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Kidney Cancer Incidence Among Non-Hispanic American Indian and Alaska Native Populations in the United States, 1999–2020

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Abstract

Background—Non-Hispanic American Indian and Alaska Native (NH-AI/AN) people experience a disproportionate incidence of kidney cancer. Nationally aggregated data does not allow for a comprehensive description of regional disparities in kidney cancer incidence among NH-AI/AN communities. This study describes kidney cancer incidence rates and trends among NH-AI/AN compared to non-Hispanic White (NHW) populations by geographic region.

Methods—Using the United States Cancer Statistics American Indian and Alaska Native (AI/AN) Incidence Analytic Database, we calculated age-adjusted incidence rates (per 100,000) of kidney cancers for NH-AI/AN and NHW people for the years 2011–2020 combined using SEER*stat software. Analyses were restricted to non-Hispanic persons living in purchased/referred care delivery area (PRCDA) counties. Average annual percent changes (AAPCs) and trends (1999–2019) were estimated using Joinpoint regression analyses.

Results—Rates of kidney cancer incidence were higher among NH-AI/AN compared to NHW persons in the U.S. overall and in 5 of 6 regions. Kidney cancer incidence rates also varied by region, sex, age, and stage of diagnosis. Between 1999 and 2019, trends in rates of kidney cancer significantly increased among NH-AI/AN males (AAPC = 2.7%) and females (AAPC = 2.4%). The largest increases in incidence were observed for NH-AI/AN males and females under age 50 and those diagnosed with localized stage disease.

Conclusions—Study findings highlight growing disparities in kidney cancer incidence rates between NH-AI/AN and NHW populations.

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Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention. CDC coauthors participated as a part of their official duties.

No conflicts of interest to disclose.

Impact: Differences in geographic region, sex, and stage highlight opportunities to decrease prevalence of kidney cancer risk factors and improve access to preventive care.

Keywords

kidney cancer incidence; American Indian; Alaska Native; health disparity

INTRODUCTION

American Indian and Alaska Native (AI/AN) people are disproportionately impacted by certain health outcomes, including some cancers, as a result of persistent inequities in resources and access to care(1,2). Previous studies have highlighted cancer disparities among non-Hispanic American Indian and Alaska Native (NH-AI/AN) populations in the United States and have demonstrated the importance of disaggregating these data by geographic region and cancer type in order to accurately describe cancer disparities in this population(3,4). Despite evidence that kidney cancer incidence rates are increasing over 1% annually among US populations(5–8), kidney cancer disparities among NH-AI/AN people have not been recently described(9).

The purpose of the present study is to examine kidney cancer incidence rates and trends by age, sex, stage at diagnosis and geographic region between NH-AI/AN and non-Hispanic White (NHW) people. The present study updates previous data reported on kidney cancer incidence rates among NH-AI/AN people using the United States Cancer Statistics Incidence American Indian and Alaska Native Analytic Database (USCS AIAD) which has been linked with the Indian Health Service (HIS) patient registration database in order to correct for racial misclassification. Identifying disparities and geographic variation in kidney cancer incidence rates and trends highlight areas for etiologic research and more focused cancer control and prevention efforts among AI/AN people.

MATERIALS AND METHODS

Cases of kidney and renal pelvis cancers were identified from population-based registries that participate in the Centers for Disease Control and Prevention's (CDC's) National Program of Cancer Registries (NPCR)(10) or the National Cancer Institute's (NCI's) Surveillance, Epidemiology, and End Results (SEER) Program(11). Incidence data from both NPCR and SEER registries must meet rigorous quality control standards for each year. Analyses included malignant cancers only. During the period covered by this study (2011–2020 for rates, 1999–2019 for trends), tumor histology, tumor behavior, and primary cancer site were classified according to the International Classification of Disease for Oncology, Third Edition (ICD-O-3)(12). Kidney cancers were identified for NH-AI/AN and NHW people using primary site code C64.9 for kidney parenchyma and C65.9 for renal pelvis.

Previous data have shown that AI/AN persons are frequently misclassified as non-AI/AN in cancer registry data, and this can lead to underestimation of cancer incidence rates(3,4). Racial misclassification of AI/AN populations in this data have been addressed using several different methodologies, which have been described in detail elsewhere(3,4). First, all case records were linked with the Indian Health Service (IHS) patient registration database using

previously validated techniques(3,4). The IHS provides medical services to AI/AN people who are enrolled members of federally recognized tribes; therefore, linking case record data to this database allows for the identification of AI/AN people who had been previously misclassified as non-AI/AN in the cancer registry data. The database containing this linked data from both NPCR and SEER were combined to create the USCS AIAD, the analytic database used for this study (U.S. Cancer Statistics Working Group. U.S. Cancer Statistics Data Visualizations tool, based on 2022 submission data (1999–2020). Available at https://www.cdc.gov/cancer/dataviz.)

Second, all analyses were restricted to purchased/referred care delivery area (PRCDA) counties, as defined by IHS(13). The methods for addressing racial misclassification are most effective in geographic areas well served by IHS, and PRCDA counties contain, or are located adjacent to, federally recognized tribal lands and have a higher proportion of AI/AN residents compared to non-PRCDA counties(3,4).

Third, previous analyses also revealed that the updated bridged intercensal population estimates substantially overestimated AI/AN populations of Hispanic origin(14). To avoid underestimating incidence rates in AI/AN populations, we limited all analyses to NH-AI/AN people and chose NHW as the reference population, consistent with prior publications(4). Therefore, all the analyses in the present study were limited to non-Hispanic populations, which resulted in North Dakota and Wisconsin being excluded from these analyses. Due to a coding issue, state- and county-specific Hispanic ethnicity data alone or in combination with any race category are not available for North Dakota and Wisconsin.

Statistical Analysis

Kidney cancer incidence rates (2011–2020) among NH-AI/AN and NHW populations were expressed per 100,000 population and were directly age-adjusted, using 19 age groups, to the 2000 US standard population using SEER*Stat software, version 8.4.1(15). Rate ratios (RR) with 95% confidence intervals (CI) were calculated for comparison of incidence rates between NH-AI/AN and NHW populations, overall and by sex, region, age group (<50, 50–74 and 75+), and stage (localized, regional, distant, unstaged) according to methods described by Tiwari et al(16). Percent distribution of stage (un-adjusted) were also calculated. To show consistency of rates between all kidney cancers and renal cell carcinomas (RCCs), kidney cancers classified as RCC were also identified for rate analyses. RCCs were identified using the primary site code C64.9 and histologic codes 8310–8319.

Time trends (1999–2019) were estimated by Joinpoint regression using Joinpoint Regression Program 4.3.10 (Joinpoint Regression Program, Version 5.0.2 - May 2023; Statistical Methodology and Applications Branch, Surveillance Research Program, National Cancer Institute). Average annual percent change (AAPC) was used to describe fixed interval trends during 1999–2019. The 2020 incidence datapoint was not included in the trend analysis in order to avoid incorrect interpretations of the effect of cancer prevention and early detection efforts. The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites(17).

