Epidemiology of Hepatocellular Carcinoma in Hispanics in the United States

Hashem B. El-Serag, MD, MPH; Melvin Lau, MD; Karl Eschbach, PhD; Jessica Davila, PhD; James Goodwin, MD

Background: To our knowledge, no detailed analysis exists of the incidence and mortality of hepatocellular carcinoma (HCC) among Hispanics in the United States. In previous studies, the rates for Hispanics have not been reported separately from other racial or ethnic groups.

Methods: We used information on patients diagnosed as having HCC from 13 registries in the Surveillance Epidemiology and End Results (SEER) database of the National Cancer Institute to calculate race-specific, age-adjusted incidence rates (AIR) between 1992 and 2002. We also used California and Texas state death records from between 1979 and 2001 to calculate race-specific, age-adjusted mortality rates for liver cancer excluding intrahepatic cholangiocarcinoma. For Hispanics and Asians/Pacific Islanders, the rates were calculated for native-born subjects and immigrants separately.

Results: In SEER, the yearly AIRs were higher by 1.2-fold in Hispanics than in blacks (6.3 vs 5.0 per 100 000 person-years of the underlying US population) and by 2.7-fold than in non-Hispanic whites (2.4 per 100 000 person-years) but lower than in Asians/Pacific Islanders (10.8 per 100 000 person-years). The median age at HCC diagnosis in Hispanics (64 years) was intermediate between whites (the oldest) and blacks (the youngest). Between the periods 1992-1995 and 2000-2002, there was a 31% increase in the incidence of HCC in Hispanic men and a 63% increase in Hispanic women. The race-specific, age-adjusted mortality rates were remarkably similar in California and Texas and were highest in immigrant Asian/Pacific Islanders followed by native Hispanics. The rates for native Hispanic men were more than twice as high as those for immigrant Hispanic men. For Texas, the rates for native Hispanic men were 65% higher than those for immigrant Hispanic men.

Conclusion: Hispanics in the United States have high rates of HCC that are second only to Asians/Pacific Islanders.

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THE INCIDENCE AND MORTALITY of hepatocellular carcinoma (HCC) has been increasing in the United States. The overall age-adjusted incidence rates have more than doubled during the last 2 decades.[1,2] Similar increases have been reported in the mortality and hospitalization rates for HCC.[1,3,4] Previous studies demonstrated significant racial and ethnic differences in the distribution of HCC.[1-7] Generally, these studies have shown that HCC rates are approximately 2-fold higher in Asians than in blacks, whose rates are 2-fold higher than those of whites. However, the epidemiology of HCC in Hispanics in the United States remains unclear.

The nation's nearly 45 million Hispanics currently constitute 14% of the population of the United States, surpassing blacks as the second largest ethnic population in the United States. The Hispanic population is growing rapidly, and the Census Bureau projects that it will make up 1/4 of the US population by 2050. Therefore, obtaining accurate estimates for the impact of HCC in Hispanics is important for predicting future HCC trends and directing preventive efforts.

Past national studies of HCC in the United States have not distinguished Hispanics from non-Hispanic whites and non-Hispanic blacks.[1,2] In most administrative database studies, data reported for whites reflects a composite of Hispanics and non-Hispanic whites. Only 1 study to our knowledge examined the rates of incident HCC in Hispanics. It was conducted in the state of Florida from 1985 to 1995 and reported that the average annual incidence HCC rates in Florida among Hispanics and blacks were consistently and significantly twice the rate of whites.[6] However, the generalizability of these findings to other regions is unclear, especially during more recent years when a significant increase in the incidence of

Author Affiliations: The Sections of Gastroenterology (Drs El-Serag and Lau) and Health Services Research (Drs El-Serag and Davila), Houston Department of Veterans Affairs Medical Center and Baylor College of Medicine, Houston, Texas; and Department of Internal Medicine, Division of Geriatrics, University of Texas Medical Branch, Galveston (Drs Eschbach and Goodwin).

HCC has been observed. Furthermore, whether HCC mortality rates in Hispanics differ between the native-born subjects and immigrants remain unknown.

