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Research Article

Emergency Department Utilization by HIV-Infected South Carolina Residents, 1996-2015

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Abstract

Introduction: Emergency Department (ED) utilization by HIV-infected patients in the United States (US) exceeds that of the general population. The demographic characteristics of HIV-infected South Carolina (SC) residents who make ED visits in this state are important to delineate because ED visits are costly and potentially avoidable. Identifying high utilizer groups will allow for the better allocation of limited resources and prevent the costly and unnecessary use of EDs in SC.

Materials/Methods: A retrospective, twenty-year cohort study was conducted to examine the demographic characteristics of ED utilization on behalf of HIV-infected SC residents. The SC Uniform Billing database (UB-40 All Payer Hospital data) maintained by the SC Revenue and Fiscal Affairs Office was used for the study.

Results: A total of 29,909 ED visits were made by HIV-infected SC residents between 1996 and 2015. The total number of annual ED visits made by HIV-infected residents increased 246.5%, whereas ED visits made on behalf of all SC residents increased only 100.7% over the same period of time. HIV-infected males comprised 60.0% of the total ED visits. The annual ED visits made by HIV-infected males increased 211.8% compared to 309.1% for HIV-infected females in this state. The majority (73.3%) of HIV-infected SC residents making ED visits were African-American. African-Americans experienced a 250.8% increase in annual ED visits over time compared to a 238.2% increase in whites and a 1,300% increase among other minorities. The majority (58.92%) of ED visits occurred in the 18-44 year old age group. This age group realized a 96.8% increase in annual ED visits over time. Annual ED visits made by the 45-64 year old age group and the 65 and older age group increased 883.7% and 2,850.0%, respectively. The 0-17 year old age group was the only age group to experience a decrease (600%) during this period of time. The majority of SC counties with the highest total annual ED visit rates were rural.

Conclusion: Despite the introduction of cART, HIV-infected SC residents make ED visits at a higher rate than the general population. Certain demographic groups appear to be disproportionately represented in the ED setting. By targeting these high utilizer groups, the state may better allocate resources and prevent the unnecessary and costly use of EDs in South Carolina.

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Introduction

Emergency Department (ED) visits have increased nationally over the past two decades [1,2]. The increase in visits surpasses the rate of population growth alone [2]. The increase in ED visits does not appear to be reversing since the Affordable Care Act (ACA) was fully implemented in 2015 [3]. ED utilization by HIV-infected patients in the United States (US) exceeds that of the general population [4]. The ACA intended to reduce ED visits on behalf of HIV-infected individuals through the expansion of Medicaid coverage, mandated inclusion of preventative care services and by establishing "'minimum essential benefits' e.g., physician visits, hospital stays and prescription drugs..." by insurance companies [5]. ED utilization on behalf of HIV-infected South Carolina (SC) residents has not been characterized since Combination Antiretroviral therapy (cART) was widely introduced in 1996. The demographic characteristics are important to delineate because ED visits on behalf of HIV-infected patients can be costly and potentially avoidable [4,6,7]. Identifying high utilizer groups will allow for the better allocation of limited resources and prevent costly and unnecessary use of EDs in SC.

Materials and Methods

This retrospective, twenty-year cohort study was conducted to examine the demographic characteristics of ED utilization on behalf of HIV-infected SC residents. The SC Uniform Billing database (UB-04 All Payer Hospital Data) maintained by the SC Revenue and Fiscal Affairs Office was used for the study. Acute care facilities in SC (N=70) collected the data. Specialty rehabilitation centers were excluded. Both HIV-infected and non-infected SC residents were included in the study. The data set was limited to HIV-infected and non-infected SC residents who made ED visits between the years 1996-2015. Inclusion criteria stipulated HIV or AIDS be listed as a top ten ED visit diagnosis. HIV-infected SC residents who made ED visits in neighboring states were excluded. The data inquiry was performed on June 7, 2017.

The data included white and African-American residents. Alternative racial/ethnic groups are included in the designation "Other" due to small representation in the data set. Age was organized into

groups consistent with those traditionally reported by the Center for Disease Control in Atlanta, Georgia. Additional variables included in the study were County of Origin and Gender. County of Origin is indicative of a patient's county of residence rather than ED visit location.