Data Availability

This dataset is not publicly available due to privacy and legal restrictions. Public use data are available on the U.S. Cancer Statistics Data Visualizations tool https://gis.cdc.gov/Cancer/USCS/#/AIAN/. Instructions for accessing the public used data can also be found on the U.S. Cancer Statistics website https://www.cdc.gov/cancer/uscs/public-use/obtain-data.htm

RESULTS

Kidney cancer incidence rates varied by geographic region, sex, and race (Table 1). During 2011–2020 there were 2,578 kidney cancers diagnosed among NH-AI/AN males and 1,651 among NH-AI/AN females. Incidence rates of kidney cancer ranged from 19.2 in the East to 64.8 in the Northern Plains among NH-AI/AN males and from 19.5 in the Southwest to 27.3 in the Northern Plains among NHW males. Rates of kidney cancer were significantly higher among NH-AI/AN males in five out of six regions (RRs: 1.39 to 2.37) but significantly lower than NHW in the East (RR= 0.81). Among NH-AI/AN females, kidney cancer incidence rates ranged from 14.2 in the East to 32.3 in the Northern Plains. Rates for NHW females were lowest in the Southwest (9.4) and highest in the Southern Plains (14.3). Rates of kidney cancer were significantly higher among NH-AI/AN females compared to NHW females in every region (RRs: 1.49 to 2.44) except in the East, where there were no significant differences between the two populations. Approximately 90% of all kidney cancers were classified as RCC (Supplemental Table 1). Rates observed for RCCs were similar to overall kidney cancer rates for both populations. Incidence rates of RCC among NH-AI/AN males ranged from 16.3 in the East to 59.1 in the Northern Plains. Rates of RCC were significantly higher among NH-AI/AN males in five out of the six regions (RRs: 1.57 to 2.84). Among NH-AI/AN females, RCC incidence rates ranged from 12.5 in the East to 28.9 in the Northern Plains and were significantly higher among NH-AI/AN females compared to NHW females in every region (RRs: 1.39 to 2.76).

Incidence rates of kidney cancer by race, region, and age group are shown in Table 2. Overall, in the U.S., rates were lowest in NH-AI/AN males under the age of 50 (12.4) and highest among males aged 75 and older (138.0). Rates varied by geographic region with the lowest rates among NH-AI/AN males under the age of 50 living in the East (5.2) and the highest among NH-AI/AN males aged 75 and older living in the Northern Plains (193.2). In the U.S. overall, rates were higher among NH-AI/AN compared to NHW males in every age group (<50 RR: 2.29, 50–74 RR: 1.81, 75+ RR: 1.42). Rates were significantly higher among NH-AI/AN compared to NHW males across each region and age group except in the East (all age groups), Alaska (75+), and the Pacific Coast (75+). The highest rate ratio was in the Southern Plains among males under the age of 50 (RR=2.83).

Among NH-AI/AN females in the U.S. overall, rates of kidney cancer were lowest among women under the age of 50 (7.7) and highest among women aged 75 and older (74.5) (Table 2). Rates varied by geographic region, with the lowest rates among NH-AI/AN females under the age of 50 in the Pacific Coast (4.3) and the highest among women aged 75 and over in the Southern Plains (117.0). Rates of kidney cancers overall were highest among NH-AI/AN compared to NHW females across each age group (<50 RR: 2.29, 50–74 RR: 2.02 and 75+ RR: 1.60). Kidney cancer incidence rates were significantly higher among

NH-AI/AN compared to NHW females in every age group and region except in the East (50–75 and 75+), Alaska (75+) , and the Pacific Coast (75+).

In the U.S. overall, a majority of kidney cancers were diagnosed at a localized stage for both NH-AI/AN and NHW males (65.8% and 63.6%, respectively) and females (69.8% and 66.4%, respectively) (Table 3). Among NH-AI/AN males, rates of kidney cancer ranged from 12.7 (East) to 43.2 (Northern Plains) for localized disease, 3.5 (East) to 9.7 (Northern Plains) for regional disease and 2.5 (East) to 8.2 (Southern Plains) for distant disease. When compared to NHW males, rates for AI/AN males were significantly higher in the U.S. overall for each stage (RR:1.67–2.02), and in every region at every stage except in the East (all stages) and Alaska (regional and distant). Among NH-AI/AN females, kidney cancer incidence rates ranged from 10.5 (East) to 22.9 (Northern Plains) for localized disease, 1.7 (East) to 3.9 (Southern Plains) for regional disease and 1.3 (East) to 4.3 (Northern Plains) for distant disease. When compared to NHW females, rates were significantly higher in the U.S. overall for each stage of disease (RRs=1.90 to 2.01) and in every region at every stage except in the East (regional and distant), Pacific Coast (regional) and Alaska (regional and distant).

Trends in kidney cancer incidence have increased significantly among NH-AI/AN and NHW males and females between 1999–2019. Among NH-AI/AN people, rates have increased by 2.7% annually among males and 2.4% annually among females while rates have increased by 1.7% annually among NHW male and females (Figure 1). Regionally, kidney cancer trends have increased significantly among NH-AI/AN males in every region except in the East, with annual increases ranging from 1.8% in the Southwest to 4.5% in the Southern Plains. Among NH-AI/AN females, trends have increased significantly in Alaska (2.8%), Southern Plains (4.1%) and the Southwest (2.6%) (Table 4). Increases in trends were significant for NH-AI/AN males and females under the age of 75. The largest increase in kidney cancer incidence annually was for localized diseases (4.3% among NH-AI/AN males, 3.7% among NH-AI/AN females). Rates of regional disease also increased annually by 2.5% for NH-AI/AN males and by 3.0% for females. While rates among NHW increased for these same categories, the AAPC was not as large as for NH-AI/AN populations (Table 4).

DISCUSSION

This study highlights continued disparities in kidney cancer incidence rates among NH-AI/AN compared to NHW people, that could be due to differences in risk factors related to kidney cancers and underlying drivers of health disparities. Kidney cancer incidence rates were elevated among NH-AI/AN people (compared to NHW people) and varied by sex, age, and geographic region. Rates of kidney cancers increased at a faster rate among NH-AI/AN compared to NHW populations over the past 20 years with some of the largest increases occurring in NH-AI/AN people under the age of 50 and those diagnosed with localized and regional disease. Previous studies have shown similar variation in kidney cancer incidence rates by region, sex, and age(9,18–20). In particular, the present study confirmed geographic variation in kidney cancer incidence rates among NH-AI/AN populations, with some of the highest rates occurring in the Northern Plains, Southern Plains, and Alaska(9). The observed

variation in kidney cancer incidence rates by region could be due to regional differences in the prevalence of important kidney cancer risk factors(21,22). Social or economic determinants of health such as access to care, poverty, and food insecurity could impact prevalence of individual level risk factors such as hypertension, obesity, and CKD(9,23,24).

