Statistics Report, Vol. 49, No 2, 2001)

Comparisons of rates or percents have been tested for statistical significance, and a statement that one is higher or lower than another indicates that the difference is indeed statistically significant unless otherwise indicated. Information on the methods used to test for statistical significance, as well as additional information on residence data, computation of rates, rate reliability, race/ethnicity, years of potential life lost, and handling of unknowns, is presented in the technical notes.

Highlights

- There were 264 firearm-related deaths recorded for Kansas residents in 2001, a decrease of 20.7 percent from the 1992 total of 333. (Table 1 and 3, Figure 1)

- Between 1997 and 2001, 1,461 Kansans died as a result of firearm related injuries, a 16.7 percent decrease from 1,697 between 1992 and 1996. (Table 1)

- Firearm-related mortality rates generally declined, as shown in Table 1, where rates were calculated for two 5-year periods, 1992-1996 and 1997-2001, by selected characteristics. Overall, the firearm-related death rate fell significantly (16.7 percent) from 13.2 to 11.0 per 100,000 population, from the earlier to the latter time period. (Table 1)

- Between these two time periods, rates for whites and blacks dropped 13.4 and 21.9 percent, respectively. The rate for Hispanics increased 5.5 percent. However, the change in the rate for Hispanics from 1992-1996 to 1997-2001 was not statistically significant. (Table 1)

- From 1992 to 2001, 85.2 percent of firearm-related deaths occurred to Kansas males, while 14.8 percent occurred to Kansas females. (Table 1)

- More deaths occurred to whites compared to blacks during both time periods. However, the death rate from 1997-2001 for blacks (36.8 per 100,000 population) was approximately four times higher than that of whites (9.7). For 1992-1996, the black rate was 47.1 per 100,000 population compared to 11.2 for whites. (Table 1)

- For both five-year periods, 1992-1996 and 1997-2001, 15-24 year olds had the highest age-specific death rate with 25.9 per 100,000 persons and 19.7, respectively. (Table 1)

- For both five-year periods, 1992-1996 and 1997-2001, the leading intent of firearm related injury was suicide, followed by homicide, and unintentional injury. (Table 1)

- Urban counties (those with population density greater than or equal to 40.0 persons per square mile) experienced slightly higher death rates during both five-year periods, 1992-1996 and 1997-2001, than their rural (population density less than 40.0 persons per square mile) counterparts. (Table 2)

- Both Kansas and the U.S. as a whole have experienced a steady decline in firearm related deaths over the last ten years. From 1992 to 2001, Kansas' age-adjusted death rate decreased significantly from 13.3 to 9.9 persons per 100,000 standard U.S. 2000 population, continuing to approach the national target of no more than 4.9 firearm-related deaths per 100,000 population. (Table 3, Figure 2)

- Kansas' crude death rate decreased 25.8 percent from 1992-2001, while the U.S. crude rate decreased 29.7 percent from 1992-2000. (Table 3)

- In any given year, age-adjusted death rates for black males have been significantly higher than that of white males. Since 1992, age-adjusted death rates of black males have decreased 23.8 percent and age-adjusted death rates of white males have decreased 19.3 percent. However, there was not a statistically significant change in the rate during this 10 year period for blacks or whites. (Table 4, Figure 3)

- Among the sex/race groups, white males have had the highest number of firearm-related deaths from 1992-2001. In 2001, white males accounted for 64.8 percent of all firearm-related deaths, followed by black males (17.0 percent), white females (12.1 percent), and black females (4.2 percent). For those of Hispanic origin, males accounted for a majority of firearm-related deaths. (Table 5, Figure 4)

- The number of firearm-related deaths for white males, black males, and white females has declined from 1992-2001, with the largest decrease (45.8 percent) occurring to white females. (Figure 4)

- For white males and females, a large percentage (76.4 and 56.7, respectively) of firearm-related deaths from 1997-2001 were the result of suicide. In contrast, the majority of deaths from firearms among black males and females were a result of homicide (81.7 percent and 87.2 percent). (Table 6)

- Most firearm-related deaths from 1997-2001 were intentionally inflicted. Among 1,461 deaths between 1997 and 2001, only 40 (2.7 percent) were classified as unintentional, while 896 (61.3 percent) were classified as suicides, 500 (34.2 percent) as homicides, and 11 (0.8 percent) as inflicted by legal intervention. (Figure 6)

- Ninety-four (94.3) percent of suicides occurred among white persons from 1997-2001. Homicides occurred almost evenly among blacks (47 percent) and whites (50 percent). (Figure 7)

- In 2001, firearm-related deaths claimed the lives of 264 residents for a loss of 10,269.6 years of potential life lost. Males were affected more severely than females, with 8,686.4 years of potential life lost compared to 1,593.4 years of potential life lost respectively. (Table 7)

- In the last ten years, from 1992 to 2001, both males and females and white and black race groups have experienced a decrease in the number of years of potential life lost. In contrast, males of Hispanic ethnic origin have experienced an increase in the number of years of potential life lost. (Table 7, Figure 8)

