

RESEARCH ARTICLE

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Stomach Cancer Incidence in Asians as Compared to Other Ethnic Populations Over Time from 2000 to 2021 in SEER Areas of the United States

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Abstract

Background: Stomach cancer is the fourth leading cause of cancer-related deaths globally, but its late-stage detection and its lack of early symptoms are still the main challenges ahead. Limited research has focused on detailed racial and ethnic disparities in stomach cancer incidence within the United States. This study aims to address these gaps by analyzing age-adjusted stomach cancer incidence rates from 2000 to 2021. **Methods:** Using data from the US Surveillance, Epidemiology, and End Results (SEER) program (2000-2021), we identified a cohort of 138,628 individuals diagnosed with incident stomach cancer at age ≥ 20 . Both crude and age-adjusted models were employed and incidence rates were adjusted by age to the 2000 US population. **Results:** This cohort comprised 73,410 non-Hispanic Whites, 18,006 non-Hispanic Blacks, 1,210 American Indians and Alaska Natives, 19,497 non-Hispanic Asians/Pacific Islanders, and 26,015 Hispanics. Overall total age-adjusted incidence rate of stomach cancer across all groups is 10.4 per 100,000. While all racial groups show a gradual overall decline in stomach cancer incidence from 2000 to 2021, NH-Whites consistently have the lowest rates across all stages and periods. Overall, significant racial disparities were observed, with NH-A/PIs and NH-Blacks showing the highest rate ratio of 1.94 compared to NH-Whites from 2000 to 2021. In the age subgroup analysis, the most significant racial disparity was identified among individuals aged 75 years and older during 2000–2006, with NH-A/PIs experiencing a stomach cancer incidence rate 2.63 times higher (95% CI: 2.51–2.76) than NH-Whites. Similarly, in the tumor stage subgroup analysis, we found the largest disparity in the regional stage group during the same period, whereas NH-A/PIs had a stomach cancer incidence rate 2.71 times higher (95% CI: 2.57–2.85) than NH-Whites. **Conclusions:** The overall trend in stomach cancer incidence shows a gradual decline. However, racial disparities persist consistently between 2000 and 2021. During the earlier years, NH-A/PIs had the highest stomach incidence rates. Nonetheless, in more recent years, attention is also needed for Non-Hispanic Blacks and Hispanics, as their incidence rates have shown an upward trend. These study results underscore the importance of targeted public health interventions to address these enduring racial disparities.

Keywords: Stomach cancer-non-Hispanic Asians- cancer incidence- racial disparities

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Introduction

Stomach cancer, formally known as Gastric cancer, ranks as the fourth leading cause of cancer-related deaths globally, making it a critical global health concern [1]. Stomach cancer treatment options include surgery, chemotherapy, radiation therapy, targeted therapy, immunotherapy, and palliative care based on the cancer's stage and patient health [2,3]. Despite the availability of various treatments, stomach cancer remains challenging for its early detection, largely due to its lack of symptoms in initial stages [4–9]. As reported by Pruthi et al. [10], stomach cancer is most commonly diagnosed in older adults, with over 95% of new cases occurring in individuals aged 40 and older. Furthermore, older age

groups face a significantly higher risk of stomach cancer [11–14]. A case-control study conducted across multiple Spanish provinces found that the average age in the case group was significantly higher than in the control group (65.0 vs. 59.5 years) [12]. In response to this trend, Japanese guidelines recommend annual screening for individuals over 40 to support early diagnosis and prevention, underscoring the importance of awareness and proactive detection measures [4].

Stomach cancer incidences vary across gender and racial groups. Some studies pointed out that males have a higher risk of stomach cancer [15,16]. According to the 2022 World Cancer Statistics Report, the global stomach cancer incidence emerged approximately 1,089,103 new cases, resulting in an age-standardized rate (ASR) of 14.2

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per 100,000 [17]. Notably, the male population accounted for around 742,000 new cases, with a significantly higher ASR of 20.4 per 100,000, compared to women (ASR=8.5). This report also highlights notable disparities in stomach cancer incidence among Asian populations, with Japan, Korea and China ranking as the top countries worldwide in age-standardized rates (ASR) at 27.6, 27.0 and 13.7 per 100,000, respectively [17]. In contrast, the United States and Brazil exhibited much lower ASRs, with 4.1 in the US and 7.6 in Brazil. This finding was similarly reported in several studies [15,16,18]. In the 2019 study using data from the Institute of Health Metrics and Evaluation, East Asia reported the highest number of stomach cancer cases globally, followed by high-income Asia Pacific and South Asia [18]. These areas also accounted for the majority of stomach cancer deaths. This top rank highlighted a significant stomach cancer burden.

