Kansas Health Statistics Report

Kansas Department of Health and Environment – Division of Health
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Cryptosporidiosis in Kansas

Background

Cryptosporidiosis is a gastrointestinal illness that is caused by protozoa in the genus *Cryptosporidium*. In otherwise healthy individuals, clinical illness is characterized by watery diarrhea often accompanied by abdominal cramps, loss of appetite, low grade fever, nausea, vomiting, and weight loss. Disease can be more debilitating and sometimes fatal among immunocompromised individuals. Cryptosporidiosis is transmitted by the fecal-oral route and results from the ingestion of *Cryptosporidium* oocysts. The infectious dose is low, requiring only 10-30 oocysts for infection [1]. Infected persons can shed about 100 oocysts in a single bowel movement, and ill individuals can continue to excrete oocysts for up to 50 days after diarrhea has ended [2].

Because of its small size, low infectious dose [3], and high tolerance to chlorine [4], *Cryptosporidium* has emerged as the most frequently recognized cause of recreational water-associated outbreaks of gastroenteritis, especially in chlorinated venues. In Kansas, three noteworthy recreational water-associated outbreaks of *Cryptosporidium* have been reported in the past decade. In 2003, a community-wide outbreak occurred in the northeast region. Local health departments, the Kansas Department of Health and Environment (KDHE) and the Centers for Disease Control and Prevention (CDC) investigated 96 confirmed cases and over 600 probable cases of *Cryptosporidium* infections as a result of this outbreak. A case-control study conducted during the outbreak investigation revealed that persons who became ill were almost five times more likely than controls to have swum in recreational water and twice as likely to have swum in certain swimming pools. In 2005, seven confirmed cases of cryptosporidiosis and 78 cases of diarrheal illness were linked to exposure to a recreational water park in southwest Kansas. A 2007 outbreak involving 25 confirmed cases, 14 probable and 5 suspect cases was potentially associated with ten pools, four lakes and three water parks.

Efforts to conduct surveillance of cryptosporidiosis are crucial to detect outbreaks, to educate public health practitioners about the epidemiologic characteristics of cryptosporidiosis, and to implement appropriate prevention and control measures. This report summarizes cryptosporidiosis surveillance data in Kansas for 2005-2009.

Methods

Information about cases of cryptosporidiosis was extracted from the Kansas Electronic Disease Surveillance System (KS-EDSS) for years 2005 - 2009. Cases in KS-EDSS are classified as suspect, probable, or confirmed, as defined by a standard set of case definitions.* In this analysis, only confirmed cases, or cases that meet the clinical description and at least one of the criteria for laboratory-confirmation, are included.

* Suspect cases meet the clinical description and are not epidemiologically linked to a confirmed case or laboratory confirmed or; confirmatory laboratory report without clinical symptoms reported. A probable case is epidemiologically linked to a confirmed case, and a confirmed case is one that meets the clinical description and laboratory confirmed.

Results

From 2005-2009, 455 confirmed cryptosporidiosis cases were reported in Kansas. The most confirmed reported cases were reported in 2007 (n=144), while 2005 had the least reported number of cases (n=40) (Table 1).

Table 1. Confirmed cases of cryptosporidiosis, Kansas 2005-2009

Year	# of Confirmed Cases
2005	40
2006	82
2007	144
2008	86
2009	103

Table 2. Number and percentages of confirmed cryptosporidiosis reports, by selected demographic characteristics, Kansas 2005-2009

Demographics	Number	Percentage
Sex		
Male	215	47.3
Female	239	52.5
Unknown	1	0.2
Race		
Caucasian	303	66.6
Black	21	4.6
Asian	3	0.7
Unknown	128	28.1
Ethnicity		
Hispanic	24	5.2
Non-Hispanic	235	51.7
Unknown	196	43.1
Age		
00-04	82	18
05-09	46	10.1
10-14	28	6.2
15-19	22	4.8
20-24	17	3.7
25-29	28	6.2
30-34	25	5.5
35-39	23	5
40-44	28	6.2
45-54	56	12.3
55-64	31	6.8
65+	66	14.5
Unknown	3	0.7

Of the 455 confirmed cases, females comprised 53% of the reported confirmed cases. Although cryptosporidiosis affects persons in all age groups, the number of reported cases was highest among children aged 0-4 years followed by person 65 years plus for the five-year period. Race was reported for 327 (71.9%) individuals and ethnicity was reported for 259 (56.9%) (Table 2).

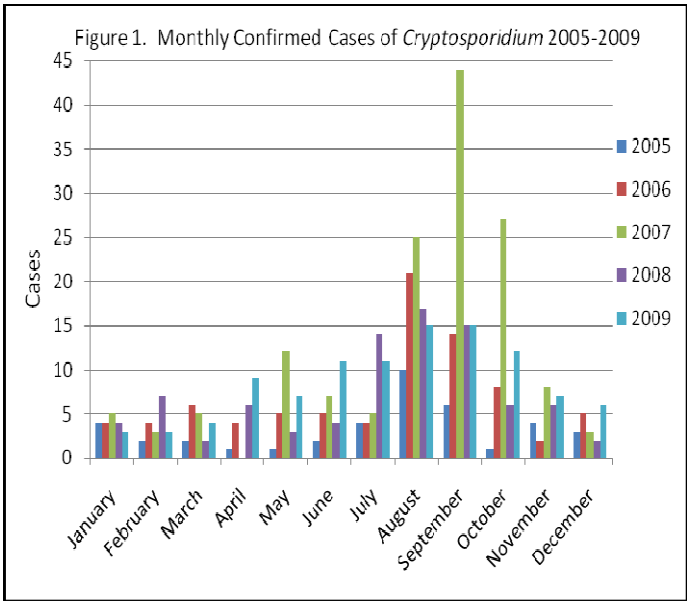
Inside

Of the 455 confirmed cases reported, individuals living in urban counties accounted for 54.3 percent of the cases. The next highest reported number of cases occurred in Densely-Settled Rural counties (Table 3).

