

COPD in Kansas Emergency Departments, 2009-2017

A Descriptive Analysis

Introduction

Chronic obstructive pulmonary disease (COPD) is one of the most common and costly respiratory diseases in the United States [1]. COPD is not one disease, but a group of illnesses that affect the respiratory system by causing airflow blockage and other breathing problems. It includes some types of asthma, emphysema, and chronic bronchitis. Some of the symptoms include wheezing, shortness of breath, coughing, fatigue, and tightness in the chest. One should note that the disease can be present without any symptoms. Smoking has been identified as the most important risk factor [2,3,5]. Other risk factors include occupational and environmental exposures, respiratory infections, and genetics [7]. Some studies have also found elderly women are at higher risk of dying of COPD than elderly men [2,4].

The following analysis is, to our knowledge, the most recent attempt to describe the burden of COPD in Kansas. While COPD is one of the leading causes of hospitalization and death in the country [1], this analysis will focus on emergency department visits as a proxy to evaluate this burden. Future analyses of hospitalization and mortality data will be undertaken to complete this assessment.

Methods

For this analysis, the data was provided by the Kansas Hospital Association and included emergency department (ED) visit de-identified records from calendar year 2009 to 2017. COPD was defined as ED visits with International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM) 490-492, 496 as the primary diagnosis when 490-492, 496 is present in any other diagnosis codes; or after October 1, 2015, ICD-10-CM codes J40-J44 as primary diagnosis. Non-Kansas residents were excluded but transfers were not.

In addition to the ED data, in-patient records were also searched to identify patients admitted from the ED who were not accounted for in the ED data set. RStudio Version 1.1.456 and R version 3.5.1

were used to calculate the summary statistics and create the graphs. All age adjustments in this analysis were made using the 2000 US population.

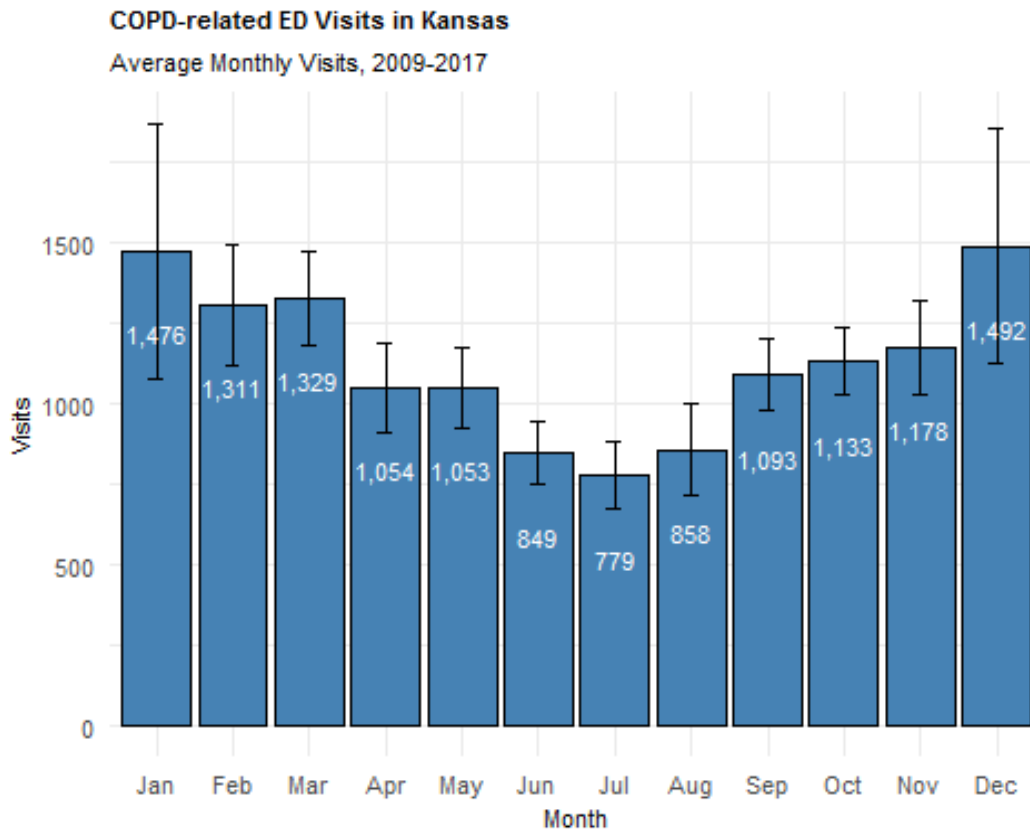
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Results

