

Cancer Death Rates in US Congressional Districts

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Knowledge of the cancer burden is important for informing and advocating cancer prevention and control. Mortality data are readily available for states and counties, but not for congressional districts, from which representatives are elected and which may be more influential in compelling legislation and policy. The authors calculated average annual cancer death rates during 2002 to 2011 for each of the 435 congressional districts using mortality data from the National Center for Health Statistics and population estimates from the US Census Bureau. Age-standardized death rates were mapped for all sites combined and separately for cancers of the lung and bronchus, colorectum, breast, and prostate by race/ethnicity and sex. Overall cancer death rates vary by almost 2-fold and are generally lowest in Mountain states and highest in Appalachia and areas of the South. The distribution is similar for lung and colorectal cancers, with the lowest rates consistently noted in districts in Utah. However, for breast and prostate cancers, while the highest rates are again scattered throughout the South, the geographic pattern is less clear and the lowest rates are in Hawaii and southern Texas and Florida. Within-state heterogeneity is limited, particularly for men, with the exceptions of Texas, Georgia, and Florida. Patterns also vary by race/ethnicity. For example, the highest prostate cancer death rates are in the West and north central United States among non-Hispanic whites, but in the deep South among African Americans. Hispanics have the lowest rates except for colorectal cancer in Wyoming, eastern Colorado, and northern New Mexico. These data can facilitate cancer control and stimulate conversation about the relationship between cancer and policies that influence access to health care and the prevalence of behavioral and environmental risk factors. *CA Cancer J Clin* 2015;65:339-344. © 2015 American Cancer Society.

Keywords: cancer mortality, Congress, geography, legislation

Introduction

Policy and legislation at the national, state, and local levels are the primary means of cancer control in the United States. Cancer surveillance is a necessary component of these activities because it provides information about patterns of disease frequency for setting priorities. The preferred measure of progress against cancer is death rates because they reflect prevention, early detection, and treatment in the absence of detection biases.¹ Although geographic patterns in cancer mortality are typically presented by state or county, data for individual congressional districts (CDs) are often more useful for legislators, policy makers, and cancer control advocates. Moreover, parsing data by CD offers the advantage of unmasking within-state heterogeneity with fewer population limitations than county-based analyses. However, mortality statistics are not readily available by CD because many do not follow county boundaries and death data are not disseminated for geographic areas smaller than the county. The most recently published cancer mortality data by CD are for 1990 through 2000.² Since 1991, overall cancer death rates have declined by 22%, but with much geographic variability.³ Therefore, we updated our previous analyses by estimating and mapping average annual cancer death rates during 2002 to 2011 overall and for the 4 most common disease sites (lung and bronchus, colorectum, breast, and prostate) by sex and race/ethnicity for each of the 435 CDs and the District of Columbia.

Materials and Methods

We accessed average annual crude cancer death rates during 2002 to 2011 for every US county from the National Center for Health Statistics using the National Cancer Institute's SEER*Stat software (version 8.2.1).⁴ All rates are presented as deaths per 100,000 population and are age-adjusted to the 2000 US standard population for 15 age groups (aged birth-19 years,

Additional Supporting Information may be found in the online version of this article.

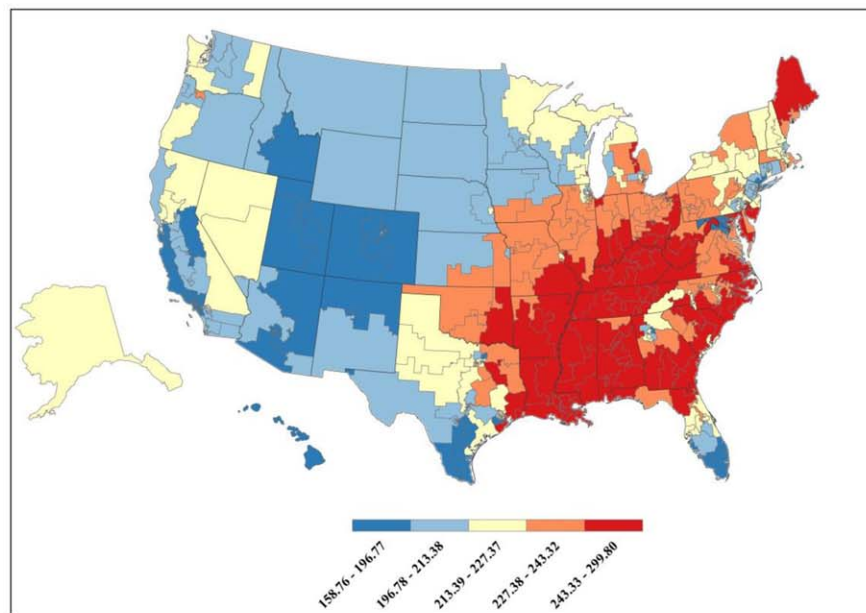
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DISCLOSURES: This work was 100% funded by the American Cancer Society. The authors report no conflicts of interest.