Firearm-Related Deaths by Number and Rate*
Kansas, 1992-2001

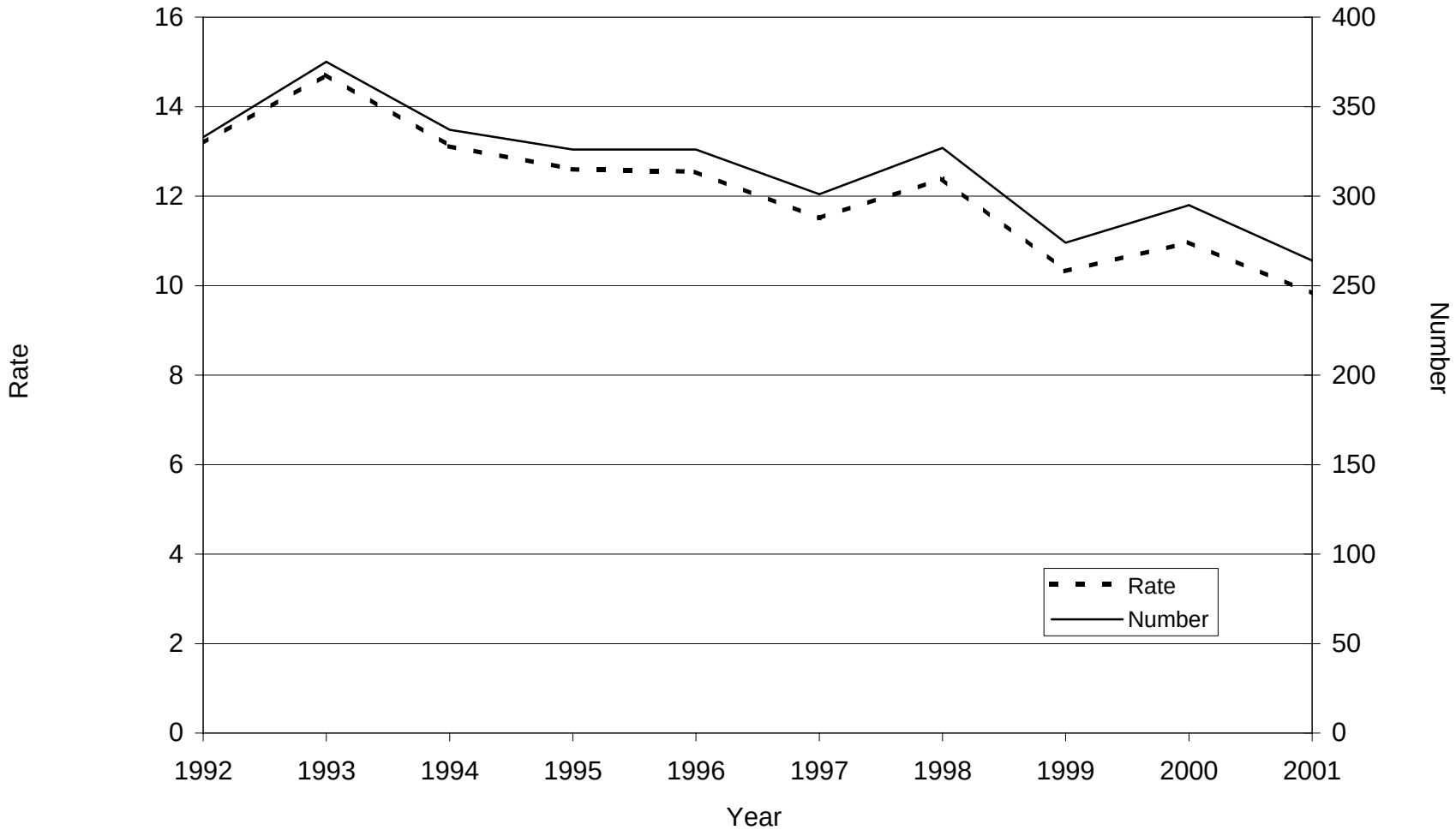


Figure 1

Table 1
Firearm-Related Deaths by Number and Five-Year Death Rate*
By Selected Characteristics
Kansas, 1992-2001

Characteristic	Number										Five Year Rate				Percent Change of Rate 1992-1996 to 1997-2001
											1992-1996		1997-2001		
	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	Number	Rate	Number	Rate	
Total	333	375	337	326	326	301	327	274	295	264	1,697	13.2	1,461	11.0	-16.7
Sex															
Male	264	335	284	277	280	259	285	233	254	221	1,440	22.8	1,252	19.1	-16.2
Female	69	40	53	49	46	42	42	41	41	43	257	3.9	209	3.1	-21.3
Race/Ethnicity															
White	266	288	249	252	262	235	252	223	235	203	1,317	11.2	1,148	9.7	-13.4
Black	64	78	84	72	59	60	67	50	52	56	357	47.1	285	36.8	-21.9
Other	3	9	4	2	5	6	8	1	8	5	23	7.3	28	7.9	8.2
Hispanic	7	13	11	18	14	19	15	24	20	15	63	11.0	93	11.6	5.5
Age-Group															
Under 1	0	1	0	0	0	0	0	0	0	0	1	0.6	0	0.0	-100.0
1-4	2	1	4	3	1	1	3	0	1	1	11	1.5	6	0.8	-46.7
5-14	8	8	9	3	6	7	8	3	4	5	34	1.8	27	1.4	-22.2
15-24	88	106	93	99	84	82	99	73	63	70	470	25.9	387	19.7	-23.9
25-34	66	79	83	75	63	72	57	56	52	58	366	19.2	295	16.9	-12.0
35-44	64	56	64	54	70	46	60	44	64	50	308	15.1	264	12.4	-17.9
45-54	40	35	28	28	31	29	41	33	40	28	162	11.5	171	10.1	-12.2
55-64	19	34	19	21	18	15	19	25	31	22	111	10.8	112	10.3	-4.6
65-74	19	27	14	21	21	26	14	15	17	17	102	11.0	89	10.0	-9.1
75-84	22	21	19	16	25	19	22	18	16	11	103	17.1	86	13.5	-21.1
85+	5	7	4	5	7	4	4	6	7	2	28	11.9	23	9.0	-24.4
N.S.	0	0	0	1	0	0	0	1	0	0	1	n/a	1	n/a	n/a
Intent of Injury															
Unintentional	18	14	15	11	14	11	11	7	2	9	72	0.6	40	0.3	-50.0
Suicide	207	217	188	191	206	181	203	165	188	159	1,009	7.9	896	6.7	-15.2
Homicide	103	134	125	117	99	101	110	97	102	90	578	4.5	500	3.8	-15.6
Legal Intervention	3	3	3	3	3	6	2	1	0	2	15	0.1	11	0.1	0.0
Undetermined	2	7	6	4	4	2	1	4	3	4	23	0.2	14	0.1	-50.0

N.S. - not stated
n/a - not applicable
* Rate per 100,000 population. Rates based on small numbers of events tend to be unreliable due to large random variation.
Residence Data

Table 2
Firearm-Related Deaths by Number and Rate*
By County of Residence and by Urban/Rural Counties
Kansas, 1992-1996, 1997-2001

County of Residence	1992-1996		1997-2001		County of Residence	1992-1996		1997-2001	
	Number	Rate	Number	Rate		Number	Rate	Number	Rate
Kansas	1,697	13.2	1,461	11.0					
Allen	15	20.4	8	11.1	Lyon	18	10.4	16	9.2
Anderson	10	25.3	6	14.8	Marion	2	3.0	5	7.4
Atchison	10	11.9	6	7.1	Marshall	2	3.5	2	3.7
Barber	4	14.3	3	11.3	McPherson	13	9.2	6	4.1
Barton	17	11.6	10	7.0	Meade	1	4.6	1	4.4
Bourbon	11	14.7	8	10.5	Miami	7	5.6	15	11.0
Brown	4	7.3	3	5.5	Mitchell	1	2.8	0	0.0
Butler	23	8.1	18	5.9	Montgomery	26	13.8	19	10.4
Chase	1	6.8	1	6.8	Morris	2	6.4	7	22.7
Chautauqua	3	13.8	4	18.5	Morton	1	5.9	1	5.8
Cherokee	13	11.8	10	8.9	Nemaha	3	5.8	9	17.4
Cheyenne	1	6.2	2	12.6	Neosho	10	11.8	7	8.3
Clark	1	8.4	1	8.4	Ness	2	10.5	1	5.7
Clay	5	10.8	3	6.7	Norton	5	17.3	1	3.5
Cloud	7	13.3	2	4.0	Osage	11	13.5	9	10.6
Coffey	6	13.8	3	6.8	Osborne	2	8.4	5	22.0
Comanche	0	0.0	0	0.0	Ottawa	3	10.6	1	3.3
Cowley	19	10.2	14	7.6	Pawnee	5	13.2	3	8.3
Crawford	25	13.7	27	14.6	Phillips	3	9.5	4	13.4
Decatur	5	27.5	3	17.4	Pottawatomie	10	11.5	9	9.7
Dickinson	9	9.2	13	13.3	Pratt	2	4.2	6	12.5
Doniphan	6	15.4	8	19.9	Rawlins	2	12.2	2	13.1
Douglas	24	5.4	34	6.9	Reno	38	12.2	29	9.1
Edwards	2	11.3	4	23.9	Republic	5	16.1	3	10.1
Elk	0	0.0	0	0.0	Rice	4	7.7	4	7.6
Ellis	9	6.9	7	5.2	Riley	23	6.8	19	6.0
Ellsworth	4	12.4	0	0.0	Rooks	3	10.1	0	0.0
Finney	18	10.3	20	10.5	Rush	2	11.1	2	11.6
Ford	17	11.9	22	14.4	Russell	3	7.8	3	8.1
Franklin	15	12.8	14	11.3	Saline	33	12.9	21	8.0
Geary	38	25.3	25	19.2	Scott	3	11.6	1	4.0
Gove	1	6.4	1	6.6	Sedgwick	367	17.2	255	11.3
Graham	1	6.0	2	13.0	Seward	8	8.3	8	7.6
Grant	3	7.9	5	12.7	Shawnee	154	18.4	147	17.3
Gray	0	0.0	4	14.0	Sheridan	2	14.1	1	7.3
Greeley	0	0.0	1	12.3	Sherman	5	14.8	2	6.1
Greenwood	5	12.5	4	10.1	Smith	0	0.0	1	4.4
Hamilton	2	17.5	2	16.2	Stafford	4	15.4	3	12.2
Harper	5	15.0	5	15.6	Stanton	0	0.0	2	17.3
Harvey	13	7.9	13	7.7	Stevens	4	15.3	3	11.1
Haskell	2	10.2	4	19.4	Sumner	12	9.1	12	9.0
Hodgeman	1	9.1	0	0.0	Thomas	2	4.8	3	7.4
Jackson	8	13.7	9	14.6	Trego	2	11.5	3	18.3
Jefferson	8	9.5	15	16.4	Wabaunsee	1	3.0	6	17.9
Jewell	1	5.0	1	5.3	Wallace	3	33.1	0	0.0
Johnson	140	7.1	122	5.5	Washington	3	8.9	0	0.0
Kearny	3	14.6	3	13.9	Wichita	4	29.0	0	0.0
Kingman	9	21.4	3	7.0	Wilson	6	11.7	7	13.6
Kiowa	1	5.6	1	6.0	Woodson	0	0.0	2	10.3
Labette	17	14.6	14	12.2	Wyandotte	288	37.0	262	33.9
Lane	1	8.8	0	0.0	Urban/Rural				
Leavenworth	38	11.1	29	8.2	Counties				
Lincoln	0	0.0	7	40.8					
Linn	4	9.3	6	12.8	Rural	427	10.6	396	9.7
Logan	2	12.8	3	20.1	Urban	1,270	14.5	1,065	11.6