From 2009 to 2017, there were a total of 122,436 COPD-related visits identified in the ED and in-patient data sets. The distribution of the number of monthly visits over the study period shows that COPD-related ED visits are significantly lower in June, July and August compared to October, November, December, January, February and March (Figure 1). This trend may coincide with incidence of other respiratory diseases such as influenza. It has been reported that in the U.S., respiratory viruses, including influenza viruses, are associated with COPD exacerbation [6].

Figure 1



When stratified by sex, women appear to be at a higher risk of visiting the ED for COPD than men (Figures 2 and 3).

Figure 2
COPD-related ED Visits in Kansas
 Average Annual Number of Visits, by Sex, 2009-2017

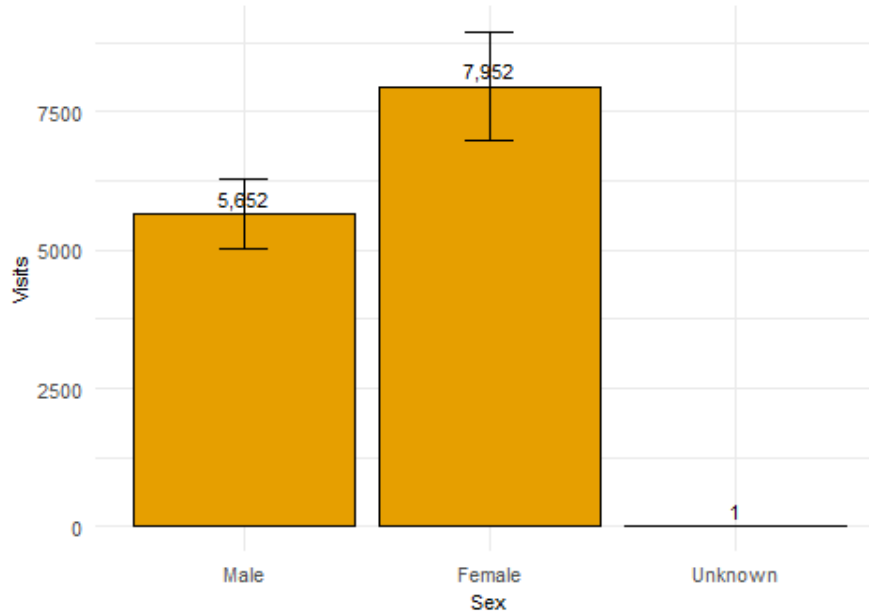
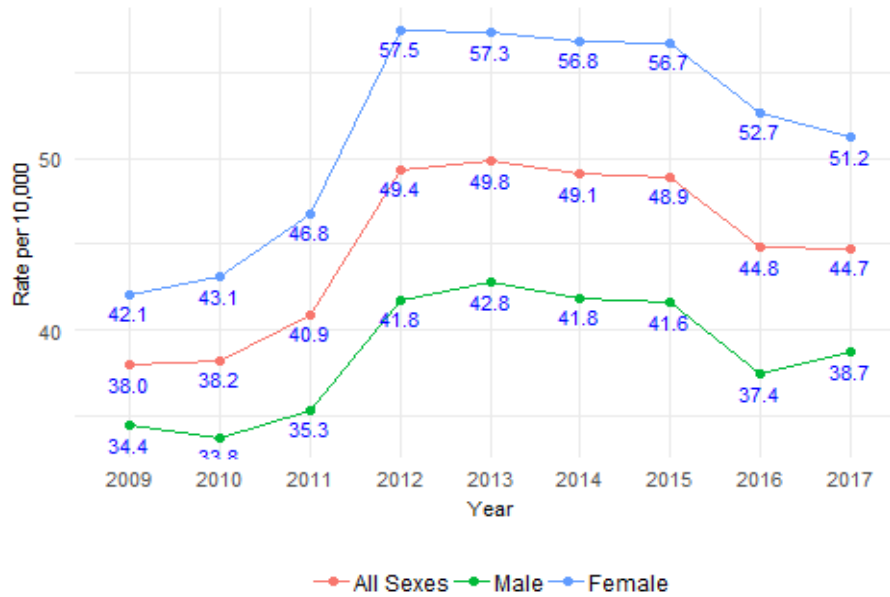