Table 3. Number and percentage of confirmed Cryptosporidiosis reports, by population density,

Population Density	Number of Cases	%
Urban	247	54.3
Semi-Urban	66	14.5
Densely-Settled Rural	82	18.0
Rural	47	10.3
Frontier	13	2.9

A five-year evaluation of the confirmed cases of *Cryptosporidium* for Kansas depicts an increase in the number of confirmed reported cases starting in May and continues through October (Figure 1). Excluding the months when increasing numbers of cases are reported, it appears the average background monthly count is approximately 4-5 confirmed cases for the entire state.



Discussion

Since 2003 an overall increase in the number of confirmed cryptosporidiosis cases has occurred for the State of Kansas. The increase can be due to a number of reasons 1) the large outbreak in 2003 raised awareness of the disease and the need for confirmatory testing; 2) in November of 2002 the Food and Drug Administration approved the use of Alinia to treat children aged 1 -11 years, and then in June 2003 the drug was approved to treat adults and adolescents 12 years and older; 3) several educational materials as well as informational templates were developed for use at the county level.

National cryptosporidiosis surveillance data indicated an annual increase during 2003-2005. This increase was influenced by outbreak-related case reporting [5]. The first National Recreational Water Illness Prevention Week was held the week proceeding Memorial Day in 2005. The week raises awareness of the potential for spread of infectious disease at swimming venues, provides information on prevention efforts, and is observed annually at the beginning of swim season. Recreational Water Illness Prevention week will be observed May 24-30, 2010.

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3. Shields JM, Hill VR, Arrowood MJ, Beach MJ. Inactivation of *Cryptosporidium parvum* under chlorinated recreational water conditions. J Water Health 2008; 6(3):513–20.
4. Korich DG, Mead JR, Madore MS, Sinclair NA, Sterling CR. Effects of ozone, chlorine dioxide, chlorine and monochloramine on Cryptosporidium parvum viability. Appl Environ Microbiol. 1990;56:1423–8.
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Population Changes in Kansas

Seventy-five Kansas counties show a drop in population according to 2009 Vintage U.S. Census Bureau (USCB) Estimates released March 23, 2010. Post-censal population estimates comprise an important part of the Kansas Department of Health and Environment's (KDHE) *Annual Summary of Vital Statistics*, serving as denominators for birth and death rates. Other KDHE programs use population estimates in order to compare trends over time.

The 2009 Vintage estimates are compared to the vintage 2008 estimates used for the 2008 KDHE *Annual Summary*. The greatest percentage rate decline occurred in Kiowa County at 8.6 percent. The largest decrease in number is in Lyon County where the 2009 estimate was 1,961 less than the previous year (Table 4).

The Census Bureau creates population estimates by calculating in-migration and out-migration, adding births, and deleting deaths to the previous year's estimate. The estimate base is the most recent decennial census – in this case, 2000.

Between 2008 and 2009, Kansas' population grew by 16,613 or 0.6 percent. Since 2000, population grew by 4.8 percent. The state's five largest counties (Johnson, Sedgwick, Shawnee, Wyandotte, and Douglas) grew by 1.4 percent in the last year. During the decade, the five counties have increased a collective 10.8 percent, despite a decrease in Wyandotte County over the decade of 1.8 percent.

The second five largest counties (Leavenworth, Riley, Reno, Butler, and Saline) experienced a modest increase of 0.4 percent from 2008 to 2009. For the decade, these counties have increased in population by 6.1 percent.

The remaining 95 counties collectively lost 3,930 residents between 2008 and 2009. This is a one-year decrease of 0.4 percent. Over the decade, however, the decrease is 2.0 percent.

The 10 most populous counties in Kansas now have slightly over three out of five of the state's residents (60.5%). This compares to the 10 counties representing 57.8 percent of the state's population in the 2000 Census.

Census estimates are subject to errors, and these can be larger near end of the decade of decennial census on which they are based. Once the Census Bureau releases the 2010 Census totals, it will prepare revised estimates for past years. USCB calls these the Inter-censal estimates.

KDHE does not revise rates in prior publications based on the inter-censal estimates. However, it will update the population data in the Kansas Information for Communities query system to incorporate inter-censal estimates, replacing post-censal estimates for the same period.

Despite the department's heavy dependence on population data, the Kansas State Library serves as the State's Census Data Center. The URL is http://kslib.info/sdc/. Direct any re-

quests for datasets or special analyses to the State Library. The source of the data for the Table 4 analyses is USCB estimates CO-EST2008-ALLDATA.csv and CO-EST2009-ALLDATA.csv, available at http://www.census.gov/popest/counties/counties.html.

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Table 4. Population Estimates and Percent Change, By County and Region, 2009, 2008, 2000

