Socioeconomic status and hepatocellular carcinoma in the United States

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Running title: Area SES & hepatocellular carcinoma

Keywords: hepatocellular carcinoma, census tract, socioeconomic status, race, ethnicity

Abbreviations: HCC-hepatocellular carcinoma, SEER: Surveillance, Epidemiology and End Results
Condensed abstract:

Compared to the general population, HCC cases lived in neighborhoods with lower mean SES and a higher mean percent of foreign born individuals. Racial and ethnic differences in patterns were seen. The findings may facilitate allocation of HCC control resources toward the most affected communities.

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ABSTRACT

Background: Hepatocellular carcinoma (HCC) has a poor prognosis and, unlike most cancers, HCC incidence and mortality rates are increasing in the United States. While risk is known to vary among different racial and ethnic groups, less is known about the variability of risk within these groups by neighborhood socioeconomic status (SES).

Methods: HCC cases diagnosed in the Surveillance, Epidemiology and End Results (SEER) 11 cancer registries between 1996 and 2007 and the population of the SEER 11 catchment areas were studied. Analyses were performed to compare census-tract area family poverty, educational attainment and unemployment by race and ethnicity. A multiple linear regression model, weighted by the number of cases and the number of individuals in each census-tract, with adjustment for registry, was used to calculate mean differences in area-level attributes between HCC cases and the population.

Results: HCC cases in most racial/ethnic groups had lower mean neighborhood-level measures of SES than their referent population. An exception was seen among Hispanics. Comparing white cases to cases of other racial groups and to Hispanics, white cases lived in neighborhoods with less family poverty, fewer high school dropouts, and lower unemployment. Compared to white cases, Asian and Pacific Islander and Hispanic cases lived in neighborhoods with higher percent foreign born population.

Conclusions: Low neighborhood-level SES and immigrant status may be associated with greater risk of HCC within specific racial and ethnic groups.

Impact: These findings could help to focus control resources for HCC toward the most affected communities.
INTRODUCTION

Hepatocellular carcinoma (HCC) incidence and mortality rates have been increasing in the United States since 1980 (1, 2). Racial and ethnic differences in these rates are reported (3). In comparison to whites, other groups experience higher incidence and mortality rates. Whether racial/ethnic differences in HCC incidence can be explained by differences in area-level socioeconomic status (SES) merits investigation because HCC incidence is thought to increase as SES decreases (4).

The limited research that has been published on the relationship between HCC incidence and SES in the United States is restricted to specific geographic regions. For instance, a California study has examined neighborhood enclave status and indices of SES (4). In the U.S., low SES and poverty (5-10) are associated with HCC risk factors (11) including diabetes (5), metabolic syndrome (6), obesity (8), alcoholism (9), hepatitis B (12), and hepatitis C infection (7, 13, 14). Low educational attainment is associated with viral hepatitis infection, alcoholism and liver inflammation (15).

Underemployment was associated with increased rates of alcoholism in some Hispanic groups (16), and hepatitis B infection is more prevalent among some foreign born Asian subgroups (17). In this report, census tract neighborhood-level measures of SES of HCC cases residing in Surveillance Epidemiology and End Results (SEER) 11 registries were compared with the general population of the registry catchment area. We hypothesized that low neighborhood-level SES and high percent foreign born population was associated with greater risk of HCC. Such findings could help to focus control efforts for HCC toward communities that are most affected by HCC.
METHODS

Cases and population

Incident HCC cases during 1996-2007 were reported to Surveillance, Epidemiology and End Results (SEER 11) registries (18): Atlanta, Connecticut, Detroit, Hawaii, Iowa, New Mexico, San Francisco-Oakland, Seattle-Puget Sound, Utah, Los Angeles, and San Jose-Monterey covering over 10% of the U.S. population. Cases were individuals with one primary tumor only, ICD-O-3 topography code C22.0 (primary liver cancer) and morphology codes 8170–8175. Stage at diagnosis and the distribution of selected demographic attributes of cases (age, sex, and race/ethnicity) were determined. Hispanic ethnicity was classified using the North American Association of Central Cancer Registries (NAACCR) Hispanic Identification Algorithm (19). The racial group Asians and Pacific Islanders was classified using the Asian/Pacific Islander Identification Algorithm (20). Cases were compared to the general population residing in the SEER 11 catchment area during year 2000. The SEER Custom Data Use Committee provided approval to link census tract-level attributes to the incidence file.