Figure 3
COPD-related ED Visits in Kansas
 Age-adjusted rates, by year and by sex, 2009-2017



The data show that Kansans aged 50 years and older were at greater risk than younger individuals. The crude rate of visits varies from 8.3 per 10,000 in the 10 to 14 age group to 142.2 in the 80 to 84 age group (Figure 4). The impact of the disease may also be more severe in this later group given the presence of comorbidities in this slice of the

population. A study on COPD and comorbidities [5] has reported that 50% of the COPD patients had 1 to 2 comorbidities.

Figure 4
COPD-related ED Visits in Kansas
 Crude rate of Visits, by Age Group, 2009-2017

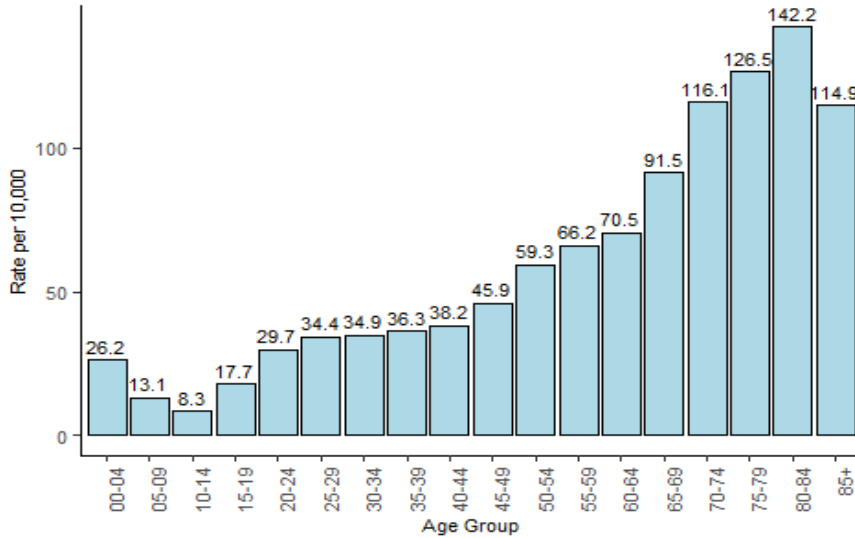
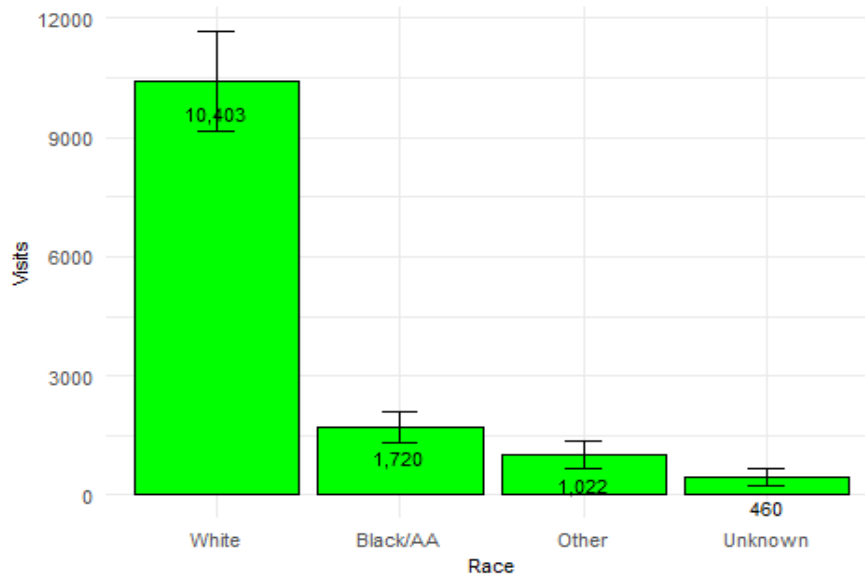
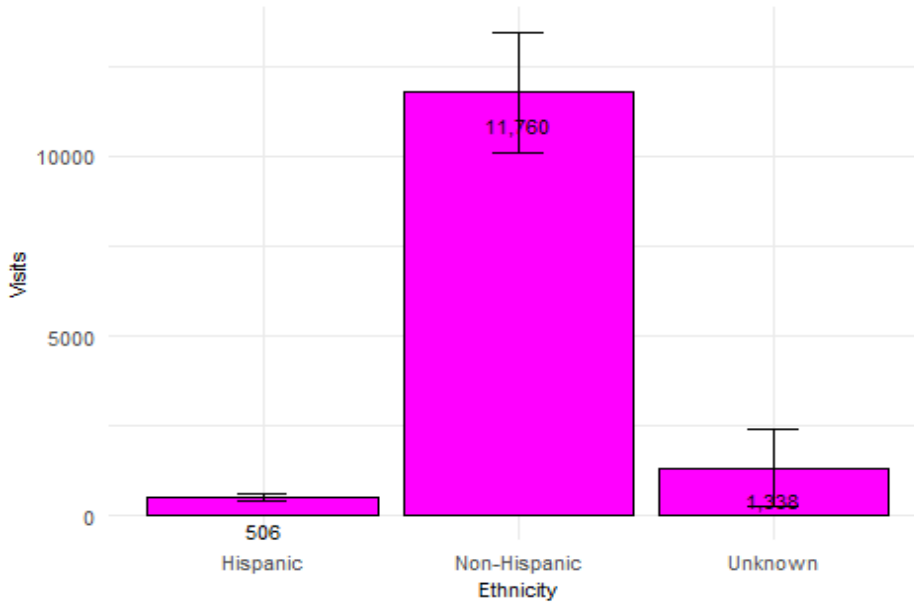