Use of commercial tobacco, obesity, and hypertension have been consistently linked with kidney cancer (9,18,19,23,24). Despite a general decrease in cigarette smoking rates, commercial tobacco use within AI/AN communities remains elevated (9,25). Previous studies have found that AI/AN people are more likely to be current smokers than White males and females in nearly all regions(26). Other studies using Behavioral Risk Factor Surveillance System (BRFSS) data have shown that smoking prevalence also varies by geographic region, with some of the highest prevalence in the Northern Plains, Southern Plains, and Alaska(27). AI/AN adults are 1.5 times more likely to be obese or current smokers than NHW adults(9). Prevalence of hypertension is higher among AI/AN people in certain regions including the Northern Plains, Southern Plains, Pacific Coast and Alaska(28,29). Geographic variation in prevalence of these risk factors could account for some of the variation in kidney cancer incidence observed among AI/AN people.

Researchers have suggested additional factors that could contribute to the risk of kidney cancer, such as pre-existing chronic kidney disease (CKD), infections, dietary habits, exposure at work, and genetic inheritance(22–24). Environmental exposures to chemical, such as arsenic, Per- and polyfluoroalkyl substances, known as PFAS, and pesticides have also been suggested as contributing factors to kidney cancer risk(22,30), though further research is needed to understand the role of these exposures among AI/AN people. Roughly 2% to 4% of kidney cancer cases identified in the U.S. are thought to have a familial link(21), though there is no documentation of recognized familial kidney cancer syndromes within the NH-AI/AN community. However, the recent rise in U.S. kidney cancer rates over the last few decades suggests that non-heritable factors are likely the main drivers behind the trends in cancer occurrence(20,24). Some studies have also shown that CKD increases risk of kidney cancer(31,32). AI/AN populations have a higher prevalence of CKD than most other racial groups, in part due to a higher prevalence of diabetes mellitus(33). The increased prevalence of CKD could also account for some of the higher incidence rates of kidney cancer in this population, though further study is needed to understand the link between CKD and kidney cancer incidence among NH-AI/AN people.

The results of this study also suggest that the incidence of early-stage kidney cancer is rising faster than that of advanced-stage disease. This aligns with previous studies, which suggest that kidney cancers are being diagnosed at an earlier stage(5,19,34). Similar increases in localized tumors have been described among black and Hispanic populations(18,23). The elevated incidence may be explained in part by the more liberal use of novel diagnostic imaging methods such as ultrasonography and computed tomography (CT), which have resulted in increased incidental findings of kidney cancers and renal masses(35,36). It is unlikely that increases in early-stage kidney cancer diagnoses among AI/AN populations are solely due to increases in incidental diagnoses, therefore further research is needed to understand the trends described in this study.

Our study also describes increasing rates of kidney cancer among NH-AI/AN people over the last 20 years, in particular for individuals under the age of 50. Though rates of kidney cancers in younger ages are generally low, recent studies have also documented increases in kidney cancer in other populations across the U.S., including NH-AI/AN, African American, and Hispanic groups(6,18,37). This pattern of increasing cancer incidence among people under the age of 50 has also been documented in other cancers including breast, colorectal, liver, pancreatic, prostate, uterine, and gastric cancers in various U.S. populations(34,38). These increasing rates could be due to the increased prevalence of established risk factors in adults under the age of 50(34,38). While our findings are consistent with other studies, further research can clarify the etiology and root causes of the increasing incidence of kidney cancers, in particularly in younger individuals, among AI/AN people.

The widening disparities between AI/AN and White populations highlight the importance of understanding the underlying drivers of increasing kidney cancer incidence. The role of community level and social determinants of health (SDOH) are now being studied as drivers of cancer disparities(2,26,39,40). Kidney cancer risk factors such as obesity, hypertension, and smoking have all been linked to social and economic determinants of health including distance to a healthcare setting, , food security, educational opportunity and attainment, and poverty(2,21,41–44). Previous studies have shown that AI/AN people have a higher prevalence of poverty(40,41,45), reduced educational opportunity(46), and limited healthcare access. AI/AN people living on tribal land may experience both geographic and financial barriers in access to care, that have been shown to impact prevalence of cancer related risk factors and cancer disparities (2,39,40). Solutions that target SDOH and the interconnected systems, policies, and practices giving rise to these inequities hold the most significant opportunity to diminish cancer disparities among AI/AN communities(40–42). Future work aimed at integrating community characteristics and data on SDOH, such as poverty, can help improve our understanding of cancer disparities and allow for the development of more focused efforts to improve health in AI/AN populations.

This study has limitations. First, the linkages only address racial misclassification for individuals who have previously accessed IHS services and are members of federally recognized tribes[4]. Second, because the data is restricted to NH-AI/AN individuals, these findings do not represent all AI/AN people. Complete Hispanic ethnicity data was not available, specifically for North Dakota and Wisconsin. Restriction of the analyses to PRCDA counties also limits the generalizability of these findings to all AI/AN populations(3,4). Finally, while the various subtypes of kidney cancer have distinct etiologies, risk factors, and trends, we were not able to conduct analyses for various subtypes outside RCC due to small counts.

This study describes rates and trends of kidney cancers among NH-AI/AN people who use IHS health care facilities, disparities between NH-AI/AN and NHW people, and regional differences and disparities in the incidence of kidney cancer. Further studies that investigate patterns of disease and underlying causes of disparities are needed to better understand factors related to the geographic variation in kidney cancer incidence, the rapidly increasing rates of kidney cancers among AI/AN people under the age of 50, and how SDOH influence the risk of kidney cancer in AI/AN populations. Future efforts to reduce kidney cancer

disparities could address risk factor prevalence in AI/AN communities through culturally tailored and community-informed interventions that support healthy behaviors and built environments and address barriers in access to care.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