Apart from this notable difference in stomach cancer incidence between Asian nations and other countries, an article has revealed that Asian American experienced a higher stomach cancer mortality rate of 5.9 (95% CI: 5.7-6.1) in 2019, compared to a lower rate of 3.5 (95% CI: 3.4-3.6) among the White population, based on data from the US National Center for Health Statistics [19]. Some studies had also reported the high stomach incidence within this population in the US [20–23]. Several factors might explain this disparity in the US. First, a meta-analysis has observed that the risk profile for stomach cancer will be maintained among Asian immigrants to the US [24]. Additionally, disparities in socioeconomic factors and inequity in healthcare access, and preventive care also contribute to this racial disparities in stomach cancer incidence [25]. Thus, it is imperative for the healthcare stakeholder to focus on this group to improve their early detection, treatment, and overall health outcomes, given these challenges. However, some studies investigating racial disparities primarily compared NH-Asians and NH-Whites, neglecting other minority groups, such as non-Hispanic American Indians. Additionally, some researches limited their study population within counties with a high density of Asian populations, making it difficult to generalize the findings to the entire nation.

This study analyzes the age-adjusted incidence rates of stomach cancer in the United States from 2000 to 2021, focusing on variations across different racial/ethnic groups. This study utilized SEER data to uncover differences in the incidence of stomach cancer between Asian and other racial groups within the US population. These findings will help to demonstrate the incidence trends of stomach cancer while accentuating the need for targeted public health interventions to resolve the health inequalities in stomach cancer.

Materials and Methods

Data sources

This study utilized the Surveillance, Epidemiology, and End Results (SEER) Public Use Datasets from the National Cancer Institute (NCI), available as of November 2023. To calculate cancer incidence, cancer cases and the total population were drawn from nine states

(Alaska, Connecticut, Iowa, New Mexico, Utah, Hawaii, Louisiana, Kentucky, and New Jersey) and eight regions (San Francisco/Oakland, San Jose-Monterey, Los Angeles, Greater California, Seattle, Atlanta, Rural Georgia, and Greater Georgia) ranging from the years 2000 to 2021. This study was exempt from Institutional Review Board (IRB) review as it involved only the analysis of de-identified SEER Public Use Data, and it did not require patient contact and did not pose health risks to participants.

Study Population

Our study identified a total of 138,628 individuals aged 20 or older who were diagnosed with incident stomach cancer between 2000 and 2021 across 17 registries in the SEER program.

The total population data, including all individuals aged 20 and older in the same SEER regions, was obtained using the SEER*Stat package.

Study Variables

We classified the race/ethnicity into non-Hispanic white (NH-Whites), non-Hispanic black (NH-Blacks), non-Hispanic American Indians and Alaska Natives (NH-AI/ANs), non-Hispanic Asians/Pacific Islanders (NH-A/PIs), and Hispanic. Since SEER*Stat does not provide incidence data for individuals with unknown race/ethnicity, we did not include them in a separate racial category; however, we incorporated them into the overall population incidence calculations. To avoid small case numbers in analyses, we grouped patient ages into the following categories: 20–54, 55–64, 65–74, and ≥75 years, based on their proportions. Additional covariates include gender (male, female), year of diagnosis (2000–2006, 2007–2013, 2014–2021), and tumor stage (in situ/local, regional, distant, or unknown).

Statistical Analysis

Firstly, we presented the number of incident cases, unadjusted and age-adjusted incidence rates per 100,000 persons, and rate ratios with 95% confidence intervals (CIs) across different racial/ethnic groups, sex, and age categories from 2000 to 2021. Incidence rates were adjusted by age to the 2000 US population, and rate ratios were used to compare these rates across subgroups. For these rate comparisons, the reference group was set as non-Hispanic white males aged 20–54.

