Country of Birth (Nativity) and Cancer Diagnosis: Findings From The National Health and Nutrition Examination Survey (NHANES) 2011-2018

Luceta McRoy (dlcmcroy@gmail.com)
Washington Adventist University
Josue Epane
University of Nevada Las Vegas
Zo Ramamonjiarivelo
Texas State University
Ferhat Zengul
University of Alabama at Birmingham
Robert Weech-Maldonado
University of Alabama at Birmingham
George Rust
Florida State University Medical School

Research Article

Keywords: Cancer, Nativity, Country of Birth, NHANES, Disparities, Immigrant Paradox

Posted Date: March 5th, 2021

DOI: https://doi.org/10.21203/rs.3.rs-260557/v1

Abstract

Purpose: Cancer incidence in the US remains higher among certain groups, regions, and communities and there are variations based on nativity. Research has primarily focused on specific groups and types of cancer. This study expands on previous studies to explore the relationship between country of birth (nativity) and all cancer site incidences among US and foreign-born residents using a nationally representative sample.

Methods*:* This is a cross-sectional study of (unweighted n= 22,554; weighted n =231,175,933) participants between the ages of 20 and 80 from the National Health and Nutrition Examination Survey (NHANES) 2011-2018. Using weighted logistic regressions, we analyzed the impact of nativity on self-reported cancer diagnosis controlling for routine care, smoking status, overweight, race/ethnicity, age, and gender. We ran a partial model, adjusting only for age as a covariate, and a full model with all other covariates.

Results: In the partial and full models, our findings indicate that US-born individuals were more likely to report a cancer diagnosis compared to their foreign-born counterparts (OR = 2.34, 95% CI [1.93; 2.84], p<0.01), and (OR=1. 39, 95 % CI [1.05; 1.84], p < 0.05), respectively. There was a significant association between cancer diagnosis and routine care (OR=1.48, 95% [1.14; 1.93], p<0.01), overweight (OR=1.16, 95% CI [1.01; 1.34], p<0.05), and smoking status (OR=1.30, 95% CI [1.13; 1.49], p<0.01). Race/ethnicity, age and gender were also significantly associated with cancer diagnosis.

Conclusion*:* A variety of factors may reflect lower cancer diagnosis in foreign-born individuals in the US other than a healthy immigrant advantage, including environmental factors.

Background

Cancer is a complex disease currently ranked as the second leading cause of death in the United States. While the mortality rate has been declining, there were approximately 1.8 million new cases of cancer in 2020, and an estimated 1.9 million are projected in 2021, which is equivalent to 5,200 new cases each day [1]. The financial burden associated with cancer care can deeply affect the patients' families and communities. In the United States, cancer care expenditures in 2018 amounted to 151 billion dollars and are expected to rise with an increase in the population and adoption of expensive treatment options [2].

Overall, cancer incidence and mortality remain higher among minority groups and variations exist based on country of birth (nativity). African American men are more likely to be affected by cancer (all sites combined) than other racial groups [3]. Hispanics have higher rates of cervical cancer than the majority population (9.6% compared to 7.1%), and Asians have a higher incidence rate of liver and stomach cancer than non-Hispanic Whites (19.7% vs. 10.3% and 12.5% vs. 7.8%, respectively)[3]. Studies show that some immigrant groups have a lower risk of site-specific cancer, yet variations remain among and within these groups [4–8]. Disparities also exist across geographic regions, including states and within communities [2, 8–10].

Beyond screening, genetic factors as well as demographic factors, drive differences in the development of this complex disease [1–2, 11–13]. Lifestyle choices such as diet, smoking habits, alcohol consumption, physical activity; social determinants of health including, education and economic factors; and environmental factors all pose a greater risk to some social groups compared to others [1–2, 12, 14–16]. According to the Centers for Disease Control and Prevention (CDC), more than half of 500,000 cancer deaths each year could be prevented by changing lifestyles and obtaining recommended cancer screenings [15].

A growing body of literature suggests that foreign-born individuals perform better on certain health measures and have lower mortality rates than US-born natives despite lower socioeconomic status and poor access to health care [5, 14, 16]. This phenomenon is termed the "healthy immigrant paradox." Common explanations of this phenomenon include the social and cultural capital that immigrants often enjoy as well as the healthy immigrant selection. While generally true for most immigrant groups, those advantages seem to weaken the longer immigrants reside in the United States, resulting in foreign-born having the same or worst outcomes than US-born natives [16–19].

Approximately 45 million immigrants are residing in the United States as of 2019, an increase of 12% from the 40 million in 2010. This, by far, is a smaller growth from 2010 when the population catapulted by 28 % from 2000 [20]. The influx of immigrants has raised concerns about the disproportionate financial burden on the US healthcare system, as most immigrants lack healthcare, particularly the undocumented immigrants who make up 12% of the immigrant population [20]. The assumption of the disproportionate financial burden on the health system has been refuted in studies that have found immigrants' health care expenditures to be lower than those who are US-born as US immigrants use less healthcare [20]. Low healthcare usage among immigrants may be attributable to several factors including, lack of health insurance, fear among the undocumented, or simply that recent immigrants are generally younger and healthier than US natives [20–21].

