

Original Research Article

Racial and Socioeconomic Disparities in Cervical Cancer Mortality

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ABSTRACT

Background: Despite the fact that cancer of the cervix is known to be a preventable cancer, it remains one of the leading causes of cancer related deaths in females. Cervical cancer is the third most commonly diagnosed cancer and the fourth leading cause of cancer related death in females

Objectives: The purposes of this study were to determine cervical cancer inpatient mortality across different racial groups and different median household income levels in the United States.

Methods: This study made use of the National/Nationwide Inpatient Sample (NIS) database. The NIS is the largest inpatient database in the United States containing data from 1988 to 2013. The four most recent available calendar years (2010 to 2013) were obtained for the analysis.

Results: In the selected four calendar years, a total of 86,193,186 female patients were admitted. Of these patients, the number of cervical cancer patients was 61,992. Out of this number, 60,972 (98.4%) patients were discharged while 1,020 (1.6%) patients died during hospitalization. The Black race had the highest death rate (3.0%) while Asian or Pacific Islander had the lowest death rate (1.1%). The lowest income category (< \$39,000) had the highest death rate (2.0%) while the highest income category (> \$63,000) had the lowest death rate (1.3%). Findings suggested that cervical cancer inpatient mortality differed significantly by race and median household income level with the P-values of 0.000 and 0.001 respectively.

Conclusion: Racial and income level disparities in cervical cancer inpatient mortality are present in the United States with the Black race having the highest mortality rate. There is a need for the creation of targeted prevention and treatment programs that will address the racial and socioeconomic gaps in cervical cancer mortality.

Keywords: race, ethnicity, income, socioeconomic, mortality, death, inpatient, cervical cancer, United States

INTRODUCTION

Cervical cancer is a type of cancer in which malignant cells form in the tissue of the cervix or cervix uteri. The cervix is the lower part of the uterus connecting the body of the uterus (corpus uteri) to the vagina. Despite the fact that cancer of the cervix is known to be a preventable cancer, it remains one of the principal causes of cancer related deaths in females under the age of 60. [1-3] Cervical cancer is the third most commonly diagnosed cancer and the fourth leading

cause of cancer related death in females worldwide with over 527,000 new cases, [1,2] and perhaps the second most common malignancy among females in the third world countries. [3-5] In the United States, over 12,000 women were diagnosed with cervical cancer in 2015. [6] In the years before 2000, studies have shown that racial differences exist in cervical cancer outcomes such as mortality rate. [6-9] However, it is less clear if there are still disparities in the recent years. Additionally,

there are no studies on the analysis of the mortality of cervical cancer that has used the NIS database. The main goals of this study were to determine cervical cancer inpatient mortality across different racial/ethnic groups and different median household income levels in the United States using the NIS data. Keeping track of cervical cancer mortality will help researchers and policy makers know what progress has been made and what still needs to be done. The outcome of this study can also influence the decision-making process regarding access to cervical screening tests, HPV vaccine, and treatment at the national, regional, state, and community levels.

METHODS AND MATERIALS

This study made use of the NIS database. The NIS database was developed by the Healthcare Cost and Utilization Project (HCUP). The NIS is the largest inpatient care database in the United States containing data from 1988 to 2013. It includes about 98% of all hospital discharges in the United States. It consists of over a hundred nonclinical and clinical data elements for each hospital stay. The four most recent available calendar years (2010 to 2013) were obtained for the analysis of cervical cancer mortality across different racial/ethnic groups and different median household income levels. Cervical cancer was identified using the ICD-9-CM codes. Cervical cancer codes include: 1800, 1801, 1808, 1809, 2331, 7950, 79501, 79502, 79503, 79504, and 79506. The SPSS statistical software was employed to extract and analyze the NIS dataset. The two-tailed chi-squared test was conducted to test for racial/ethnic and median household income differences in cervical cancer mortality. The statistical significance was defined as $P < 0.05$.

RESULTS

This section presents the findings from the analysis of data from the NIS for 2010, 2011, 2012, and 2013. In the selected four calendar years, a total of 86,193,186

female patients were admitted. Of these patients, the number of cervical cancer patients was 61,992. Out of this number, 60,972 (98.4%) patients were discharged while 1,020 (1.6%) patients died during hospitalization. Table 1 shows the distribution of cervical cancer patients' discharge and dead counts as well as the discharge and death rates and total count by the calendar year.