Figure 5
COPD-related ED Visits in Kansas
 Average Annual Number of Visits, by Race, 2009-2017



Based on these data, White and Non-Hispanic Kansas were more likely than others to be admitted to the emergency department for COPD (Figure 5 and Figure 6). It is important to note that the data contained a substantial number of unknown race and/or

Figure 6
COPD-related ED Visits in Kansas
 Average Annual Number of Visits, by Ethnicity, 2009-2017



ethnicity that may affect the statistics. These graphs were included in this report for information purposes since race and ethnicity have been identified in the literature as risk factors for ED visits due to COPD [6].

A recent study by Croft JB. et al. [7] reported that in 2015 in the U.S., people living in rural areas had a higher prevalence of COPD than those living in micropolitan or metropolitan areas, even after adjusting for age. The following figures (figure 7 and figure 8) present a ranking of Kansas counties based on the age-adjusted rate of ED visits due to COPD in 2017. Figures 7 and 8 represent counties that had a rated above or below the state's rate respectively. Given the diverse nature of the counties listed in each category, it is clear that population density (rural vs. urban) was not the only factor leading to a high or low ED visit rate. Other factors such as household income, occupational exposure, and smoking rate [1] may be influencing the observed distribution. More studies are warranted to better understand the current statistics.

Figure 7

Age-Adjusted Rate of COPD-related ED Visits in Kansas, in 2017,
 per 10,000 Population, by Selected Counties in 2017, (Kansas rate: 44.72)
 (Rate for small population size counties may be unstable)