The literature examining cancer incidence and nativity has focused mostly on sub-groups of immigrants, primarily Hispanics and Asians, site-specific cancers, and geographic regions in the country [5–8, 16–19, 21–27]. These studies generally show that foreign-born residents are less likely to have site-specific cancers than their US-born counterparts, but within each subpopulation group, there are ethnic variations. Other studies on cancer and nativity have focused on cancer screening related to specific types of cancer and racial/ethnic groups with findings pointing to lower rates of screening among foreign-born, though the results vary depending on the length of residence in the US [5, 28–30]. Additional research has explored the relationship between nativity and cancer mortality with the general finding of lower mortality among foreign-born [8, 16–18, 31–32]. While previous work addressed the heterogeneity among and within different immigrant populations, there remain shared socioeconomic factors among this population and the overall immigrant experience. Immigrants often must overcome linguistic and other barriers and are affected by immigration policies associated with their status that directly affect their access to care and, ultimately, their health [3].

The purpose of this study is to examine the relationship between self-reported lifetime cancer diagnosis and nativity. This study seeks to expand on previous research examining nativity and cancer diagnosis to explore the relationship between all cancer types among immigrant racial groups and US-born, using a large national dataset. We further examined the potential healthy immigrant advantage in terms of self-reported cancer diagnosis by specific racial groups. To our knowledge, the relationship between all types of self-reported cancer diagnoses and nativity among the general immigrant population, using a large population-based dataset, has not been examined. The findings of this study may lead to further investigations seeking to explain the disparities in self-reported cancer diagnosis based on nativity.

Methods

Data

To determine the association between nativity and self-reported cancer diagnosis, we used data from the National Health and Nutrition Examination Survey (NHANES). The survey was conducted by the National Center for Health Statistics (NCHS) at the CDC and included nationally representative information on both the health and nutrition status of the general US population, which was obtained through self-reported personal interviews and physical examination each year for children and adults. Data used included those released in two-year cycles from the demographic and questionnaire data files which included Medical Conditions, Hospital Utilization and Access to Care, and Smoking-Cigarette Use. This retrospective cross-sectional study included four interview cycles, 2011–2012, 2013–2014, 2015–2016, and 2017–2018. After applying an age criterion of ages 20 to 80, and deleting missing observations, our final sample size was n = 22,554 (unweighted); n = 231,175,933 (weighted).

Variables

The dependent variable, self-reported cancer diagnosis, was obtained from the Medical Conditions file. That variable was extracted from responses to the question, “Have you ever been told by a doctor or other health professional that you had cancer or a malignancy of any kind?” and categorized as a dichotomous variable with “1 = yes” and “0 = no.” The independent variable, country of birth (nativity), was identified from responses to the question, “In what country were you born?” Respondents who indicated being born in one of the 50 United States or Washington DC were classified as US-born. Those who indicated that they were born in other countries were classified as foreign-born. The variable was coded as “1 = US-born” and “0 = foreign-born.”

We controlled for routine care, overweight, smoking status, race/ethnicity, gender, and age. The variable routine care was obtained from the Hospital Utilization and Access to Care data file. The question “Is there a place that you usually go when you are sick or need advice?” was categorized as a dichotomous variable. Those who answered “yes,” and indicated that they had one or more than one place, were combined and recoded as “yes,” “1 = yes” and “0 = no.” The variable overweight was obtained from the Medical Conditions data file. The question “Has a doctor or other health professional ever told you that you were overweight?” was categorized as a dichotomous variable with “1 = yes” and “0 = no.” The smoking variable was obtained from the Smoking-Cigarette Use file. We combined the questions, “Have you smoked at least 100 cigarettes in your lifetime” and “Do you now smoke cigarettes?” for the smoking variable. Responses of “no” to both questions were combined and classified as “nonsmokers.” All other responses were classified as smokers, current or past. We categorized this as a dichotomous variable “1 = yes” for smokers and “0 = no” for nonsmokers. Race/ethnicity was categorized as non-Hispanic White, non-Hispanic Black, Mexican American, other Hispanic, Asian, and other race/ethnicity. We created six dummy variables for each racial/ethnic category. We used non-Hispanic White, which was the largest group, as the reference category. Gender was classified as male and female. Age was used as a continuous variable.

Data Analysis

All analyses were performed using the complex samples module in IBM SPSS version 27 to adjust for the clustered hierarchical sample designs of NHANES, using cluster, stratum, and sample weights provided by the NCHS.
Descriptive statistics were used to examine respondent characteristics. Weighted logistic regressions were performed to model the association between nativity and the dependent variable, self-reported cancer diagnosis. To determine the effect of age given the age differences between US and foreign-born individuals, we used two models. Model 1 adjusted for nativity and age only as a covariate.
In Model 2, we added covariates routine care, overweight, smoking status, race/ethnicity, gender, and age.
We further examined the association between nativity and cancer diagnosis among racial groups. The statistical significance was established at $p < 0.05$.