The annual ED visit rate for HIV-infected SC residents was calculated by dividing the total number of ED visits made annually on behalf of HIV-infected residents by the total number of HIV-infected residents documented that year. The annual ED visit rate for all SC residents was calculated by using the number of ED visits made annually divided by the total state population documented that year. Annual ED visit rates for HIV-infected SC residents were calculated by County of Origin using similar, region-specific calculations in order to account for population disparities between counties. The total number of HIV-infected SC residents was obtained from the HIV surveillance report monitored by the STD/HIV Division, SC Department of Health and Environmental Control. Only SC residents were included. In 1981, the state of SC mandated that all AIDS cases be reported. A mandate was instituted in 1986 that all HIV cases be reported. The data inquiry used in the study was performed on September 27, 2017.

The total number of SC residents was obtained from data published by the US Census Bureau. For years that the total state or county population was unknown projections were formulated from data sets based on acceptable estimated rates of growth. The data inquiry used in the study was performed on September 27, 2017. Counties were designated as rural based on criteria established by the Office of Rural Health Policy, Health Resources and Service Administration in Rockville, Maryland. The information was based on US Census data from 2010. The data inquiry was made on October, 5, 2017.

Results

General trends

The total number of ED visits made from 1996-2015 by HIV-infected SC residents was 29,909. The lowest number of annual ED visits made by HIV-infected SC residents occurred in 1998 (N=780) while the highest number occurred in 2014 (N=2,703). The total number of annual ED visits for HIV-infected SC residents increased 246.54% over time (Figure 1). The total number of ED visits on behalf of all SC residents from 1996-2015 was 31,652,809. The lowest number of annual ED visits occurred in 1996 (N=1,055,510) while the highest number occurred in 2015 (N=2,118,602). This represents a 100.72% increase in ED visits on behalf of all SC residents during this period of time. The annual ED visit rate increased 55.67% for all SC residents and 88.03% for HIV-infected SC residents (Figure 2).

Gender

Males constituted 60.00% (N=17,947) of the total ED visits made by HIV-infected residents from 1996-2015 while 40.00% (N=11,962) of ED visits were made by females. The lowest number of annual ED visits on behalf of HIV-infected males occurred in 1998 (N=493) and the highest number occurred in 2014 (N=1,537), reflecting a 211.76% increase over time (Figure 3). The lowest number of annual ED visits on behalf of HIV-infected females occurred in 1999 (N=285) and the highest number of visits occurred in 2014 (N=1,166), reflecting a 309.12% increase over time. Male HIV-infected SC residents comprised 68.61% of ED visits in 1996 and 59.31% of ED visits in 2015. Females comprised 31.39% of ED visits in 1996 and 40.68% of ED visits in 2015.

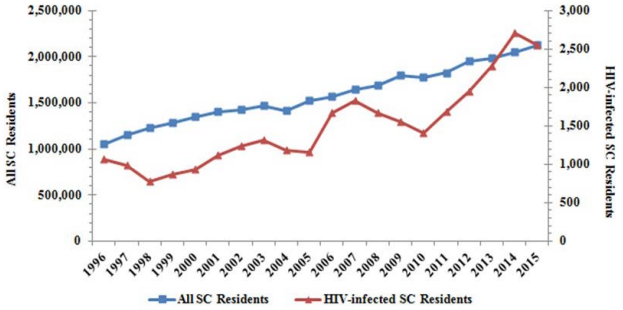

Figure 1: Total annual ED visits made by all South Carolina residents (left axis) and HIV-infected SC residents (right axis), South Carolina hospitals, 1996-2015.

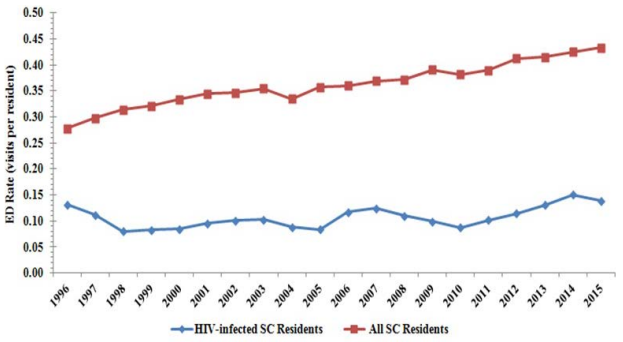

Figure 2: Annual ED visit rates among all South Carolina residents and HIV-infected South Carolina residents, South Carolina hospitals, 1996-2015.

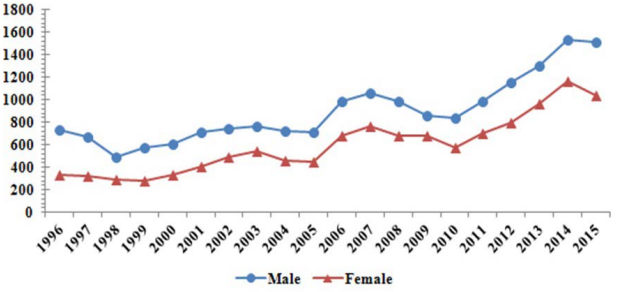

Figure 3: Total number of annual ED visits on behalf of HIV-infected South Carolina residents by gender, South Carolina hospitals, 1996-2015.