Neighborhood-level attributes of persons living in the SEER catchment area were obtained by linking census tract of residence of cases and the population. Four determinants of health disparities (21) were examined based on 2000 census tract-level attributes, two widely utilized variables (22): 1) percent of families living below the year 2000 poverty level, 2) percent of persons 25 years and older with less than a high school diploma and two other HCC relevant variables, 3) percent of persons 16 years and older who were unemployed, and 4) percent population born outside the United States (4, 23).

Data were available for all races combined and for non-Hispanic whites, blacks, Asians and Pacific Islanders, and Hispanics (all races). Among cases, whites had the highest proportion of Hispanic ethnicity (30%), followed by American Indian and Alaska Native (4%), black (1.2%) and Asian and Pacific Islander (1%) cases. Population estimates were unavailable for bridged race, accounting for
multiracial individuals at the census-tract level by age and gender. In the 2010 Census, a small proportion of the population designated multiple race (<5%), supporting the use of non-bridged race categories. Percent foreign born population was only available for all races combined. Spearman and Pearson correlations of census tract level variables were examined.

**Comparison of census tract SES of cases and the population**

Mean census tract SES measures and 95% confidence intervals of HCC cases and the population were compared. Multiple linear regression models using the census tracts as the units of analysis were weighted by the number of cases or population size in each census tract and adjusting for registry. These regression models were used to estimate mean differences in census tract attributes between HCC cases and the population. Models were developed for all cases and by race/ethnicity. Differences in census tract percent foreign born population could only be estimated between all cases and the overall population. Stratified analyses were performed for localized stage and regional/distant stage cases, combined. Because of the differential weighting of the census tracts in our sample, we used robust variance estimation to estimate standard errors, a method that is used in analysis of weighted survey data (24). The use of robust variances avoids assumptions that the residuals from the regression analyses have homogeneous variances and applies large sample theory to justify using normality for statistical testing and establishing confidence interval limits (24).

**Case-case comparisons of census tract SES by race/ethnicity**

Multiple linear regression modeling adjusted for age, sex and stage was used to make case-case comparisons where Non-Hispanic whites were the reference group. Non-overlapping racial groups were examined: non-Hispanic blacks, non-Hispanic Asians/Pacific Islanders, and Hispanics (all races combined).
All statistical analyses were performed with SAS software (SAS 9.2; Cary, NC). We utilized the procedures Proc Surveymeans to obtain means and confidence intervals and Proc Surveyreg to conduct the weighted multiple linear regression analyses when comparing census tract SES of cases to the population.
RESULTS

The study compared 18,473 HCC cases to the general population of the SEER 11 catchment areas (Table 1). Compared to the general population, HCC cases were more likely to be male and 45 years of age or older. In addition, compared to the population distribution, a smaller proportion of cases were non-Hispanic white and a higher proportion of cases were Asians or Pacific Islanders.

The mean census tract SES attributes among cases and the population by race and Hispanic ethnicity are shown in Table 2. Statistically significant correlations existed between population census tract attributes, most notably for family poverty, educational attainment, and unemployment (data not shown). The mean census tract percent of families living below the poverty level was 10.8% among cases compared to 8.8% among the population. This pattern held true for most racial/ethnic groups, including non-Hispanic whites (4.9% versus 4.1%), blacks (21.0% versus 18.5%), and Asians and Pacific Islanders (10.2% versus 8.4%). All these differences were statistically significant. In contrast, among Hispanics the mean census tract percent poverty of cases was slightly lower than the referent population (18.5% versus 20.0%). Compared to the population, cases resided in census tracts with a higher mean percent of adults without a high school education. This pattern was seen for all races combined (23.2% versus 19.0%), non-Hispanic white (11.8% versus 10.3%), black (25.5% versus 22.4%) and Asians and Pacific Islanders (23.6% versus 19.2%). The mean census tract percent of non-high school graduates was slightly lower among Hispanic cases than the Hispanic population (50.9% versus 53.1%). The mean census tract percent of people 16 years of age and older that were unemployed was higher among cases than the population for the overall population (6.9% versus 6.0%), non-Hispanic white (4.6% versus 4.2%), and blacks (14.0% versus 11.8%). A small but statistically significant elevated percent unemployment was seen among Asian and Pacific Islander cases compared to their referent population (5.3% versus 4.9%). Among Hispanics no difference in mean census tract
unemployment was observed between cases and the population (9.5% versus 9.5%). Overall, cases resided in neighborhoods with a higher mean percent of foreign born individuals than the population (31.9% versus 19.3%).

