Time Trends in Liver Cancer Incidence by Race/Ethnicity and Cancer Stage, United States, 1992-2011

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Abstract

PURPOSE: Liver cancer is the seventh leading cause of cancer death in the United States. The goal of this study was to evaluate the trends of liver cancer incidence between 1992 and 2011 by race/ethnicity and by cancer stage.

METHODS: We used data from 13 population-based cancer registries participating in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program. Liver cancer incidence among White, Black, and Asian/Pacific Islander patients aged 20 to 84 years between 1992 and 2011 was stratified by race/ethnicity and by cancer stage. Biennial percent changes (BPC) and their associated 95% confidence intervals were calculated using Joinpoint software (Version 4.04) developed by the National Cancer Institute.

RESULTS: Liver cancer incidence rates rose steadily for White and Black populations, but fluctuated for Asians/Pacific Islanders during 1992-2011. Patterns of liver cancer incidence varied when stratified by cancer stage. Incidence rates for Whites significantly increased for all stages, with the BPC ranging from 5.5% for distant stage disease to 18.8% for localized stage disease (1992-2007). During 1992 to 2007, incidence rates increased by 16.9%, 13.1% and 4.0% biennially for localized, regional, and distant stage disease, respectively, for Black individuals. However, the incidence rates for regional stage disease plateaued from 2007-2011 for Black patients with liver cancer. Incidence of localized liver cancer increased by 10.9% for Asians/Pacific Islanders biennially between 1992 and 2007, followed by a nonsignificant decline between 2007 and 2011. Regional stage incidence did not change significantly over the study period for Asians/Pacific Islanders, while distant stage disease decreased by 3.8% biennially.

CONCLUSIONS: Overall, liver cancer incidence rates are steadily increasing for White and Black populations across all stages. Although incidence rates for Asians/Pacific Islanders have plateaued in recent years, they remain the highest across all racial groups.

Introduction

Liver cancer remains highly fatal with a five-year survival rate of 16.6% and is the seventh leading cause of cancer death in the United States.[1] The burden of liver cancer varies significantly by race/ethnicity, as the incidence of liver cancer is 21.3 and 8.0 per 100,000 for Asian/Pacific Islander men and women, respectively, 14. 9 and 4.4 for Black men and women, and 8.7 and 2.9 for White men and women.[2]

The incidence of liver cancer in the United States has been consistently rising since 1992, increasing 3.7% and 3.0% per year for men and women, respectively. There is evidence that this upward trend differs by race as well, with incidence rates for White and Black populations increasing more sharply than rates for Asians/Pacific Islanders.[3] What remains less clear is how the trends in liver cancer incidence differ jointly by race and by cancer stage. It is vital to accurately characterize rates for different stages of cancer as the survival rate of liver cancer varies greatly by stage (five-year survival rates are 29.7% for those with localized tumors compared to 2.8% for those with distant tumors).[4,5] Enhanced understanding of the effects of race on liver cancer stage could drive targeted measures towards reducing the burden of this disease in the United States.

Methods

White, Black, and Asian men and women aged 20 to 84 years diagnosed with liver cancer between 1992 and 2011 were identified through 13 population-based cancer registries in the United States that participate in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program. Liver cancer patients in the SEER registries were defined by the International Classification of Diseases ICD-O-3/WHO 2008 topography C22.0 (Liver). We chose 1992 as the starting point for this analysis as this was the year when the Los Angeles and San Jose registries were added to the program. Other registries used in the study serve Detroit, San Francisco-Oakland, Seattle and their suburbs, as well as the states of Connecticut, Hawaii, Iowa, New Mexico, and Utah. The SEER 13 registries cover approximately 14% of the United States' population. It is estimated that more than 95% of incident cases in the populations under surveillance are ascertained.

Among the total of 40,807 potentially eligible cases identified, patients with unknown stage of liver cancer (n=7,139) were excluded. Age-adjusted incidence rates were calculated through the SEER Stat software (Version 8.1.5) by race/ethnicity and subsequently stratified by stage. The variables utilized in selection were: age (20-84 years), race recode (White, Black, Asian/Pacific Islander), and SEER Historic Stage A (localized, regional, distant). Because of small annual case numbers, we collapsed data from two years into single data points in order to evaluate time trends. Biennial percent changes (BPC) and their associated 95% confidence intervals were calculated using Joinpoint software (Version 4.04) developed by the National Cancer Institute.