Results

Table 1 presents the descriptive characteristics of the sample. The weighted sample included 82% US-born and 18% foreign-born. Approximately 11% of the sample indicated that they had a cancer diagnosis. The percentage of US-born individuals who had a self-reported cancer diagnosis was more than twice that of foreign-born individuals (12% vs. 5%, p<0.001). The unweighted mean age of the sample was 49.75, median 50, and interquartile range 30. The weighted average age of the sample was 47.78. On average, foreign-born natives were younger than US-born. The weighted average age was 45.56 among foreign-born compared to 48.28 among US-born natives. More than one-third (64%) of the foreign-born natives were between the ages of 20 and 50, compared to (54%) US-born. A larger percentage of foreign-born was within the age group 51-64 versus US-born (36.3 vs. 26.3, p<0.001). Within age group 65-80, US-born accounted for a larger percentage (20.5% vs. 13.8%, p<0.001). The percentage of females was slightly higher than males (52% vs. 48%). There was almost an equal percentage of foreign-born and US-born males (49% vs. 48%) and an even split among foreign-born and US-born females (52% vs. 52%). Most of the weighted sample was non-Hispanic White (65%), followed by non-Hispanic Black (11%). Mexican Americans and other Hispanics accounted for 15%, with 9% and 6% for each group, respectively. US-born non-Hispanic Whites account for a higher percentage than foreign-born Whites (75% vs. 15%, p< 0.001). US-born non-Hispanic Blacks made up a larger percentage of the sample than foreign-born Blacks (13% vs. 7%, p<0.001). On the other hand, US-born Mexican Americans made up a smaller percentage than foreign-born Mexican Americans (5% vs. 26%, p<0.001). There was a similar pattern with US-born Other Hispanics vs foreign-born Other Hispanics (3% vs. 26. %, p < 0.001), US-born Asians vs. foreign-born Asians (1% vs. 26%, p<0.001) and those who were US-born of other races vs. foreign-born (2% vs. 3%, p<0.001).

Most of the respondents received routine care in at least one location (84%). US-born individuals received routine care at a higher rate than foreign-born (85% vs.77%, p <0.001). Over one-third (36%) of the sample reported being told that they were overweight by their doctor and more US-born individuals reported being overweight compared to foreign-born (40% vs. 27%). Less than half of the sample were smokers who either smoked in the past or were current smokers (43%). However, US-born individuals were more likely to be smokers than foreign-born (46% vs. 31%, p = <0.001).

Table 2 shows the multivariate logistic regression examining the association between nativity and cancer diagnosis after adjusting for routine care, being overweight, smoking status, race/ethnicity, gender, and age. In Model 1, we adjusted for age as a continuous variable using logistic regression. We found that nativity was significantly associated with a cancer diagnosis. US-born individuals were more likely to report a self-reported cancer diagnosis compared to their foreign-born counterparts (OR = 2.34, 95% CI [1.93; 2.83], p<0.001). With each unit increase in age, there was a higher odds of a self-reported cancer diagnosis (OR=1.07, 95% CI [1.06; 1.07], p<0.001). In the fully adjusted model, nativity was significantly associated with a self-reported cancer diagnosis. US-born individuals were more likely to report a cancer diagnosis compared to their foreign-born counterparts (OR=1. 39, 95 % CI [1.05; 1.84], p<0.05). The association between age and self-reported cancer did not vary from the first model (OR= 1.06, 95% CI [1.06; 1.07], p<0.001). Mexican Americans, other Hispanics, non-Hispanic Blacks, and Asians were significantly less likely to report having cancer compared to non-Hispanic Whites (OR=0.46, 95% CI [0.36; 0.58], p<0.001), (OR=0.60, 95% CI [0.42, 0.86], p<0.001), (OR=0.40, 95% CI [0.36; 0.45], p<0.001), (OR=0.37, 95% CI [0.27; 0.51], p<0.001), respectively. Males were significantly less likely to report having been told they had cancer compared to females (OR=0.87, 95% CI [0.76; 1.0], p<0.05). Individuals who had a place of routine care were more likely to have been told they have cancer (OR=1.48, 95% [1.14; 1.93], p<0.001). Those that were overweight were more likely to have reported a cancer diagnosis compared to those who were not overweight (OR 1.16, 95% CI [1.01; 1.34], p<0.05). Smokers were more likely to report having been diagnosed with cancer (OR 1.30, 95% CI [1.13; 1.49], p<0.001). We performed a sensitivity analysis with age categorized (20 -34); (35-50); (51-64); and (65-80) with the youngest age group as the reference group. There were no significant differences in the results from age as a continuous variable.

There was not a significant association between nativity and self-reported cancer diagnosis among non-Hispanic Whites (OR =1.35, 95% CI [0.87;2.08], p =0.17). With each unit increase in age, there was a higher odds of a self-reported cancer diagnosis among non-Hispanic Whites (OR=1.07, 95% CI [1.06; 1.07], p<0.001). Non-Hispanic White smokers were also more likely to report being diagnosed with cancer than non-Hispanic White nonsmokers (OR= 1.27, 95% CI [1.08;1.5], p<0.05). There was no significant difference based on gender, routine care, or being overweight (OR=0.90, 95% CI [0.76;1.07], p=0.23), (OR=1.27, 95% CI [0.95;1.71], p=0.06), (OR=1.16, 95% CI [0.99;1.36], p=0.11), respectively.

There was no significant association with nativity and self-reported cancer among Mexican Americans (OR=0.98, 95% CI [0.62;1.60], p=0.94). With each unit increase in age, there was a higher odds of a self-reported cancer diagnosis among Mexican Americans (OR=1.06, 95% CI [1.05;1.08], p<0.001). Mexican American males compared to Mexican American females were significantly less likely to report a cancer diagnosis (OR=0.32, 95% CI [0.20;0.49], p<0.001). Among this group, there was a higher odds of a self-reported cancer diagnosis among those who reported having routine care compared to those who did not receive routine care (OR=2.35, 95% CI [1.20;4.60], p<0.05). Mexican American smokers had significantly higher odds of reporting a cancer diagnosis than nonsmokers (OR=1.07, 95% CI [1.16;2.67], p<0.05.), but there was no significant relationship between being overweight and a reported cancer diagnosis among Mexican Americans (OR=1.07, 95% CI [0.73;1.57], p=0.72).