To further investigate the racial disparities over time, we calculated age-adjusted incidence rates for the periods 2000–2006, 2007–2013, and 2014–2021. We also estimated annual percentage changes (APC) in incidence rates to assess trends over time, with p-values to evaluate their statistical significance. Then, age-adjusted incidence rates of stomach cancer were calculated by race/ethnicity and age group for each period, cancer stage and cancer histological classification, as presented in Supplemental Table S1, Supplemental Table S2 and Supplemental Table S3, respectively. We also presented the trends in stomach cancer incidence rates by racial groups and gender from 2000 to 2021 in two figures. These figures illustrated the variations in incidence rates across different subgroups, highlighting disparities that may inform public health

interventions and further research. We conducted all analyses using SEER*Stat software (version 8.4.4), a statistical tool developed by the NCI for analyzing cancer data from the SEER program.

Results

The total population, case counts, crude/adjusted incidence rates and rate ratio, of stomach cancer for various age groups, sexes, and racial/ethnic groupings in SEER areas from 2000 to 2021 are shown in Table 1. The overall total age-adjusted incidence rate of stomach cancer across all groups is 10.4 per 100,000. The NH-Asians/Pacific Islanders have the highest stomach cancer crude incidence rate at 14.1 per 100,000 (95% CI: 13.9-14.3). However, when using the age-adjusted model, both NH-A/PI and NH-Blacks show a rate ratio of 1.94, significantly higher than the reference group--NH Whites. Figure 1 illustrates trends in age-adjusted rate of stomach cancer by race from 2000 to 2021. NH-Whites consistently show the lowest rates, and all groups demonstrate a gradual decline over time. Among other subgroups, rate ratio also rises significantly with age, with individuals aged 65-74 and those 75+ experiencing sharp rate ratio increases to 10.19 (95%CI: 10.03-10.36) and 16.79 (95%CI: 16.53-17.05), respectively. Among the different cancer stage groups, the distant stage showed higher stomach cancer rates compared to the in-situ/local stage, while the regional stage had lower rates. Figure 2 illustrates the trends in cancer rates across the three stage groups, with both distant and regional stages showing a moderate decline over time. Females have a significant lower risk of stomach cancer, with a 54% (95%CI: 0.53-0.55) decline,

compared to the males. This trend, as depicted in Figure 3, shows consistently lower rates for females compared to males. However, a slight increase is observed in both subgroups over time.

Table 2 shows the incidence rates of stomach cancer among various racial and ethnic groups in the United States across three distinct time periods, along with the annual percentage change (APC) in age-adjusted incidence rates. The total age-adjusted incidence rate of stomach cancer has declined from 11.1 in 2000–2006 to 9.8 per 100,000 in 2014–2021, with an annual percentage change (APC) of -0.8% (95% CI: -1.2 to -0.4). The NH Asian or Pacific Islander group had the highest incidence rates in the first two periods, with a substantial decline from 20.2 to 12.9 from 2000 to 2021. During the 2014–2021 period, NH Black individuals had the highest stomach cancer incidence rate at 14.0 per 100,000 (95% CI: 13.7–14.4). In contrast, NH White individuals consistently had the lowest incidence rates across all periods, showing a slight decline with an annual percentage change (APC) of -0.9%.

Supplemental Table S1 presents the racial disparities of incidence rates of stomach cancer per 100,000 people by age groups across 3 time periods. stomach cancer incidence rates notably increased with age across all racial and ethnic groups. In the 2000-2006 period, the NH-Asian or Pacific Islander group had the highest incidence rate, reaching 112.9 (95% CI: 108.1-117.7) in the 75+ age group. Although this rate declined to 64.4 in the 2014-2021 period, it remains the highest among all age groups and racial/ethnic categories. Compared to NH-Whites, all other racial groups exhibit significantly higher rate ratios across each age group and time period. Notably, NH-Asian/Pacific Islanders and NH-Blacks consistently

Table 1. Number of Population, Number of Incident Stomach Cancer Cases, and Stomach Cancer Incidence in Asians and Other Racial/Ethnic Populations in All SEER Areas, 2000-2021