*Rate per 100,000 population. Rates based on small numbers of events tend to be unreliable due to large random variations.
Residence Data

Table 3
Firearm Related Deaths by Number, Crude Rate*, and Age-Adjusted Rate**
Kansas and the U.S., 1992-2001

	Kansas			U.S.		
Year	Number	Crude Rate	Age-Adj. Rate	Number	Crude Rate	Age-Adj. Rate
1992	333	13.2	13.3	37,776	14.8	14.6
1993	375	14.7	14.7	39,595	15.4	15.1
1994	337	13.1	13.0	38,505	14.8	14.6
1995	326	12.6	12.4	35,957	13.7	13.6
1996	326	12.5	12.4	34,040	12.8	12.8
1997	301	11.5	11.4	32,436	12.1	12.1
1998	327	12.4	12.3	30,708	11.4	11.3
1999	274	10.3	10.2	28,874	10.6	10.6
2000	295	11.0	11.0	28,663	10.4	10.4
2001	264	9.8	9.9	n.a.	n.a.	n.a.

n.a. - not available
* Rate per 100,000 standard U.S. 2000 population
Residence Data

Firearm-Related Age-Adjusted Death Rate*
Kansas and the U.S., 1992-2001

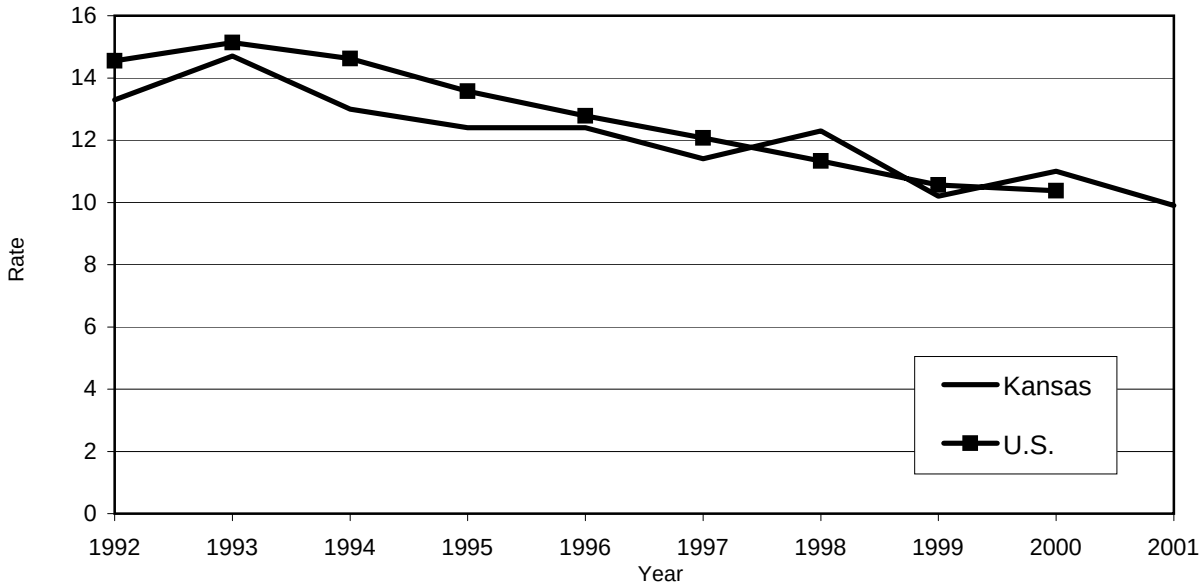


Figure 2

National Year 2010 Health Objective 7.3
Reduce firearm-related deaths to no more than 4.9 per 100,000

* Rate per 100,000 standard U.S. 2000 population
Residence Data

Table 4
Firearm-Related Age-Adjusted Death Rate*
All Races, Black and White Males
Kansas, 1992-2001

All Year	All Races	Black Males	White Males
1992	13.3	65.9	18.7
1993	14.7	83.1	22.7
1994	13.0	78.1	18.2
1995	12.4	66.0	18.3
1996	12.4	63.9	19.4
1997	11.4	60.9	17.1
1998	12.3	61.7	18.8
1999	10.2	49.8	16.1
2000	11.0	54.3	18.0
2001	9.9	50.2	15.1

* Rate per 100,000 standard U.S. 2000 population
Residence Data

Firearm-Related Age-Adjusted Death Rate*
All Races, Black and White Males
Kansas, 1992-2001