Associations generally retained statistically significance after stratification by localized versus regional and distant stage HCC. The most notable exceptions were seen among blacks with localized stage HCC, for whom associations between HCC and neighborhood poverty and low high school graduation rates lost statistical significance. In addition the association between neighborhood-level unemployment and HCC among Asians and Pacific Islanders was no longer statistically significant after stratification by stage.

After finding that HCC cases often lived in neighborhoods with lower SES or higher percentages of foreign born individuals than the overall population (Table 2), case-case comparisons were performed between non-Hispanic white cases, cases of other racial origin, and Hispanic cases. Compared to white cases, cases in other racial and ethnic groups lived in census tracts with higher mean percents of family poverty, high school dropout and unemployment rates (Table 3). Compared to white cases the mean difference in census tract level percent poverty among black cases and Hispanic cases was 10.8% and 8.2%, respectively. Compared to white cases Hispanic cases had the highest mean census tract excess percentage of adults without high school diplomas (19.3%), followed by black cases (12.0%). Compared to white cases mean census tract differences in percent unemployment for black and Hispanic cases were 5.7% and 3.3%, respectively. Among Asian and Pacific Islander cases area measures of low SES were also elevated compared to white cases, although the magnitude of the differences were more modest. Compared to white cases, Asian and Pacific Islander cases had the largest difference in mean census tract percent foreign birth (18.9%), followed by Hispanic cases (15.7%). Mean census tract percent foreign birth was similar among white and black cases.
DISCUSSION

In this SEER 11 study, HCC cases in all racial and ethnic groups except Hispanics lived in census tracts with lower mean SES than their referent population. Black and Hispanic HCC cases lived in areas with the highest mean percent family poverty, unemployment and high school dropouts. Asian and Pacific Islander and Hispanic cases lived in census tracts with the highest mean percent foreign born population. The results support the hypothesis that HCC cases tend to live in neighborhoods with lower SES and more immigration than the population. This may reflect the prevalence of risk factors for HCC such as obesity, hepatitis infection and alcoholism. These findings could help to allocate HCC control efforts to the most adversely affected communities.

This study supports targeting some HCC control resources to specific low socioeconomic status and immigrant communities. HCC risk is influenced by access to care, social support, and lifestyle (25, 26). This study of registries across the United States expands on evidence of an association between low neighborhood SES and high HCC incidence in California (4) and is consistent with reports from other nations on HCC risk and income (27-32), occupation (30) and foreign birth (31, 32). Many HCC cases are preventable through HBV vaccination, antiviral therapy, treatment of alcoholism and weight reduction (33). Furthermore HCC is increasingly amenable to screening and early treatment (34).

Other research (4-9, 13, 14, 16, 17) documents relationships between poverty, low educational attainment and unemployment and known HCC risk factors. In the United States, low SES and poverty (5-9) are associated with diabetes (5), metabolic syndrome (6), obesity (8), alcoholism (9) and hepatitis C infection (7, 13, 14). Particularly strong relationship between SES and these risk factors are seen among blacks (5, 7, 8). Furthermore, low educational attainment is associated with viral hepatitis infection, alcoholism and liver inflammation among men (15). In a multi-state study (8), obesity was associated with unemployment especially among blacks. In California marginally employed migrant
workers had high rates of alcoholism (16). We found that Asian and Hispanic HCC cases lived in neighborhoods with the highest percentages of foreign born residents. Data from the National Health and Nutrition Examination Survey (NHANES) indicate that hepatitis B infection is more prevalent among foreign than U.S. born Asians (17). In California, foreign birth was associated with HCC among Asians while living in an ethnic enclave was associated with HCC among both Asians and Hispanic (4).

