

Sepsis: an analysis of New Jersey Hospital Discharge Data

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BACKGROUND

- Sepsis affects approximately 1.7 million adults in the United States each year and potentially contributes to more than 250,000 deaths.¹
- According to CDC data from 2017, septicemia was the fifth leading cause of death among New Jersey (NJ) residents totaling 1,898 deaths¹ with a rate of 16.7 per 100,000 persons compared to the national average of 10.6 per 100,000.
- In NJ, there is heterogeneity in the incidence of septicemia related mortality.

PURPOSE: The purpose of the study is to evaluate whether this heterogeneity in sepsis mortality is associated with regional disparities in community such as socioeconomic level and the individual risk for sepsis-related morbidity and mortality in hospitalized patients.

HYPOTHESIS: We hypothesized that communities with higher rates of poverty would experience higher rates of mortality due to sepsis. Further, we investigated the impact of other variables, such as race, age, and gender, on sepsis mortality.

METHODS

- Using the New Jersey Discharge Data Collection System database (NJDDCS), a retrospective case-control study of acute care patients discharged with a diagnosis that included sepsis was performed.
- Population of interest were identified using computerized discharge ICD10 diagnostic code, A41 for "Other Sepsis." The diagnostic category "other sepsis" includes the eight child codes of A41 other sepsis: A41.0 Sepsis due to *Staphylococcus aureus*, A41.1 Sepsis due to other specified staphylococcus, A41.2 Sepsis due to unspecified staphylococcus, A41.3 Sepsis due to *Hemophilus influenzae*, A41.4 Sepsis due to anaerobes, A41.5 Sepsis due to other Gram-negative organisms, A41.8 Other specified sepsis, and A41.9 Sepsis, unspecified organism. To analysis cases of mortality, a modifier code was applied.
- We reviewed demographic data including age (percentage of the population 65 years and older), gender, and race.
- To analyze socioeconomic status, the American Community Survey (ACS) was used to extract data on the percentage of families in New Jersey living below the poverty level at the zip code level.
- The ACS is the largest household survey that the Census Bureau administers. It is sent to approximately 295,000 addresses monthly (or 3.5 million per year) and is used by many public-sector, private-sector, and not-for-profit stakeholders to allocate funding, track shifting demographics, plan for emergencies, and learn about local communities.

KEY FINDINGS

An examination of the discharge data of 1,286,314 acute care hospitalizations identified 62,160 (4.61%) cases of sepsis and 7,892 deaths associated with hospitalization with sepsis.

- 28,886 (46.5%) sepsis cases are in females
- 13.3% of female sepsis cases did not survive

Table 1 summarizes demographic data of patients hospitalized with sepsis and associated deaths.

- White patients had higher percentage of hospitalization for sepsis (70.3%) than nonwhite patients.
- Black and Asians had the highest percentages of death, 14.4% and 14.5%, respectively, compared to 13.5% of white patients.
- Higher poverty rates was not associated with increased hospitalization for sepsis with the highest percentage of hospitalization for sepsis occurring among the lowest poverty rate (<=25%).

	Sepsis-related inpatient hospitalizations, n = 62,160	Sepsis-associated deaths, n = 7,892	% death of Age, Race, and Poverty level (Case fatality rate)
Age			
<45 years old	10531, 17%	332	3%
45-65 years old	16023, 26%	1,776	11%
65-85 years old	25730, 41%	3,881	15%
>85 years old	9876, 16%	1,903	20%
Distribution of race n, % (Missing 4414)			
White	40564, 70%	5473	13.5%
Black	9585, 17%	1375	14.4%
Asian	1305, 2%	189	14.5%
Multiracial	69, 0.2%	6	8.7%
Other	5072, 9%	525	10.4%
Unknown/Declined	1151, 2%	176	15.3%
Distribution of poverty rates			
<=25% below poverty rate	27333, 44%	3217	11.8%
>25 to <=50%	11847, 19%	1515	12.8%
>50 to <=75%	11502, 19%	1595	13.9%
>75%	11478, 19%	1565	13.6%

Asian/Pacific Islander (Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, Other Asian, Native Hawaiian, Guamanian or Chamorro, Samoan, Other Pacific Islander)

Table 2 shows hospitalization for sepsis and sepsis death (per 100,000) by race

	Sepsis death rate per 100,000	Sepsis death rate per 100,000	Sepsis death rate per 100,000
White	6.07M, 67.91%	40564/6.07M = 668	5473/6.07M = 90
Black	6.07M, 67.91%	40564/6.07M = 668	5473/6.07M = 90
Asian	841K, 9.41%	1305/841K = 155	189/841K = 22
Multiracial	232K, 2.6%	69/232K = 30	6/232K = 3
Other	590K, 6.6%	5072/590K = 860	525/590K = 89

Table 3 compares demographic data between survivors and non-survivors.

- Gender and race were not statistically different between survivors and non-survivors.
- Age and poverty are associated with increased sepsis mortality.
- Patients residing in zip codes with the highest poverty rate (>75%) were 1.18 times more likely to not survive hospitalization for sepsis compared to patients residing in less impoverished zip codes <=25% (p<0.0001).

Variable	Survivor	Non-survivor	OR	CI
Gender				
F	25032	3854	1.02	0.97-1.07
Age				
<45 years old	10199	332	1	
45-65 years old	14247	1776	3.8	3.4-4.3
65-85 years old	21849	3881	5.5	4.9-6.1
>85 years old	7973	1903	7.3	6.5-8.3
Distribution of race n, %				
White	35091	5473	1	
Black	8210	1375	1.07	1.01-1.14
Asian	1116	189	1.08	0.93-1.27
Multiracial	63	6	0.61	0.26-1.41
Other	4547	525	0.74	0.68-.82
Unknown/Declined	975	176		
Distribution of poverty rates			1	
<=25%	24116	3217	1.1	
>25 to <=50%	10332	1515	1.10	1.03-1.17
>50 to <=75%	9907	1595	1.21	1.13-1.28
>75%	9913	1565		1.11-1.26

DISCUSSION

- Contrary to previous reports that show disparities in sepsis-related health outcomes (incidence and mortality) with race differences, this analysis did not find an increase in sepsis mortality associated with race or gender.
- However, it showed a statistically significant association in mortality from sepsis with age and poverty.
- Patients residing in zip codes with high poverty rates were 1-1.2 times more likely to not survive hospitalization for sepsis compared to patients residing in less impoverished zip codes.
- While this report shows that age and poverty appear to be associated with sepsis related mortality, this significance would need to be examined in models adjusted for other clinical and socioeconomic variables.

LIMITATIONS

- This study did not examine differences in clinical metrics among patients, such as severity of illness scores (SOFA, sepsis related organ dysfunction/failure score).
- Data was limited to administrative data from NJDDCS, which may also have issues related to accuracy, specificity and completeness. As a result, further investigation and research is needed into marrying the clinical presentation of patients with sepsis reporting, coding and management of hospitalized adult sepsis patients.
- In addition, multivariable analysis is needed to find patterns and relationships between more than one variable simultaneously. Variables to consider for multivariable analysis may include but are not limited to age, gender, race/ethnicity, health insurance, transfer from another hospital, admission on weekend, teaching status of the hospital, and number of organ dysfunctions.

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