doi: 10.3322/caac.21292. Available online at cancerjournal.com

Males



Females

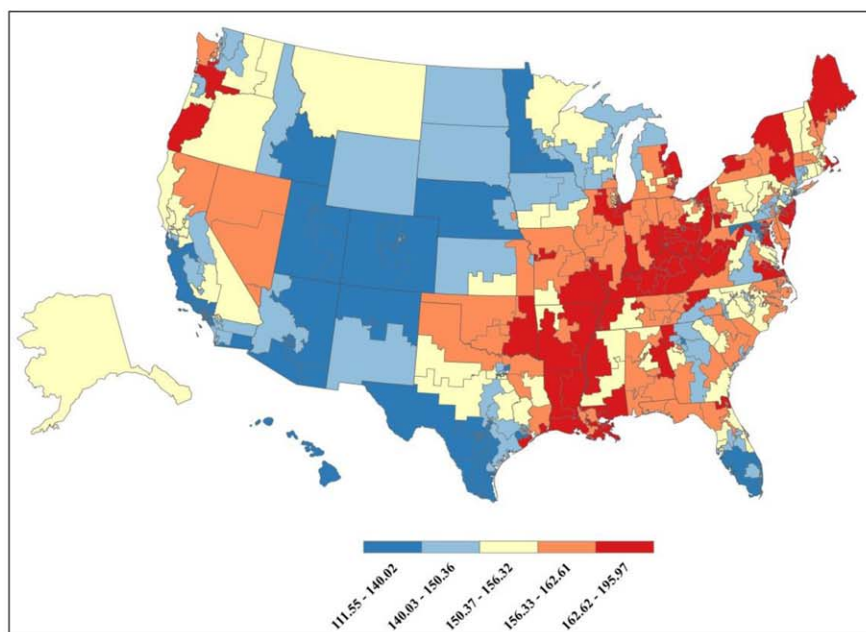


FIGURE 1. Cancer Death Rates (per 100,000 Population) by Congressional District and Sex, 2002 to 2011.

20-24 years, 25-29 years, 30-34 years...80-84 years, and ≥ 85 years). Death rates are stratified by cancer type (lung and bronchus, colorectum, breast, and prostate) and race/ethnicity (all races, non-Hispanic white, African American, and Hispanic).

The 435 seats of the US House of Representatives are reapportioned among the 50 states based on the decennial census. CDs average a population size of 710,767 residents based on the 2010 Census,⁵ and may be comprised of an entire state or groups of counties, partial counties, or combinations thereof. For our estimates, CDs at-large (includes the entire state) were assigned the state rate. If the CD

covered one and only one county, then the rate was equal to the county rate. For all other configurations, the county-level age-specific rates were applied to each census block within the county and a population-weighted average was used to estimate the CD rate (see online supporting information). Rates were suppressed if there were <20 total deaths in the CD over the 10-year period.