Characteristic	Number of populations	Number of stomach cancer cases	Unadjusted Incidence rates (N of cases per 100,000) (95% CI)	Age-adjusted* incidence rates (N of cases per 100,000) (95% CI)	Rate ratio (between age-adjusted incidence rates) (95% CI)
Race/ethnicity					
Non-Hispanic (NH) white	762,269,073	73,410	9.6 (9.6-9.7)	8.0 (7.9-8.1)	1.00 (REF)
NH Asians/ Pacific Islanders	10,610,967	19,497	14.1 (13.9-14.3)	15.5 (15.3-15.7)	1.94 (1.91-1.97)
NH black	138,338,153	18,006	12.9 (12.7-13.1)	15.5 (15.2-15.7)	1.94 (1.90-1.97)
NH American Indians/ Alaska Natives	139,610,321	1,210	11.4 (10.8-12.1)	13.5 (12.7-14.3)	1.69 (1.59-1.80)
Hispanics	265,651,861	26,015	9.8 (9.7-9.9)	15.1 (14.9-15.3)	1.89 (1.86-1.92)
Sex					
Male	643,763,589	83,531	13.0 (12.9-13.1)	14.0 (13.9-14.1)	1.00 (REF)
Female	672,716,786	55,097	8.2 (8.1-8.3)	7.5 (7.5-7.6)	0.54 (0.53-0.55)
Age groups					
20-54 yrs	884,218,477	24,856	2.8 (2.8-2.8)	2.8 (2.8-2.9)	1.00 (REF)
55-64 yrs	200,855,688	28,310	14.1 (13.9-14.3)	14.0 (13.9-14.2)	4.98 (4.90-5.07)
65-74 yrs	128,730,731	36,509	28.4 (28.1-28.7)	28.7 (28.4-29.0)	10.19 (10.03-10.36)
≥75 yrs	102,675,479	48,953	47.7 (47.3-48.1)	47.3 (46.9-47.8)	16.79 (16.53-17.05)
Tumor stages					
In-situ or Local	4,100,211	39,196	3.0 (2.9-3.0)	2.9 (2.9-3.0)	1.00 (REF)
Regional	1,772,684	36,405	2.8 (2.7-2.8)	2.7 (2.7-2.7)	0.92 (0.91-0.94)
Distant/Unknown	2,677,065	63,207	4.8 (4.8-4.8)	4.7 (4.7-4.7)	1.60 (1.58-1.62)
Total	1,316,480,375	138,628	10.5 (10.5-10.6)	10.4 (10.3-10.4)	

*Incidence rates were age adjusted to the 2000 US population.

show the highest rate ratios, while NH-AI/AN typically have the lowest. However, an exception occurs in the 20-54 age group, where NH-AI/AN displays the highest rate ratio from 2007 to 2021. Specifically, from 2014 to 2021, the rate ratio for NH-AI/AN in this age group is 2.69 (95% CI: 2.24-3.19), indicating the highest risk relative to non-Hispanic Whites.

Supplemental Table S2 presents racial disparities in age-adjusted incidence rates of different cancer stages across 3 time periods. NH-Asian or Pacific Islanders consistently show higher incidence rates of stomach cancer compared to other racial/ethnic groups across most of the time periods and stages. For example, in the 2014–2021 period, the age-adjusted rate for NH-Asians or Pacific Islanders at distant stage is 2.02 (95% CI: 1.92-2.13) than that of NH-Whites. Across 2000-2006 period, incidence rates tend to increase as the tumor stage advances from in-situ to distant. The incidence rate for NH-Blacks at the in-situ/local stage is 4.5 (95% CI: 4.3-4.8), which is lower than that of distant stage (8.1, 95% CI: 7.8-8.5). As for the trend over time, there appears to be a slight decrease in incidence rates for most groups, particularly in the regional stage. Among NH-Asians or Pacific Islanders, the regional stage incidence rate decreased from 7.0 (95% CI: 6.7–7.3) in 2000–2006 to 5.0 (95% CI: 4.8–5.2) in 2007–2014 and further to 3.4 (95% CI: 3.2–3.5) in 2014–2021.