In this study, we have conducted a detailed analysis of the incidence and mortality related to HCC among Hispanics as well as other racial and ethnic groups in the United States. Recently, the Surveillance Epidemiology and End Results (SEER) database has made appropriate population denominators available for calculating age-adjusted incidence rates in Hispanics. In addition, we examined the death records for 2 large states (Texas and California) with large Hispanic representation, in which the distinction between natives and immigrants can be made. These states together account for half of the Hispanic population of the United States and 66% of the Mexican-origin population of the United States. California by itself accounts for 1/3 of US Hispanics. In addition, these states were chosen for inclusion in the study because of the reported high quality of vital statistics.

METHODS

INCIDENCE

Data Source

We used publicly available data from the SEER program.[8] For this analysis, we used information from 13 population-based registries representing 14% of the US population. These registries were Utah; San Francisco–Oakland, California; Connecticut; Detroit, Michigan; Iowa; New Mexico; Seattle-Puget Sound, Washington; Atlanta, Georgia; Alaska; Hawaii; San Jose–Monterey, California; Los Angeles, California; and rural Georgia. We identified cases with HCC diagnosed between 1992 and 2002 using the site-specific code "Liver" and International Classification of Diseases for Oncology[9] code 8170.

Analysis

We calculated directly standardized age-adjusted incidence rates (per 100 000 person-years) for the following racial/ethnic groups: Hispanic (white and nonwhite), non-Hispanic white, black, Asian/Pacific Islander, and American Indian/Alaska native. Average yearly rates were calculated for 3 consecutive periods: 1992-1995, 1996-1999, and 2000-2002. We used the 2000 US population as the standard for age standardization. The age-standardized incidence rate is a weighted average of the age-specific incidence rates, where weights are the proportions of persons in the corresponding age groups of the US general population (2000). This is a standard method to remove the effect of differences in age composition in comparing vital rates in populations with different age composition.

Estimated annual percentage change (EAPC) was calculated using the method of weighted least squares.[8] Finally, we constructed Poisson regression models to examine incidence rate ratios in different racial and ethnic groups while adjusting for age, year of diagnosis, sex, and geographic region (SEER registry).

MORTALITY

Data Source

We used public-use California and Texas death statistical master files obtained from the California and Texas State Health Departments. These states were chosen for inclusion in the study because the quality of vital statistics for Hispanic populations has been reported to be high. In addition, California and Texas together account for 50% of the Hispanic population and 66% of the Mexican-origin population of the United States. These files contain information reported from death certificates for all persons who died in each state. For California, we identified all deaths during 1979-1981, 1989-1991, and 1999-2001 with cancer of the liver (*International Classification of Diseases, Ninth Revision* [*ICD-9*] code 155 and *International Statistical Classification of Diseases, 10th Revision* [*ICD-10*] code C22) as underlying cause of death, but excluding deaths from cancers of the intrahepatic bile ducts (*ICD-9* code 155.1 and *ICD-10* code C22.1). Data for Hispanics and Asians/Pacific Islanders were further examined by native vs immigrant status. For denominators, we used population counts from the censuses of 1980, 1990, and 2000. We used the 5% public-use microdata files for each year to form denominators by age, sex, race/ethnicity, and immigrant status (US Bureau of the Census 1983, 1993, 2003). Data for Texas were also used for the 1999-2001 period.

For a small number of cases for Asians/Pacific Islanders and Hispanics, country of birth was not reported on the death certificate. To include these cases in the analysis, we imputed nativity status using a "hot-deck" method that selected at random a record for a decedent matched on age, sex, ethnicity, and county of residence, and assigned the nativity status reported for that case.[10] This method is similar to that used by the US Census Bureau to impute missing status for the census data used in the denominator. Hot-deck imputations are made by substituting a value for a missing variable by selecting at random a record that is matched on a set of other variables, for example, county of residence, age, sex, and nativity might be used to define a pool of records from which to assign ethnicity where this is missing. These methods are routinely applied by the National Center for Health Statistics and the Census Bureau in preparing population totals for rate calculations. Random error is introduced by the assignments. However, the effect on rate calculation is negligible, less than 0.5% for ethnicity, nativity, and race, and occurs in trace numbers for age. Cause of death is never imputed.

Analysis

We calculated the directly standardized mortality rates per 100 000 person-years of the underlying US population for native-US and foreign-born (immigrants) Hispanics for 3 periods: 1979-1981, 1989-1991, and 1999-2001 for the state of California. Directly standardized mortality rates were calculated by applying the age-specific rates calculated for each group by the age structure of a chosen standard population, in this case, the population of the United States in 2000. This is a standard method used by epidemiologists to remove the effect of differences in age composition in comparing vital rates in populations with different age composition.