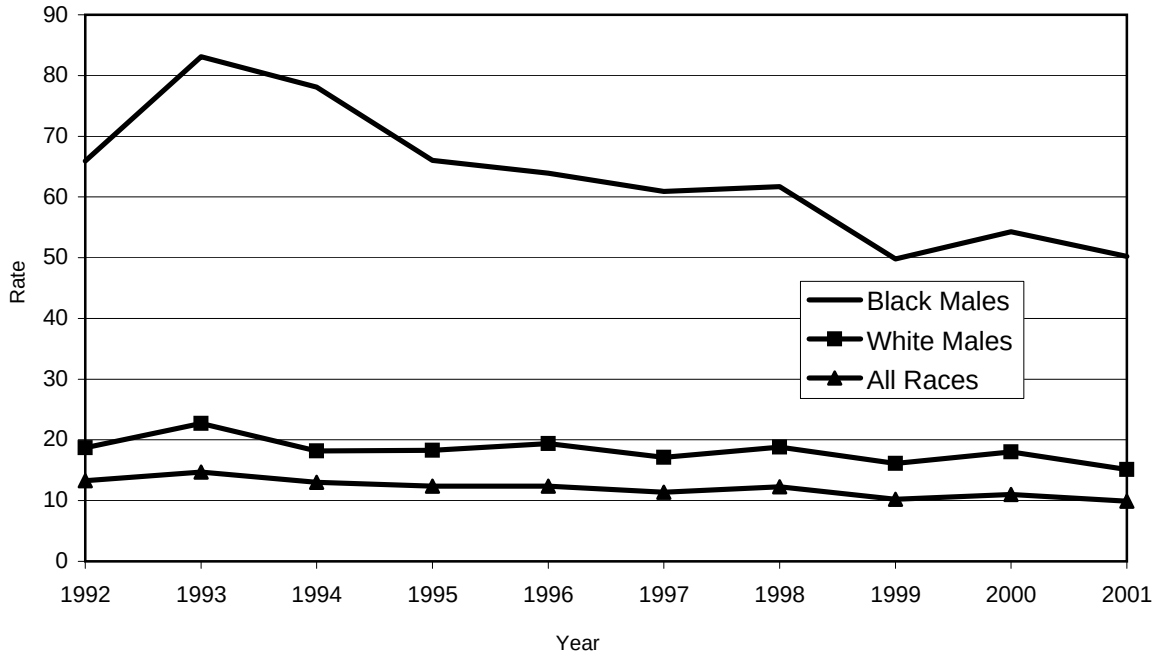


Figure 3

* Rate per 100,000 standard U.S. 2000 population
Residence Data

Table 5
Firearm-Related Deaths
By Race/Hispanic Origin and Sex
Kansas, 1992-2001

Year	White		Black		American Indian		Asian/Pacific Islander		Hispanic*	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
1992	207	59	54	10	1	0	2	0	7	0
1993	255	33	73	5	3	1	4	1	11	2
1994	208	41	74	10	1	0	1	2	11	0
1995	213	39	62	10	1	0	1	0	14	4
1996	224	38	53	6	1	1	2	0	11	3
1997	200	35	55	5	1	1	3	1	17	2
1998	221	31	57	10	3	0	4	1	14	1
1999	189	34	43	7	0	0	1	0	20	4
2000	203	32	46	6	0	2	5	1	17	3
2001	171	32	45	11	3	0	2	0	15	0

* Hispanic Origin can be of any race
Residence Data

Firearm-Related Deaths by Race* and Sex
Kansas, 1992-2001

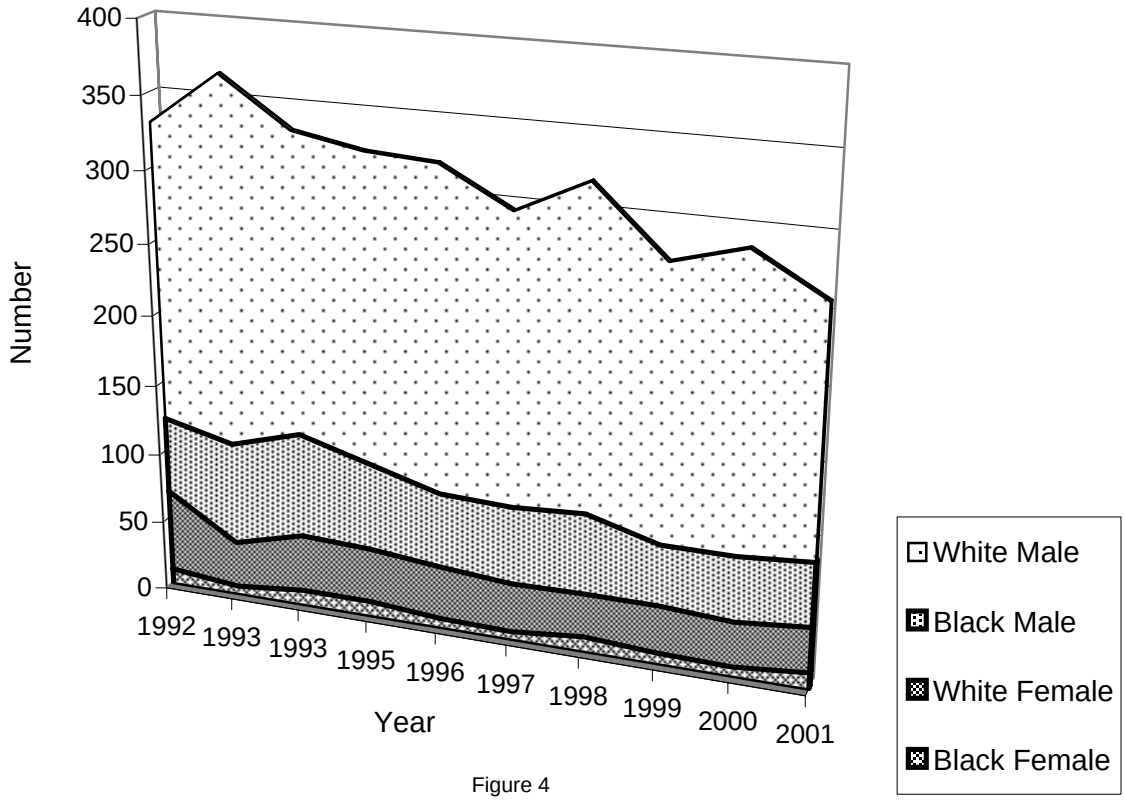


Figure 4

*Other nonwhite data is not included due to small numbers.
Residence Data

Table 6
Firearm-Related Deaths
By Race/Hispanic Origin, Sex and Intent
Kansas, 1997-2001

Intent	Total	White		Black		Other		Hispanic*	
		Male	Female	Male	Female	Male	Female	Male	Female
Total	1,461	984	164	246	39	22	6	83	10
Intent of Injury									
Unintentional	40	29	5	5	0	1	0	3	2
Suicide	896	752	93	34	5	11	1	27	0
Homicide	500	184	66	201	34	10	5	50	8
Legal Intervention	11	9	0	2	0	0	0	2	0
Undetermined	14	10	0	4	0	0	0	1	0

*Hispanic can be of any race.