Selected Findings

Figure 1 shows overall cancer death rates by sex for the 435 CDs. Eight CDs follow state boundaries (Alaska,

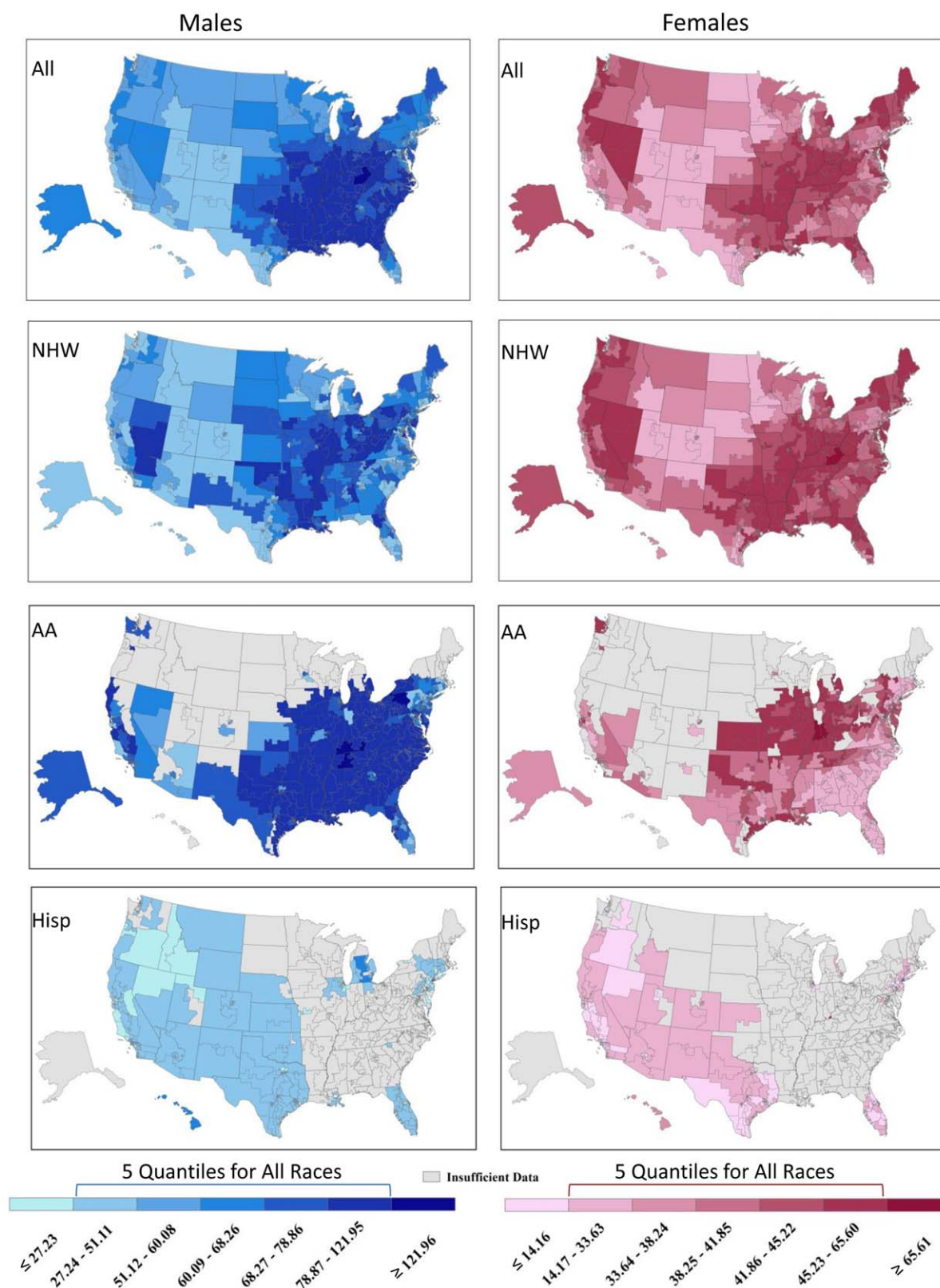


FIGURE 2. Lung Cancer Death Rates (per 100,000 Population) by Congressional District, Sex, and Race/Ethnicity, 2002 to 2011. AA indicates African American; Hisp, Hispanic, NHW, non-Hispanic white.