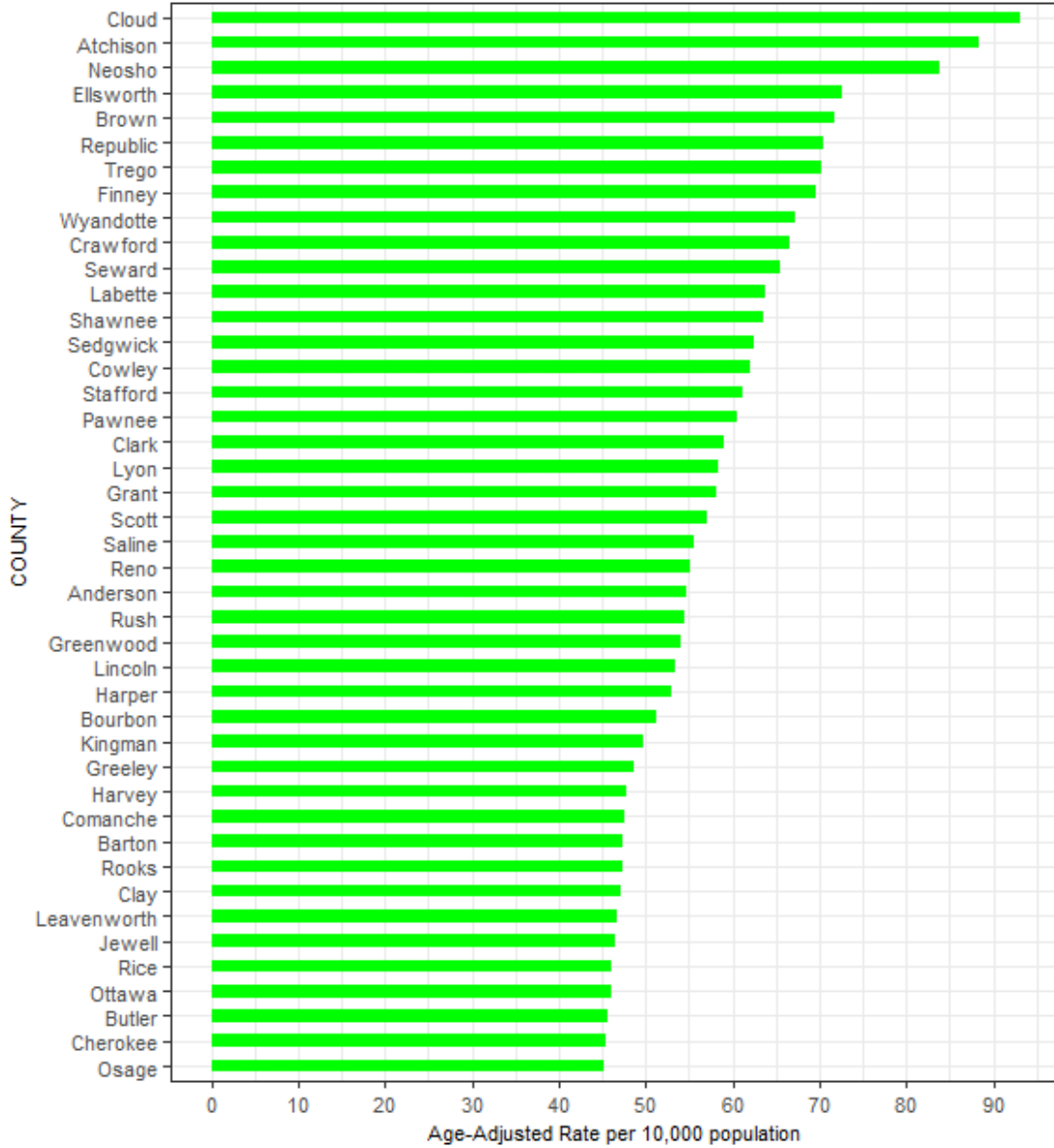
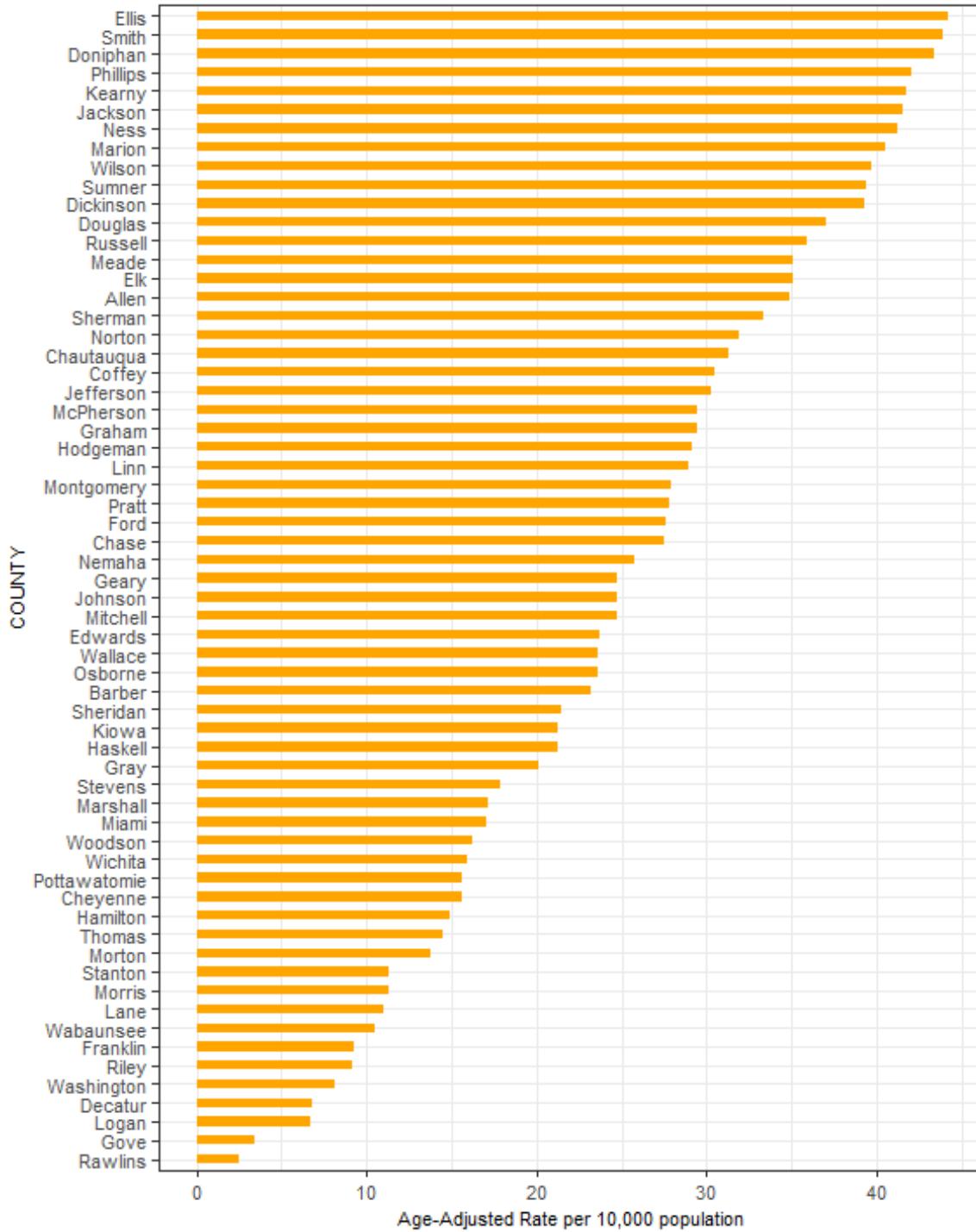