Among the other Hispanic group, there was a significant association between self-reported cancer diagnosis and age (OR =1.04, 95% CI [1.03;1.06], p<0.001) and routine care (OR=3.96, 95% CI [1.60;9.77], p<0.05). There was not a significant association between nativity and self-reported cancer diagnosis (OR=1.19, 95% CI [0.76;1.86], p=0.44), gender (OR=. 0.64, 95%, CI [0.39;1.06], p=0.08), being overweight (OR=0.99, 95% [CI [0.60;1.62], p=0.96), and smoking (OR=1.32, 95% CI [0.91;1.91], p=0.14).

Among Asians, there was no significant association between nativity and self-reported diagnosis (OR=1.52, 95% CI [0.85;2.77], p=0.17). An increase in age among this group showed a significant likelihood of self-reported cancer (OR=1.08, 95% CI [1.06;1.09], p<0.001). Asian males were significantly less likely to report having cancer diagnosis than Asian females (OR=0.39, 95% CI [0.23;0.59], p<0.001). There was no significant relationship between routine care, overweight and smoking among and self-reported cancer among this group (OR=1.50, 95% CI [0.62;3.63], p=0.36); (OR=1.58, 95% CI [0.90;2.80], p=0.11); (OR=1.16, 95% CI [0.60;2.22], p=0.66), respectively.

While there was no significant association between nativity and self-reported diagnosis among the group, “Other race” (OR=2.21, 95% CI [0.78;6.31], p=0.135), there was an association between age and self-reported cancer diagnosis as with all racial groups (OR=1.07, 95% CI [1.03;1.10], p < 0.001). Smokers were significantly more likely to report a cancer diagnosis compared to non-smokers (OR=3.98, 95% CI [1.56;10.20], p < 0.001). Gender, routine care and being overweight were not significantly associated with a cancer self-diagnosis (OR=0.81, 95% CI [0.37;1.79], p = 0.60), (OR=2.00, 95% [CI 0.60;6.72], p = 0.26), (OR=1.48, 95% [CI 0.63;3.46], p = 0.36), respectively.

Discussion

The findings of this study reveal an association between nativity and self-reported cancer diagnosis for all racial groups combined. Compared to US-born natives, foreign-born individuals were less likely to have reported a cancer diagnosis. The findings seem to validate the healthy immigrant paradox, which suggests that immigrants experience better health outcomes than US-born notwithstanding access to fewer resources [33-34], and show that it potentially extends to all racial/ethnic groups. Better health outcomes among foreign-born may also be attributed to the selective process that occurs during the immigration process. Only those who pass stringent health examinations are allowed entry in the US [35]. While those who enter the country without legal documents may bypass this health screening process, their health may be protected by cultural factors [3, 14]. Additionally, the various pathways to entry which include, family relationships, having a particular skill set, or humanitarian protection may directly affect overall health status [19-20].

Mexican Americans and other Hispanics account for only 15 percent of the study sample, but almost half of the foreign-born in the sample. The Hispanic paradox of cultural and social advantages among this group that results in better health outcomes than non-Hispanic Whites despite lower socioeconomic status may also explain our findings. It should be noted, however, that the protection may weaken over time with acculturation. The health of Hispanics is also said to be “protected” by cultural factors, including traditional diet and support of family [36] and others, lending support to our findings.

As age increased, there was a higher likelihood of a cancer diagnosis, which is consistent with the development of cancer over time. The foreign-born group was slightly younger than the US-born group, and a higher percentage of US-born were in the 65 and older age category, which may explain our findings of a lower odds of a self-reported cancer diagnosis among foreign-born individuals. The findings on gender reflect reports on cancer incidence among gender which report men having higher cases on some site-specific cancers than women in general and variations in gender-specific cancer [3].

In the fully adjusted model, Mexican Americans, other Hispanics, non-Hispanic Blacks, and Asians were significantly less likely to have a self-reported cancer diagnosis compared to non-Hispanic Whites, which confirms other studies, particularly for specific cancer types [24,27]. However, when stratified by race, we found that US-born non-Hispanic Blacks were more likely to report a cancer diagnosis compared to foreign-born non-Hispanic Blacks. Hispanics and Asians account for the largest percentage of immigrants in the United States. Blacks account for a smaller percentage of immigrants and are more likely to be more recent immigrants who have maintained some protective social factors, such as particular dietary and behavioral patterns [20]. This may also be explained by the more stringent health screening in the selection process resulting in better health among this group.

Health insurance is a key factor in access to preventive screening, early diagnosis, and treatment of cancer [2]. In this study, we controlled for routine care, assuming those who have routine care or usual source of care would have health insurance and hence access to care. We found a significant association between self-reported cancer and routine care. Those who receive routine care were more likely to report a cancer diagnosis. This finding is not surprising as access and routine care result in diagnosis at the early, asymptomatic stage. Hence, the higher reported cases of cancer among individuals receiving routine care. Among racial groups, non-Hispanic Blacks and Mexican Americans who received routine care were significantly more likely to report having a cancer diagnosis which may simply suggest detection at screening.

It is important to note that although there may not be a cancer diagnosis, cancer may still be present as the frequency of screening differs among populations. Several studies report late-stage cancer diagnosis or disparity in screening among immigrants and those lacking health insurance or usual source of care [30, 37-39]. About a quarter of the foreign-born individuals in this study did not have access to routine care, and thus may have had missed opportunities to diagnose cancers that were asymptomatic or sub-clinical.