County	2008 - Vintage 2008	CENSUS2000 POP	2009 - Vintage 2009	2008 - 2009 # Change	2008 - 2009 % Change	2000 - 2009 % Change
Allen	13,319	14,385	13,203	-116	-0.9%	-8.2%
Anderson	7,984	8,110	7,872	-112	-1.4%	-2.9%
Atchison	16,481	16,774	16,411	-70	-0.4%	-2.2%
Barber	4,674	5,307	4,593	-81	-1.7%	-13.5%
Barton	27,703	28,205	27,464	-239	-0.9%	-2.6%
Bourbon	14,851	15,379	14,884	33	0.2%	-3.2%
Brown	10,009	10,724	9,927	-82	-0.8%	-7.4%
Butler	63,562	59,482	64,084	522	0.8%	7.7%
Chase	2,804	3,030	2,798	-6	-0.2%	-7.7%
Chautauqua	3,768	4,359	3,745	-23	-0.6%	-14.1%
Cherokee	21,082	22,605	21,064	-18	-0.1%	-6.8%
Cheyenne	2,742	3,165	2,700	-42	-1.5%	-14.7%
Clark	2,108	2,390	2,081	-27	-1.3%	-12.9%
Clay	8,859	8,822	8,704	-155	-1.7%	-1.3%
Cloud	9,453	10,268	9,263	-190	-2.0%	-9.8%
Coffey	8,409	8,865	8,436	27	0.3%	-4.8%
Comanche	1,950	1,967	1,873	-77	-3.9%	-4.8%
Cowley	34,065	36,291	33,634	-431	-1.3%	-7.3%
Crawford	38,868	38,242	38,869	1	0.0%	1.6%
Decatur	2,912	3,472	2,855	-57	-2.0%	-17.8%
Dickinson	19,328	19,344	19,015	-313	-1.6%	-1.7%
Doniphan	7,753	8,249	7,624	-129	-1.7%	-7.6%
Douglas	114,748	99,962	116,383	1,635	1.4%	16.4%
Edwards	3,082	3,449	3,071	-11	-0.4%	-11.0%
Elk	3,047	3,261	3,001	-46	-1.5%	-8.0%
Ellis	27,801	27,507	27,739	-62	-0.2%	0.8%
Ellsworth	6,250	6,525	6,179	-71	-1.1%	-5.3%
Finney	40,998	40,523	42,074	1,076	2.6%	3.8%
Ford	33,293	32,458	33,692	399	1.2%	3.8%
Franklin	26,562	24,784	26,441	-121	-0.5%	6.7%
Geary	31,171	27,947	31,751	580	1.9%	13.6%
Gove	2,548	3,068	2,480	-68	-2.7%	-19.2%
Graham	2,592	2,946	2,435	-157	-6.1%	-17.3%
Grant	7,395	7,909	7,353	-42	-0.6%	-7.0%
Gray	5,688	5,904	6,005	317	5.6%	1.7%
Greeley	1,266	1,534	1,234	-32	-2.5%	-19.6%
Greenwood	6,861	7,673	6,666	-195	-2.8%	-13.1%
Hamilton	2,631	2,670	2,625	-6	-0.2%	-1.7%
Harper	5,857	6,536	5,667	-190	-3.2%	-13.3%
Harvey	33,675	32,869	34,247	572	1.7%	4.2%
Haskell	3,919	4,307	4,006	87	2.2%	-7.0%
Hodgeman	1,948	2,085	1,906	-42	-2.2%	-8.6%
Jackson	13,240	12,657	13,412	172	1.3%	6.0%
Jefferson	18,421	18,426	18,207	-214	-1.2%	-1.2%
Jewell	3,142	3,791	3,059	-83	-2.6%	-19.3%
Johnson	534,093	451,086	542,737	8,644	1.6%	20.3%
Kearny	4,159	4,531	4,169	10	0.2%	-8.0%
Kingman	7,719	8,673	7,571	-148	-1.9%	-12.7%
Kiowa	2,541	3,278	2,322	-219	-8.6%	-29.2%
Labette	21,871	22,835	21,776	-95	-0.4%	-4.6%
Lane	1,743	2,155	1,742	-1	-0.1%	-19.2%
Leavenworth	74,276	68,691	75,227	951	1.3%	9.5%
Lincoln	3,261	3,578	3,123	-138	-4.2%	-12.7%
Linn	9,616	9,570	9,335	-281	-2.9%	-2.5%
Logan	2,593	3,046	2,549	-44	-1.7%	-16.3%
Lyon	35,562	35,935	33,601	-1,961	-5.5%	-6.5%

Table 4 continued

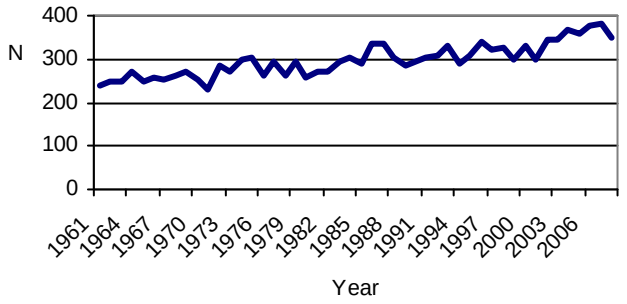
County	2008 - Vintage 2008	CENSUS2000 POP	2009 - Vintage 2009	2008 - 2009 # Change	2008 - 2009 % Change	2000 - 2009 % Change
Marion	12,100	13,361	11,982	-118	-1.0%	-10.3%
Marshall	10,178	10,965	10,123	-55	-0.5%	-7.7%
McPherson	29,044	29,554	28,866	-178	-0.6%	-2.3%
Meade	4,359	4,631	4,407	48	1.1%	-4.8%
Miami	30,989	28,351	30,969	-20	-0.1%	9.2%
Mitchell	6,292	6,932	6,344	52	0.8%	-8.5%
Montgomery	34,395	36,252	34,254	-141	-0.4%	-5.5%
Morris	6,037	6,104	5,994	-43	-0.7%	-1.8%
Morton	2,978	3,496	3,031	53	1.8%	-13.3%
Nemaha	10,112	10,717	9,968	-144	-1.4%	-7.0%
Neosho	16,223	16,997	16,046	-177	-1.1%	-5.6%
Ness	2,945	3,454	2,835	-110	-3.7%	-17.9%
Norton	5,370	5,953	5,330	-40	-0.7%	-10.5%
Osage	16,327	16,712	16,104	-223	-1.4%	-3.6%
Osborne	3,804	4,452	3,849	45	1.2%	-13.5%
Ottawa	6,026	6,163	5,974	-52	-0.9%	-3.1%
Pawnee	6,291	7,233	6,206	-85	-1.4%	-14.2%
Phillips	5,339	6,001	5,272	-67	-1.3%	-12.1%
Pottawatomie	19,695	18,209	19,994	299	1.5%	9.8%
Pratt	9,411	9,647	9,304	-107	-1.1%	-3.6%
Rawlins	2,503	2,966	2,425	-78	-3.1%	-18.2%
Reno	63,427	64,790	63,357	-70	-0.1%	-2.2%
Republic	4,812	5,835	4,808	-4	-0.1%	-17.6%
Rice	10,060	10,761	10,079	19	0.2%	-6.3%
Riley	71,069	62,843	71,341	272	0.4%	13.5%
Rooks	5,136	5,685	4,984	-152	-3.0%	-12.3%
Rush	3,232	3,551	3,143	-89	-2.8%	-11.5%
Russell	6,641	7,370	6,596	-45	-0.7%	-10.5%
Saline	54,657	53,597	54,364	-293	-0.5%	1.4%
Scott	4,577	5,120	4,560	-17	-0.4%	-10.9%
Sedgwick	482,863	452,869	490,864	8,001	1.7%	8.4%
Seward	23,016	22,510	23,013	-3	0.0%	2.2%
Shawnee	174,709	169,871	176,255	1,546	0.9%	3.8%
Sheridan	2,510	2,813	2,435	-75	-3.0%	-13.4%
Sherman	6,013	6,760	5,860	-153	-2.5%	-13.3%
Smith	3,901	4,536	3,753	-148	-3.8%	-17.3%
Stafford	4,326	4,789	4,342	16	0.4%	-9.3%
Stanton	2,148	2,406	2,107	-41	-1.9%	-12.4%
Stevens	5,056	5,463	5,129	73	1.4%	-6.1%
Sumner	23,616	25,946	23,488	-128	-0.5%	-9.5%
Thomas	7,277	8,180	7,343	66	0.9%	-10.2%
Trego	2,882	3,319	2,920	38	1.3%	-12.0%
Wabaunsee	6,922	6,885	6,846	-76	-1.1%	-0.6%
Wallace	1,404	1,749	1,408	4	0.3%	-19.5%
Washington	5,791	6,483	5,683	-108	-1.9%	-12.3%
Wichita	2,148	2,531	2,109	-39	-1.8%	-16.7%
Wilson	9,698	10,332	9,474	-224	-2.3%	-8.3%
Woodson	3,285	3,788	3,240	-45	-1.4%	-14.5%
Wyandotte	154,287	157,882	155,085	798	0.5%	-1.8%
Kansas	2,802,134	2,688,418	2,818,747	16,613	0.6%	4.8%
Big Five	1,359,192	1,244,365	1,378,353	19,161	1.4%	10.8%
2nd Five	326,991	309,403	328,373	1,382	0.4%	6.1%
Remainder	115,951	1,134,650	1,112,021	-3,930	-0.4%	-2.0%

