

Race/Ethnicity and Socioeconomic Status are Associated with Delayed Time to Treatment in Patients with Hepatocellular Carcinoma: Results from the Surveillance, Epidemiology, and End Results Cancer Registry

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Introduction: Hepatocellular carcinoma (HCC) is a major complication in patients with cirrhosis and a leading cause of cancer-related deaths in the United States (US). Delays in initiation of treatment are associated with poor HCC outcomes; however, factors that predict time to treatment are underexplored. We aimed to examine differences in time to treatment by race, ethnicity, and socioeconomic status (SES) in adults with HCC.

Methods: The source of data for this cross-sectional analysis was the National Cancer Institute (NCI)'s Surveillance, Epidemiology, and End Results Cancer Registry (SEER 22), a racially and ethnically diverse cancer database. We used SEER*Stat version 8.4.0.1 to identify individuals age ≥ 18 with a confirmed HCC diagnosis in 2006-2018 and treatment within 12 months of diagnosis. We excluded individuals with fibrolamellar histology, history of prior cancer, missing data, or liver transplant. Our primary outcome was diagnosis-to-treatment interval (DTI), defined as time (months) between diagnosis and first HCC treatment (surgery, radiation, and/or chemotherapy). We categorized DTI into two groups: 1) ≤ 3 months (standard of care) and 2) >3 months (delayed care). We used Chi-square tests to compare DTI by race/ethnicity and by SES. We used multivariable logistic regression to determine predictors of delayed DTI, with particular attention to race/ethnicity and SES. Covariates included age, sex, race/ethnicity (6 mutually exclusive categories), stage at diagnosis, treatment type, residence type, and SES (5 quintiles).

Results: 35,363 individuals were included in the study. Mean age was 63.2 years (s.d.=10.0), 77.2% were male, and 51.8% were non-White. Average DTI was 2 months, and 5,799 (16.1%) individuals had delayed DTI. Delayed DTI varied by race/ethnicity, SES, stage at diagnosis, and treatment type ($p < 0.001$) (Table 1). Hispanic (adjusted Odds Ratio 1.51; 95%CI 1.40-1.63) and Non-Hispanic American Indian/Alaskan Native race/ethnicity (aOR 1.44; 95%CI 1.04-1.94) were associated with significantly higher odds of delayed DTI than non-Hispanic White individuals. Odds of delayed DTI decreased as SES level increased. Individuals who underwent surgery only (aOR 0.72, 95%CI 0.66-0.77) and who received 2 or 3 treatment modalities [(aOR 0.74, 95%CI 0.68-0.81), (aOR 0.37, 95%CI 0.21-0.62)] had decreased odds of delayed DTI when compared to those who received chemotherapy only. Regional (aOR 0.74, 95%CI 0.69-0.79) and distant (aOR 0.31, 95%CI 0.27-0.36) stage at diagnosis were also associated with decreased odds of delayed DTI.

Conclusion: We used national cancer registry data to show that race/ethnicity and SES are predictors of delayed DTI in adult patients with HCC. Future work must elucidate why these differences exist, and providers and health systems must identify methods to assure that all patients have access to timely treatment.

Table 1: Characteristics of study sample with hepatocellular carcinoma, diagnosed 2006-2018, SEER 22. N=35,363