Percent of Firearm-Related Deaths
By Race, Sex and Intent
Kansas, 1997-2001

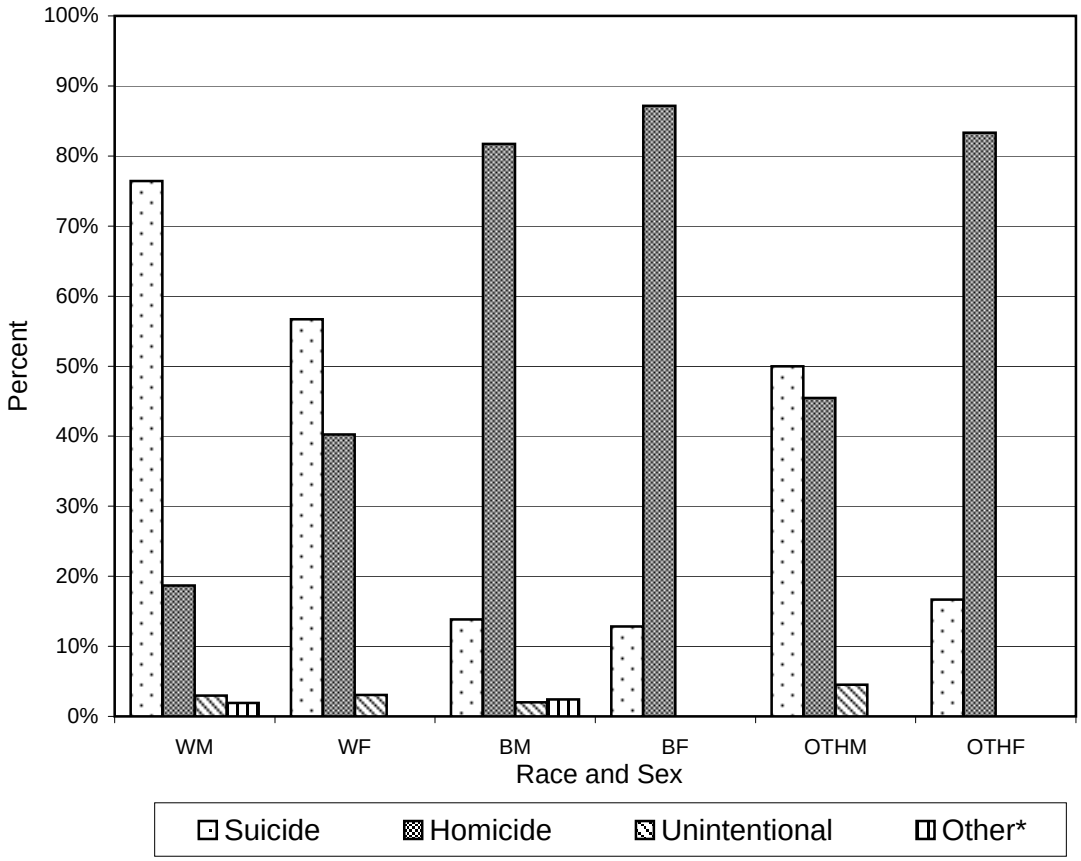


Figure 5

*Other includes legal intervention and undetermined.

Percent of Firearm-Related Deaths by Intent
Kansas, 1997-2001

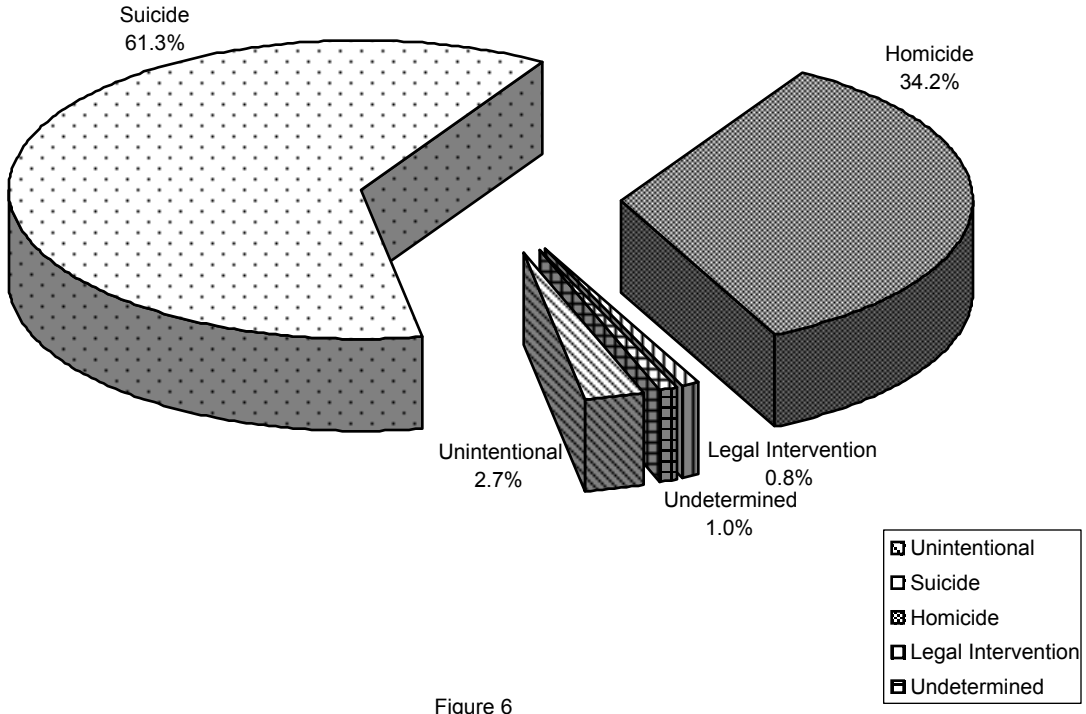
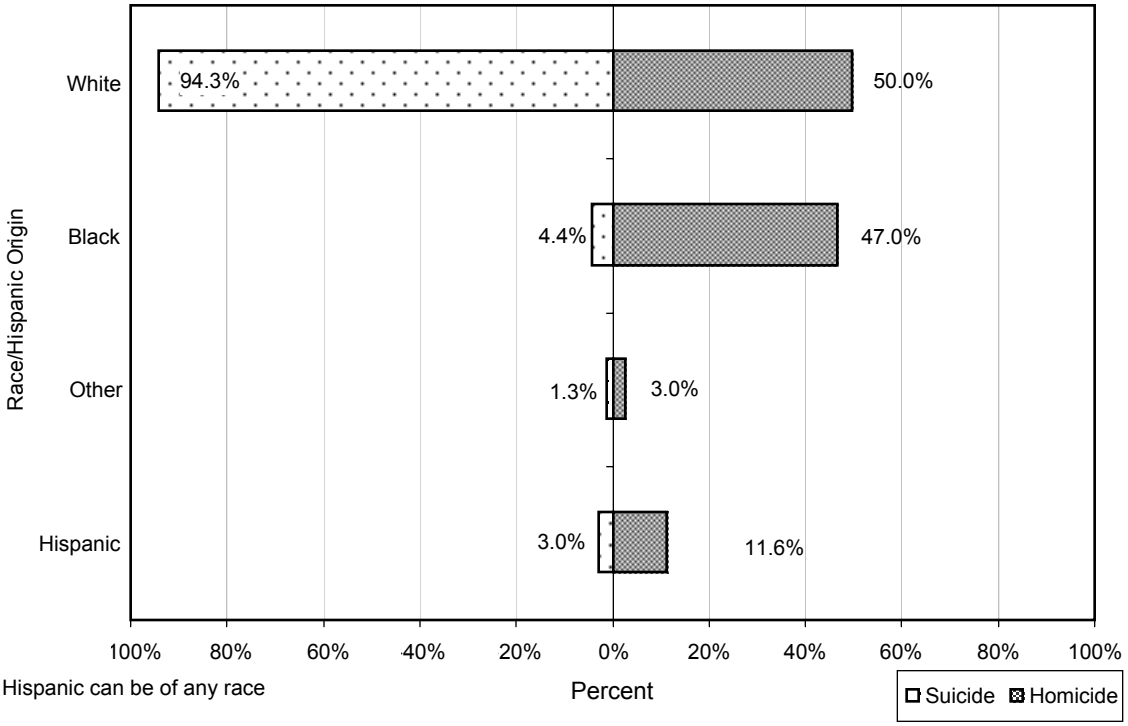


Figure 6

Residence Data

Percent Firearm-Related Suicide and Homicide Deaths
By Race/Hispanic Origin*
Kansas, 1997-2001