In the years 2010, 2011, 2012, and 2013, 19833, 15859, 13875, and 12425 cervical cancer patients were admitted respectively. Fig 1 presents the trend of the cervical cancer patient count by the calendar year.

Table 1: Distribution of Cervical Cancer Inpatient by Calendar Years, United States, 2010-2013

Calendar Year	Discharge		Died During Hospitalization		Total
	Count	%	Count	%	Count
2010	19587	98.8	246	1.2	19833
2011	15555	98.1	304	1.9	15859
2012	13615	98.1	260	1.9	13875
2013	12215	98.3	210	1.7	12425
Total	60972	98.4	1020	1.6	61992

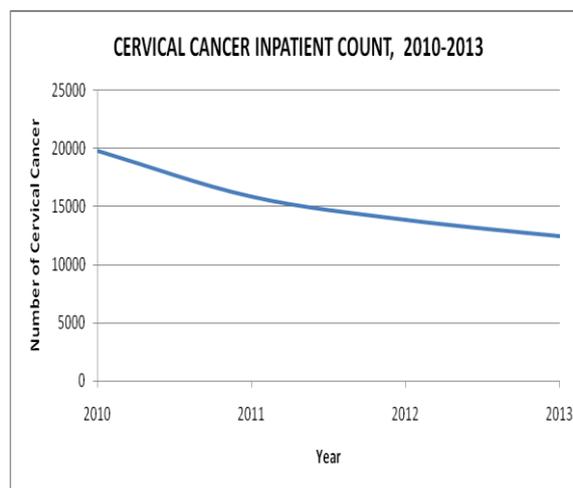


Fig 1: Trend of Cervical Cancer Inpatient Count, United States, 2010 - 2013

The racial distribution of the study sample is as follows: 33,026 White cervical cancer patients were admitted, 459 (1.4%) patients died during hospitalization, 9,597 Black, cervical cancer patients were admitted, 284 (3.0%) patients died during hospitalization, 9597 Hispanic cervical cancer patients were admitted, 178 (1.9%) patients died during hospitalization, 2,336 Asian or Pacific Islanders cervical cancer

patients were admitted, 26 (1.1%) patients died during hospitalization, 331 Native American cervical cancer patients were admitted, 5 (1.5%) patients died during hospitalization, and 2062 other category cervical cancer patients were admitted, 21

(1.0%) patients died during hospitalization. $\chi^2 = 23.067$ and $P = 0.000$.

Table 2 shows the distribution of cervical cancer patients' discharge and dead counts as well as the discharge and death rates and total count by race. Fig 2 shows rates of died during hospitalization by race

Table 2: Distribution of Cervical Cancer Patients by Race, United States, 2010-2013

Race	Discharge		Died During Hospitalization		Total	Chi-Squared Value	P-Value
	Count	%	Count	%			
WHITE	32567	98.6	459	1.4	33026		
BLACK	9313	97.0	284	3.0	9597		
HISPANIC	9419	98.1	178	1.9	9597		
ASIAN OR PACIFIC ISLANDER	2310	98.9	26	1.1	2336		
NATIVE AMERICAN	326	98.5	5	1.5	331		
OTHER	2041	99.0	21	1.0	2062		
Total	55976	98.3	973	1.7	56949	23.067	0.000

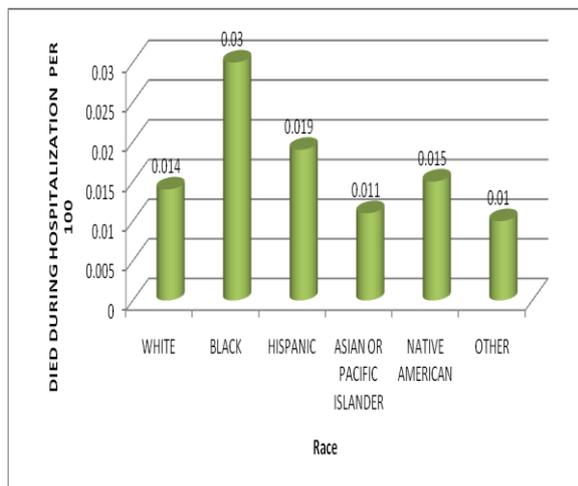


Fig 2: Rates of Died During Hospitalization by Race, United States, 2010-2013

The median household income distribution of the study sample is as follows: In the category of 1 (\$1 - \$38,999),