Table 1

Selected Characteristics of Liver Cancer Incidence, 1992-2011

	White		Black		Asian	
	n	Column %	n	Column %	n	Column %
Age						
20-44 years	873	4.2	255	5.8	684	8.1
45-64 years	10,351	49.6	2,715	62.3	3,745	44.4
65-84 years	9,644	46.2	1,390	31.9	4,011	47.5
Sex						
Male	15,630	74.9	3,286	75.4	6,066	71.9
Female	5,238	25.1	1,074	24.6	2,374	28.1
SEER Historic Stage A						
Localized	9,889	47.4	1,852	42.5	4,002	47.4
Regional	6,590	31.6	1,491	34.2	2,875	34.1
Distant	4,389	21.0	1,017	23.3	1,563	18.5
Year of Diagnosis						
1992-93	941	4.5	188	4.3	395	4.7
1994-95	1,022	4.9	194	4.4	512	6.1
1996-97	1,346	6.5	251	5.8	623	7.4
1998-99	1,533	7.3	296	6.8	724	8.6
2000-01	1,761	8.4	361	8.3	802	9.5
2002-03	2,048	9.8	385	8.8	924	10.9
2004-05	2,409	11.5	548	12.6	1,012	12.0
2006-07	2,864	13.7	647	14.8	1,156	13.7
2008-09	3,341	16.0	740	17.0	1,094	13.0
2010-11	3,603	17.3	750	17.2	1,198	14.2
SEER Registry						
San Francisco-Oakland SMSA - 1992+	2,482	11.9	675	15.5	2,007	23.8
Connecticut - 1992+	2,132	10.2	284	6.5	98	1.2
Detroit (Metropolitan) - 1992+	2,145	10.3	1,257	28.8	129	1.5
Hawaii - 1992+	298	1.4	16	0.4	1,415	16.8
Iowa - 1992+	1,440	6.9	55	1.3	66	0.8
New Mexico - 1992+	1,368	6.6	21	0.5	38	0.5
Seattle (Puget Sound) - 1992+	2,559	12.3	278	6.4	796	9.4
Utah - 1992+	723	3.5	16	0.4	70	0.8
Atlanta (Metropolitan) - 1992+	816	3.9	723	16.6	207	2.5
San Jose-Monterey - 1992+	1,391	6.7	72	1.7	1,012	12.0
Los Angeles - 1992+	5,460	26.2	944	21.7	2,602	30.8
Rural Georgia - 1992+	54	0.3	19	0.4	0	0.0

Results

Within the identified cohort of 33,668 incident liver cancer cases, 20,868 were White (62%), 4,360 were Black (13%), and 8,440 were Asian/Pacific Islander (25%) (Table 1). White and Asian/Pacific Islander patients tended to be older than Black patients, and for all racial groups male patients accounted for over 70% of all cases. Across all three racial groups, less than half of all cases had localized tumors, with Black patients having the highest proportion of distant tumors. Two thirds of Asian/Pacific Islander patients in this study resided in California at the time of diagnosis (San Jose-Monterey, Los Angeles, and San Francisco-Oakland areas), while White and Black patients were more evenly distributed across the country.

Between 1992 and 2011, liver cancer incidence rates rose steadily for White and Black populations (Biennial percent change (BPC) of 12.4% and 10.9%, respectively) (Figure 1 (a)). However, trends for Asian/Pacific Islanders fluctuated during the study period, with nonsignificant change during 1992-1997 followed by a sharp increase during 1997-2007 at 4.1% biennially and then a nonsignificant decline through 2011. In absolute terms, the incidence rates for Asians/Pacific Islanders remained highest among all racial groups throughout the study period (7.5, 11.7, and 15.2 per 100,000 in 2010-2011 for White, Black and Asian/Pacific Islander patients, respectively).