While approximately five to ten percent of all cancers may be due in part to genetic defects, more cancers may be attributed to environmental or behavioral factors [40]. Smoking is a risk factor for lung, liver, and colorectal cancer. It is responsible for 80% of lung cancer, one of the most common types of cancer in the United States [3]. Our findings of a significant association between smoking and cancer diagnosis are supported by studies pointing to environmental factors including behavior or lifestyle as the differentiating contributing risk factors to cancer. However, there are fewer smokers among foreign-born as we found in our study. This is validated by previous studies that have shown that US-born individuals are more likely to be smokers and at a greater risk for lung cancer [16, 41]. Smoking, however, generally increases with acculturation diminishing the differences in health outcomes of new immigrants and US-born individuals. Individuals who are overweight are at a greater risk for many diseases, including cancer, particularly breast and colon cancer [3]. In our study, there was a small percentage of respondents who indicated being told that they were overweight. However, there was a significantly higher odds of a cancer diagnosis among those who reported being overweight. Our finding is supported by previous studies that show being overweight as a factor contributing to the increased risk of cancer [42-45].

Strengths of this study include its nationally representative nature of the NHANES data and the large sample size, yet the cross-sectional nature of the data does not allow for the observation of changes over time among the participants. Additionally, the self-reported nature of the data may result in a potential error with the data, such as recall bias or social desirability in survey responses. NHANES data do not provide information on specific birthplace, but rather on whether individuals were born in the United States or another country. Therefore, in this study, Hispanics and Asians were presented as subgroups without capturing their heterogeneity and variations in health outcomes related to cancer [46-47]. Additionally, due to data limitations, we did not examine the length of time individuals had been in the United States, which may have had an impact on acculturation, socioeconomic status, and access to care. The scope of this study included self-reported cancer diagnosis or incidence and not prevalence, which is a function of disease incidence and survival time given the data. Additionally, the data did not include a specific time frame for cancer diagnosis, and we were not able to capture the specific types of cancer. Several studies have shown that immigrants who have resided in the United States for a longer period lose the positive immigrant advantage on health over time [48-49]. Future longitudinal studies may examine cancer diagnosis among recent immigrants compared to those who have resided in the US for longer periods and specific birthplace.

Conclusions

This study finds that foreign-born individuals have a significantly lower likelihood of being diagnosed with all-site cancer compared to US-born and may reflect a healthy immigrant advantage. However, other factors may be driving these findings, such as actual differences in environmental or behavioral exposures, lower rates of cancer screening, and a disparity in identifying cancers at the earliest and most curable stages. Future longitudinal studies are needed to further elucidate the factors behind the differences in cancer diagnoses based on nativity status.

Declarations

Funding

The authors did not receive funding for this research.

Conflicts of interest/Competing interests

The authors have no potential conflicts of interest to disclose.

Availability of data and material

Not Applicable

Code availability

Not Applicable

References

1. Institute, N.-N.C. Cancer Statistics. 2020 [cited 2021 February 10]; Available from: https://www.cancer.gov/about-cancer/understanding/statistics.
2. Cancer Facts & Figures 2021. 2021 [cited 2021 February 10]; Available from: https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/annual-cancer-facts-and-figures/2021/cancer-facts-and-figures-2021.pdf
3. Cancer Facts & Figures for Hispanics/Latinos 2018-2020. [cited 2020, June, 2020]; Available from: https://www.cancer.org/content/dam/cancer-org/research/cancer-facts-and-statistics/cancer-facts-and-figures-for-hispanics-and-latinos/cancer-facts-and-figures-for-hispanics-and-latinos-2018-2020.pdf
4. Siegel R Naishadham D Jemal A: Cancer statistics for Hispanics/Latinos, 2012. CA Cancer J Clin, 2012. 62(5): 283-98.
5. Chang ET Yang J Alfaro-Velcamp T So SK Glaser SL Gomez SL: Disparities in liver cancer incidence by nativity, acculturation, and socioeconomic status in California Hispanics and Asians. Cancer Epidemiol Biomarkers Prev, 2010. 19(12): 3106-18.