We calculated these rates for non-Hispanic whites, blacks, and native and foreign-born Asians/Pacific Islanders. For the 1999-2001 period, we calculated these rates separately as well as together for the states of Texas and California. Because the census enumeration occurs near the midpoint of the 3-year interval, the enumeration gives an estimate of the midpoint population for the interval. For denominators, we multiplied this figure by 3 to form a denominator for an annual rate estimate. We used the 2000 United States population as the standard.

Hispanic ethnicity was not coded on the California death certificate for 1979-1981 for approximately half of the records for each year. An alternative way to assess Hispanic ethnicity

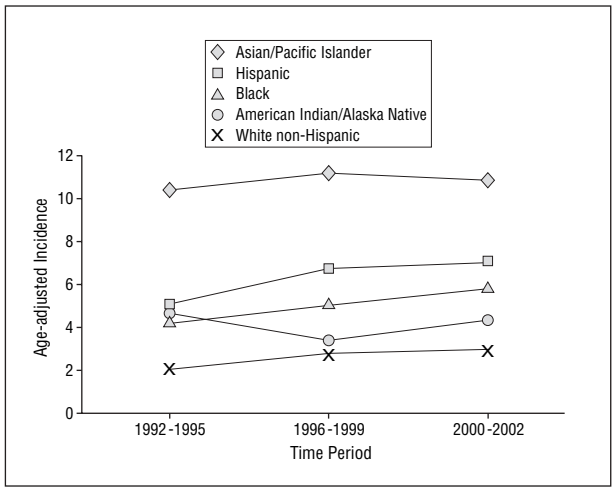

Figure 1. Age-adjusted incidence rates of hepatocellular carcinoma by race/ethnicity per 100 000 person-years in the underlying US population between 1992 and 2002 (N=14 342).

Table 1. The Estimated Annual Percentage Change (EAPC) in Hepatocellular Carcinoma Incidence by Race/Ethnicity and Sex During the 1992-2002 Period[a]

Race/Ethnicity	EAPC (95% Confidence Interval) (n = 14 210)
Hispanic	4.7 (2.8 to 6.6)
Male	3.5 (1.4 to 5.8)
Female	6.8 (3.6 to 10.1)
White non-Hispanic	4.3 (2.9 to 5.8)
Male	4.0 (2.4 to 5.6)
Female	3.6 (1.9 to 5.3)
Black	4.3 (2.7 to 6.0)
Male	5.4 (3.5 to 7.2)
Female	1.7 (–2.1 to 5.8)
Asian/Pacific Islander	0.6 (–0.8 to 2.0)
Male	0.7 (–0.8 to 2.2)
Female	0.7 (–1.2 to 2.8)

[a] Statistical significance may be inferred when the 95% confidence intervals do not include 1.0.

that has been reported to be reliable is the use of a surname coding method.[11]

The public-use California death statistical master file for these years includes the surname of the decedent. Thus, for California for these years, we calculated rates for the Spanish surname population. We matched the last name of the decedent reported in the death master file to the Census Bureau's 1980 surname list. For women, the father's surname was substituted. The Census Bureau's public-use file for this year included a Hispanic identification using the same surname list, so that Hispanic ethnicity was determined from a consistent source.

RESULTS

INCIDENCE OF HCC IN SEER REGISTRIES

We identified in the SEER registries a total of 14 342 unique patients with incident HCC diagnosed during the 1992-2002 period, of whom 2172 were Hispanic (15%). The largest proportion of HCC cases was recorded in non-Hispanic whites (46%), followed by Asians/Pacific Islanders (27%), blacks (11%), and American Indians/Alaska natives (1%). Of the 2172 cases of Hispanics diagnosed as having HCC, 70% (n=1522) were microscopically confirmed based on histologic or cytologic analysis; 19% (n=409) by radiographic analysis without microscopic confirmation; 3% (n=63) based on laboratory tests and/or marker studies; 1% (n=10) by direct visualization without microscopic confirmation; 3% (n=70) by clinical diagnosis only; and 4% (n=98) by an unknown method of diagnosis. The mean yearly age-adjusted incidence rates in Hispanics were 2.7-fold higher than in non-Hispanic whites; 30% higher than in blacks; but 40% lower than in Asians/Pacific Islanders. However, average yearly age-adjusted incidence rates increased significantly in Hispanics by 40% from 5.0 per 100 000 person-years during the 1992-1995 period to 7.0 per 100 000 person-years during 2000-2002 period (**Figure 1**). All differences were statistically significant as evidenced by nonoverlapping 95% confidence intervals (data not shown). Similar overall increases were seen in non-Hispanic whites as well as blacks, whereas the rates for Asians/Pacific Islanders and American Indians/Alaskan natives remained virtually unchanged between 1992 and 2002.