Suicides in Kansas

Suicide is the 10th leading cause of death to Kansas residents in 2008. The 350 suicide deaths are 7.9 percent less than in 2007 when the 380 deaths was the highest ever recorded (Figure 2). Rates are from the Kansas Department of Health and Environment's health information portal, Kansas Information for Communities (KIC) [1]. Only 236 resident suicide deaths occurred in 1960.

While a one-year decline in Kansas resident suicides is an improvement, one needs to see several years of decreases before pronouncing it a downward trend. However, the overall decline from 2007-2008 masked an increase in one age group.

Figure 2. Resident Suicide Deaths, Kansas, 1960-2008



Source: KDHE Bureau of Public Health Informatics

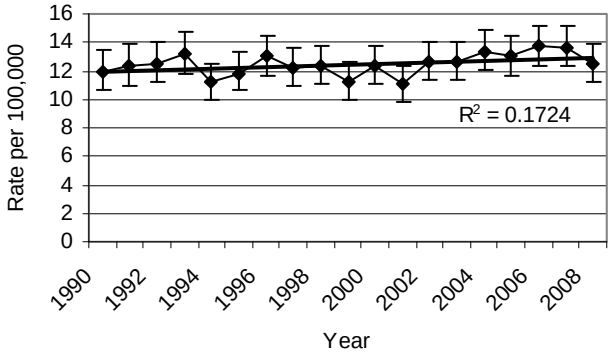
In 2007 the 45-64 age group had the highest suicide mortality rate, 20.5 deaths per 100,000 population (Table 5). In 2008, that age group had a large decrease in deaths, but an increase was noted in the 15-24 age group. This increase though not statistically significant bears watching. A one year change does not indicate a trend.

Table 5. Kansas Resident Age-group Specific Mortality Rates, 2007 & 2008

	2007		2008	
Age-group	N	Rate	N	Rate
Under 15	4	< 1.0	2	<1.0
15 to 24	59	14.4	69	16.8
25 to 44	120	16.5	121	16.6
45 to 64	144	20.5	108	15.1
65 and over	53	14.7	50	13.6
Source: Kansas Information for Communities, KDHE Rates per 100,000 population				

The age-adjusted suicide mortality rate for 2008 was 12.5 per 100,000 population. The 8.1 percent decrease from the 2007 age-adjusted mortality rate of 13.6 however is not statistically significant. Between 1990 and 2008, the highest age-adjusted mortality rate was 13.6 in 2006 with the lowest 11.1 in 2001.

Figure 3. Age-Adjusted Suicide Rates and 95% Confidence Intervals, Kansas, 1990-2008



Age-adjusted suicide mortality rates are subject to some volatility because of the relatively small statistical values. Plotting a linear regression trend line indicates the direction of that trend. The trend line in Figure 3 shows a very modest upward trend in age-adjusted suicide mortality rates. The R-squared value of 0.1724 is close to zero and thus the trend line is not very reliable.

While national rates are generally a couple of years behind published Kansas rates, they offer some comparison value. The most recent national age-adjusted suicide mortality rate was 11.1 per 100,000 in 2006 [2] which compares to 13.7 for Kansas in the same year.

The number of suicides reported to persons of Hispanic origin increased from 20 to 31 in 2008. Slightly more than nine out of 10 suicides occurred to persons of white race (90.3%) with blacks accounting for 13 suicide deaths (3.7%). Over four out of five suicides occurred to males (84.9%).

Guns were used in suicides in 54.3 percent (190) of Kansas resident suicides in 2008. Hanging was the second most frequent method at 25.7% of suicides (90) [3].