6. Stern MC Fejerman L Das R Setiawan VW Cruz-Correa MR Perez-Stable EJ Figueiredo JC: Variability in Cancer Risk and Outcomes Within US Latinos by National Origin and Genetic Ancestry. Curr Epidemiol Rep, 2016. 3: 181-190.
7. 7. Stern MC Zhang J Lee E Deapen D Liu L: Disparities in colorectal cancer incidence among Latino subpopulations in California defined by country of origin. Cancer Causes Control, 2016. 27(2): 147-55.
8. Miller, B. A., Chu, K. C., Hankey, B. F., & Ries, L. A. (2008). Cancer incidence and mortality patterns among specific Asian and Pacific Islander populations in the U.S. *Cancer causes & control: CCC*, *19*(3), 227–256. https://doi.org/10.1007/s10552-007-9088-3
9. Rust G Zhang S Yu Z Caplan L Jain S Ayer T McRoy L Levine RS: Counties eliminating racial disparities in colorectal cancer mortality. Cancer, 2016. 122(11): 1735-48.
10. Rust G Zhang S Malhotra K Reese L McRoy L Baltrus P Caplan L Levine R: Paths to health equity: Local area variation in progress toward eliminating breast cancer mortality disparities, 1990-2009. Cancer, 2015. 121(16): 2765-74.
11. Pal T Permuth-Wey J Betts JA Krischer JP Fiorica J Arango H LaPolla J Hoffman M Martino MA Wakeley K Wilbanks G Nicosia S Cantor A Sutphen R: BRCA1 and BRCA2 mutations account for a large proportion of ovarian carcinoma cases. Cancer, 2005. 104(12): 2807-16.
12. Fortune ML: The Influence of Social Determinants on Late Stage Breast Cancer for Women in Mississippi. J Racial Ethn Health Disparities, 2017. 4(1): 104-111.
13. Torbrand C Wigertz A Drevin L Folkvaljon Y Lambe M Håkansson U Kirrander P: Socioeconomic factors and penile cancer risk and mortality; a population-based study. BJU Int, 2017. 119(2): 254-260.
14. McDonald JT Farnworth M Liu Z: Cancer and the healthy immigrant effect: a statistical analysis of cancer diagnosis using a linked Census-cancer registry administrative database. BMC Public Health, 2017. 17(1): 296.
15. Prevention, C.f.D.C.a. National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP). [cited 2018 August 16]; Available from: https://www.cdc.gov/chronicdisease/resources/publications/aag/dcpc.htm
16. Blue L Fenelon A: Explaining low mortality among US immigrants relative to native-born Americans: the role of smoking. Int J Epidemiol, 2011. 40(3): 786-93.
17. Hagopian GS Lieber M Dottino PR Kemeny M Li X Overbey J Clark LD Beddoe AM: The impact of nativity on cervical cancer survival in the public hospital system of Queens, New York. Gynecol Oncol, 2018. 149(1): 63-69.
18. Setiawan VW Wei PC Hernandez BY Lu SC Monroe KR Le Marchand L Yuan JM: Disparity in liver cancer incidence and chronic liver disease mortality by nativity in Hispanics: The Multiethnic Cohort. Cancer, 2016. 122(9): 1444-52.
19. Goldman N Pebley AR Creighton MJ Teruel GM Rubalcava LN Chung C: The consequences of migration to the United States for short-term changes in the health of Mexican immigrants. Demography, 2014. 51(4): 1159-73.
20. Batalova, Jeanne, Blizzard, Brittany and Bolter, Jessica, Frequently Requested Statistics on Immigrants and Immigration in the United States (Washington, DC: Migration Policy Institute, 2020), (https://www.migrationpolicy.org/article/frequently-requested-statistics-immigrants-and-immigration-united-states)
21. Flavin L, Zallman L, McCormick D, Wesley Boyd J. Medical Expenditures on and by Immigrant Populations in the United States: A Systematic Review. *Int J Health Serv*. 2018;48(4):601-621. doi:10.1177/0020731418791963.
22. Gomez SL Yang J Lin SW McCusker Sandler A Cheng I Wakelee HA Patel M Clarke CA: Incidence trends of lung cancer by immigration status among Chinese Americans. Cancer Epidemiol Biomarkers Prev, 2015. 24(8): 1157-64.
23. Le GM, Gomez SL, Clarke CA, Glaser SL, West DW. Cancer incidence patterns among Vietnamese in the United States and Ha Noi, Vietnam. Int J Cancer 2002 102:412-427. Erratum in: Int J Cancer 2003;104(6):798.
24. Ladabaum U Clarke CA Press DJ Mannalithara A Myer PA Cheng I Gomez SL: Colorectal cancer incidence in Asian populations in California: effect of nativity and neighborhood-level factors. Am J Gastroenterol, 2014. 109(4): 579-88.
25. Kem R Chu KC: Cambodian cancer incidence rates in California and Washington, 1998-2002. Cancer, 2007. 110(6): 1370-5.
26. Ziegler RG Hoover RN Pike MC Hildesheim A Nomura AM West DW Wu-Williams AH Kolonel LN Horn-Ross PL Rosenthal JF Hyer MB. Migration patterns and breast cancer risk in Asian-American women. J Natl Cancer Inst 1993;85:1819-1827.
27. Keegan TH John EM Fish KM Alfaro-Velcamp T Clarke CA Gomez SL: Breast cancer incidence patterns among California Hispanic women: differences by nativity and residence in an enclave. Cancer Epidemiol Biomarkers Prev, 2010. 19(5): 1208-18.
28. Kim K Chapman C Vallina H: Colorectal cancer screening among Chinese American immigrants. J Immigr Minor Health, 2012. 14(5): 898-901.
29. Kim K Quinn M Lam H: Promoting Colorectal Cancer Screening in Foreign-Born Chinese-American Women: Does Racial/Ethnic and Language Concordance Matter? J Racial Ethn Health Disparities, 2018.
30. Shoemaker ML White MC: Breast and cervical cancer screening among Asian subgroups in the USA: estimates from the National Health Interview Survey, 2008, 2010, and 2013. Cancer Causes Control, 2016. 27(6): 825-9.