REFERENCES

1. Hutchinson RN, Shin S. Systematic review of health disparities for cardiovascular diseases and associated factors among American Indian and Alaska Native populations. PLoS One 2014;9(1):e80973 doi 10.1371/journal.pone.0080973. [PubMed: 24454685]
2. Melkonian SC, Crowder J, Adam EE, White MC, Peipins LA. Social Determinants of Cancer Risk Among American Indian and Alaska Native Populations: An Evidence Review and Map. Health Equity 2022;6(1):717–28 doi 10.1089/heq.2022.0097. [PubMed: 36225665]
3. Espey DK, Wiggins CL, Jim MA, Miller BA, Johnson CJ, Becker TM. Methods for improving cancer surveillance data in American Indian and Alaska Native populations. Cancer. 2008 Sep 1;113(5 Suppl):1120–30. doi: 10.1002/cncr.23724. [PubMed: 18720372]
4. Jim MA, Arias E, Seneca DS, Hoopes MJ, Jim CC, Johnson NJ, Wiggins CL. Racial misclassification of American Indians and Alaska Natives by Indian Health Service Contract Health Service Delivery Area. Am J Public Health 2014;104 Suppl 3(Suppl 3):S295–302 doi 10.2105/AJPH.2014.301933. [PubMed: 24754617]
5. Batai K, Harb-De la Rosa A, Zeng J, Chipollini JJ, Gachupin FC, Lee BR. Racial/ethnic disparities in renal cell carcinoma: Increased risk of early-onset and variation in histologic subtypes. Cancer Medicine 2019;8(15):6780–8 doi 10.1002/cam4.2552. [PubMed: 31509346]
6. Lipworth L, Morgans AK, Edwards TL, Barocas DA, Chang SS, Herrell SD, et al. Renal cell cancer histological subtype distribution differs by race and sex. BJU Int 2016;117(2):260–5 doi 10.1111/bju.12950. [PubMed: 25307281]
7. Sims JN, Yedjou CG, Abugri D, Payton M, Turner T, Miele L, Tchounwou PB. Racial Disparities and Preventive Measures to Renal Cell Carcinoma. Int J Environ Res Public Health 2018;15(6):1089 doi 10.3390/ijerph15061089. [PubMed: 29843394]
8. Cronin KA, Scott S, Firth AU, Sung H, Henley SJ, Sherman RL, et al. Annual report to the nation on the status of cancer, part 1: National cancer statistics. Cancer 2022;128(24):4251–84 doi 10.1002/cncr.34479. [PubMed: 36301149]
9. Li J, Weir HK, Jim MA, King SM, Wilson R, Master VA. Kidney cancer incidence and mortality among American Indians and Alaska Natives in the United States, 1990–2009. Am J Public Health 2014;104 Suppl 3(Suppl 3):S396–403 doi 10.2105/AJPH.2013.301616. [PubMed: 24754655]
10. Thoburn KK, German RR, Lewis M, Nichols PJ, Ahmed F, Jackson-Thompson J. Case completeness and data accuracy in the Centers for Disease Control and Prevention's National Program of Cancer Registries. Cancer 2007;109(8):1607–16 doi 10.1002/cncr.22566. [PubMed: 17343277]
11. Hankey BF, Ries LA, Edwards BK. The surveillance, epidemiology, and end results program: a national resource. Cancer Epidemiol Biomarkers Prev 1999;8(12):1117–21. [PubMed: 10613347]
12. World Health Organization. International Classification of Diseases for Oncology. 3rd ed. Geneva, Switzerland: World Health Organization Press; 2000.
13. Re-Designation of the Delivery Area for the Tolowa Dee-ni' Nation, Formerly Known as Smith River Rancheria. Federal Register 2017.
14. Arias E, Heron M, Hakes J; National Center for Health Statistics; US Census Bureau. The validity of race and hispanic-origin reporting on death certificates in the United States: an update. Vital Health Stat 2016;2(172):1–21
15. Surveillance Research Program, National Cancer Institute SEER*Stat software (seer.cancer.gov/seerstat) version 8.4.1.

16. Tiwari RC, Clegg LX, Zou Z. Efficient interval estimation for age-adjusted cancer rates. Stat Methods Med Res 2006;15(6):547–69 doi 10.1177/0962280206070621. [PubMed: 17260923]
17. Centers for Disease Control and Prevention. U.S. Cancer Statistics: Highlights from 2020 Mortality and Incidence with Comparison to 2019 Incidence to Assess the Effect of the COVID-19 Pandemic. USCS Data Brief, no. 35. Atlanta, GA: Centers for Disease Control and Prevention, US Department of Health and Human Services; 2023.
18. Vaishampayan UN, Do H, Hussain M, Schwartz K. Racial disparity in incidence patterns and outcome of kidney cancer. Urology. 2003 Dec;62(6):1012–7. doi: 10.1016/j.urology.2003.07.010. [PubMed: 14665346]
19. Valencia CI, Asmar S, Hsu C-H, Gachupin FC, Wong AC, Chipollini J, et al. Renal Cell Carcinoma Health Disparities in Stage and Mortality among American Indians/Alaska Natives and Hispanic Americans: Comparison of National Cancer Database and Arizona Cancer Registry Data. Cancers (Basel) 2021;13(5):990 doi 10.3390/cancers13050990. [PubMed: 33673457]
20. Wilson RT, Richardson LC, Kelly JJ, Kaur J, Jim MA, Lanier AP. Cancers of the Urinary Tract Among American Indians and Alaska Natives in the United States, 1999–2004. Cancer 2008;113(5 Suppl):1213–24 doi 10.1002/cncr.23733. [PubMed: 18720377]
21. Moore LE, Wilson RT, Campleman SL. Lifestyle factors, exposures, genetic susceptibility, and renal cell cancer risk: a review. Cancer Invest 2005;23(3):240–55 doi 10.1081/cnv-200055962. [PubMed: 15945510]
22. Scelo G, Larose TL. Epidemiology and Risk Factors for Kidney Cancer. J Clin Oncol 2018;36(36):JCO2018791905 doi 10.1200/JCO.2018.79.1905. [PubMed: 30372394]
23. Cho E, Adami H-O, Lindblad P. Epidemiology of Renal Cell Cancer. Hematology/oncology clinics of North America 2011;25:651–65 doi 10.1016/j.hoc.2011.04.002. [PubMed: 21763961]
24. Chow W-H, Dong LM, Devesa SS. Epidemiology and risk factors for kidney cancer. Nat Rev Urol 2010;7(5):245–57 doi 10.1038/nrurol.2010.46. [PubMed: 20448658]
25. Odani S, Armour BS, Graffunder CM, Garrett BE, Agaku IT. Prevalence and Disparities in Tobacco Product Use Among American Indians/Alaska Natives — United States, 2010–2015. MMWR Morb Mortal Wkly Rep 2017;66(50):1374–8 doi 10.15585/mmwr.mm6650a2. [PubMed: 29267265]
26. Espey D, Paisano R, Cobb N. Regional patterns and trends in cancer mortality among American Indians and Alaska Natives, 1990–2001. Cancer 2005;103(5):1045–53 doi 10.1002/cncr.20876. [PubMed: 15685622]
27. Cobb N, Espey D, King J. Health behaviors and risk factors among American Indians and Alaska Natives, 2000–2010. Am J Public Health 2014;104 Suppl 3(Suppl 3):S481–9 doi 10.2105/AJPH.2014.301879. [PubMed: 24754662]
28. Espey DK, Wu XC, Swan J, Wiggins C, Jim MA, Ward E, et al. Annual report to the nation on the status of cancer, 1975–2004, featuring cancer in American Indians and Alaska Natives. Cancer 2007;110(10):2119–52 doi 10.1002/cncr.23044. [PubMed: 17939129]
29. Melkonian SC, Jim MA, Reilley B, Erdrich J, Berkowitz Z, Wiggins CL, et al. Incidence of primary liver cancer in American Indians and Alaska Natives, US, 1999–2009. Cancer Causes Control 2018;29(9):833–44 doi 10.1007/s10552-018-1059-3. [PubMed: 30030669]
30. Kshirsagar AV, Zeitler EM, Weaver A, Franceschini N, Engel LS. Environmental Exposures and Kidney Disease. Kidney360 2022;3(12):2174–82 doi 10.34067/KID.0007962021. [PubMed: 36591345]
31. Kitchlu A, Reid J, Jeyakumar N, Dixon SN, Munoz AM, Silver SA, et al. Cancer Risk and Mortality in Patients With Kidney Disease: A Population-Based Cohort Study. American Journal of Kidney Diseases 2022;80(4):436–48.e1 doi 10.1053/j.ajkd.2022.02.020. [PubMed: 35405208]
32. Weng P-H, Hung K-Y, Huang H-L, Chen J-H, Sung P-K, Huang K-C. Cancer-Specific Mortality in Chronic Kidney Disease: Longitudinal Follow-Up of a Large Cohort. Clin J Am Soc Nephrol 2011;6(5):1121–8 doi 10.2215/CJN.09011010. [PubMed: 21511834]
33. Unruh ML, Arzhan S, Feldman HI, Looker HC, Nelson RG, Faber T, et al. American Indian chronic Renal insufficiency cohort study (AI-CRIC study). BMC Nephrology 2020;21(1):291 doi 10.1186/s12882-020-01954-y. [PubMed: 32698776]