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2. Final Data for 2006. National Vital Statistics Reports; vol 57 no 14. Hyattsville, MD: National Center for Health Statistics, 2009.
3. 2008 Kansas Annual Tables, Kansas Department of Health and

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Hospitalization Rates for Asthma by Insurance Status

Asthma is a chronic respiratory condition that can develop at any age and is characterized by repeated episodes of wheezing, breathlessness, tightness of the chest, and coughing [1]. Hospitalizations for asthma are considered preventable as symptoms can be managed using environmental controls and medication. Despite advances in therapy, the morbidity, mortality and costs of asthma continue to increase. Furthermore, according to one estimate, "20 percent of asthmatic patients consume 80 percent of medical resources [2]. Most of the "high cost" asthmatic patients are those with "enhanced vulnerabilities to the disease and/or have greater barriers to effective management of asthma [3]." For example, children eligible for Medicaid "are among the most vulnerable to asthma and most likely to suffer poor outcomes [3]."

Asthma hospitalizations cost the U.S. economy $14.7 billion in direct health care costs [4]. In Kansas, the direct costs available for calculation for hospitalizations alone from 2003-2008 averaged approximately $12 million per year [5].

Table 6. Hospital Discharge Statistics for Asthma in Kansas, 2003-2008.

Age Group	Number	Rate per 10,000
Under 15	6,548	19.1
15 to 24	979	3.9
25 to 44	3,136	7.1
45 to 64	4,164	10.3
65 to 84	2,890	16.1
85 and over	608	17.4

Data Source: Kansas Department of Health and Environment (2003-2008), Kansas Information for Communities [7].

Analysis of hospital discharge data provides information regarding risk factors associated with the population(s) experiencing severe asthma in a community. Disease, age and income level have been shown to influence frequency of hospitalizations for asthma. Findings from the Kansas Asthma Burden Report in 2009, from the Kansas Department of Health and En-

vironment, showed that the highest hospitalization rates for asthma were among children, however, after the age of 15, hospitalization rates increase with increasing age as illustrated in Table 6 [6].

Data collected from the Canadian National Longitudinal Survey of Children and Youth (NLSCY) measured longitudinal health outcomes among children with asthma in years 1994/95 and 1996/97. Their findings concluded that having both asthma and living in low-income families significantly predicted hospitalizations and health service usage [8].

Other studies reported during the 1980s when hospital payment systems had constricted as the number of uninsured Americans grew, showed that the probability of hospital admissions through the emergency department for urgent medical conditions increased for both uninsured and Medicaid patients. Researchers concluded that primary medical access for these groups had deteriorated during the period when payment systems had constricted [9]. More recently, Fredrickson (2004) et al., found emergency room utilization was frequent among asthmatic children insured with Medicaid due to barriers to effective treatment in primary care and a lack of attention to preventive care [2].

The purpose of the current study is to review Kansas asthma hospitalization rates and trends across 2003-2008 by age group and to compare the effects of insurance status on hospital admission rates.

Methods

Community hospital discharge data are analyzed from the Kansas Hospital Association 2003-2008 [3]. Medicare 2003-2008 payment estimates are based on national Medicare payment averages supplied by Ingenix for Medicare [10]. Medicaid 2005-2006 payment/reimbursement estimates are derived from data provided by the Centers for Medicare and Medicaid Services via the Kansas Health Policy Authority [11]. Medicaid reimbursement estimates of payments for hospitalizations of children, adults and older adults for years 2003 and 2004 are estimates based on the Consumer Price Index (CPI) for medical care from 2005 data and years 2007 and 2008 are projections based on the CPI for medical care from 2006 data. Medicaid data for years 2005 and 2006 were records based on the Kansas federal-state funding partnership including benefit plans for the HCBS Frail Elderly, Medically Needy, Title XIX, Title XIX Presumptive Eligibility, Qualified Medicare Beneficiary, and Sixth Omnibus Bill Reconciliation Act (SOBRA). Private insurance payment estimates for 2003 - 2005 and 2007 are from the Kansas Health Insurance Information System (KHIIS) data provided by the Kansas Insurance Department [12]. The 2006 and 2008 private insurance allowed amount estimates for payments of hospitalizations for children, adults and older adults are projections based on the CPI for medical care from 2005 and 2007, respectively [13]. Payments for the uninsured categories are based on average charges of hospitalizations obtained from HCUPnet: Agency for Healthcare Research and Quality for the state of Kansas [14]. Mean charges in 2008 for the uninsured categories are derived from the CPI for medical care from 2007 charges from HCUPnet. The asthma record case definition is defined as those records with a primary diagnosis code using the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)= 493.

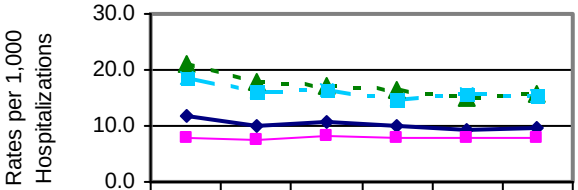
Emergency admissions are defined as those admitted to the hospital after being seen for asthma in the emergency room, while non-emergency admissions include all other types of admissions. Hospitalization rates per 1,000 are calculated by dividing the frequency of asthma hospitalizations by the total number of hospitalizations multiplied by 1,000 within each pay source, i.e., Medicaid, Medicare, private insurance and uninsured, for each year and within groups of analysis, i.e., hospitalizations of children, adults and older adults. Relative rates are calculated by dividing the average rate of primary payers Medicaid, uninsured and Medicare (numerator) by the average rate of Private insurance (denominator). Payers that have higher average hospitalization rates than private insurance have a relative rate greater than 1.0, while those payers with average hospitalization rates lower than private insurance will have relative rates less than 1.0. Statistical significance is determined at the 95 percent level of confidence. For this report, children are considered to be 17 years of age and younger, adults 18-64 years of age and other adults 65 years and above. Finally, historically, insurance status is used as a proxy measure for socioeconomic status (SES) in numerous studies [15,16,17]. Frequent SES indices of interest i.e., education, occupation and income are not always available in the data, but do affect access to health insurance [18]. Therefore, hospitalizations for individuals paid by Medicaid, and who are uninsured as well as individuals under 65 who are on Medicare are considered a proxy measure for those of lower SES. Hospitalizations paid by private insurance are considered a proxy measure for individuals of higher SES with the financial means necessary to afford insurance [17, 19].