The temporal trends of HCC incidence are further examined by calculating EAPC (**Table 1**). Hispanics as a group have experienced the fastest increase in HCC incidence with non-Hispanic whites and blacks coming in tied for a very close second. Surprisingly, Hispanic women had the fastest increase in HCC incidence compared with other racial/ethnic and sex groups. Again, there was no significant change in the incidence of HCC among Asian/Pacific Islander men or women. Finally, the age-adjusted incidence rates were 3.2-fold higher in Hispanic men than in Hispanic women. However, similar to the EAPC findings, there was a 31% increase in HCC among Hispanic men, while Hispanic women had a 63% increase between 1992 and 2002. There were no significant differences in the rate of HCC among Hispanics, non-Hispanic whites, and blacks, whereas Asians/Pacific Islanders had significantly lower rates (Table 1).

A Poisson regression model (**Table 2**) confirmed that Hispanics had the second highest HCC incidence adjusted for time period of diagnosis, age, sex, and variations among geographic regions. Before age 40 years, HCC is rare in all groups. The median age at the time of HCC diagnosis was 64.0 years for Hispanics, 69.0 for non-Hispanic whites, 64.0 for Asians/Pacific Islanders, and 61.0 for blacks. Regarding age distribution, HCC tended to affect younger age groups among Hispanics vs non-Hispanic whites, American Indians/Alaskan natives, and blacks (**Figure 2**). Approximately 49% of Hispanic patients were 65 years or older compared with 62%, 49%, and 40% of non-Hispanic whites, Asians/Pacific Islanders, and blacks, respectively.

MORTALITY OF HCC IN CALIFORNIA AND TEXAS

Similar to the incidence data from SEER, Hispanics made up 20% of all cases of liver cancer (excluding cancer of

Table 2. Poisson Regression Multivariate Analysis of the Association Between Hepatocellular Carcinoma Incidence and Race/Ethnicity Between 1992 and 2002

Variable	Incidence Rate Ratio (95% CI)[a] (n = 14 210)	*P* Value
Race/ethnicity		
Non-Hispanic white	1.00 [Reference]	
Hispanic	2.11 (2.00-2.23)	<.001
Black	2.03 (1.92-2.15)	<.001
Asian/Pacific Islander	4.34 (4.15-4.55)	<.001
Time of diagnosis		
1992-1995	1.00 [Reference]	
1996-1999	1.22 (1.17-1.27)	<.001
2000-2002	1.28 (1.23-1.34)	<.001
Age at diagnosis, y		
0-39	1.00 [Reference]	
40-64	35.89 (32.51-39.63)	<.001
>65	134.10 (121.49-148.03)	<.001
Sex		
Men	1.00 [Reference]	
Women	0.30 (0.29-0.31)	<.001
Geographic region		
Utah	1.00 [Reference]	
San Francisco–Oakland, CA	2.07 (1.82-2.35)	<.001
Connecticut	1.65 (1.44-1.89)	<.001
Detroit, MI	1.82 (1.59-2.07)	<.001
Iowa	1.28 (1.11-1.47)	<.001
New Mexico	1.69 (1.46-1.95)	<.001
Seattle–Puget Sound, WA	1.84 (1.62-2.10)	<.001
Atlanta, GA	1.42 (1.23-1.64)	<.001
Hawaii	1.11 (0.96-1.29)	.14
San Jose–Monterey, CA	1.88 (1.64-2.15)	<.001
Los Angeles, CA	1.96 (1.73-2.22)	<.001
Rural Georgia	0.95 (0.62-1.44)	.81

[a]Risk estimates for all variables are adjusted for all other covariates in the model.