Race/Ethnicity

The majority (73.26%) of HIV-infected SC residents who made ED visits between 1996 and 2015 were African-American (N=21,912). White HIV-infected SC residents comprised 25.27% of ED visits during this period of time (N=7,557). Minority groups not otherwise characterized comprised 1.47% of total ED visits (N=440). The total number of ED visits made annually on behalf of African-American

HIV-infected SC residents peaked in 2014 (N=1,947) and was at its lowest in 1998 (N=555). This reflects a 250.81% increase in ED visits over the two decades studied (Figure 4). The total number of ED visits made annually on behalf of white HIV-infected SC residents peaked in 2014 (N=700) and was at its lowest in 1999 (N=207). This reflects a 238.16% increase in ED visits over the two decades studied. The total number of ED visits made annually on behalf of other minority groups peaked in 2014 and 2015 (N=56) and was at its lowest in 1997 and 1998 (N=4 for each year). This reflects a 1,300.00% increase in ED visits over the two decades studied.

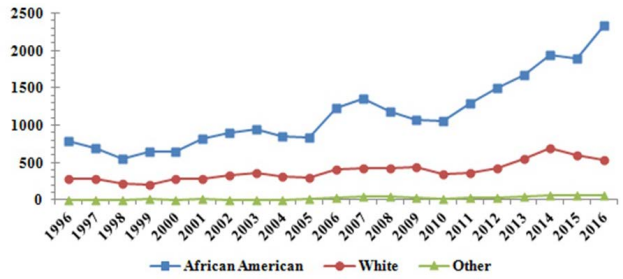

Figure 4: Total annual ED visits on behalf of HIV-infected South Carolina residents by Race/Ethnicity, South Carolina hospitals, 1996-2015.

The racial/ethnic composition of HIV-infected SC residents making ED visits has changed over time. In 1996, African-Americans comprised 73.50% of total ED visits, whites 26.03% and other racial/ethnic groups 0.47%. In 2015, African-Americans comprised 74.47% of total ED visits, whites 23.34% and other racial/ethnic groups 2.19%.

Age groups

The majority (58.92%) of HIV-infected SC residents who made ED visits between 1996 and 2015 were in the 18-44 year old age group (N=17,623). The 45-64 year old age group compromised 38.94% of total ED visits during this time (N=12,793). The 65 and older age group compromised 2.75% (N=260) of total ED visits and the 0-17 year old age group represented 0.79% (N=253) of the total ED visits. The total number of ED visits made annually on behalf of the 18-44 year old age group peaked in 2014 (N=1,210) and was at its lowest in 1998 (N=615). The percent increase in annual ED visits for this age group was 96.75% (Figure 5). The total number of ED visits made annually on behalf of the 45-64 year old age group peaked in 2014 (N=1,377) and was at its lowest in 1998 (N=140), indicating a 883.57% increase over time. The total number of ED visits made annually on behalf of the 65 and older age group peaked in 2015 (N=118) and was at its lowest in 1996 and 1998 (N=4 for each year). This represents a 2,850.00% increase in annual ED visits over time. The 0-17 year old age group recorded the highest number of annual ED visits in 1998 (N=21) and the lowest in 2010 (N=3), indicating a 600.00% decrease in annual ED visits over time.

The distribution of HIV-infected SC residents who made annual ED visits within specific age groups has changed over time. In 1996, the 18-44 year old age group comprised 83.27% of annual ED visits, the 45-64 year old age group, 14.94%, the 65 and older age group, 0.38% and the 0-17 year old age group, 1.41%. In 2015, the 18-44 year old age group comprised 45.38% of annual ED visits, the 45-64 year old age group, 49.84%, the 65+ year old age group, 4.62%, and the 0-17 year old age group, 0.16%.

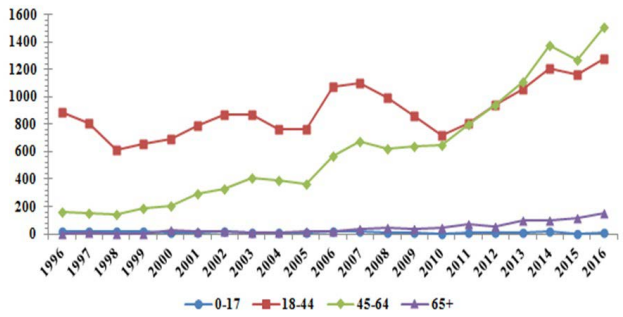

Figure 5: Total annual ED visits on behalf of HIV-infected South Carolina residents by age group, South Carolina hospitals, 1996-2015.