34. Hamilton AC, Donnelly DW, Fitzpatrick D, Coleman HG. Early-Onset Cancers in Adults: A Review of Epidemiology, Supportive Care Needs and Future Research Priorities. Cancers (Basel) 2022;14(16):4021 doi 10.3390/cancers14164021. [PubMed: 36011014]
35. Krajewski KM, Pedrosa I. Imaging Advances in the Management of Kidney Cancer. J Clin Oncol 2018;36(36):JCO2018791236 doi 10.1200/JCO.2018.79.1236. [PubMed: 30372386]
36. Sánchez-Martín FM, Millán-Rodríguez F, Urdaneta-Pignalosa G, Rubio-Briones J, Villavicencio-Mavrich H. Small Renal Masses: Incidental Diagnosis, Clinical Symptoms, and Prognostic Factors. Adv Urol 2008;2008:310694 doi 10.1155/2008/310694. [PubMed: 19165347]
37. Stafford HS, Saltzstein SL, Shimasaki S, Sanders C, Downs TM, Sadler GR. RACIAL/ETHNIC AND GENDER DISPARITIES IN RENAL CELL CARCINOMA INCIDENCE AND SURVIVAL. J Urol 2008;179(5):1704–8 doi 10.1016/j.juro.2008.01.027. [PubMed: 18343443]
38. Ugai T, Sasamoto N, Lee H-Y, Ando M, Song M, Tamimi RM, et al. Is early-onset cancer an emerging global epidemic? Current evidence and future implications. Nat Rev Clin Oncol 2022;19(10):656–73 doi 10.1038/s41571-022-00672-8. [PubMed: 36068272]
39. Krieger N, Singh N, Waterman PD. Metrics for monitoring cancer inequities: residential segregation, the Index of Concentration at the Extremes (ICE), and breast cancer estrogen receptor status (USA, 1992–2012). Cancer Causes Control 2016;27(9):1139–51 doi 10.1007/s10552-016-0793-7. [PubMed: 27503397]
40. Moss JL, Pinto CN, Srinivasan S, Cronin KA, Croyle RT. Persistent Poverty and Cancer Mortality Rates: An Analysis of County-Level Poverty Designations. Cancer Epidemiol Biomarkers Prev 2020;29(10):1949–54 doi 10.1158/1055-9965.EPI-20-0007. [PubMed: 32998949]
41. Goins RT, Conway C, Reid M, Jiang L, Chang J, Huyser KR, et al. Social determinants of obesity in American Indian and Alaska Native peoples aged ≥ 50 years. Public Health Nutr;25(8):2064–73 doi 10.1017/S1368980022000945.
42. Jernigan VBB, D'Amico EJ, Duran B, Buchwald D. Multilevel and Community-Level Interventions with Native Americans: Challenges and Opportunities. Prev Sci 2020;21(Suppl 1):65–73 doi 10.1007/s11121-018-0916-3.
43. Magnani JW. Hypertension-A Social Disease in Need of Social Solutions. Hypertension 2023;80(7):1414–6 doi 10.1161/HYPERTENSIONAHA.123.21296. [PubMed: 37315120]
44. Mentis AA. Social determinants of tobacco use: towards an equity lens approach. Tob Prev Cessat 2017;3:7 doi 10.18332/tpc/68836. [PubMed: 32432182]
45. Sarche M, Spicer P. Poverty and Health Disparities for American Indian and Alaska Native Children: Current Knowledge and Future Prospects. Ann N Y Acad Sci 2008;1136:126–36 doi 10.1196/annals.1425.017. [PubMed: 18579879]
46. Adamsen C, Schroeder S, LeMire S, Carter P. Education, Income, and Employment and Prevalence of Chronic Disease Among American Indian/Alaska Native Elders. Prev Chronic Dis 2018;15:E37 doi 10.5888/pcd15.170387. [PubMed: 29565785]

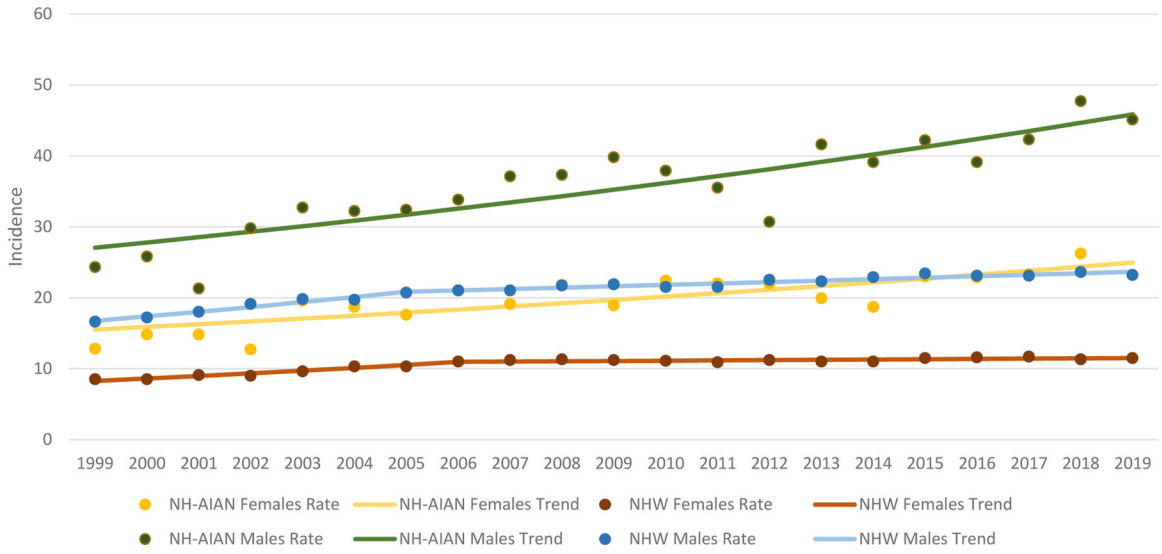

Figure 1:

Trends in Kidney Cancer Incidence among non-Hispanic American Indian/Alaska Native[a] and non-Hispanic White Males and Females All Regions, PRCDA, US 1999–2019

Figure 1 shows an image of a graph with four lines that represent the trends and average annual percent change in incidence race associated with kidney cancer incidence between the years 1999–2019 for NH-AI/AN males and females and NHW males and females

Average annual percent change (AAPC)[b] 1999–2019

NHW Male : 1.7* (95% CI: 1.4–2.1)

NH-AI/AN Male 2.7* (95% CI: 1.9–3.4)

NHW Female: 1.7* (95% CI: 1.3–2.0)

NH-AI/AN Female: 2.4* (95% CI:1.6–3.2)

Source: Cancer Registries in the National Program of Cancer Registries (NPCR) of the Centers for Disease Control and Prevention and the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute

Note: The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites. The 2020 incidence datapoint was not included in the trend analysis in order to avoid incorrect interpretations of the effect of cancer prevention and early detection efforts.