Supplemental Table S3 showed the age-adjusted incidence rates and rate ratios of intestinal-type and diffuse-type stomach cancer by race and time period. NH-Asian or Pacific Islanders exhibited higher incidence rates for both intestinal-type and diffuse-type stomach cancer from 2000 to 2021. For intestinal-type stomach cancer, the incidence rate for this group was 8.8 (95%CI: 8.4-9.3) from 2000 to 2006. The most notable disparity was observed in diffuse-type stomach cancer, with a rate ratio of 2.62 (95%CI: 2.45-2.80) for NH-A/PIs, compared to NH-Whites during 2000 to 2006. For intestinal-type stomach cancer, the largest rate ratio was 2.04 (95%CI: 1.96-2.13) for NH-Black, and 1.89 (95%CI: 1.81-1.98) for NH-A/PIs, compared with NH-White during 2000 to 2006. Although the rate ratio for all racial groups diminishes over time, NH-White groups consistently had the lowest incidence rate, and NH-A/PIs and NH-Black showed higher risk. Overall, the results showed that the racial disparities still exist when classified by the cancer histology and the racial disparities were more pronounced for the diffuse-type stomach cancer from 2000 to 2021.

Discussion

This study utilized SEER data from 2000 to 2021 to examine a persistent racial disparity in stomach cancer incidence rate with a focus on the NH-Asians/Pacific Islanders population. Despite an overall cancer incidence decline over time in the US, NH-Asians/Pacific Islanders and NH-Blacks showed a higher age-adjusted incidence rate compared to NH-Whites. A slight increase from 2020 to 2021 was observed in most of the subgroup's trend analysis. Our subgroup analysis reveals that racial

Table 2. Annual Percentage Change (APC) in Age-Adjusted Incidence Rates* (number of stomach cancer cases per 100,000 population) by time period and race/ethnicity

Race/Ethnicity	2000-2006			2007-2013			2014-2021			APC (95% CI)	P value
	N. Population	N. Cases	Incidence rate (95% CI)	N. Population	N. Cases	Incidence rate (95% CI)	N. Population	N. Cases	Incidence rate (95% CI)		
NH White	238,910,429	22,957	8.6 (8.5-8.7)	242,667,064	23,200	8.0 (7.9-8.1)	280,691,580	27,253	7.5 (7.4-7.6)	-0.9 (-1.4-0.4)	< 0.05
NH Asian or Pacific Islander	34,976,293	5,519	20.2 (19.7-20.8)	43,119,331	6,206	16.4 (16.0-16.8)	60,242,529	7,772	12.9 (12.6-13.2)	-3.1 (-3.7--2.4)	< 0.05
NH Black	39,179,526	5,148	17.8 (17.3-18.3)	43,806,441	5,592	15.7 (15.3-16.1)	56,624,354	7,266	14.0 (13.7-14.4)	-1.6 (-2.2--0.9)	< 0.05
NH American Indian/Alaska Native	3,106,789	323	15.1 (13.4-17.0)	3,350,101	366	13.7 (12.3-15.3)	4,154,077	521	12.9 (11.8-14.2)	-0.9 (-2.7-1.0)	0.12
Hispanic (All Races)	68,137,513	6,260	17.3 (16.8-17.7)	84,076,178	7,974	15.4 (15.0-15.7)	113,438,170	11,781	14.1 (13.8-14.3)	-1.4 (-1.9--0.9)	< 0.05
Total	384,310,550	40,275	11.1 (11.0-11.3)	417,019,115	43,446	10.0 (10.3-10.5)	515,150,710	54,907	9.8 (9.8-9.9)	-0.8 (-1.2--0.4)	< 0.05

*Incidence rates were age adjusted to the 2000 US population.