Results

Hospitalizations by Insurance Status

In the U.S., asthma hospitalizations are relatively stable or decreasing slightly by primary pay source during the study period . Medicaid recipients have the highest rate followed closely by the uninsured across most years, and the privately insured have higher rates of hospitalizations for asthma than Medicare recipients (see Figure 4) [14].

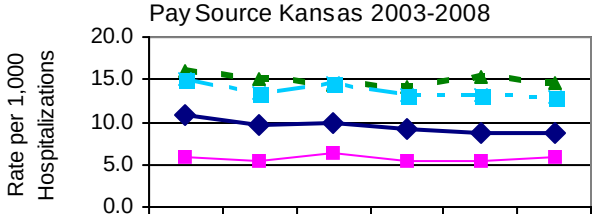
Figure 4. Rates of Asthma Hospitalizations by Pay Source U.S. 2003-2008



	2003	2004	2005	2006	2007	2008
Private Ins	11.8	9.9	10.6	9.9	9.2	9.5
Medicare	7.9	7.5	8.2	7.9	7.7	7.8
Medicaid	20.9	17.8	17.0	16.5	15.0	15.8
Uninsured	18.4	15.9	16.5	14.6	15.8	15.2

Year

Figure 5. Rates of Asthma Hospitalizations by Pay Source Kansas 2003-2008



	2003	2004	2005	2006	2007	2008
Private Ins	10.9	9.6	9.9	9.1	8.7	8.6
Medicare	5.9	5.3	6.4	5.5	5.3	5.9
Medicaid	16.1	15.0	14.4	14.2	15.4	14.7
Uninsured	15.0	13.5	14.6	13.2	13.1	13.0

Year

In Kansas, the trends in hospitalizations from 2003-2008 for people among all pay sources are relatively stable or declining slightly, with Medicaid and uninsured hospitalizations having the highest rates followed by private insurance and Medicare rates across the study period (Figure 5) [3]. Rates of asthma hospitalizations are lower in Kansas than the U.S. for all pay sources and years.

Table 7 shows that among all Kansans hospitalized for Asthma, Medicaid recipients are 1.57 times and the uninsured 1.43 times more likely to be hospitalized for asthma than persons with private insurance, while individuals receiving Medicare are less likely to be hospitalized, i.e., 0.60 on average than those with private insurance.

Table 7. Asthma Hospitalization Average Rates, Relative Rates and Confidence Intervals by Pay Source and Within Age Groups in Kansas, 2003-2008.

Pay Source	Rate per 1,000	95% Confidence Interval		Differences Between Pay Sources	
		Lower Limit	Upper Limit		
All				Significance	Relative Rate
Private Insurance	9.5	9.28	9.72		1.00
Medicare	5.7	5.54	5.86	S	.60
Medicaid	14.9	14.46	15.34	S	1.57
Uninsured	13.6	12.90	14.30	S	1.43
Children					
Private Insurance	16.53	16.00	17.10		1.00
Medicare	*	*	*		N/A
Medicaid	22.21	21.40	23.02	S	1.34
Uninsured	17.13	15.44	18.82	NS	1.04
Insufficient Data*					
Adults 18-64 Years					
Private Insurance	7.05	6.82	7.28		1.00
Medicare	12.44	11.79	1.09	S	1.76
Medicaid	9.20	8.73	9.67	S	1.30
Uninsured	13.22	12.43	14.01	S	1.88
Older Adults 65+					
Private Insurance	3.93	3.32	4.55		1.00
Medicare	4.65	4.49	4.81	NS	1.18
Medicaid	10.96	7.63	15.24	S	2.79
Uninsured	3.95	2.07	6.10	NS	1.01

Hospital admission rates for children, show Medicaid recipients are 1.34 times more likely to be admitted to the hospital than children with private insurance. Medicare rates are excluded from this analysis due to lack of statistical reliability.

Lower income adults ages 18-64 years receiving Medicaid, Medicare or those who are uninsured have significantly higher rates of admissions to the hospital on average across the study period than those with higher incomes who have private insurance. Uninsured admissions are 1.88 times more likely than those privately paid, while Medicare recipients are 1.76 times more likely and Medicaid recipients 1.30 times more likely to be admitted to the hospital for asthma than those with private insurance. In the case of older adults, Medicaid paid hospitalizations are 2.79 times more likely than private insurance paid hospitalizations.

When comparing emergency and non-emergency admissions to the hospital, children with private insurance have significantly lower rates of emergency admissions than non-emergency admissions (Table 8). The rates of Medicaid paid admissions did not differ significantly between emergency and non-emergency hospital admissions of children, however, the average rate of emergency admissions paid by Medicaid are higher than both uninsured and private insurance paid emergency admissions.

Adults age 18-64 years who receive Medicaid, and those who are uninsured have significantly higher rates of emergency admissions to the hospital than non-emergency admissions, while there was no difference in emergency and non-emergency admissions for those with private insurance. Additionally, the uninsured, Medicare and Medicaid recipients have higher emergency admission rates than those with private insurance. Finally, there are no significant differences in emergency admissions and non-emergency admissions to the hospital within pay source for individuals age 65 years and older.

Table 8. Comparison of Significant Differences Between Average Rates of Hospitalizations for Asthma Via Emergency and Non-emergency Conditions by Pay Source and Within Age Groups in Kansas, 2003-2008.