31. Pinheiro PS Callahan KE Gomez SL Marcos-Gragera R Cobb TR Roca-Barcelo A Ramirez AG: High cancer mortality for US-born Latinos: evidence from California and Texas. BMC Cancer, 2017. 17(1): 478.
32. Martínez ME Anderson K Murphy JD Hurley S Canchola AJ Keegan TH Cheng I Clarke CA Glaser SL Gomez SL: Differences in marital status and mortality by race/ethnicity and nativity among California cancer patients. Cancer, 2016. 122(10): 1570-8.
33. McDonald JT Neily J: Race, immigrant status, and cancer among women in the United States. J Immigrant and Minority Health, 2011. 13(1): 27-35.
34. Acevedo-Garcia D Bates LM Osypuk TL McArdle N: The effect of immigrant generation and duration on self-rated health among US adults 2003-2007. Soc Sci Med, 2010. 71(6): 1161-72.
35. Riosmena F Wong R Palloni A: Migration selection, protection, and acculturation in health: a binational perspective on older adults. Demography, 2013. 50(3): 1039-64.
36. Dixon LB Sundquist J Winkleby M: Differences in energy, nutrient, and food intakes in a US sample of Mexican-American women and men: findings from the Third National Health and Nutrition Examination Survey, 1988-1994. Am J Epidemiol, 2000. 152(6): 548-57.
37. Montealegre JR Zhou R Amirian ES Follen M Scheurer ME: Nativity disparities in late-stage diagnosis and cause-specific survival among Hispanic women with invasive cervical cancer: an analysis of Surveillance, Epidemiology, and End Results data. Cancer Causes Control, 2013. 24(11): 1985-94.
38. Mojica CM Glenn BA Chang C Bastani R: The Relationship between Neighborhood Immigrant Composition, Limited English Proficiency, and Late-Stage Colorectal Cancer Diagnosis in California. Biomed Res Int, 2015. 2015: 460181.
39. Idowu KA Adenuga B Otubu O Narasimhan K Kamara F Hunter-Richardson F Larbi D Sherif ZA Laiyemo AO: Place of birth, cancer beliefs and being current with colon cancer screening among US adults. Ann Gastroenterol, 2016. 29(3): 336-40.
40. Anand P Kunnumakkara AB Sundaram C Harikumar KB Tharakan ST Lai OS Sung B Aggarwal BB: Cancer is a preventable disease that requires major lifestyle changes. Pharm Res, 2008. 25(9): 2097-116.
41. Wilkinson AV Spitz MR Strom SS Prokhorov AV Barcenas CH Cao Y Saunders KC Bondy ML: Effects of nativity, age at migration, and acculturation on smoking among adult Houston residents of Mexican descent. Am J Public Health, 2005. 95(6): 1043-9.
42. Colditz GA Peterson LL: Obesity and Cancer: Evidence, Impact, and Future Directions. Clin Chem, 2018. 64(1): 154-162.
43. Calle EE Rodriguez C Walker-Thurmond K Thun MJ: Overweight, obesity, and mortality from cancer in a prospectively studied cohort of U.S. adults. N Engl J Med, 2003. 348(17): 1625-38.
44. Calle EE Kaaks R: Overweight, obesity and cancer: epidemiological evidence and proposed mechanisms. Nat Rev Cancer, 2004. 4(8): 579-91.
45. De Pergola G Silvestris F: Obesity as a major risk factor for cancer. J Obes, 2013. 2013: 291546.
46. Horn-Ross PL McClure LA Chang ET Clarke CA Keegan TH Rull RP Quach T Gomez SL: Papillary thyroid cancer incidence rates vary significantly by birthplace in Asian American women. Cancer Causes Control, 2011. 22(3): 479-85.
47. Giddings BH Kwong SL Parikh-Patel A Bates JH Snipes KP: Going against the tide: increasing incidence of colorectal cancer among Koreans, Filipinos, and South Asians in California, 1988-2007. Cancer Causes Control, 2012. 23(5): 691-702.
48. Lee J Demissie K Lu SE Rhoads GG: Cancer incidence among Korean-American immigrants in the United States and native Koreans in South Korea. Cancer Control, 2007. 14(1): 78-85.
49. McCracken M Olsen M Chen MS Jr Jemal AThun M Cokkinides V Deapen D Ward E: Cancer incidence, mortality, and associated risk factors among Asian Americans of Chinese, Filipino, Vietnamese, Korean, and Japanese ethnicities. CA Cancer J Clin, 2007. 57(4): 190-205.