	Total, N (%) (N=35,363)	Diagnosis-to-Treatment Interval, N (%)		P value
		≤3 month (n=29,564)	>3 month (n=5,799)	
Male Sex	27,308 (77.2)	22,766 (83.4)	4,542 (16.6)	0.03
Race/Ethnicity				
Non-Hispanic White	17,104 (48.4)	14,564 (85.1)	2,540 (14.2)	<0.0001
Non-Hispanic Black	4,575 (12.9)	3,819 (83.5)	756 (16.5)	
Hispanic (All Races)	6,965 (19.7)	5,421 (77.8)	1,544 (22.2)	
Non-Hispanic Asian or Pacific Islander	6,264 (17.7)	5,393 (86.1)	871 (13.9)	
Non-Hispanic American Indian/Alaska Native	372 (1.1)	293 (78.8)	79 (21.2)	
Non-Hispanic Unknown Race	83 (0.2)	74 (89.2)	9 (10.8)	
Socioeconomic Status (SES), quintile				
Group 1 (Lowest SES)	6,267 (17.7)	5,079 (81.0)	1,188 (19.0)	<0.0001
Group 2	5,991 (16.9)	4,903 (81.8)	1,088 (18.2)	
Group 3	6,461 (18.3)	5,432 (84.1)	1,029 (15.9)	
Group 4	7,208 (20.4)	6,042 (83.8)	1,166 (16.2)	
Group 5 (Highest SES)	7,402 (20.9)	6,433 (86.9)	969 (13.1)	
Unknown	2,034 (5.8)	1,675 (82.4)	359 (17.6)	
Stage at Diagnosis				
Localized	21,247 (60.1)	17,324 (81.5)	3,923 (18.5)	<0.0001
Regional	9,444 (26.7)	7,998 (84.7)	1,446 (15.3)	
Distant	3,668 (10.4)	3,396 (92.3)	272 (7.4)	
Unknown/Unstaged	1,004 (2.8)	846 (84.3)	158 (15.7)	
Treatment Type				
Chemotherapy Only	17,342 (49.1)	14,261 (82.2)	3,081 (17.8)	<0.0001
Radiation Only	2,935 (8.3)	2,294 (78.2)	641 (21.8)	
Surgery Only	8,785 (24.9)	7,530 (85.7)	1,255 (14.3)	
2 Treatment Modalities	5,979 (16.9)	5,180 (86.6)	799 (13.4)	
3 Treatment Modalities	286 (0.8)	268 (93.7)	18 (6.3)	
Setting of Residence, n (%)				
Urban	31,213 (88.3)	26,108 (83.6)	5,105 (16.4)	0.10
Rural	2,648 (7.5)	2,229 (84.2)	419 (15.8)	
Unknown	1,502 (4.3)	1,227 (81.7)	275 (18.3)	
<p>For race/ethnicity, we created a single variable with mutually exclusive categories: non-Hispanic White, non-Hispanic Black, non-Hispanic Asian/Pacific Islander, non-Hispanic American Indian/Alaska Native, Hispanic, and non-Hispanic Unknown.</p> <p>Socioeconomic status (SES) level was determined by YOST, a composite score provided by NCI/SEER that is constructed from seven variables (median household income, median house value, median rent, percent below 150% of poverty line, education index, percent working class, and percent unemployed) to measure different aspects of the SES of a census tract. The census tracts were categorized into SES groups from 1 to 5, with 5 being the highest SES group.</p>				
SEER: Surveillance, Epidemiology, and End Results				

Table 2: Clinical and sociodemographic factors associated with delayed diagnosis-to-treatment interval among individuals with HCC using a multivariable logistic regression model. N=32,316

	Adjusted Odds Ratio (95% CI)	P-value
Sex		
Female	1.00	
Male	0.99 (0.87-1.00)	0.050
Race/Ethnicity		
Non-Hispanic White (ref.)	1.00	
Non-Hispanic Black	1.02 (0.92-1.13)	0.705
Hispanic (All Races)	1.51 (1.40-1.63)	<0.001
Non-Hispanic Asian or Pacific Islander	0.98 (0.90-1.07)	0.619
Non-Hispanic American Indian/Alaska Native	1.44 (1.08-1.94)	0.014
Socioeconomic Status (SES), quintile		
Group 1 (Lowest SES)	1.00	
Group 2	0.97 (0.88-1.06)	0.490
Group 3	0.84 (0.76-0.92)	<0.001
Group 4	0.88 (0.80-0.97)	0.009
Group 5 (Highest SES)	0.70 (0.63-0.78)	<0.001
Stage at diagnosis		
Localized (ref.)	1.00	
Regional	0.74 (0.69-0.79)	<0.001
Distant	0.31 (0.27-0.36)	<0.001
Treatment type		
Chemotherapy Only	1.00	
Radiation Only	1.44 (1.30-1.60)	<0.001
Surgery Only	0.72 (0.66-0.77)	<0.001
2 Treatment Modalities	0.74 (0.68-0.81)	<0.001
3 Treatment Modalities	0.37 (0.22-0.62)	<0.001
Setting of Residence		
Rural	1.00	
Urban	1.13 (1.01-1.27)	0.037
<p>The multivariable model was controlled for: age, sex, stage at diagnosis, treatment type, setting of residence, race/ethnicity, and SES.</p> <p>Records missing data from any variables in the model were excluded from the multivariable analysis.</p> <p>For race/ethnicity, we created a single variable with mutually exclusive categories: non-Hispanic White, non-Hispanic Black, non-Hispanic Asian/Pacific Islander, non-Hispanic American Indian/Alaska Native, Hispanic, and non-Hispanic Unknown.</p> <p>Socioeconomic status (SES) level was determined by YOST, a composite score provided by NCI/SEER that is constructed from seven variables (median household income, median house value, median rent, percent below 150% of poverty line, education index, percent working class, and percent unemployed) to measure different aspects of the SES of a census tract. The census tracts were categorized into SES groups from 1 to 5, with 5 being the highest SES group.</p>		