* Hispanic can be of any race

Residence Data

Figure 7

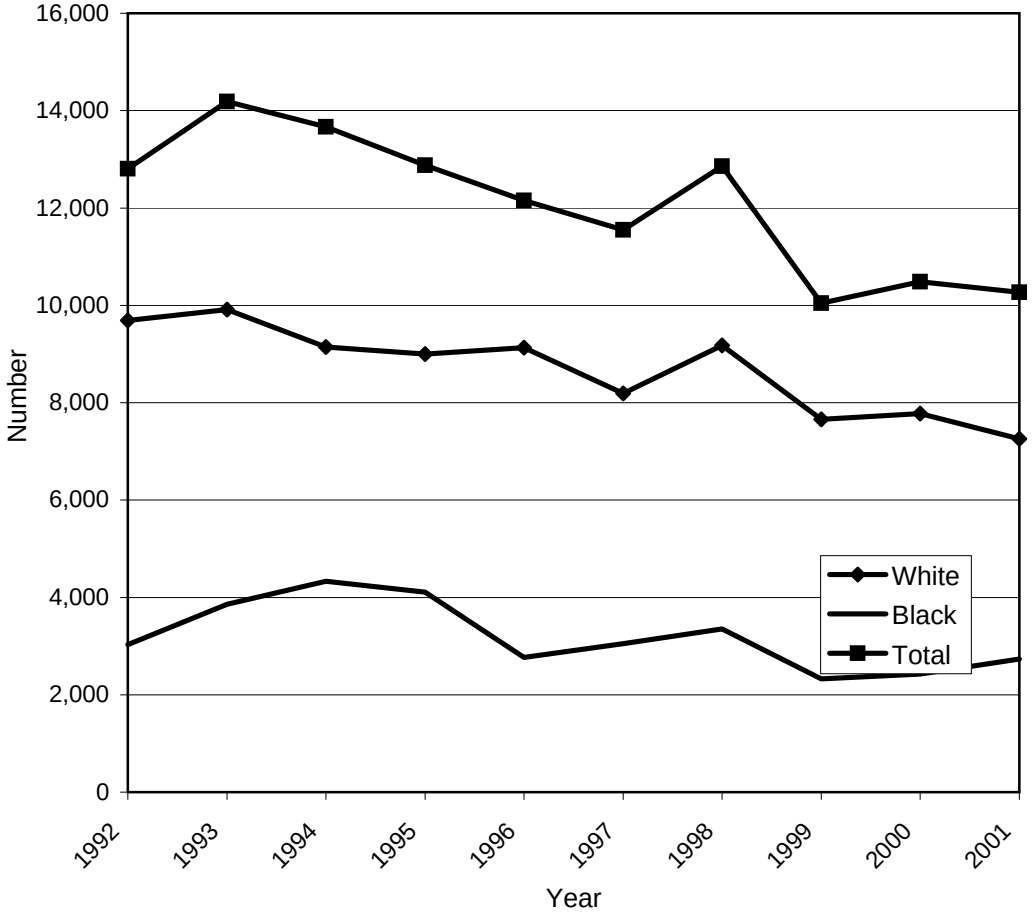
Table 7
Years of Potential Life Lost (YPLL) Before Life Expectancy
For Firearm-Related Deaths by Sex and Race/Hispanic Origin*
Kansas, 1992-2001

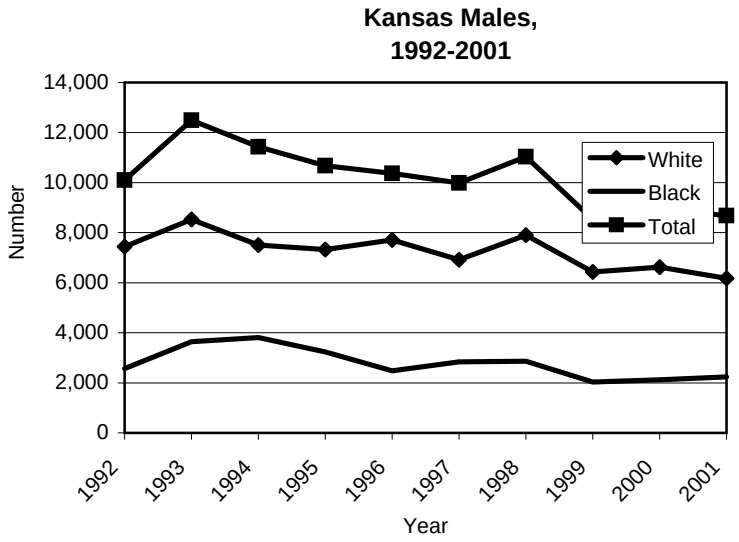
	Total		White		Black		Hispanic	
Year and Sex	YPLL	Rate**	YPLL	Rate**	YPLL	Rate**	YPLL	Rate**
Both Sexes								
1992	12,807.6	5.1	9,688.6	4.2	3,030.2	20.2	367.2	3.6
1993	14,186.2	5.6	9,910.6	4.2	3,859.2	25.6	634.8	5.9
1994	13,669.4	5.3	9,144.6	3.9	4,331.4	28.5	545.6	4.8
1995	12,878.4	5.0	8,998.0	0.0	4,111.2	26.9	778.2	6.5
1996	12,157.4	4.7	9,128.0	3.8	2,766.4	18.2	644.4	5.1
1997	11,548.8	4.4	8,190.2	3.4	3,051.0	20.0	917.4	6.9
1998	12,859.6	4.9	9,174.2	3.8	3,353.2	21.6	694.0	4.9
1999	10,045.4	3.8	7,660.0	3.2	2,325.8	14.8	1,085.4	7.3
2000	10,486.2	3.9	7,775.2	3.4	2,424.2	15.7	937.0	5.0
2001	10,269.6	3.8	7,254.0	3.1	2,737.6	17.8	749.0	4.0
Male								
1992	10,103.6	8.1	7,441.0	6.6	2,573.8	34.1	357.2	6.6
1993	12,497.2	10.0	8,528.8	7.4	3,641.2	48.1	520.6	9.2
1994	11,429.8	9.1	7,510.2	6.5	3,815.4	50.2	545.6	9.2
1995	10,678.0	8.4	7,328.6	6.3	3,235.2	42.5	569.8	9.2
1996	10,370.4	8.1	7,707.8	6.6	2,483.8	32.8	505.6	7.8
1997	9,980.2	7.8	6,918.8	5.9	2,838.0	37.4	813.2	11.9
1998	11,031.0	8.5	7,896.2	6.7	2,867.2	37.2	659.4	9.1
1999	8,530.6	6.5	6,432.8	5.4	2,038.2	26.0	922.0	12.1
2000	8,947.2	6.7	6,627.6	5.8	2,116.6	27.2	823.2	8.2
2001	8,686.4	6.5	6,171.4	5.4	2,237.0	28.8	749.0	7.4
Female								
1992	2,714.2	2.1	2,247.6	1.9	456.4	6.1	0.0	0.0
1993	1,695.8	1.3	1,381.8	1.2	218.0	2.9	114.2	2.2
1994	2,263.4	1.7	1,634.4	1.4	516.0	6.8	0.0	0.0
1995	2,214.0	1.7	1,669.4	1.4	531.0	6.9	208.4	3.6
1996	1,790.4	1.4	1,420.2	1.2	282.6	3.7	138.8	2.3
1997	1,572.0	1.2	1,271.4	1.0	213.0	2.8	104.2	1.6
1998	1,845.6	1.4	1,278.0	1.0	486.0	6.2	34.6	0.5
1999	1,521.6	1.1	1,227.2	1.0	287.6	3.6	163.4	2.3
2000	1,542.4	1.1	1,147.6	1.0	307.6	4.0	113.8	1.3
2001	1,593.4	1.2	1,082.6	0.9	500.6	6.5	0.0	0.0