Figure 8

Age-Adjusted Rate of COPD-related ED Visits in Kansas, in 2017,
 per 10,000 Population, by Selected Counties in 2017, (Kansas rate: 44.72)
 (Rate for small population size counties may be unstable)



Limitations

- Reporting of emergency department visits is not required in Kansas. Therefore, we assume that the data may not be complete. However, analysis for data consistency did not identify any significant data gap.
- Numbers may be too small in rural areas to calculate stable rates.
- Institutionalized populations and data from the Veterans' Affairs are not included in these statistics. Therefore, some statistics may be underestimated.
- To our knowledge, the accuracy of patients' race and ethnicity information reporting has not been validated. Caution should be used when interpreting race and ethnicity statistics from Kansas ED data.
- One should note that not all COPD patients are treated in hospital settings which will lead to an under estimation of the number of cases.

Based on this analysis, it appears that COPD is a significant cause for admission to Kansas emergency departments. We found that COPD disproportionately affects, female and the elderly. Further studies are needed to evaluate the contribution of race, ethnicity, and socioeconomic factors. The age-adjusted rate of COPD-related ED Visits varies significantly among Kansas counties and need to be explored further. In addition, COPD-related ED visits are more common when the outdoors temperature is low compared to summer months. This initial epidemiological description of the condition may serve as a baseline for future health interventions. Since smoking has been identified as one of the risk factors for COPD in the literature, it would be interesting to compare trends in ED visits and smoking rates in the population. Finally, studies of Kansas inpatient and mortality data are warranted to improve our knowledge about this common and preventable health condition.