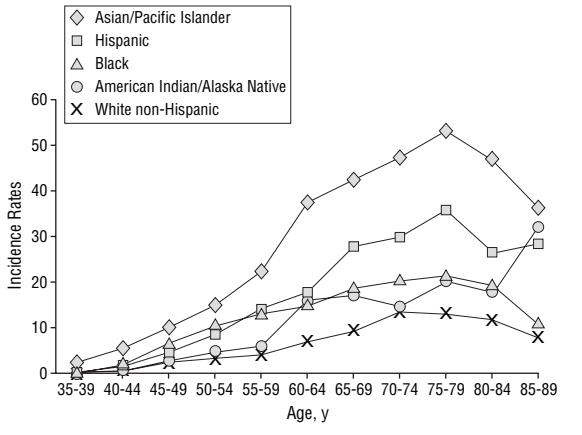

Figure 2. Age-specific incidence rates of hepatocellular carcinoma by race/ethnicity per 100 000 person-years in the underlying US population between 1992 and 2002 (N = 14 342).

the intrahepatic bile duct) in California and 31% in Texas in the 1999-2001 period. The share of deaths attributable to Asians/Pacific Islanders was much smaller in Texas (5%) because of the small relative population share of Asians/Pacific Islanders in this state (data not shown).

The race-specific, age-adjusted mortality rates for liver cancer (excluding cancer of the intrahepatic bile duct) were remarkably similar between California and Texas during the 1999-2001 period (**Table 3**). In general, these rates were highest in immigrant Asians/Pacific Islanders, followed by Hispanics. For California, the rates for immigrant Asian/Pacific Islander men were 3-fold higher than those for native Asian/Pacific Islander men (**Table 4**).

Changes over time in the age-adjusted mortality rates for liver cancer excluding cancer of the intrahepatic bile duct in the state of California are listed in Table 4. Mortality rates increased over time for all racial/ethnic groups from the 1979-1981 period to the 1999-2001 period. The overall mortality rate for Hispanics increased from 4.0 per 100 000 person-years during the 1979-1981 period to 6.3 during the 1999-2001 period. The relative increases were largest for Hispanic native men and women. For both men and women among Hispanic natives, death rates more than doubled between 1979-1981 and 1999-2001. A modest increase in HCC mortality rates was seen in non-Hispanic white men but not women. Increases were also observed in immigrant Asian/Pacific Islander men and women but not in native Asian/Pacific Islander men or women.

The mortality rates for California were only slightly lower than the corresponding incidence rates seen in the California SEER regions in the same years (eg, yearly incidence in Hispanics during 1999-2001 was 7.4 per 100 000 US population vs 6.3 per 100 000 population mortality during the same period).

For California, the mortality rates for native Hispanic men were more than twice as high as those for immigrant Hispanic men (Table 3). For Texas, the mortality rates for native Hispanic men were 65% higher than those for immigrant Hispanic men. There were no differences in mortality rates between native and immigrant Hispanic women in California or Texas.

Most of the increased incidence among Hispanic women occurred in native rather than immigrant Hispanics. The increase in liver cancer incidence over time in Hispanic men was seen in both native and immigrant groups but was more pronounced in native Hispanics. Table 4 (California) also indicates that during 1979-1981, the mortality rates were similar for native Hispanic and immigrant Hispanic men; while in 1999-2001, the mortality rate among native Hispanic men was higher mainly owing to the rapid increase in the incidence of liver cancer for native men. During 1999-2001, mortality rates were dissimilar for Hispanic immigrant women (higher for immigrants). However, by 1999-2001, these differences had disappeared because of the rapid increase in liver cancer incidence for native women.

COMMENT

Hispanics in the United States have high incidence and mortality rates of HCC that are second only to Asians/Pacific Islanders. Importantly, the fastest rise in the incidence of HCC has been observed in Hispanic men and

Table 3. Standardized Mortality Rates (SMRs) per 100 000 Person-Years and Rate Ratios (RRs) Compared With Non-Hispanic Whites for Liver Cancer, 1999-2001[a]