Tables

Table 1. Characteristics of NHANES US-born and Foreign-born Individuals							
			US-born				
Variables		Total			Foreign-born		
	N =22554 (unweighted)	**N=231,175,933 (weighted)**	**n=15,486 (68.7%) (unweighted)**	**n=188,732,847 (82%) (weighted)**	**n=7,068 (31.3%) (unweighted)**	**n=42,443,086 (18%) (weighted)**	**Chi-Square P-value**
Self-Reported Cancer Diagnosis							***
Yes	2,168(9.6%)	24,827,331 (10.7%)	1,803(11.6%)	22,801,970(12.1%)	365(5.2%)	2,025,361(4.8%)	
No	20,386(90.4%)	206,348,602(89.3%)	13,683(88.4%)	165,930,877(87.9%)	6,703(94.8%)	40,417,725(95.2%)	
Age							
Mean	49.75	47.78		48.28		45.56	
Median	50						
IQ-Q3(64) Q1(34))	30						
Age Groups			4,173(26.9%)				
20-34	5,710(25.3%)	63,967,371(27.7%)		52,229,571(27.7%)	1,537(21.7%)	11,737,800(27.7%)	
35-50	5,888(26.1%)	65,036,181(28.1%)	3,679(23.8%)	49,632,875(26.3%)	2,209(31.3%)	15,403,306(36.3%)	**
51-64	5,542(24.6%)	57,544,566(24.9%)	3,604(23.3%)	48,088,380(25.5%)	1,938(27.4%)	9,456,186(22.3%)	***
65-80	5,414(24.0%)	44,627,815(19.3%)	4,030(26.0%)	38,782,021(20.5%)	1,384(19.6%)	5,845,795(13.8%)	***
Gender							
Male	10,916(48.4%)	111,124,152(48.1%)	7,545(48.7%)	90,521,496(48.0%)	3,371(47.7%)	20,602,656(48.5%)	
Female	11,638(51.6%)	120,051,781(51.9%)	7,941(51.3%)	98,211,351(52.0%)	3,697(52.3%)	21,840,430(51.5%)	
Race/Ethnicity							
Non-Hispanic White	8,293(36.8%)	149,277,560(64.6%)	7,926(51.2%)	142,815,618 (75.7%)	367(5.2%)	6,461,942(15.2%)	***
Non-Hispanic Black	5,116(22.7%)	26,438,781(11.4%)	4,544(29.3%)	23,561,593 (12.5%)	572(8.1%)	2,877,188(6.8%)	***
Mexican American	3,027(13.4%)	19,963,715 (8.6%)	1,260(8.1%)	8,830,349(4.7%)	1,767(25.0%)	11,133,365(26.2%)	***
Other Hispanic	2,360(10.5%)	14,729,670(6.4%)	702(4.5%)	5,078,664(2.7%)	1,635(23.5%)	9,651,006 (22.7%)	***
Asian	2,952(13.1%)	12,871,375(5.6%)	380(2.5%)	1,738,092(0.9%)	2572(36.4%)	11,133,283(26.2%)	***
Other Races	806(3.6%)	7,894,833(3.4%)	674(4.4%)	6,708,531(3.6%)	132(1.9%)	1,186,302(2.8%)	
Routine Care							***
Yes	18757(83.2%)	193,284,943(83.6%)	13,189(85.2%)	161,159,004(85.4%)	5,568(78.8%)	32,125,939(75.7%)	
No	3,797(16.8%)	37,890,990 (16.4%)	2,297(14.8%)	27,573,843(14.6%)	1,500(21.2%)	10,317,147(24.3%)	
Overweight							***
Yes	8,043(35.7%)	86,519,882 (37.4%)	6,104 (39.4%)	75,032,538(39.8%)	1939(27.4%)	1,1487,344(27.1%)	
No	14,511(64.3%)	144,656,051(62.6%)	9,382(60.6%)	113,700,309 (60.2%)	5129(72.6%)	30,955,742(72.9%)	

Smoking Status							***
Yes	9,603(42.6%)	100,205,991(43.3%)	7523(48.6%)	87,169,079 (46.2%)	2080(29.4%)	13,036,911(30.7%)	
No	12,951(57.4%)	130,969,942(56.7%)	7,963(51.4%)	101,563,768(53.8%)	4,988(70.6%)	29,406,175(69.3%)	

*** p<0.05; ***p<0.01*

Table 2. Logistic Regression -Nativity and Self-Reported Cancer Diagnosis

	Model 1	Model 2
	OR 95% CI	**OR 95% CI**
Nativity	2.34*** 1.93 2.84	1.39** 1.05 1.84
Age	1.07*** 1.06 1.07	1.06*** 1.06 1.07
Race/Ethnicity		
Mexican American		0.46*** 0.36 0.58
Other Hispanic		0.60** 0.42 0.86
Non-Hispanic Black		0.40*** 0.36 0.45
Asian		0.37*** 0.27 0.51
Other Race/Ethnicity		0.75 0.46 1.22
Gender		0.87** 0.76 1.00
Routine Care		1.48*** 1.14 1.93
Overweight		1.16** 1.01 1.34
Smokers		1.30*** 1.13 1.45
Reference Groups: Race: non-Hispanic White; Gender: Female		

**** p-value <0 .01 **p-value <0.05*

OR = Odds Ratio; CI = Confidence Interval

Table 3: Stratification by Race Nativity and Self-Reported Cancer Diagnosis

	Model 3 Non-Hispanic White OR(CI)	**Model 4 Mexican American OR(CI)**	**Model 5 Non-Hispanic Black OR(CI)**	**Model 6 Other Hispanic OR(CI)**	**Model 7 Asians OR(CI)**	**Model 8 Other Race OR(CI)**
Nativity	1.35 (0.87-2.08)	0.98 (0.62-1.60)	2.30 (1.31-4.02) **	1.19(0.76-1.86)	1.52(0.83-2.77)0.17	2.21(0.78-6.31)
Age	1.07 (1.06-1.07) ***	1.06 (1.05-1.08) ***	1.07 (1.06-1.08) ***	1.04 (1.03-1.06) ***	1.08 (1.06-1.09) ***	1.07 (1.03-1.10) ***
Gender	0.90(0.76-1.07)	0.32 (0.20-0.49)***	1.30 (1.04-1.61) **	0.64(0.39-1.06)	0.39 (0.23-0.59) ***	0.81(0.37-1.79)
Routine Care	1.27(0.95-1.71)	2.35 (1.20-4.60)**	5.65 (2.23-14.34) ***	3.96 (1.60-9.77) **	1.50(0.62-3.63)0.36	2.00(0.60-6.72)
Overweight	1.16(0.99-1.36)	1.07 (0.73-1.57)	1.07(0.84-1.38)	0.99(0.60-1.62)	1.58(0.90-2.80)0.11	1.48(0.63-3.46)
Smokers	1.27 (1.08-1.50) **	1.76 (1.16-2.67) **	1.18(0.92-1.53)	1.32(0.91-1.91)	1.16(0.60-2.22)0.66	3.98 (1.56-10.20) **
Reference Group: Gender- Female						

*** p<0.05; ***p<0.01*

OR = Odds Ratio; CI = Confidence Interval: 95%