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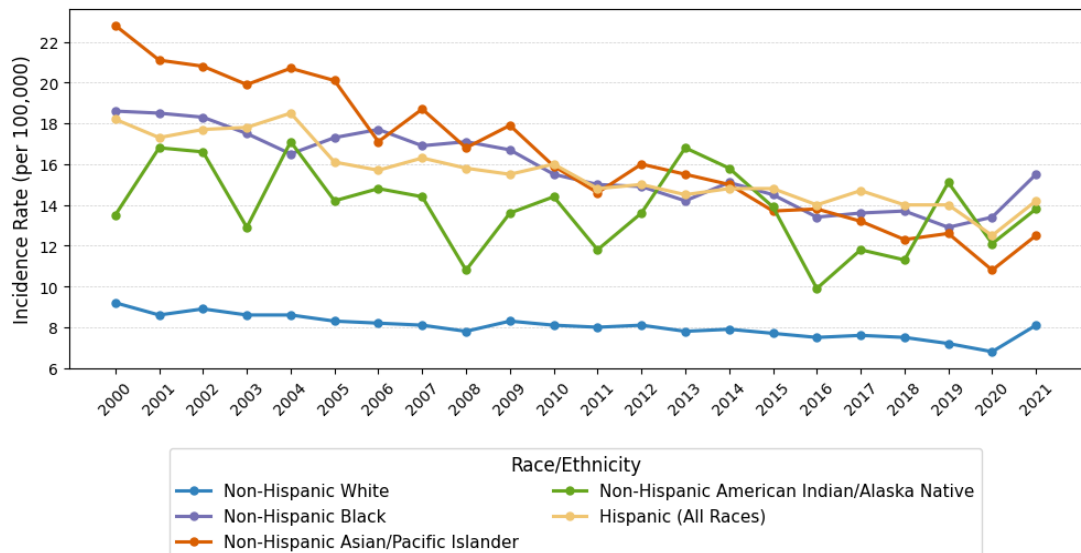


Figure 1. Trends in Age-Adjusted Incidence Rates (Number of Stomach Cancer Cases per 100,000 Population) by Race/Ethnicity in SEER Areas from 2000 to 2021

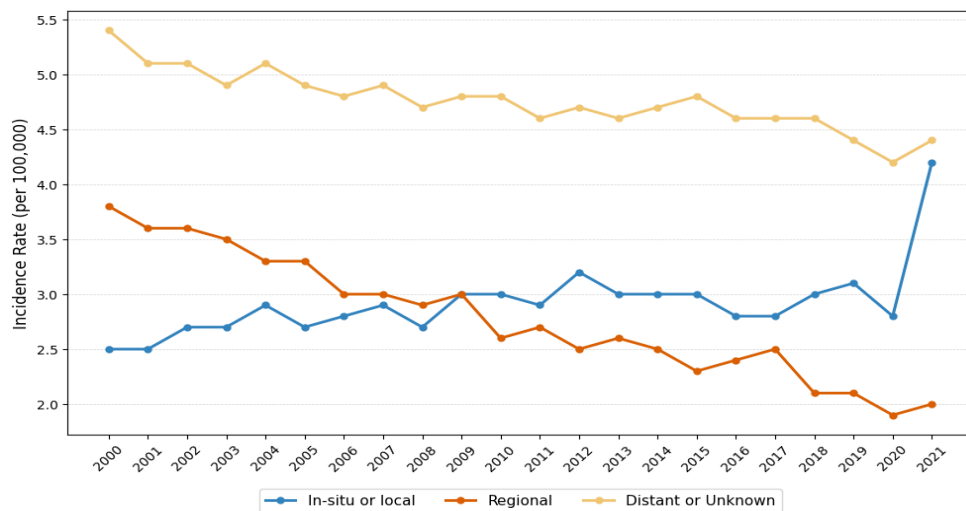


Figure 2. Trends in Age-Adjusted Incidence Rates (Number of Stomach Cancer Cases per 100,000 Population) by tumor stage in SEER areas from 2000 to 2021