PRCDA indicates Purchased/Referred Care Delivery Areas; IHS: Indian Health Service; NH-AI/AN: non-Hispanic American Indian/Alaska Natives; NHW: non-Hispanic white

* 2-sided P<0.05

[a] AI/AN race is reported by NPCR and SEER registries or through linkage with the IHS patient registration database. Includes only AI/AN of non-Hispanic origin. Hispanic origin data for ND and WI were suppressed.

[b] APC (Annual Percent Change) is based on rates that were age-adjusted to the 2000 US standard population (11 age groups, Census P25–1130).

Table 1:

Kidney Cancer Incidence by Geographic Region and Sex among non-Hispanic American Indian/Alaska Native[a] and non-Hispanic White Males and Females, PRCDA, US, 2011–2020

Sex	Region	NH AI/AN Count	NH AI/AN Rate[b] (95% CI)	NHW Rate[b] (95% CI)	AI/AN:NHW RR[c] (95% CI)
Males					
	Northern Plains	316	64.8 (57.3–72.9)	27.3 (26.7–27.9)	2.37[d] (2.09–2.68)
	Alaska	173	37.7 (31.9–44.3)	22.3 (20.4–24.3)	1.69[d] (1.40–2.03)
	Southern Plains	796	52.8 (49.0–56.7)	24.7 (24.0–25.5)	2.13[d] (1.97–2.31)
	Pacific Coast	428	29.7 (26.8–32.8)	21.4 (21.1–21.7)	1.39[d] (1.25–1.54)
	East	114	19.2 (26.8–32.8)	23.6 (23.3–23.9)	0.81[d] (0.66–0.98)
	Southwest	751	39.9 (37.0–43.0)	19.5 (19.0–19.9)	2.05[d] (1.90–2.22)
	US Overall	2,578	40.4 (38.8–42.1)	22.6 (22.5–22.8)	1.79[d] (1.71–1.86)
Females					
	Northern Plains	177	32.3 (27.6–37.6)	13.3 (12.8–13.7)	2.44[d] (2.07–2.85)
	Alaska	119	23.1 (19.0–27.8)	11.9 (10.5–13.4)	1.94[d] (1.54–2.43)
	Southern Plains	537	31.1 (28.5–33.9)	14.3 (13.7–14.8)	2.18[d] (1.98–2.40)
	Pacific Coast	261	15.4 (13.6–17.5)	10.4 (10.2–10.6)	1.49[d] (1.30–1.69)
	East	92	14.2 (11.4–17.6)	11.5 (11.3–11.7)	1.24 (0.99–1.53)
	Southwest	465	19.5 (17.7–21.4)	9.4 (9.1–9.7)	2.08[d] (1.88–2.29)
	US Overall	1,651	22.1 (21.0–23.2)	11.2 (11.0–11.3)	1.98[d] (1.88–2.08)

Source: National Program of Cancer Registries and Surveillance - Epidemiology - and End Results SEER*Stat Database: U.S. Cancer Statistics American Indian and Alaska Native Incidence Analytic Database - 1999 – 2020 United States Department of Health and Human Services - Centers for Disease Control and Prevention. Released June 2023 - based on the 2022 submission.

Note: The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites.

PRCDA indicates Purchased/Referred Care Delivery Areas; IHS: Indian Health Service; NH-AI/AN: non-Hispanic American Indian/Alaska Natives; NHW: non-Hispanic white

[a] AI/AN race is reported by NPCR and SEER registries or through linkage with the IHS patient registration database. The updated bridged intercensal population estimates significantly overestimate AI/AN populations of Hispanic origin. All analyses are limited to non-Hispanic AI/AN populations. Non-Hispanic White was chosen as the reference population. The term “non-Hispanic” is omitted when discussing both groups. Hispanic origin data for ND and WI were suppressed.

[b] Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population (19 age groups-Census P25–1130) standard; Confidence Intervals (Tiwari model) are 95% for rates and ratios

[c] Rate ratios (RR) are AI/AN versus White and are calculated in SEER*Stat prior to rounding of rates and may not equal RR calculated from rates presented in table.

[d] The rate ratio indicates that the rate is significantly different than the rate for NHW ($P<0.05$)

IHS Regions are defined as follows: Northern Plains (IL, IN*, IA*, MA*, MN*, MT*, NE*, ND*, SD*, WI*, WY*); Alaska (AK*); Southern Plains (OK*, KS*, TX*); Pacific Coast (CA*, ID*, OR*, WA*, HI); East (AL*, AR, CT*, DE, FL*, GA, KY, LA*, ME*, MD, MA*, MS*, MO, NH, NJ, NY*, NC*, OH, PA*, RI*, SC*, TN, VT, VA, WV, DC, IL, IN*, IA*, MI*); Southwest (AZ*, CO*, NV*, NM*, UT*); * identifies states with at least one county designated as PRCDA.

Percent regional coverage of AI/AN in PRCDA counties to AI/AN in all counties: Northern Plains=54.2%; Alaska=100%; Southern Plains=55.7%; Pacific Coast=61.4%; East=17.9%; Southwest=86.3%; US=53.8%.

Table 2:

Kidney Cancer Incidence by Geographic Region, Sex and Age among non-Hispanic American Indian/Alaska Native[a] and non-Hispanic White Males and Females, PRCDA, US, 2011–2020

		<50			50–74			75+		
Sex	**Region**	**NH-AI/AN Rate[b]**	**NHW Rate[b]**	**NH-AI/AN:NHW RR[c] (95% CI)**	**NH-AI/AN Rate[b]**	**NHW Rate[b]**	**NH-AI/AN:NHW RR[c] (95% CI)**	**NH-AI/AN Rate[b]**	**NHW Rate[b]**	**NH-AI/AN:NHW RR[c] (95% CI)**
Males										
	Northern Plains	17.2	6.5	2.66[d] (2.11–3.32)	157.7	69.4	2.27[d] (2.00–2.57)	193.2	118.3	1.63[d] (1.15–2.26)
	Alaska	9.9	5.5	1.82[d] (1.18–2.72)	101.4	54.8	1.85[d] (1.49–2.29)	143.1	108.2	1.32 (0.76–2.18)
	Southern Plains	17.3	6.1	2.83[d] (2.38–3.36)	139.9	66.5	2.10[d] (1.91–2.31)	166.1	98.2	1.69[d] (1.34–2.12)
	Pacific Coast	7.9	4.8	1.65[d] (1.28–2.08)	80.6	55.4	1.45[d] (1.07–2.06)	109.0	98.3	1.11 (0.83–1.45)
	East	5.2	5.9	0.89 (0.54–1.39)	59.2	62.2	0.95 (0.77–1.17)	61.1	98.7	0.62 (0.34–1.05)
	Southwest	12.4	4.8	2.57[d] (2.17–3.02)	101.9	51.7	1.97[d] (1.79–2.17)	147.9	79.2	1.87[d] (1.51–2.29)
	US Overall	12.4	5.4	2.29[d] (2.09–2.49)	107.3	59.4	1.81[d] (1.72–1.90)	138.0	97.3	1.42[d] (1.26–1.59)
Females										
	Northern Plains	9.8	4.4	2.24[d] (1.65–2.97)	75.9	31.9	2.38[d] (2.00–2.81)	82.9	50.4	1.64[d] (1.06–2.44)
	Alaska	9.1	2.7	3.39[d] (2.02–5.60)	62.6	31.9	1.96[d] (1.49–2.57)	49.9	50.9	0.98 (0.44–1.96)
	Southern Plains	10.6	4.3	2.45[d] (1.97–3.02)	75.8	37.3	2.03[d] (1.80–2.29)	117.0	51.1	2.29[d] (1.81–2.86)
	Pacific Coast	4.3	2.9	1.50[d] (1.07–2.06)	43.0	25.5	1.69[d] (1.45–1.96)	50.0	46.6	1.07 (0.74–1.50)
	East	5.8	3.6	1.62[d] (1.02–2.44)	35.8	27.9	1.28 (0.98–1.65)	50.8	48.4	1.05 (0.60–1.71)
	Southwest	7.2	2.9	2.49[d] (2.01–3.05)	46.6	23.0	2.02[d] (1.78–2.30)	69.5	38.0	1.83[d] (1.43–2.31)
	US Overall	7.7	3.4	2.29[d] (2.06–2.55)	55.4	27.4	2.02[d] (1.90–2.15)	74.5	46.7	1.60[d] (1.40–1.81)