In this study, there was an attenuation of associations between HCC and high neighborhood poverty and high school dropout rates among black cases with localized stage HCC. As screening and curable therapy for this cancer become more widely available, a higher proportion of cases are being diagnosed with localized stage HCC (34). To the extent that people living in high SES census tracts are most likely to benefit from HCC screening technology (21) associations between low SES and HCC might be expected to diminish among cases with localized stage HCC.

Unlike all other racial groups in this study, Hispanic cases lived in neighborhoods with lower mean percent family poverty and fewer adults without high school diplomas compared to their referent (i.e., Hispanic) population. Studies indicate that most U.S. Hispanic HCC cases are born in the United States (1, 3). Compared to foreign born Hispanics, those born in the United States have higher mean family income (35) and are more likely to be high school graduates (36). The relatively low and more homogeneous socioeconomic position of Hispanics compared to other racial groups (35-39) may have impeded detection of area-level differences in unemployment between Hispanic HCC cases and their referent population. The Hispanic workforce is susceptible to unemployment due to comparatively low educational attainment (37). However, since low neighborhood measures of SES were not clearly associated with HCC among Hispanics, a broader HCC control effort for Hispanic Americans may have advantages over efforts targeting specifically to only low SES Hispanic neighborhoods (40).
In the United States, Hispanics account for about half of the foreign born population followed by Asians, who account for 30% of immigrants (41). These large and fast growing minority groups experience a disproportionate burden of HCC (1). Along with other area-level SES measures highlighted in this report, control efforts might be partially targeted toward enclaves with high percents of foreign born Asians and Hispanics given elevated proportions of HCC cases living in these areas (4, 17).

This study has strengths including a population-based design with more than 18,000 incident HCC cases from the SEER 11 population, which resembles the U.S. population with regard to poverty and education. The analysis of 2000 census tract level data for cases and the catchment population focused on four census-tract level SES measures: poverty, education, unemployment, and foreign birth. While studies that use an index of area-level socioeconomic position (4, 28, 29, 42) limit multiple comparisons, specific area-level attributes used in the present study revealed tendencies for black cases to live in neighborhoods with elevated rates of poverty and unemployment, Hispanic cases to reside in areas with low educational attainment, and Asian and Pacific Islander cases to live in communities with a high percentage of residents born outside the United States.

Limitations of the present study include absence of data on etiologic risk factors of HCC including viral hepatitis infection, alcohol and obesity. When interpreting area-level attributes, caution is urged since characteristics of case and of people residing in a census tract may differ from one another. Thus, use of area-measures as proxies for individual SES is not recommended since they can operate independently of each other (43, 44).

In summary, our data support the hypothesis that HCC cases often reside in neighborhoods with lower mean SES and a higher percent of foreign born individuals than the general population. Exceptions were seen among Hispanics for SES but not foreign birth. Our results may help target HCC control efforts to underserved racial and ethnic populations identified in this study.
Disclosure of Potential Conflicts of Interest

No potential conflicts of interest were disclosed.

Acknowledgements

We thank Todd Gibson (data), Mandi Yu and Li Zhu (review)

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References

Table 1  Demographic characteristics of hepatocellular carcinoma cases and population of the SEER-11 cancer registry area, 1996 to 2007

<table>
<thead>
<tr>
<th></th>
<th>Case</th>
<th></th>
<th>Year 2000 Population</th>
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</thead>
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<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Total</td>
<td>18,473</td>
<td>100</td>
<td>38,733,536</td>
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<tr>
<td>Stagea</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Localized</td>
<td>7,148</td>
<td>38.7</td>
<td>-</td>
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<tr>
<td>Regional/distant</td>
<td>8,496</td>
<td>46.0</td>
<td>-</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>4,703</td>
<td>25.5</td>
<td>19,601,837</td>
</tr>
<tr>
<td>Male</td>
<td>13,770</td>
<td>74.5</td>
<td>19,131,699</td>
</tr>
<tr>
<td>Age in yrs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;45</td>
<td>1,151</td>
<td>6.2</td>
<td>26,192,037</td>
</tr>
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<td>45- &lt;65</td>
<td>9,059</td>
<td>49.0</td>
<td>8,277,262</td>
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<tr>
<td>65+</td>
<td>8,263</td>
<td>44.7</td>
<td>4,264,237</td>
</tr>
<tr>
<td>Race/ Ethnicityb</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Non-Hispanic White</td>
<td>7,651</td>
<td>41.4</td>
<td>22,285,501</td>
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<td>Black</td>
<td>2,212</td>
<td>12.0</td>
<td>4,350,944</td>
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<td>Asian/Pacific Islander</td>
<td>5,026</td>
<td>27.2</td>
<td>4,342,196</td>
</tr>
<tr>
<td>Hispanic (All Races)</td>
<td>3,357</td>
<td>18.2</td>
<td>7,732,353</td>
</tr>
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</table>