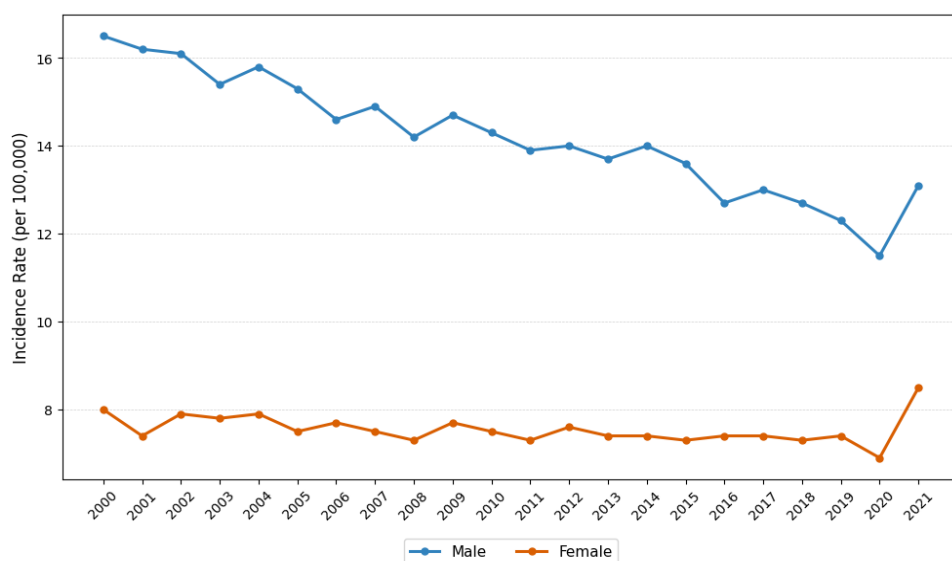


Figure 3. Trends in Age-Adjusted Incidence Rates (Number of Stomach Cancer Cases Per 100,000 Population) by Sex in SEER Areas from 2000 to 2021

disparities widen with increasing age, coinciding with a notable rise in overall incidence rates for each racial/ethnic group aged 55 and above. Among NH-A/PIs and NH-Blacks, the incidence rate for distant-stage cancer remained the highest from 2000 to 2014 compared to other cancer-stage groups. However, from 2014 to 2021, NH-AI/ANs exhibited the highest incidence rates in the distant-stage group. As for the racial disparities, the largest difference was observed in the regional stage group between 2000 and 2006, with a rate ratio of 2.48 (NH-A/PIs vs NH-W, 95% CI: 2.33-2.63). Over time, while all age groups showed a declining trend of stomach cancer incidence, the NH-A/PIs demonstrated the greatest changes with an APC of -3.1 (95%CI: -3.7-2.4).

From 2000 to 2020, all racial groups experienced a smooth decline in stomach cancer incidence rates. This trend aligns with findings reported in other published studies [26–28]. Several factors have contributed to the decline in stomach cancer incidence globally. Improved food preservation methods and better sanitation have lowered exposure to carcinogens and *Helicobacter pylori* (*H. pylori*) infection, a major risk factor for stomach cancer [29]. A meta-analysis reported that *H. pylori* eradication therapy significantly reduces stomach cancer incidence in healthy individuals and patients with stomach neoplasia, with a risk ratio of 0.54 (95%CI: 0.40-0.72) [30]. Additionally, advances in early detection and treatment of precancerous lesions have reduced the risk [31].

Racial disparities in stomach cancer rates have persisted in the US over the years. In terms of stomach cancer rates, non-Hispanic Asians still have relatively higher rates compared to other groups. This pattern has been published in multiple studies [26,32,33]. A similar study using SEER and the Puerto Rico Central registry reported that non-Hispanic Asians had the highest age-standardized rate of 8.66 among all racial groups [26]. Similar to our study, a significant racial disparity in stomach cancer incidence, was observed in the US population between 1997 and 2014, with notably higher rates among NH-A/PIs and non-Hispanic Blacks compared to non-Hispanic Whites [34]. Notably, a population-based analysis also found Korean Americans exhibit a remarkably elevated risk, with rates reaching 14.5 times higher than those of non-Hispanic Whites [32]. In addition to socioeconomic factors, influence of pathological factors cannot be neglected. *H. pylori* is a gram-negative, spiral-shaped bacterium known for causing stomach infections [35]. *H. pylori* infection and its key exotoxin, CagA (cytotoxin-associated gene A) [36], are significant risk factors for stomach cancer by inducing chronic inflammation and cellular dysregulation [37]. For the epidemiology between *H. pylori*/CagA and stomach cancer risk, limited studies have been conducted among the US population. A retrospective analysis revealed that Asians had a 23% higher risk of stomach cancer (95% CI: 0.23–0.24) compared to non-Hispanic Whites [38]. A systematic review study demonstrated that non-Hispanic whites had a lower relative risk of *H. pylori* infection than other ratio groups [39].