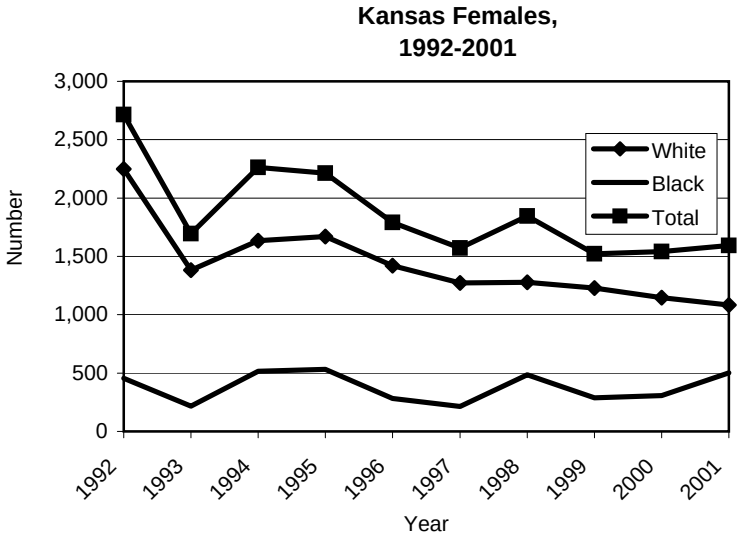
* Hispanic origin can be of any race.

**Rate per 1,000 population

Years of Potential Life Lost For Firearm-Related Deaths







*Rate per 1,000 population

Figure 8

Technical Notes

Cause of Death Coding

The firearm-related mortality statistics presented were coded in accordance with a system known as the International Classification of Diseases (ICD). This system promotes uniformity and comparability in the collection and presentation of mortality or death data. Effective with deaths occurring in 1999, Kansas began using the Tenth Revision of the classification, (ICD-10). Prior to 1999, Kansas used the ICD-9 to report mortality statistics. Periodically the classification system needs to be updated to address new diseases and reflect a better understanding of causes of death. The World Health Organization maintains ICD-10 and the National Center for Health Statistics (NCHS), which compiles national statistics, modifies ICD-10 for use by Kansas and other states.

Firearm ICD Codes	Ninth Revision	Tenth Revision
Unintentional	E922	W32-W34
Self-inflicted	E955.0-E955.4	X72-X74
Assault	E965.0-E965.4	X93-X95
Legal Intervention	E970	Y35.0
Undetermined	E985.0-E985.4	Y22-Y24

One of the challenges in the conversion to a new classification system is comparability with statistics compiled under the old system. NCHS did a comparability study to determine the impact of ICD-10 on mortality statistics. By re-coding deaths originally classified under ICD-9, NCHS researchers produced a comparability ratio. The comparability between classification schemes for this particular cause of death is high (.9973), meaning that the change should have little or no impact on the comparisons of mortality statistics over time. (Health, United States, 2002 and National Vital Statistics Report, Vol. 49, No. 2, 2001)

Age-Adjusted Death Rates

Mortality rates, the number of deaths per 100,000 population, are a common way to report death statistics so that comparisons can be made from year to year or among geographic areas. Crude death rates compensate for the differences in population within the areas or time periods studied. Crude death rates, however, do not compensate for the different make up of compared populations. For example, some Kansas counties may have more older residents than other counties. To address this, statisticians prepare age-adjusted death rates. The direct method for calculating age-adjusted death rates was used in this report. Age-adjusting is a process by which the age composition of a population is defined as constant so that differences in age composition can be eliminated from the analysis. This is needed because older populations have higher death rates, merely because death rates increase with age. Age-adjusted rates allow for more meaningful comparison of the risk of mortality over time and among groups.

For decades Kansas and many other states have used the 1940 standard population for age-adjusting. Other states have used a 1970 or 1980 population standard. Moving to a 2000 population standard, as recommended by NCHS, will eliminate confusion and misunderstanding created by the use of various population standards. Age-adjusted rates calculated using the 1940 population standard can not be compared to rates created using the 2000 standard. Since the benefit from age-adjusting rates comes only from researchers using the same population standard, comparison between different standards would produce misleading results. Kansas and many other states will be recalculating prior years' age-adjusted rates to the 2000 population standard. As part of its implementation of the new age-adjusting population standard, the Center for Health and Environmental Statistics (CHES) produced the report *Age Standardization of Kansas Death Rates: Implications of the Year 2000 Standard*. Copies can be obtained at the CHES Web site http://www.kdhe.state.ks.us/ches/.

Population

State, county, age, sex and race population estimates for 1992-1999 were obtained from the U.S. Bureau of the Census (U.S.C.B.) on the Internet at:
http://eire.census.gov/popest/archives/1990.php.

Actual population counts from the U.S.C.B. were obtained for 2000 on the Internet at:
http://www.census.gov/census2000/states/ks.html.

Population estimates for 2001 by the U.S.C.B. were only available for state and county totals (http://eire.census.gov/popest/data/counties/tables/CO-EST2001-07.php). U.S.C.B 2000 census counts were used to calculate age-race-sex specific and adjusted rates for 2001 data.

Residence Data

Residence data is information compiled according to the usual residence of the decedent regardless of where the event occurred (including events occurring out of state).

Rate Reliability

Vital statistics may be influenced by random variation, and single years rates can fluctuate widely. Rates can vary widely when based on a small number of events in sparely populated areas. In some instances a multiple-year rate such as a five- or ten- year average of single year rates would be more accurate in formulating conclusions on vital events. A five- or ten- year rate smoothes some of the variation in single-year rates and would be a more reliable indicator of mortality rates.

Race/Ethnicity

Please note that persons of Hispanic origin are those who classified themselves as Mexican, Puerto Rican, Cuban, Central or South American or other and unknown Spanish in response to questions asked on the Kansas birth certificate. Hispanic origin is not a race. It can be viewed as

the ancestry or country of birth of the person or the person's parents or ancestors before their arrival in the United States. Persons of Hispanic origin may be of any race.

Rural /Urban Counties

The designation of urban or rural county is an arbitrary division between counties with population density of 40.0 persons per square mile and greater and those with population density of less than 40.0 persons per square mile. These groupings are based on definitions originated by the Kansas Department of Health and Environment, Office of Local and Rural Health (OLRH). For purposes of this paper, urban counties include those defined by the OLRH as semi-urban (40.0-149.9 persons per square mile) and urban (150.0 persons or more). Rural counties include those defined as frontier (less than 6.0 persons per square mile), rural (6.0-19.9 persons), and densely-settled rural (20.0-39.9 persons). Neither the OLRH definitions nor those used in this paper should be confused with the U.S. Census Bureau's definition of urban and rural areas.

Confidence Intervals and Significance Tests

Since more than 99 percent of all births and deaths are registered, the number of vital events reported for Kansas is essentially a complete count. Although these numbers are not subject to sampling errors, they may be affected by non-sampling errors, such as mistakes in recording the mother's residence or age during the registration process.