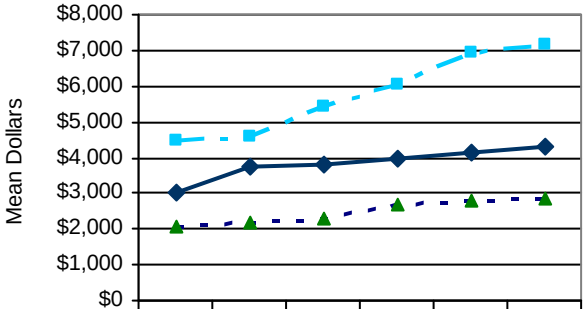
Pay Source	Average Rate of Emergency Admissions per 1,000 Hospitalizations	Average Rate of Non-emergency Admissions per 1,000 Hospitalizations	Differences Between Emergency and Non-emergency Admissions
Children			Significance
Private Insurance	5.33	11.75	S
Medicare	*	*	N/A
Medicaid	10.95	11.26	NS
Uninsured	7.65	9.39	NS
Insufficient Data*			
Adults 18-64 Years			
Private Insurance	5.51	3.55	NS
Medicare	6.59	5.84	NS
Medicaid	5.64	3.53	S
Uninsured	9.19	4.03	S
Older Adults 65+			
Private Insurance	2.13	1.90	NS
Medicare	2.21	2.44	NS
Medicaid	6.58	4.38	NS
Uninsured	2.47	1.48	NS

Payments for Children Hospitalized for Asthma

Figure 6 shows available direct payment data for children hospitalized for asthma for years 2003-2008 in Kansas. The average allowed payments for asthma hospitalizations of children is highest for those who are uninsured followed by those with private insurance. Payments by the uninsured are based on average charges since there is no price negotiating entity such as a private insurance company or the government to pro-

viders [20]. Children on Medicaid have the lowest payments across the study period. The average payments for hospitalizations of children admitted for asthma are increasing for all three pay sources.

Figure 6. Asthma Hospitalization Average Payments for Children by Pay Source Kansas 2003-2008

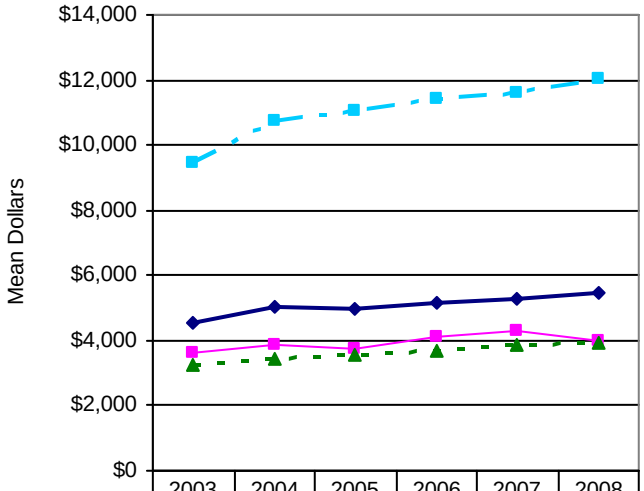


	2003	2004	2005	2006	2007	2008
Priv Ins Allowed Amount paid	$2,995	$3,735	$3,816	$3,969	$4,145	$4,298
Medicaid Net Paid Amount	$2,084	$2,175	$2,267	$2,680	$2,798	$2,868
Uninsured	$4,484	$4,595	$5,430	$6,061	$6,928	$7,184

Year

Payments for Adults Hospitalized for Asthma

Figure 7. Average Payments of Asthma Hospitalizations of Adults Ages 18-64 Years by Pay Source Kansas 2003-2008



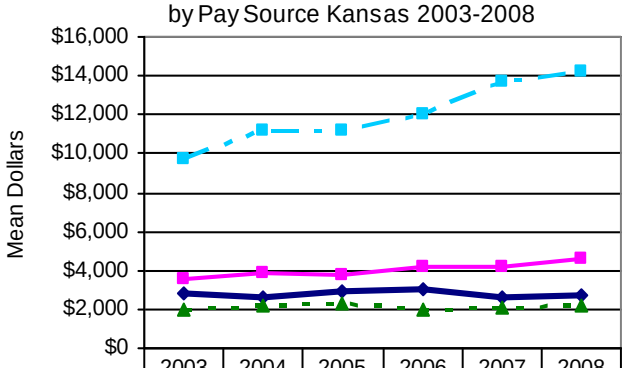
	2003	2004	2005	2006	2007	2008
Priv Ins Allowed Amount Paid	$4,565	$5,019	$4,982	$5,182	$5,258	$5,453
Medicare	$3,633	$3,882	$3,739	$4,121	$4,269	$3,967
Medicaid Net Paid Amount	$3,275	$3,419	$3,563	$3,701	$3,865	$3,960
Uninsured	$9,466	$10,723	$11,048	$11,438	$11,626	$12,056

Year

Figure 7 shows the average payments for hospitalizations of adults between ages 18 to 64 years. Hospitalization payments are increasing for private insurance, Medicaid and the uninsured, while Medicare payments are relatively stable across the study period. Private insurance payments are higher than both Medicare and Medicaid, while uninsured hospitalization payments are highest across the study period.

Figure 8 shows the mean payments for the three major pay sources are relatively stable for older adults hospitalized for asthma (Figure 5). The uninsured have the highest average payments from 2003-2008. During the study period, it appears that rising uninsured hospitalization charges were approximately double the payments of the other pay sources. Medicare payments were higher than private insurance and Medicaid for older individuals admitted to the hospital for asthma.

Figure 8. Average Payments of Asthma Hospitalizations of Adults Age 65 Years and Older by Pay Source Kansas 2003-2008



	2003	2004	2005	2006	2007	2008
Priv Ins Allowed Amount Paid	$2,846	$2,600	$2,936	$3,054	$2,666	$2,765
Medicare	$3,584	$3,883	$3,786	$4,153	$4,216	$4,576
Medicaid Net Paid Amount	$2,007	$2,168	$2,260	$2,023	$2,112	$2,165
Uninsured	$9,688	$11,188	$11,198	$12,037	$13,727	$14,235

Year

Study Limitations

Kansas hospitalization rates are based on hospitalizations for asthma from community hospital discharge data only; therefore, private, specialty or Veteran's Administration hospitalizations are not represented. Private insurance pay rates and payment estimates are derived from claims data from the top 20 Kansas private health insurers only; thus not all private insurance carriers are represented. In addition, the Employee Retirement Income Security Act (ERISA) data are not included in the private insurance data collection. Finally, direct hospitalization payment estimates presented here are conservative, since there are many other expenses associated with asthma hospitalizations, treatment and care. For example, professional charges and/or payments connected with hospitalization, in addition to hospital outpatient services, emergency department visits, prescribed medications and indirect payments are not included.