County of origin

Charleston County had the largest number of ED visits on behalf of HIV-infected SC residents between 1996 and 2015 (N=3,967, 12.19%). McCormick County had the lowest number of ED visits during this period (N=57, 0.17%). The highest average annual ED visit rate occurred in Newberry County. The lowest average annual ED visit rate occurred in Edgefield County (Table 1).

The sixteen counties with the highest total annual ED visit rates made by HIV-infected county residents were Allendale, Bamberg, Chesterfield, Dillon, Fairfield, Florence, Georgetown, Greenwood, Laurens, Lexington, Marlboro, Newberry, Oconee, Saluda, Union and Williamsburg. Ten of these sixteen counties are considered rural (Figure 6). Several counties realized a decrease in their annual ED visit rate from 1996 to 2015. These counties were Aiken, Allendale, Anderson, Bamberg, Barnwell, Beaufort, Calhoun, Clarendon, Darlington, Dillon, Dorchester, Edgefield, Fairfield, Florence, Greenville, Greenwood, Jasper, Laurens, Lexington, Marion, Marlboro, Oconee, and Richland.

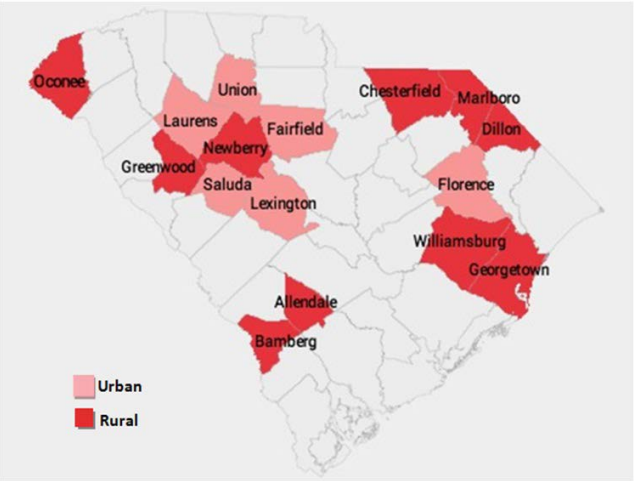

Figure 6: Counties in South Carolina with the highest total sum of ED visit rates on behalf of HIV-infected residents from 1996 to 2015 (in color), South Carolina hospitals.

	Total ED Visits 1996	Total ED Visits 2015	Total ED Visits 1996-2015	Annual ED Visit Rate 1996 (per 1,000 Residents)	Annual ED Visit Rate 2015 (per 1,000 Residents)	Average Annual ED Visit Rate 1996-2015 (per 1,000 Residents)
Abbeville	1	9	76	53	196	112
Aiken	12	19	233	65	46	38
Allendale	8	14	224	364	286	272
Anderson	27	30	397	162	83	75
Bamberg	13	10	282	217	99	174
Barnwell	10	5	215	161	40	115
Beaufort	20	41	519	121	97	78
Berkeley	2	66	969	10	134	133
Calhoun	3	3	81	143	60	100
Charleston	62	288	3652	61	144	118
Cherokee	7	36	224	156	387	143
Chester	6	26	79	150	277	54
Chesterfield	1	12	218	21	108	143
Clarendon	17	15	214	165	84	69
Colleton	13	42	271	137	228	85
Darlington	40	37	460	328	136	121
Dillon	27	18	358	474	122	191
Dorchester	21	50	674	156	127	118
Edgefield	1	2	35	16	14	18
Fairfield	1	1	303	23	10	178
Florence	119	97	1657	363	120	144
Georgetown	15	49	713	124	187	175
Greenville	124	200	1843	209	140	127
Greenwood	21	17	548	183	70	157
Hampton	1	27	321	22	185	140
Horry	54	243	1769	144	245	126
Jasper	6	9	89	130	88	54
Kershaw	20	53	406	206	272	130
Lancaster	4	128	427	58	472	94
Laurens	30	29	574	330	155	205
Lee	7	46	266	140	279	107
Lexington	68	28	1762	209	36	149
McCormick	0	0	56	0	0	132
Marion	26	36	254	289	211	103
Marlboro	19	15	437	229	112	199
Newberry	3	79	716	65	681	351
Oconee	20	7	179	500	81	152
Orangeburg	18	101	909	61	201	105
Pickens	5	21	179	79	135	80
Richland	124	127	2984	85	38	58
Saluda	0	1	83	0	26	143
Spartanburg	36	220	1716	105	285	141
Sumter	40	233	1417	113	345	119
Union	1	10	164	37	182	198
Williamsburg	5	26	642	57	103	180
York	6	39	356	28	71	40

Table 1: Counties in South Carolina with the highest and lowest total sum of ED visit rates on behalf of HIV-infected residents from 1996 to 2015, South Carolina Hospitals 1996-2015.