a Unstaged and unknown stage not shown  
b Hispanic ethnicity may overlap with race
Table 2 Census tract socioeconomic attributes, hepatocellular carcinoma cases and population, SEER 11, 1996 to 2007

<table>
<thead>
<tr>
<th>2000 Census Tract Attribute/ Race &amp; Ethnicity</th>
<th>All Cases Population</th>
<th>Year 2000 Population</th>
<th>All Case Population Difference a,b</th>
<th>Localized Stage Population Difference a,b</th>
<th>Regional/Distant Stage Population Difference a,b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of families living below poverty level</td>
<td>Mean Percent (95% CI)</td>
<td>Mean Percent (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
</tr>
<tr>
<td>All Races Combined</td>
<td>10.8 (10.5, 11.1)</td>
<td>8.8 (8.6, 9.0)</td>
<td>1.6 (1.3, 2.0)</td>
<td>1.1 (0.6, 1.5)</td>
<td>2.3 (6.0, 7.0)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>4.9 (4.7, 5.1)</td>
<td>4.1 (4.0, 4.2)</td>
<td>0.9 (0.7, 1.1)</td>
<td>0.7 (0.4, 1.0)</td>
<td>1.2 (0.9, 1.5)</td>
</tr>
<tr>
<td>Black</td>
<td>21.0 (20.1, 22.0)</td>
<td>18.5 (17.8, 19.2)</td>
<td>1.9 (0.8, 3.0)</td>
<td>0.7 (-0.8, 2.2)</td>
<td>3.2 (1.6, 4.8)</td>
</tr>
<tr>
<td>Asian and Pacific Islander</td>
<td>10.2 (9.5, 11.0)</td>
<td>8.4 (8.0, 8.8)</td>
<td>1.4 (0.7, 2.1)</td>
<td>1.2 (0.2, 2.2)</td>
<td>1.5 (0.6, 2.4)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>18.5 (18.3, 19.5)</td>
<td>20.0 (19.6, 20.5)</td>
<td>-0.9 (-1.6, -0.2)</td>
<td>-1.5 (-2.5, -0.4)</td>
<td>-0.5 (-1.4, 0.5)</td>
</tr>
<tr>
<td>Percent, no high school diploma (25+ years of age)</td>
<td>Mean Percent (95% CI)</td>
<td>Mean Percent (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
</tr>
<tr>
<td>All Races Combined</td>
<td>23.2 (22.3, 23.6)</td>
<td>19.0 (18.6, 19.3)</td>
<td>3.3 (2.7, 3.9)</td>
<td>2.5 (1.6, 3.3)</td>
<td>4.3 (3.5, 5.1)</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>11.8 (11.5, 12.1)</td>
<td>10.3 (10.1, 10.5)</td>
<td>1.6 (1.3, 1.9)</td>
<td>1.5 (1.0, 1.9)</td>
<td>1.9 (1.4, 2.4)</td>
</tr>
<tr>
<td>Black</td>
<td>25.5 (24.7, 26.4)</td>
<td>22.4 (21.7, 23.1)</td>
<td>2.5 (1.5, 3.6)</td>
<td>1.1 (-0.2, 2.4)</td>
<td>4.1 (2.7, 5.5)</td>
</tr>
<tr>
<td>Asian and Pacific Islander</td>
<td>23.6 (21.2, 24.8)</td>
<td>19.2 (18.5, 19.9)</td>
<td>4.3 (2.9, 5.7)</td>
<td>4.0 (1.8, 6.1)</td>
<td>4.7 (2.9, 6.5)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>50.9 (50.0, 51.9)</td>
<td>53.1 (52.4, 53.8)</td>
<td>-1.2 (-2.3, -0.1)</td>
<td>-2.2 (-3.7, -0.7)</td>
<td>-0.5 (-1.9, 0.9)</td>
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<tr>
<td>Percent unemployed (16+ years of age)</td>
<td>Mean Percent (95% CI)</td>
<td>Mean Percent (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
</tr>
<tr>
<td>All Races Combined</td>
<td>6.9 (6.8, 7.1)</td>
<td>6.0 (5.8, 6.1)</td>
<td>0.7 (0.6, 0.9)</td>
<td>0.6 (0.3, 0.8)</td>
<td>1.0 (0.8, 1.3)</td>
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<tr>
<td>Non-Hispanic White</td>
<td>4.6 (4.5, 4.8)</td>
<td>4.2 (4.1, 4.3)</td>
<td>0.4 (0.2, 0.6)</td>
<td>0.4 (0.1, 0.6)</td>
<td>0.4 (0.2, 0.7)</td>
</tr>
<tr>
<td>Black</td>
<td>14.0 (13.4, 14.7)</td>
<td>11.8 (11.4, 12.2)</td>
<td>1.7 (1.0, 2.4)</td>
<td>1.4 (0.4, 2.4)</td>
<td>2.2 (1.2, 3.1)</td>
</tr>
<tr>
<td>Asian and Pacific Islander</td>
<td>5.3 (5.0, 5.5)</td>
<td>4.9 (4.7, 5.2)</td>
<td>0.4 (0.1, 0.7)</td>
<td>0.4 (-0.04, 0.8)</td>
<td>0.3 (-0.1, 0.7)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>9.5 (9.3, 9.8)</td>
<td>9.5 (9.3, 9.7)</td>
<td>-0.01 (-0.3, 0.3)</td>
<td>-0.1 (-0.6, 0.4)</td>
<td>0.2 (-0.3, 0.6)</td>
</tr>
<tr>
<td>Percent born outside the United States</td>
<td>Mean Percent (95% CI)</td>
<td>Mean Percent (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
<td>β (95% CI)</td>
</tr>
<tr>
<td>All Races Combined</td>
<td>31.9 (31.2, 32.7)</td>
<td>19.3 (18.9, 19.7)</td>
<td>5.6 (4.8, 6.4)</td>
<td>5.4 (4.3, 6.6)</td>
<td>5.9 (4.9, 7.0)</td>
</tr>
</tbody>
</table>