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2017 Kansas Annual Summary Notes Demographic Trends

Among the results reported in the *Kansas Annual Summary of Vital Statistics, 2017*, are several which suggest the State may face demographic challenges in the future. Items of concern include 1) slowing population growth and an aging population; 2) continuing declines in both the number and rate of births to Kansas women; leading to 3) total fertility rates below the replacement rate and 4) decreases in the rate of natural increase. Declines in marriage rates have been accompanied by declines in out of wedlock births and declines in teen pregnancy.

The Annual Summary does not attempt to determine causes for these trends, as it is a summary of events recorded by the State's Vital Records Office. Factors that are impacting the state's demography are outside the scope of information that can be discerned from vital event records.

Kansas total population as of July 1, 2017 was estimated at 2,913,123, an increase of 5,834 (0.2%) from the estimate of Kansas total population as of July 1, 2016 (2,907,289) released in 2017. The median age of Kansans in 2017 was 36.6 years, a 4.0 percent increase from the median age of 35.2 in 1998. The median ages for men and women were 35.4 and 37.9, respectively.

There were 36,464 live births to Kansas resident mothers in 2017. The most recent year with fewer live births was 1976, when there were 35,278 live births. The birth rate in 2017 was 12.5 births per 1,000 population, the lowest rate since Kansas began statewide recording of vital events in 1912.

Over the past 20 years (1998-2017), the Kansas birth rate has fluctuated between a peak of 15.1 births per 1,000 population (reported in 2007) and a low of 12.5 births per 1,000 population (reported in 2017). Recent low birth rates continue a sustained decline that began in 2008.

In 2017, the rate of natural increase (the birth rate minus the death rate: a rate of natural increase of less than zero would mean the insufficient births are occurring to replace the number of people dying in the state) was 3.3 persons per 1,000 population, a decrease of 19.5 percent from 4.1 per 1,000 population in 2016, and the lowest rate of natural increase in the past twenty years. Over the past 20 years (1998-2017), the rate of natural increase has fluctuated between a maximum of 6.3 persons per 1,000 population (2007) and a minimum of 3.3 persons per 1,000 population (2017).

The total fertility rate (the number of children who would be born per 1,000 women if they were to pass through the childbearing years bearing children according to the current distribution of age-specific fertility rates) has been below the replacement rate of 2,100 for each of the last five years. The total fertility rate in 2017 was 2,053 births per 1,000 women of childbearing age.

Part of the decline in childbearing in recent years is due to factors generally considered desirable: teen pregnancy rates have declined from 32.4 pregnancies per 1,000 young women in the 10-19 age-group in 1998 to 12.7 per 1,000 in 2017, and out-of-wedlock births have decreased from a peak of 37.7 percent of all births in 2010 to 35.6 percent in 2017.

In 2017, 17,274 marriages occurred in Kansas, a decrease of 3.8 percent from the 2016 total of 17,948 marriages. The Kansas marriage rate in 2017 was 5.9 marriages per 1,000 population. This rate was 4.8 percent lower than the 6.2 percent rate recorded in 2016, and was the lowest rate recorded for the state of Kansas in the last twenty years (1998–2017). For the entire period, Kansas marriage rates have been lower than U.S. marriage rates.

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STI and HIV Statistics Updated

The Bureau of Disease Control and Prevention has posted their bi-annual reports for HIV and STI statistics. The two reports summarize reported cases for the first 6 months of the year by race, area of state, age-group, sex, and other factors. The HIV report includes a map of the number of people living with HIV by County (figure 1).

Figure 1. Number of People Living with HIV by County, Kansas as of June 30, 2018



This map reflects the number of persons living in Kansas who have been diagnosed with HIV. Last reported address was utilized to determine residency. If the last reported county variable was unknown, that individual will not be reflected in this map.