Source: National Program of Cancer Registries and Surveillance - Epidemiology - and End Results SEER*Stat Database: U.S. Cancer Statistics American Indian and Alaska Native Incidence Analytic Database - 1999 – 2020 United States Department of Health and Human Services - Centers for Disease Control and Prevention. Released June 2023 - based on the 2022 submission.

Note: The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites.

PRCDA indicates Purchased/Referred Care Delivery Areas; IHS: Indian Health Service; NH-AI/AN: non-Hispanic American Indian/Alaska Natives; NHW: non-Hispanic white

[a] AI/AN race is reported by NPCR and SEER registries or through linkage with the IHS patient registration database. The updated bridged intercensal population estimates significantly overestimate AI/AN populations of Hispanic origin. All analyses are limited to non-Hispanic AI/AN populations. Non-Hispanic White was chosen as the reference population. The term “non-Hispanic” is omitted when discussing both groups. Hispanic origin data for ND and WI were suppressed.

[b] Rates are per 100,000 and age-adjusted to the 2000 U.S. standard population (19 age groups-Census P25–1130) standard; Confidence Intervals (Tiwari model) are 95% for rates and ratios

[c] Rate ratios (RR) are AI/AN versus White and are calculated in SEER*Stat prior to rounding of rates and may not equal RR calculated from rates presented in table.

[d] The rate ratio indicates that the rate is significantly different than the rate for NHW ($P<0.05$)

IHS Regions are defined as follows: Northern Plains (IL, IN*, IA*, MA*, MN*, MT*, NE*, ND*, SD*, WI*, WY*); Alaska (AK*); Southern Plains (OK*, KS*, TX*); Pacific Coast (CA*, ID*, OR*, WA*, HI); East (AL*, AR, CT*, DE, FL*, GA, KY, LA*, ME*, MD, MA*, MS*, MO, NH, NJ, NY*, NC*, OH, PA*, RI*, SC*, TN, VT, VA, WV, DC, IL, IN*, IA*, MI*); Southwest (AZ*, CO*, NV*, NM*, UT*); * identifies states with at least one county designated as PRCDA.

Percent regional coverage of AI/AN in PRCDA counties to AI/AN in all counties: Northern Plains=54.2%; Alaska=100%; Southern Plains=55.7%; Pacific Coast=61.4%; East=17.9%; Southwest=86.3%; US=53.8%.

Table 3.

Kidney Cancer Incidence among non-Hispanic AI/AN[a] and non-Hispanic White Males and Females, 2011–2020 by Region and Stage, PRCDA, United States

	Localized[c]			Regional[d]			Distant[e]			Unstaged[f]		
	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)
Males												
Northern Plains	66.8(61.9)	43.2(17.0)	2.54[h](2.18–2.94)	16.1(17.5)	9.7 (4.7)	2.05[h](1.50–2.75)	12.0(15.0)	8.0(4.0)	2.03[h](1.37–2.88)	5.1(5.6)	3.8(1.6)	2.41[h](1.22–4.20)
Alaska	68.8(64.6)	25.9(14.1)	1.84[h](1.46–2.30)	13.9(15.0)	4.9(3.4)	1.43(0.84–2.35)	13.9(15.0)	5.4(3.4)	1.60(0.94–2.60)	3.5(5.3)	1.6(1.4)	1.09(0.34–2.72)
Southern Plains	60.9(60.5)	31.6(15.1)	2.09[h](1.89–2.31)	17.1(16.6)	9.1(4.0)	2.26[h](1.86–2.74)	15.5(15.0)	8.2(3.6)	2.30[h](1.86–2.82)	6.5(8.0)	3.8(2.0)	1.92[h](1.36–2.62)
Pacific Coast	59.6(63.7)	17.5(13.7)	1.28[h](1.12–1.45)	21.3(16.4)	6.2(3.5)	1.78[h](1.41–2.22)	15.9(15.1)	4.9(3.1)	1.57[h](1.20–2.02)	3.3(4.8)	1.1(1.1)	1.03(0.53–1.78)
East	64.9(64.2)	12.7(15.3)	0.83(0.64–1.05)	18.4(17.3)	3.5(4.0)	0.87(0.52–1.36)	14.0(13.5)	2.5(3.1)	0.80(0.45–1.33)	2.6(5.0)	0.5(1.2)	0.43(0.09–1.31)
Southwest	57.7(64.1)	22.2(12.6)	1.76[h](1.59–1.95)	18.2(16.3)	7.3(3.1)	2.36[h](1.95–2.83)	16.9(13.4)	7.0(2.6)	2.72[h](2.22–3.30)	7.2(6.2)	3.4(6.2)	2.91[h](2.12–3.90)
US Overall	65.8(63.6)	24.3(14.5)	1.67[h](1.59–1.76)	15.6(16.8)	7.2(3.8)	1.90[h](1.72–2.10)	12.9(14.3)	6.4(3.1)	2.02[h](1.81–2.25)	5.7(5.2)	2.6(1.2)	2.13[h](1.77–2.62)
Females												
Northern Plains	71.2(65.8)	22.9(9.0)	2.54[h](2.10–3.06)	11.9(15.6)	3.8(2.0)	1.88[h](1.13–2.93)	13.9(12.9)	4.3(1.6)	2.70[h](1.67–4.13)	3.4(5.7)	1.4(0.7)	2.05(0.70–4.49)
Alaska	75.6(70.6)	17.4(8.4)	2.07[h](1.58–2.68)	13.4(14.0)	3.1(1.7)	1.81(0.92–3.36)	9.2(9.7)	2.1(1.0)	2.07(0.90–4.37)	1.7(5.7)	0.5(0.7)	0.68(0.07–2.77)
Southern Plains	71.7(64.7)	21.9(9.5)	2.31[h](2.06–2.59)	12.3(14.0)	3.9(1.9)	2.05[h](1.54–2.68)	10.4(13.5)	3.3(1.8)	1.78[h](1.30–2.38)	5.6(7.8)	2.0(1.0)	1.89[h](1.23–2.79)
Pacific Coast	69.0(66.1)	10.6(7.0)	1.51[h](1.29–1.76)	11.9(14.9)	1.9(1.5)	1.26(0.84–1.82)	16.9(13.6)	2.6(1.4)	1.89[h](1.35–2.59)	2.3(5.4)	0.4(0.5)	0.71(0.25–1.62)
East	72.8(67.1)	10.5(7.9)	1.32[h](1.02–1.69)	12.0(15.6)	1.7(1.8)	0.94(0.46–1.73)	9.8(11.8)	1.3(1.3)	1.01(0.45–1.98)	5.4(5.5)	0.8(0.5)	1.52(0.25–1.62)
Southwest	65.4(66.3)	12.7(6.4)	1.98[h](1.75–2.24)	19.4(14.8)	3.6(1.3)	2.68[h](2.12–3.37)	10.3(11.9)	2.1(1.1)	1.96[h](1.42–2.66)	4.9(7.0)	1.1(0.6)	1.95[h](1.21–2.99)