Conclusions

Patients with private insurance are less likely to be hospitalized for asthma. Additional findings include:

- Kansas' total rates of asthma hospitalizations mirror the national trend.
- Trends in Kansas hospitalizations for asthma by pay source are relatively stable across the study period.

- Medicaid and the uninsured have higher rates of hospitalizations than those paid by private insurance and Medicare.
- Medicaid recipients have the highest rate of emergency admissions on average in all three age groups.
- Children and older adults receiving Medicaid have the highest rate of non-emergency admissions.
- For adults 18-64 years of age, the uninsured, Medicare and Medicaid paid hospitalization relative rates are higher compared to the private insurance paid rate.
- Payments for hospitalizations for asthma during the study period are relatively stable for adults for private insurance, Medicare and Medicaid; however, payments are increasing for private insurance and Medicaid for children's hospitalizations for asthma.
- Uninsured charges for hospitalizations are higher than payments from private insurance, Medicaid or Medicare and are increasing both nationally and in Kansas.

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Ischemic Stroke Patterns in Kansas

In 2007, a team of Canadian researchers reported that patients hospitalized for ischemic stroke on weekends were more likely to die than were patients admitted on weekdays [1]. A subsequent Swedish Hospital Discharge Register study found a similar "weekend effect" for stroke admissions [2]. Two recent U.S. studies, however, show no statistically significant difference in stroke mortality based on the day of the week the patient was hospitalized [3][4]. Examination of the Kansas Hospital Discharge data for 2006-2008 shows no statistically significant difference between death rates for ischemic stroke patients admitted on weekends and those admitted on weekdays.

Method

For this survey, all records from admissions for which ischemic stroke was the primary diagnosis were selected from the Kansas Hospital Discharge dataset for the years 2006-2008. The ICD9-CM diagnosis codes selected were those used by Saposnik et al.: 433.01, 433.11, 433.21, 433.31, 433.81, 433.91, 434.01, 434.11, and 434.91. Data in secondary diagnosis fields were not considered.

Following Albright et al, the weekend was defined as the period from 5:00 PM Friday to 8:00 AM Monday [5]. The analyses were based on Kansas occurrence hospitalizations only.

Death rates are calculated by dividing the number of ischemic stroke hospitalizations ending in death by the total number of ischemic stroke hospitalizations. These rates should not be confused with the population-based death rates reported in other publications.

Results

Kansas hospitals reported 9,918 admissions for ischemic stroke during the years 2006-2008. In 490 of these admissions the final discharge status was "deceased," with 367 dying within seven days of admission. The over-all death rate for ischemic stroke was 4.94 deaths per 100 hospitalizations; for deaths occurring within seven days of admittance the over-all rate was 3.70 deaths per 100 hospitalizations.

The death rate for weekend admissions (5.15%) is higher than the death rate for weekday admissions (4.84%), and the same is true of the seven-day death rates (3.93% for weekend admissions vs. 3.59% for weekday admissions) (Table 9). However, these differences are not statistically significant: (1) the intervals between the upper and lower confidence intervals for weekend and weekday mortality rates overlap for both over-all and seven-day mortality; and (2) the z-test values (0.64 for over-all mortality and 0.81 for seven-day mortality) are far below the value of 1.96 needed to indicate statistical significance.

Table 9. Admissions for ischemic stroke in Kansas Hospital Discharge data
Kansas Occurrence, 2006-2008

	Weekend Admissions	Weekday Admissions
Admissions	3,282	6,636
Total Deaths	169	321
Death Rate	5.15	4.84
LCI	4.37	4.31
UCI	5.93	5.37
Z-test	0.64	
7-Day Mortality	129	238
7-Day Death Rate	3.93	3.59
LCI	3.25	3.13
UCI	4.61	4.04
Z-test	0.81	

Saposnik et al. concluded rather tentatively that the weekend "effect may be larger in patients admitted to rural hospitals...," but there is no evidence for this in the Hospital Discharge dataset. Death rates for weekend admissions are actually lower than death rates for weekend admissions for the residents of the least densely populated Kansas counties (those counties in the Frontier and Rural Peer Groups), but the "weekend effect" is not statistically valid for any of the Peer Groups, from Frontier up to Urban. The confidence intervals for weekend admissions overlap those for weekday admissions for every Peer Group (Table 10).

Table 10. Deaths rates for Kansas residents admitted to Kansas hospitals for ischemic stroke, by population density Peer Group of home county, 2006-2008

	Weekend Rate	Weekday Rate	Weekend 95% CI	Weekday 95% CI
Frontier	4.83	6.73	1.25-8.40	3.92-9.54
Rural	5.22	6.01	3.08-7.35	4.31-7.71
Dense-Set Rural	7.13	5.55	4.70-9.56	4.06-7.04
Semi-Urban	3.76	4.62	2.26-5.27	3.42-5.81
Urban	5.31	4.14	4.11-6.50	3.41-4.87

Conclusions and Reservations

An analysis of hospital admissions for ischemic stroke from the Kansas hospital discharge dataset does not support the hypothesis that patients admitted on the weekend are more likely to die than patients admitted on weekdays. Furthermore, there is no evidence that residents of frontier and rural counties suffer from a more severe weekend effect than residents of more populous counties.

However, the stroke admissions studied in this analysis included only the records submitted by Kansas community hospitals to the Kansas Hospital Association (KHA). Veterans hospitals and most specialty hospitals do not report to KHA. Deaths in the emergency room (before formal admission with inpatient status) and inpatient admissions with length of stay less than 24 hours are not included in the hospital discharge dataset received from KHA. Since KDHE receives a de-identified version of the hospital discharge dataset, there is no way to follow any individual case through one or more transfers from one hospital to another, so some cases are represented by more than one record. It is possible that a statistically significant "weekend effect" might be identified if emergency department data were available for analysis.

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264-39
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