The HIV report is available at: http://www.kdheks.gov/sti_hiv/download/std_reports/FH2018_Stat_Pack_Data.pdf. The STI report contains statistics on chlamydia, gonorrhea and syphilis. Syphilis cases are further broken out by early, early latent, primary or secondary. This report is available at: http://www.kdheks.gov/sti_hiv/download/std_reports/FH2018_Stat_Pack_Data.pdf.

Bureau of Disease Control and Prevention

2017 Kansas Vital Statistics

County of Residence	Live Births	Deaths	Marriages	Marriage Dissolutions	County of Residence	Live Births	Deaths	Marriages	Marriage Dissolutions
Kansas	36,464	26,725	17,274	6,494					
Allen	140	164	56	28	Lyon	393	300	197	48
Anderson	104	115	34	46	McPherson	324	389	160	51
Atchison	174	161	77	29	Marion	113	161	52	15
Barber	55	70	22	10	Marshall	121	139	50	15
Barton	284	293	156	72	Meade	44	60	21	10
Bourbon	180	218	87	48	Miami	387	335	216	110
Brown	130	139	58	22	Mitchell	74	94	28	10
Butler	763	635	453	132	Montgomery	350	459	174	102
Chase	19	29	39	1	Morris	72	75	30	12
Chautauqua	30	50	18	9	Morton	45	32	16	4
Cherokee	212	274	72	40	Nemaha	151	138	60	15
Cheyenne	30	31	5	9	Neosho	196	194	108	28
Clark	22	31	4	4	Ness	15	58	18	7
Clay	91	85	61	17	Norton	50	59	31	21
Cloud	109	132	51	27	Osage	171	191	65	39
Coffey	94	93	43	137	Osborne	45	63	20	6
Comanche	18	29	8	4	Ottawa	44	81	26	9
Cowley	415	405	212	97	Pawnee	81	95	27	13
Crawford	460	421	216	77	Phillips	49	74	30	8
Decatur	33	49	17	6	Pottawatomie	355	178	112	22
Dickinson	208	235	108	73	Pratt	104	105	49	16
Doniphan	69	101	30	5	Rawlins	33	37	16	6
Douglas	1,134	792	758	187	Reno	693	769	423	157
Edwards	23	34	13	8	Republic	60	96	23	13
Elk	24	46	17	7	Rice	103	131	55	14
Ellis	299	254	169	53	Riley	883	370	692	178
Ellsworth	58	97	40	39	Rooks	52	67	32	14
Finney	625	218	262	76	Rush	31	39	8	4
Ford	589	259	249	83	Russell	73	95	48	12
Franklin	305	269	126	52	Saline	702	612	324	187
Geary	890	205	484	323	Scott	57	51	41	13
Gove	31	29	5	7	Sedgwick	6,907	4,439	3,209	1,429
Graham	21	47	11	7	Seward	419	114	157	94
Grant	113	62	19	15	Shawnee	2,065	1,880	995	296
Gray	88	39	25	8	Sheridan	29	23	12	7
Greeley	25	15	11	1	Sherman	73	65	41	23
Greenwood	57	116	32	4	Smith	43	56	18	8
Hamilton	31	25	12	4	Stafford	54	68	21	9
Harper	64	90	34	19	Stanton	28	21	20	11
Harvey	379	396	220	72	Stevens	69	52	36	23
Haskell	46	30	16	8	Sumner	262	268	140	61
Hodgeman	17	21	14	6	Thomas	120	67	39	22
Jackson	180	162	43	11	Trego	27	42	20	10
Jefferson	178	213	142	41	Wabaunsee	77	50	46	7
Jewell	31	31	16	7	Wallace	18	13	4	3
Johnson	7,207	3,980	2,598	760	Washington	76	70	42	8
Kearny	65	25	20	6	Wichita	30	23	11	6
Kingman	72	91	39	16	Wilson	113	117	41	23
Kiowa	32	26	12	2	Woodson	34	42	25	5
Labette	260	258	89	47	Wyandotte	2,539	1,362	1,340	255
Lane	15	30	3	8	n.s.	0	2	0	0
Leavenworth	951	609	495	210					
Lincoln	22	32	14	9					
Linn	99	107	73	41					
Logan	39	36	17	5					

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