The potential impact of variation increases as the number of events decreases. This makes resulting rates subject to volatility, and requires caution when comparing them to rates from other populations, geographic areas, and time periods.

The 95 percent confidence interval is the range of values for the number of events, rates or percent of events that you could expect in 95 out of 100 cases (95 out of 100 rule). The confidence limits are the end points of this range of values (the highest and lowest values). Confidence limits for numbers, rates and percents can be estimated from the actual number of events. Procedures differ for rates and percent calculations and also differ depending on the number of events on which the statistics are based.

Confidence limits are important in determining whether one rate is "significantly" different from another. The term "significantly" refers to whether or not the difference between two rates indicates a small probability (< 5%) that the difference might have occurred by chance.

Confidence limits specify the degree of certainty that can be placed on a given number or rate. Similarly statistical significance tests try to specify how often a difference between two rates could be expected.

If the difference between two rates would occur due to variability less than 5 times out of 100, the difference is statistically significant at the 95% level. In essence, there is a 95 percent level of confidence the difference is not due to the chance variability in the rates or the number of

events on which the rates are based. On the other hand, if the difference would occur more than 5 times out of 100, then the difference is not statistically significant.

Computing confidence limits, and ultimately statistical significance, for pairs of rates varies depending on the number of events on which each rate was created. The procedures are listed below.

Confidence limits for rates based on less than 100 events

When the numerator's number of events is less than 100, the confidence interval for a rate can be estimated using the two formulas which follow and the values in Table X.

$$\textit{Lower limit} = R \times L$$

$$\textit{Upper limit} = R \times U$$

where:

- R = the rate (birth rate, mortality rate, etc.)
- L = the value in Table 8 that corresponds to the number N in the numerator of the rate
- U = the value in Table 8 that corresponds to the number N in the numerator of the rate

Confidence limits for rates when the numerator is 100 or more

In this case, use the following formula for the rate R based on the number of events N:

$$\textit{Lower limit} = R - [\, 1.96 \times (R / \sqrt{N}) \,]$$

$$\textit{Upper limit} = R + [\, 1.96 \times (R / \sqrt{N}) \,]$$

where:

- R = the rate (birth rate, mortality rate, etc.)
- N = the number of events (births, deaths, etc.)

Significance test when at least one of the rates is based on fewer than 100 events

To compare two rates, when one or both of those rates are based on less than 100 events, first compute the confidence intervals for both rates. Then check to see if those intervals overlap. If they do overlap, the difference is not statistically significant at the 95-percent level. If they do not overlap, the difference is indeed "statistically significant."

Significance test when both rates are based on 100 or more events

To compare two rates when both are based on 100 or more events, first calculate the difference between the two rates by subtracting the lower rate from the higher rate. This difference is considered statistically significant if it exceeds the statistic in the formula below. This statistic equals 1.96 times the standard error for the difference between two rates.

$$1.96 \sqrt{\frac{R_1^2}{N_1} + \frac{R_2^2}{N_2}}$$

where:

R_1 = the first rate
R_2 = the second rate
N_1 = the first number of events
N_2 = the second number of events

$ If the difference is greater than this statistic, then the difference would occur by chance less than 5 times out of 100. The difference is statistically significant at the 95 percent confidence level.

$ If the difference is less than this statistic, the difference might occur by chance more than 5 times out of 100. The difference is not statistically significant at the 95 percent confidence level.

Confidence limits and statistical significance between two percents

When testing the difference between two percents, both percents must meet the following conditions:

$$B \times p >= 5 \quad and \quad B \times q >= 5$$

where:

B = number of events in the denominator
p = percent divided by 100
$q = 1 - p$

When both percents meet these conditions then the difference between the two percents is considered statistically significant if it exceeds the statistic in the formula below. This statistic equals 1.96 times the standard error for the difference between two percents.

$$1.96 \sqrt{p(1-p)\left(\frac{1}{B_1} + \frac{1}{B_2}\right)}$$

where:

B_1 = number of events in the denominator for the first percent

B_2 = number of events in the denominator for the second percent

$$P = \frac{B_1 \ p \ + \ B_2 \ p}{B_1 + B_2}$$

p_1 = first percent divided by 100

Note: The National Center for Health Statistics was used as a source for confidence interval and significance tests.

Table 8. Values of Lower (L) and Upper (U) Limits for Calculating 95 % Confidence Limits For Numbers of Events and Rates When the Number of Events Is Less Than 100

N	L	U	N	L	U
1	0.02532	5.57164	50	0.74222	1.31838
2	0.12110	3.61234	51	0.74457	1.31482
3	0.20622	2.92242	52	0.74685	1.31137
4	0.27247	2.56040	53	0.74907	1.30802
5	0.32470	2.33367	54	0.75123	1.30478
6	0.36698	2.17658	55	0.75334	1.30164
7	0.40205	2.06038	56	0.75539	1.29858
8	0.43173	1.97040	57	0.75739	1.29562
9	0.45726	1.89831	58	0.75934	1.29273
10	0.47954	1.83904	59	0.76125	1.28993
11	0.49920	1.78928	60	0.76311	1.28720
12	0.51671	1.74680	61	0.76492	1.28454
13	0.53246	1.71003	62	0.76669	1.28195
14	0.54671	1.67783	63	0.76843	1.27943
15	0.55969	1.64935	64	0.77012	1.27698
16	0.57159	1.62394	65	0.77178	1.27458
17	0.58254	1.60110	66	0.77340	1.27225
18	0.59266	1.58043	67	0.77499	1.26996
19	0.60207	1.56162	68	0.77654	1.26774
20	0.61083	1.54442	69	0.77806	1.26556
21	0.61902	1.52861	70	0.77955	1.26344
22	0.62669	1.51401	71	0.78101	1.26136
23	0.63391	1.50049	72	0.78244	1.25933
24	0.64072	1.48792	73	0.78384	1.25735
25	0.64715	1.47620	74	0.78522	1.25541
26	0.65323	1.46523	75	0.78656	1.25351
27	0.65901	1.45495	76	0.78789	1.25165
28	0.66449	1.44528	77	0.78918	1.24983
29	0.66972	1.43617	78	0.79046	1.24805
30	0.67470	1.42756	79	0.79171	1.24630
31	0.67945	1.41942	80	0.79294	1.24459
32	0.68400	1.41170	81	0.79414	1.24291
33	0.68835	1.40437	82	0.79533	1.24126
34	0.69253	1.39740	83	0.79649	1.23965
35	0.69654	1.39076	84	0.79764	1.23807
36	0.70039	1.38442	85	0.79876	1.23652
37	0.70409	1.37837	86	0.79987	1.23499
38	0.70766	1.37258	87	0.80096	1.23350
39	0.71110	1.36703	88	0.80203	1.23203
40	0.71441	1.36172	89	0.80308	1.23059
41	0.71762	1.35661	90	0.80412	1.22917
42	0.72071	1.35171	91	0.80514	1.22778
43	0.72370	1.34699	92	0.80614	1.22641
44	0.72660	1.34245	93	0.80713	1.22507
45	0.72941	1.33808	94	0.80810	1.22375
46	0.73213	1.33386	95	0.80906	1.22245
47	0.73476	1.32979	96	0.81000	1.22117
48	0.73732	1.32585	97	0.81093	1.21992
49	0.73981	1.32205	98	0.81185	1.21868
			99	0.81275	1.21746

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