This study has several strengths. First, it utilized a

large population-based cohort, enabling the inclusion of minority groups often underrepresented in similar research. While some studies investigate racial disparities among the US population, they may fail to account for non-Hispanic Asians and Pacific Islanders due to insufficient data [27,34,40]. With SEER data, this study was able to analyze racial disparities in the stomach incidence among US population from 2000 to 2021. Second, we also examined the racial disparities across multiple subgroups, including age and tumor stage, which are known risk factors for stomach cancer. The subgroup analyses, which were not performed in many previous studies, can provide more specific information about the need for intervention for certain racial groups. Third, we are able to estimate trend over time as this study incorporated long-term data. For instance, the decline in stomach cancer incidence after 2007 may be associated with improvements in cancer screening and awareness. Furthermore, the slight increase in stomach cancer incidence in 2021 can be attributed to the COVID-19 crisis that might have restricted people's access to hospitals and cancer screenings [41]. This is because those who could not be diagnosed during the pandemic in 2020 because of service disruptions sought diagnosis and treatment in 2021, leading to the observed increased incidence. Consequently, we need caution in concluding about stomach cancer incidence trends during this time, as this increase may be transient rather than long-term changes in underlying risk.

However, there are limitations in this study. First, the SEER*Stat data does not provide details on the country of origin. Thus, we cannot explore stomach cancer incidence disparities based on the origins of migration. But there are two regional studies in California that reported Korean Americans to have the highest incidence of stomach cancer, highlighting the need for targeted public health interventions specific to this group [32,42]. Additionally, we lack data on behavioral factors such as smoking, drinking, exercise, and access to healthcare resources, as well as genetic factors or biomarkers like CagA. Socioeconomic factors were also not included in the SEER*Stat software, and thus, we were unable to account for education, income, neighborhood derivation, access to timely healthcare and screening when examining the incidence rate difference by race groups. As a result, caution is needed in interpreting the observed incidence differences as we cannot fully estimate racial disparities in stomach cancer incidence without adjusting for these factors.

In conclusion, we observed significant racial disparities in stomach cancer incidence among the US population from 2000 to 2021. Notably, non-Hispanic Asians/Pacific Islanders had the highest incidence rates from 2000 to 2009, while in more recent years, non-Hispanic Blacks emerged as the group with the highest rates. In contrast, non-Hispanic Whites remain consistently the lowest stomach cancer incidence rates from the entire study period. Regarding the racial disparities, it appears to be diminishing gradually, although the association is still significant. The racial disparities varied by age and tumor stage, emphasizing the importance of further investigation

to target subgroup. Future studies should explore the underlying biological, behavioral, and socioeconomic factors that contributed to the stomach cancer outcomes to assist the decision-making process of prevention and early detection strategies.

Author Contribution Statement

Zhuoyun Li conducted the data analysis and drafted the manuscripts. Dr. Du conceptualized the study and supervised the research result and interpretation of findings. All authors critically reviewed the final manuscripts.

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Availability of Data

This study's incidence and mortality data were accessed and analyzed using SEER*Stat v8.4.4 (Surveillance Research Program, National Cancer Institute). All data were obtained under a data use agreement with the NCI and subject to SEER's confidentiality and statistical stability rules. Detailed variable definitions and data dictionaries are available on the SEER*Stat Database pages (<https://seer.cancer.gov/data-software/documentation/seerstat/nov2024/>).

Study Registration

Not applicable. The study is an observational secondary data analysis.

Ethical Consideration

This study used de-identified data from the SEER Public Use Database of the National Cancer Institute, and this is generally considered to pose minimal or no risk to individuals due to protected privacy, according to the U.S. Department of Health and Human Services and common IRB guidelines. The study was deemed exempt from full review by the Institutional Review Board at UTHealth Houston because it conducted secondary analyses.

Conflict of Interest

All other authors declare that there are no competing interests.

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