	Texas and California		California Only		Texas Only	
Race/Ethnicity	SMR	RR	SMR	RR	SMR	RR
			Men			
Hispanic native	14.661	2.82	13.445	2.76	15.842	2.75
Hispanic immigrant	7.848	1.51	6.982	1.43	9.512	1.65
White	5.202	1.00 [Reference]	4.866	1.00 [Reference]	5.765	1.00 [Reference]
Black	9.896	1.90	9.873	2.03	9.889	1.72
API native	6.396	1.23	6.702	1.38	NR[b]	NR[b]
API immigrant	18.726	3.60	18.217	3.74	25.268	4.38
			Women			
Hispanic native	4.733	2.47	3.811	2.16	5.604	2.60
Hispanic immigrant	4.446	2.32	3.823	2.17	5.713	2.65
White	1.914	1.00 [Reference]	1.763	1.00 [Reference]	2.158	1.00 [Reference]
Black	3.610	1.89	3.673	2.08	3.536	1.64
API native	2.407	1.26	2.503	1.42	NR[b]	NR[b]
API immigrant	6.904	3.61	6.546	3.71	10.803	5.01

Abbreviations: API, Asian/Pacific Islander; NR, not reported.
[a] Excluding cancer of the intrahepatic bile duct.
[b] Data for API natives are not reported for Texas because the population and death counts were too low to estimate rates.

Table 4. Standardized Mortality Rates (SMRs) in California per 100 000 Person-Years and Rate Ratios (RRs) Compared With Non-Hispanic Whites for Liver Cancer, 1979-1981, 1989-1991, and 1999-2001[a]

	1999-2001		1989-1991		1979-1981[b]	
Race/Ethnicity	SMR	RR	SMR	RR	SMR	RR
			Men			
Hispanic native	13.445	2.76	8.106	2.31	5.806	1.80
Hispanic immigrant	6.982	1.43	4.783	1.37	4.750	1.47
White	4.866	1.00 [Reference]	3.502	1.00 [Reference]	3.221	1.00 [Reference]
Black	9.873	2.03	6.969	1.99	7.821	2.43
API native	6.702	1.38	4.967	1.42	6.119	1.90
API immigrant	18.217	3.74	17.891	5.11	13.835	4.30
			Women			
Hispanic native	3.811	2.16	2.090	1.35	1.672	0.99
Hispanic immigrant	3.823	2.17	3.831	2.47	3.316	1.96
White	1.763	1.00 [Reference]	1.549	1.00 [Reference]	1.688	1.00 [Reference]
Black	3.673	2.08	3.331	2.15	2.408	1.43
API native	2.503	1.42	2.914	1.88	2.031	1.20
API immigrant	6.546	3.71	5.452	3.52	3.655	2.17

Abbreviation: API, Asian/Pacific Islander.
[a] Excluding cancer of the intrahepatic bile duct.
[b] During 1979-1981, "Hispanic" refers to "Spanish surname" in both numerator and denominator.

women, followed by non-Hispanic whites and blacks. Asians/Pacific Islanders experienced the least increase in the incidence of HCC. Interestingly, the highest rates, as well as most of the increase in the incidence of HCC, were seen in native rather than immigrant Hispanics. In contrast, among Asians/Pacific Islanders, the highest HCC rates as well as a modest increase were seen in only immigrant rather than native populations. In general, the magnitude as well as pattern for HCC mortality in Hispanics was very similar in Texas and California in 1999-2001.

This study confirms and extends previous observations pertaining to the rising incidence and mortality for HCC.[1-5] The present analysis of incidence data extends to 2002 while previous analysis by our group covered the time period up to 1998.[2] The increase in the incidence of HCC has continued in all racial/ethnic groups except for Asians/Pacific Islanders. The parallel temporal trends in mortality and incidence rates argue against early detection as a predominant reason for the observed increase in HCC incidence. If these findings were attributable to early detection of HCC, incidence rates would initially increase followed by a decline in mortality rates. In addition, to our knowledge, this study reports 2 previously unexamined aspects of the racial/ethnic distribution of HCC in the United States: incidence and mor-

tality in Hispanics and an examination of rates in native and immigrant groups.