	Localized[c]			Regional[d]			Distant[e]			Unstaged[f]		
	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)	% AI/AN (W)	Rate AI/AN (W)[b]	RR[g] (AI/AN:W)
US Overall	69.8(66.4)	15.3(7.6)	2.01[h](1.89–2.14)	14.2(15.1)	3.1(1.6)	1.90[h](1.65–2.17)	11.6(12.6)	2.6(1.3)	1.94[h](1.66–2.25)	4.4(5.9)	1.1(0.6)	1.93[h](1.50–2.46)

Source: National Program of Cancer Registries and Surveillance - Epidemiology - and End Results SEER*Stat Database: U.S. Cancer Statistics American Indian and Alaska Native Incidence Analytic Database - 1999 – 2020 United States Department of Health and Human Services - Centers for Disease Control and Prevention. Released June 2023 - based on the 2022 submission.

Note: The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites.

PRCDA indicates Purchased/Referred Care Delivery Areas; IHS: Indian Health Service; NH-AI/AN: non-Hispanic American Indian/Alaska Natives; NHW: non-Hispanic white

[a] AI/AN race is reported by NPCR and SEER registries or through linkage with the IHS patient registration database. Includes only AI/AN of non-Hispanic origin. Hispanic origin data for ND and WI were suppressed.

[b] Rates are per 100,000 persons and are age-adjusted to the 2000 U.S. standard population (19 age groups - Census P25–1130).

[c] Localized cancer refers to a malignancy limited to the organ of origin; no spread beyond organ of origin; infiltration past basement membrane of epithelium into stroma of organ.

[d] Regional cancer refers to tumor extension beyond limits of organ of origin by direct extension, lymph nodes, both, or not otherwise specified

[e] Distant cancer refers to a tumor which has spread to areas of the body distant or remote from the primary tumor.

[f] Unstaged cancer includes cases for which sufficient evidence is not available to adequately assign stage.

[g] RR are AI/AN versus White and are calculated in SEER*Stat prior to rounding of rates and may not equal RR calculated from rates presented in table.

[h] Indicates RR is statistically significantly different from zero (2-sided p<0.05).

~ counts fewer than 6 are suppressed

IHS Regions are defined as follows: Northern Plains (IL, IN*, IA*, MA*, MN*, MT*, NE*, ND*, SD*, WI*, WY*); Alaska (AK*); Southern Plains (OK*, KS*, TX*); Pacific Coast (CA*, ID*, OR*, WA*, HI); East (AL*, AR, CT*, DE, FL*, GA, KY, LA*, ME*, MD, MA*, MS*, MO, NH, NJ, NY*, NC*, OH, PA*, RI*, SC*, TN, VT, VA, WV, DC, IL, IN*, IA*, MI*); Southwest (AZ*, CO*, NV*, NM*, UT*); * identifies states with at least one county designated as PRCDA.

Percent regional coverage of AI/AN in PRCDA counties to AI/AN in all counties: Northern Plains=54.2%; Alaska=100%; Southern Plains=55.7%; Pacific Coast=61.4%; East=17.9%; Southwest=86.3%; US=53.8%.

Table 4:

Trends in Kidney Cancer Incidence among non-Hispanic American Indian/Alaska Native[a] and non-Hispanic White Males and Females By Region, Age, and Stage, PRCDA, US 1999–2019

	Males				Females			
IHS Region	**NH-AI/AN AAPC[b]**	**p-value**	**NHW AAPC[b]**	**p-value**	**NH-AI/AN AAPC[b]**	**p-value**	**NHW AAPC[b]**	**p-value**
Northern Plains	2.9	0.009	1.9	<0.001	0.3	0.802	1.2	<0.001
Alaska	2.5	0.018	1.1	0.097	2.8	0.043	2.3	0.011
Southern Plains	4.5	<0.001	2.7	<0.001	4.1	<0.001	2.9	<0.001
Pacific Coast	2.0	0.017	2.0	<0.001	0.6	0.593	1.7	<0.001
East	0.9	0.532	1.3	0.008	1.4	0.302	1.5	<0.001
Southwest	1.8	0.005	2.0	0.004	2.6	0.001	1.3	0.015
Age								
<50	5.2	<0.001	2.9	<0.001	3.7	<0.001	2.9	<0.001
50–74	2.9	<0.001	1.9	<0.001	3.0	<0.001	1.7	<0.001
75+	1.1	0.182	1.1	<0.001	−1.9	0.082	1.2	<0.001
Stage								
Localized	4.3	<0.001	2.8	<0.001	3.7	<0.001	2.4	<0.001
Regional	2.5	0.003	0.8	<0.001	3.0	<0.001	0.8	0.017
Distant	−0.1	0.912	−0.2	0.070	−1.9	0.070	−0.5	0.026

Source: Cancer Registries in the National Program of Cancer Registries (NPCR) of the Centers for Disease Control and Prevention and the Surveillance, Epidemiology, and End Results (SEER) program of the National Cancer Institute

Note: The COVID-19 pandemic disrupted health services, leading to delays and reductions in cancer screening, diagnosis, and reporting to some central cancer registries. This may have contributed to an observed decline in 2020 incidence for most cancer sites. The 2020 incidence datapoint was not included in the trend analysis in order to avoid incorrect interpretations of the effect of cancer prevention and early detection efforts.

PRCDA indicates Purchased/Referred Care Delivery Areas; IHS: Indian Health Service; NH-AI/AN: non-Hispanic American Indian/Alaska Natives; NHW: non-Hispanic white

[a] AI/AN race is reported by NPCR and SEER registries or through linkage with the IHS patient registration database. Includes only AI/AN of non-Hispanic origin. Hispanic origin data for ND and WI were suppressed.

[b] AAPC is based on rates that were age-adjusted to the 2000 US standard population (11 age groups, Census P25–1130).