Patterns of liver cancer incidence varied when further stratified by stage (Figure 1 (b, c, d)). Incidence rates for Whites significantly increased throughout the study period across all stages, with the BPC ranging from 5.5% for distant stage disease to 18.8% for localized stage disease (1992-2007). Similar sharp rises in incidence rates were seen for Black patients across all stages during 1992 to 2007, with BPC ranging from 16.9% and 13.1% for localized and regional stage disease, respectively, to 4.0% for distant stage disease. However, the incidence rates for regional disease plateaued from 2007-2011 for Black patients with liver cancer.

Incidence of localized liver cancer increased by 10.9% for Asians/Pacific Islanders biennially between 1992 and 2007, followed by a nonsignificant decline between 2007 and 2011. Regional stage incidence did not change significantly over the twenty year period, while distant stage disease decreased by 3.8% biennially.

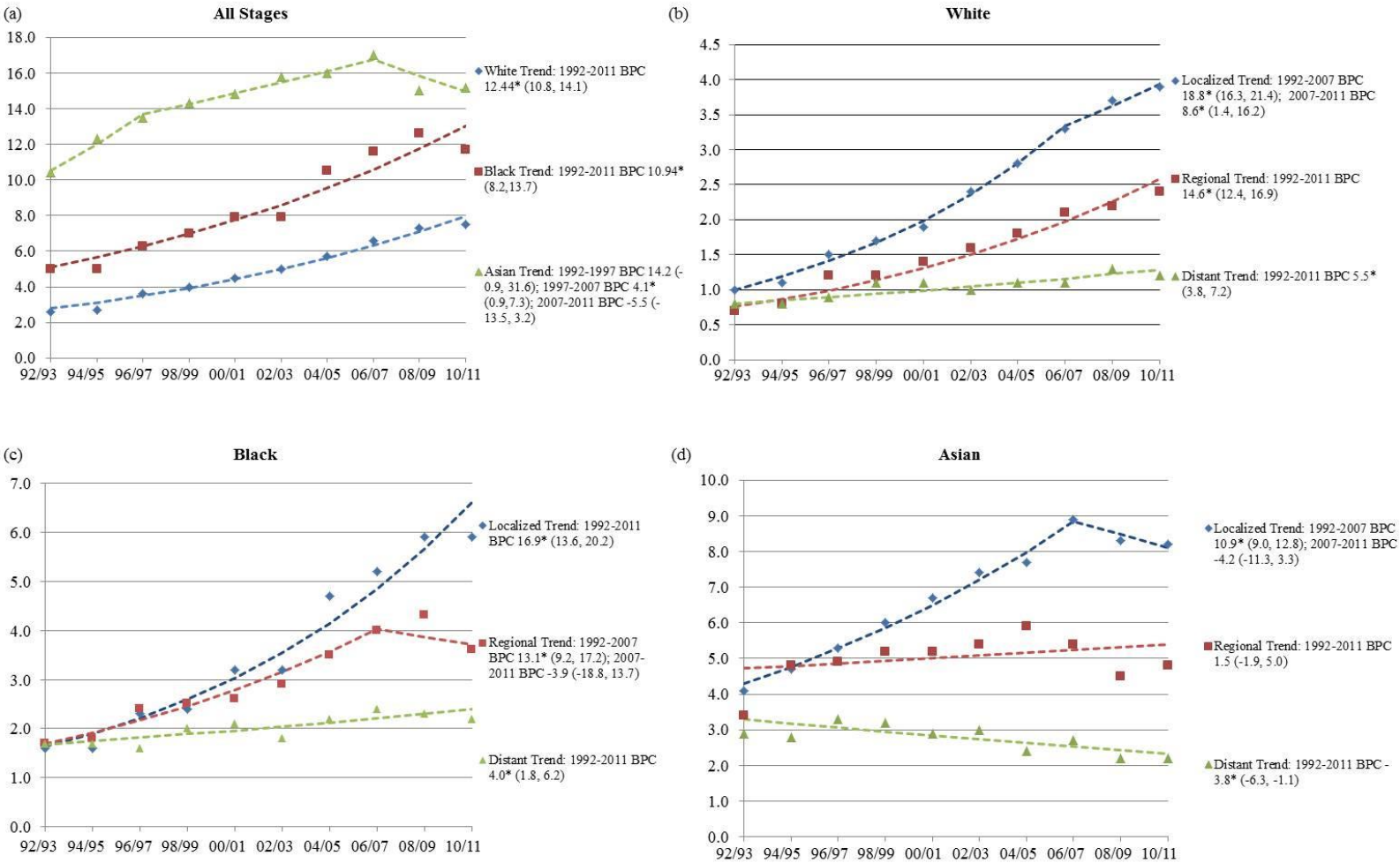

Figure 1: Time trends of liver cancer incidence rates by stage and race. (a) All stages, (b) White , (c) Black and (d) Asian/Pacific Islander, 1992-2011
Numbers associated with the trends represent estimated biennial percent changes with the corresponding 95% confidence intervals in parentheses.
* Statistically significant at 0.05.

Discussion

Overall increasing trends for liver cancer incidence over the past two decades observed in this study were consistent with trends in other developed countries including Sweden and Denmark.[5,6] This rise in liver cancer incidence correlates with the increase in the obesity rates in industrialized countries as obesity is a well-established risk factor for liver cancer through its linkage with fatty liver disease.[7] The risk of cirrhosis, a known precursor for liver cancer, has been shown to be significantly higher among obese individuals.[8] Between 1988-1994 and 2007-2008, the prevalence of obesity increased from 20-21% to 30-33% among Black and White populations, which may partly account for the increasing trends in liver cancer incidence for these racial groups.[9] Furthermore, obesity rates for Black individuals have been found to be 51% higher than those for White individuals, which may explain the higher overall incidence rates for the former racial group.[10]

Hepatitis C virus infection (HCV) has been identified as a common precursor to liver cancer, as roughly half of all HCV patients develop cirrhosis.[8,11] Persons born between 1945–1965, or "baby-boomers," constitute roughly 66% of HCV-infected patients in the United States.[7] As age is a known risk factor for the progression from HCV to liver cancer, the aging of the baby-boomer generation among whom the HCV infection is more common, which includes predominantly White and Black individuals, may also contribute to the overall increase of liver cancer incidence rates within these racial groups.