1958 cervical cancer patients were admitted, 398 (2.0%) patients died during hospitalization; in the category of 2 (\$39,000 - \$47,999), 15,118 cervical cancer patients were admitted, 238 (1.6%) patients died during hospitalization; in the category of 3 (\$48,000 - \$62,999), 13,950 cervical cancer patients were admitted, 208 (1.5%) patients died during hospitalization., in the category of 4 (\$63,000 or more), 11,651 cervical cancer patients were admitted, 146 (1.3%) patients died during hospitalization. $\chi^2 = 17.26$ and $P = 0.001$. Table 3 shows the distribution of cervical cancer patients' discharge and dead counts as well as the discharge and death rates and total count by median household income.

Table 3: Distribution of Cervical Cancer Patients by Median Household Income, United States, 2010-2013

Income	Discharge		Died During Hospitalization		Total	Chi-Squared Value	P-Value
	Count	%	Count	%			
\$1 - \$38,999	19184	98.0	398	2.0	19581		
\$39,000 - 47,999	14883	98.4	234	1.6	15118		
\$48,000 - \$62,999	13742	98.5	208	1.5	13950		
\$63,000 or more	11505	98.7	146	1.3	11651		
Total	59314	98.4	986	1.6	60300	17.26	0.001

DISCUSSION

The findings of this study indicate a gradual decrease in the total number of cervical patients admitted from 2010 to 2013 with the highest number recorded in 2010 with 19,833 patients and the lowest number of cervical patients recorded in

2013 as 12,425. However, there were no consistent patterns regarding the number of cervical cancer patients who died during hospitalization. Percentage wise, the year 2010 recorded the lowest percentage of deaths at 1.2% while in both the years 2011 and 2012, the highest percentage occurred at

1.9% and in 2013 the mortality rate was 1.7%.

In terms of median household income levels; the mortality rate distribution shows that the lowest income category (median household income less than \$39,000) has the highest death rate (2.0%) while the highest income category (median household income equal or greater than \$63,000) records as having the lowest death rate (1.3%). As the median household income increases, the death rate decreases. Conversely, as the median household income increases, the discharge rate increases. The chi-squared test shows that there is statistically significant ($\chi^2= 17.26$ and $P= 0.001$) median household income differences in died during hospitalization at alpha ($P < 0.05$). These results are similar to the findings from the study conducted by Singh and colleagues on socioeconomic disparities in USA incidence of cervical cancer, stage, mortality, and survival, 1975-2000 (pre-HPV vaccination era).^[10]

The death rate distribution shows that the Black (3.0%) has the highest death rate followed by others (1.7%), Native Americans (1.5%), White (1.4%) while Asian or Pacific Islanders (1.1%) have the lowest death rate. The chi-squared test shows statistically significant ($\chi^2= 23.067$ and $P= 0.000$) racial differences in died during hospitalization at alpha ($P < 0.05$).

The discharge rate distribution shows that the others category (99%) has the highest discharge rate followed by the Asian and Pacific Islanders (98.8%), White (98.6%), Native Americans (98.5%) and Black (97.0%) document as having the lowest discharge rate.

In previous studies, racial differences in cervical cancer outcomes have been attributed to many factors, including stage at presentation,^[11-19] treatment differences,^[11,12,9,16,20,21] co-morbid conditions,^[20] and socioeconomic status,^[13,14,20,22-28] So with the continuous racial disparities in cervical cancer mortality, it is highly recommended that the roles of cervical cancer genomic profiles in

racial differences are investigated. Uncovering tumor genomic patterns across different racial groups can lead to the discovery of therapeutic targets and improved cervical cancer treatments that will contribute to alleviating cervical cancer outcome inequalities.

CONCLUSION

Overall, racial disparities in cervical cancer inpatient mortality exist in the United States with the Black race having the highest mortality rate. Therefore, there is a need for the creation of targeted prevention and treatment programs that will address the racial gaps in cervical cancer inpatient mortality. This research has provided valuable information regarding the mortality rates of cancer of the cervix across different ethnicities/racial groups and different median household income levels in the United States.

Conflicts of interest: No conflict of interest associated with this work

Author's contributions: FFO conceived and designed the study, analyzed and interpreted the data, and wrote the manuscript.

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