a Models weighted by number of individuals in each strata
b Models adjusted for registry
**Table 3** Hepatocellular carcinoma case census tract socioeconomic attributes of non-Hispanic white versus other racial/ethnic groups "a, b"

<table>
<thead>
<tr>
<th>2000 Census Tract Attribute</th>
<th>Non-Hispanic White Alone Mean difference (95% CI)</th>
<th>Non-Hispanic Black Alone Mean difference (95% CI)</th>
<th>Non-Hispanic Asian Alone Mean difference (95% CI)</th>
<th>Hispanic (All Races) Mean difference (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percent of families living below poverty level</td>
<td>Reference 10.8 (10.3, 11.2)</td>
<td>2.9 (2.5, 3.2)</td>
<td>8.2 (7.8, 8.6)</td>
<td></td>
</tr>
<tr>
<td>Percent, no high school diploma (25+ years of age)</td>
<td>Reference 12.0 (11.2, 12.8)</td>
<td>7.1 (6.5, 7.7)</td>
<td>19.3 (18.6, 20.0)</td>
<td></td>
</tr>
<tr>
<td>Percent unemployed (16+ years of age)</td>
<td>Reference 5.7 (5.5, 6.0)</td>
<td>1.0 (0.8, 1.2)</td>
<td>3.3 (3.1, 3.5)</td>
<td></td>
</tr>
<tr>
<td>Percent born outside the United States</td>
<td>Reference 0.6 (-0.3, 1.4)</td>
<td>18.9 (18.3, 19.5)</td>
<td>15.7 (15.0, 16.4)</td>
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</tbody>
</table>

"a" Multiple linear model  
"b" Adjusted for age, sex, stage
# Socioeconomic status and hepatocellular carcinoma in the United States


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