Discussion

This study aimed to define the demographic characteristics of HIV-infected SC residents who made ED visits since cART was widely introduced in 1996. This population-based study examined a twenty-year period from 1996-2015. Our investigation revealed many significant findings. The number of ED visits made annually by HIV-infected SC residents has increased over time. The rate of increase is greater than that of the general population and therefore cannot be attributed to population growth alone. Previously published studies have suggested similar trends nationwide [4,8,9]. The reasons for this finding are not known. Prior studies have suggested that HIV-infected patients that visit EDs' have a higher admission rate and therefore may present in worse condition than their uninfected counterparts [4,7]. They are also more likely to use the ED for low urgency visits [6]. Poor access to preventative services, greater incidence of comorbidities, substance abuse, low socioeconomic status and lack of insurance may preferentially direct HIV-infected patients to use ED services more commonly than uninfected patients [6,10-12].

Males represent 49% of the total state population but comprise the majority (71%) of HIV infected residents [13]. Males also consistently make the majority of ED visits in this state, however, women have been shown to comprise a growing percentage of annual ED visits over time. This is contrasted by a 34% decrease in newly diagnosed HIV cases in women over the past ten years [13]. Prior authors have suggested HIV-infected women demonstrate increased health care utilization and are more likely to use the ED than their male counterparts [9,14-16]. This, paired with inadequate primary care engagement, may be contributing factors to this discrepancy [17,18].

African-Americans are disproportionately affected by HIV in the state of SC. They comprise 28% of the total state population but represent 69% of the total HIV cases in this state [19,13]. The majority of ED visits were made by African-Americans, reflecting high disease prevalence in this group. Unfortunately, an increasing percentage of annual ED visits are made by African-Americans or other minority groups. Racial disparities in care exist which may increase the need for minorities to utilize EDs to meet their health care needs [20,21]. Other variables that have been associated with higher ED utilization that are found commonly in minority groups include poverty, lack of insurance, cost barriers, poor access to medical care and inadequate testing [19,22-24].

The HIV population in SC is aging. HIV-infected residents age 50 and older represent 46.7% of the total infected patients compared to 37% of the total state population [13]. While the majority of ED visits from 1996-2015 were made by the 18-44 year old age group, the greatest increase in ED visits occurred in the 45-64 year old and 65 years and older age groups. This trend likely reflects the changing demographic characteristics of our state's HIV population. In addition, the aging HIV population in our state is realizing an increase in age-related conditions that require additional medical care and services which likely contributes to ED utilization [25]. The only age group to realize a decrease in ED utilization over time was the 0-17 year old age group. This reflects the continued decrease in HIV incidence documented in this age group.

Finally, the majority (62.5%) of counties that were listed in the top third percentile for total annual ED visits rates from 1996-2015 are considered rural. Rural residents in the US face many health issues including physician or provider work shortages, a widening gap in life expectancy and a wave of hospital closures [26]. Rural residents tend to be less healthy than their urban counterparts in part because of poor lifestyle choices [27]. Medicaid covers a larger percentage of rural residents compared to urban dwellers and therefore inadequate insurance coverage and the lack of Medicaid expansion in SC may also be adversely affecting rural-based, HIV-infected residents' access to preventative care [28]. Rural residents are more likely to have a low socioeconomic status and this has been shown to be associated with greater ED use for conditions that can be managed in the outpatient setting [12]. Rural counties are also less likely to receive HIV preventative services which are likely to unfavorably influence ED utilization [29].

Our study has several limitations. The uniform billing database does not contain ED visits made on behalf of HIV-infected South Carolina residents in other states. In addition the database does not include clinical information i.e., CD4 counts, use of cART, or whether they are currently in care. Despite the introduction of cART, SC HIV-infected residents make ED visits at a higher rate than the general population. Certain demographic groups appear to be disproportionately represented in the ED setting. By targeting these high utilizer groups, the state may begin to better allocate resources and prevent the unnecessary and costly use of EDs in South Carolina.

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