To our knowledge, this is the first national study of HCC in the United States to distinguish Hispanics from non-Hispanic whites and blacks. The data show that incidence and mortality rates for HCC in native Hispanics are second only to immigrant Asians/Pacific Islanders. Alarmingly, Hispanic men and women have the fastest rising incidence rates among all racial/ethnic groups. The discrepancy between native and immigrant Hispanics was also striking. For both men and women, immigrant Hispanics have relatively low death rates, whereas native-born Hispanic men have high death rates. Our research group previously reported a similar finding in a large county hospital in Houston.[12] The reasons for this finding are unclear and may represent an acculturation effect. A greater prevalence of risk factors for HCC, including hepatitis C infection, heavy alcohol consumption, or nonalcoholic steatohepatitis related to obesity and diabetes mellitus, are factors that are presumably more important among native Hispanics than among immigrant Hispanics and thus may explain the higher HCC rates in the native group.[5,7,13]

Death rates were highest for Asian/Pacific Islander immigrants. However, in contrast to Hispanics, there is an inverse acculturation effect for Asian/Pacific Islander men. While Asian/Pacific Islander immigrants have the highest death rates, native-born Asians/Pacific Islanders have relatively low death rates. These observations are likely to be explained by the high lifetime risk of HCC among immigrants from countries in Southeast Asia. This risk is related to high rates of hepatitis B infection that is acquired at birth or shortly after in the country of origin. Native Asians on the other hand have a much smaller hepatitis B infection risk. The rates of HCC in native Asians/Pacific Islanders are only marginally higher than those in non-Hispanic whites and lower than in Hispanics and blacks. To sum up, native Hispanics acquire risk factors for HCC vs immigrant Hispanics, whereas native Asians lose risk factors vs immigrant Asians.

The use of state mortality statistics in this study has several advantages. These data are different from those that might be reported in state vital statistics reports because of the stratification for immigrant status among Asians/Pacific Islanders and Hispanics. Studies have compared Hispanic race/ethnicity reported on death certificates with self-reported race/ethnicity ascertainment of Hispanic identity based on country of birth and surname match algorithms; these studies have found that Hispanic identity is accurately reported on the death certificate for foreign-born Hispanics, while for native-born Hispanics, there is a net under ascertainment of approximately 7%.[14,15] Reporting of Hispanic ethnicity on the death certificate was incomplete in California before 1984. For data from the 1979-1981 period, availability of the surname on the California death records permits alternative ascertainment of Hispanic ethnicity using the Census Bureau surname match algorithm, which was also used to generate census population counts. Spanish surname coding has frequently been adopted as a surrogate for identification of Hispanic populations and is recommended by some as superior to self-identification for use in developing vital rate estimates for the Hispanic population when consistent methods are used for numerator and denominator counts.[11] In calculating the numerator from vital records, we used the same surname coder used by the Census Bureau to produce denominator counts. Evaluation studies show that the Spanish surname coding algorithm used by the Census Bureau for the 1980 census was 92% specific and 82% sensitive with respect to the self-identification of the Hispanic population in an evaluation using 1990 census responses.[16] The large degree of overlap in the populations identified by self-identification and those using the surname coder should insure a high degree of comparability in estimates made using the 2 types of sources.

Immigrant status has been reported to be strongly consistent between matched census and death certificate records, implying consistent numerators and denominators for rate calculations. Matched studies show discrepancies in net counts of 1% or 2% between census and death certificates.[15,17] Similarly, only small discrepancies have been reported when data from death certificates were compared with those from Social Security Administration records.[14,18] Therefore, errors introduced to immigrant status from the use of vital statistics should be negligible.

The rise in HCC in the United States is largely attributable to the increase in the incidence of HCC among Hispanic and non-Hispanicwhite populations. Given that these 2 groups constitute the first and second largest racial/ethnic groups in the United States, and given that Hispanics are the most rapidly growing racial/ethnic group, the overall increase in HCC is likely to continue. Epidemiology and public health efforts should be directed toward understanding and preventing HCC in this high-risk group.

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Correspondence: Hashem B. El-Serag, MD, MPH, The Houston Veterans Affairs Medical Center (152), 2002 Holcombe Blvd, Houston, TX 77030 (hasheme@bcm.tmc.edu).
Author Contributions: *Study concept and design:* El-Serag and Goodwin. *Acquisition of data:* El-Serag and Lau. *Analysis and interpretation of data:* El-Serag, Eschbach, Davila, and Goodwin. *Drafting of the manuscript:* El-Serag and Eschbach. *Critical revision of the manuscript for important intellectual content:* El-Serag, Davila, Goodwin, and Lau. *Statistical analysis:* Eschbach and Davila. *Obtained funding:* El-Serag and Goodwin. *Administrative, technical, and material support:* El-Serag. *Study supervision:* El-Serag.
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