Our results were consistent with the historical trend of elevated liver cancer incidence among Asians/Pacific Islanders.[12] Hepatitis B virus infection, another strong risk factor for liver cancer, is more common among Asian/Pacific Islanders, especially those who were born outside the U.S.; this may contribute to higher overall rates for this racial group.[13] Our results showed a decline in liver cancer incidence for Asians/Pacific Islanders in recent years, especially for localized and regional stage disease. This may be attributed to the fact that approximately 42% of all Asians/Pacific Islanders living in the United States are native born, and that incidence rates for the descendants of Asian immigrants are up to three times lower than those born overseas.[14,15]

Increased acknowledgement of risk among persons aged 50 to 70 years may play a role in the increased detection of localized stage cancers.[16] The steady increase in localized stage disease can additionally be attributed to improvements in HCV detection.[17] Substantial advances in screening must be developed to identify at-risk patients prior to the onset of hepatic cirrhosis. While effective mechanisms towards treating liver tumors through ablation and transplantation have been devised, identifying and controlling localized tumors early in development still proves to be challenging.

It is important to acknowledge the limitations of this study. The small number of patients when stratified by year of diagnosis may impact our ability to detect true trend among Black and Asian/Pacific Islander populations as the biennial sample sizes for these two groups range from

188 to 750 cases and 395 to 1198 cases, respectively. Due to the limitations of SEER data, which does not provide immigration status or patient history, the risk factors for individual cases cannot be accurately determined. The lack of specific-population denominators and small data size mean that we are unable to effectively determine the ethnic origin of individual patients.

Overall, liver cancer incidence rates are steadily increasing for White and Black populations across all stages. Although incidence rates for Asians/Pacific Islanders have steadied in recent years, they remain the highest across all racial groups. Given the racial disparities shown here, it is vital that race-targeted liver cancer prevention measures are taken through health policy on a national scale.

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