Delaware, the District of Columbia, Montana, North Dakota, South Dakota, Vermont, and Wyoming). Overall cancer death rates are generally lowest in Mountain states

and highest in Appalachia and areas of the South. Rates range from 159 (per 100,000 population) in eastern Utah to 300 in eastern Kentucky among men and from 112 in

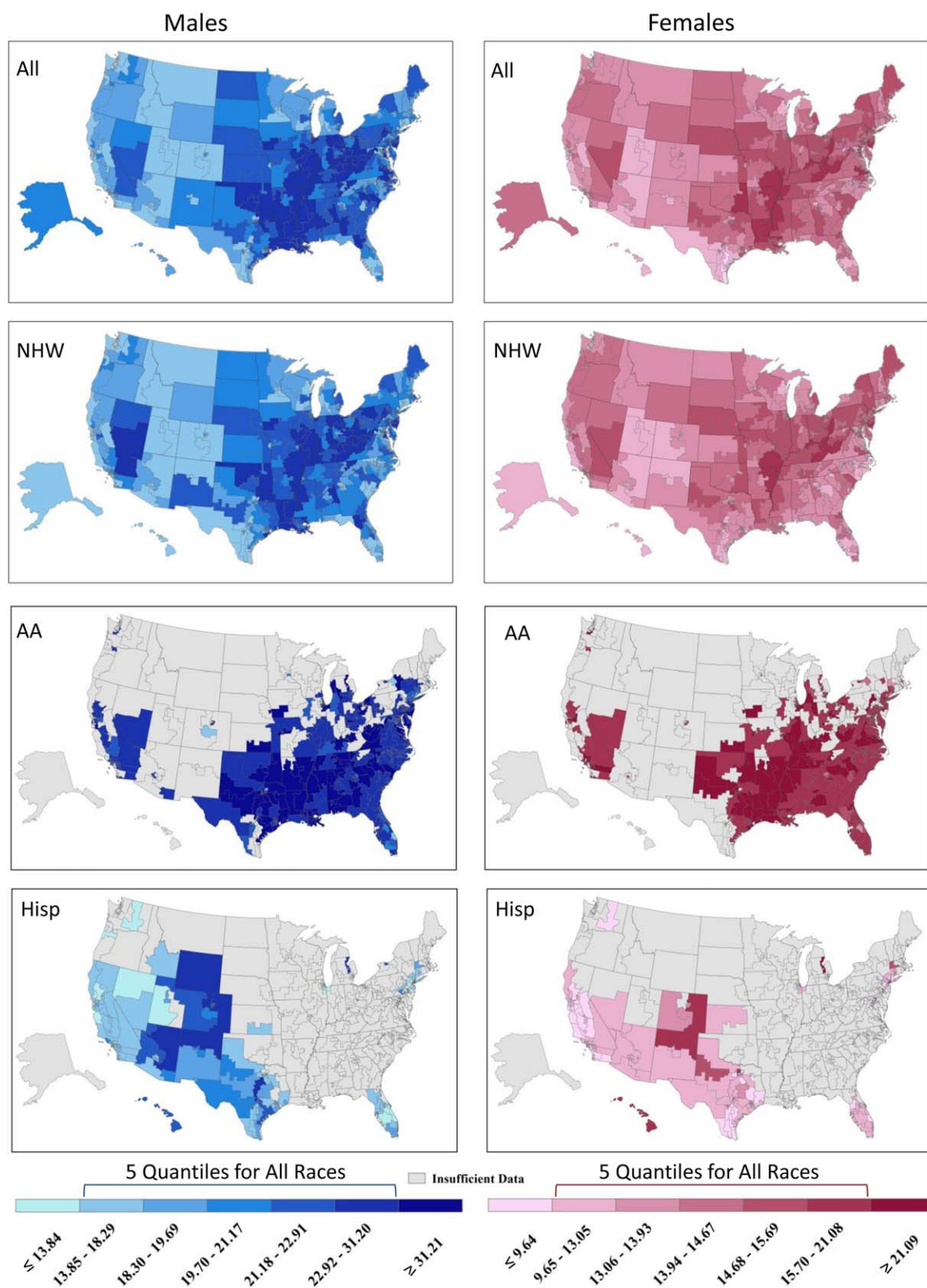


FIGURE 3. Colorectal Cancer Death Rates (per 100,000 Population) by Congressional District, Sex, and Race/Ethnicity, 2002 to 2011. AA indicates African American; Hisp, Hispanic; NHW, non-Hispanic white.

northern Utah to 196 in the same eastern Kentucky CD in women (see Supporting Information Table 1). Among men, rates are fairly homogenous within states with the

exceptions of Texas, Georgia, and Florida, where district rates span all 5 quantiles. Within-state variation is somewhat more common among women.

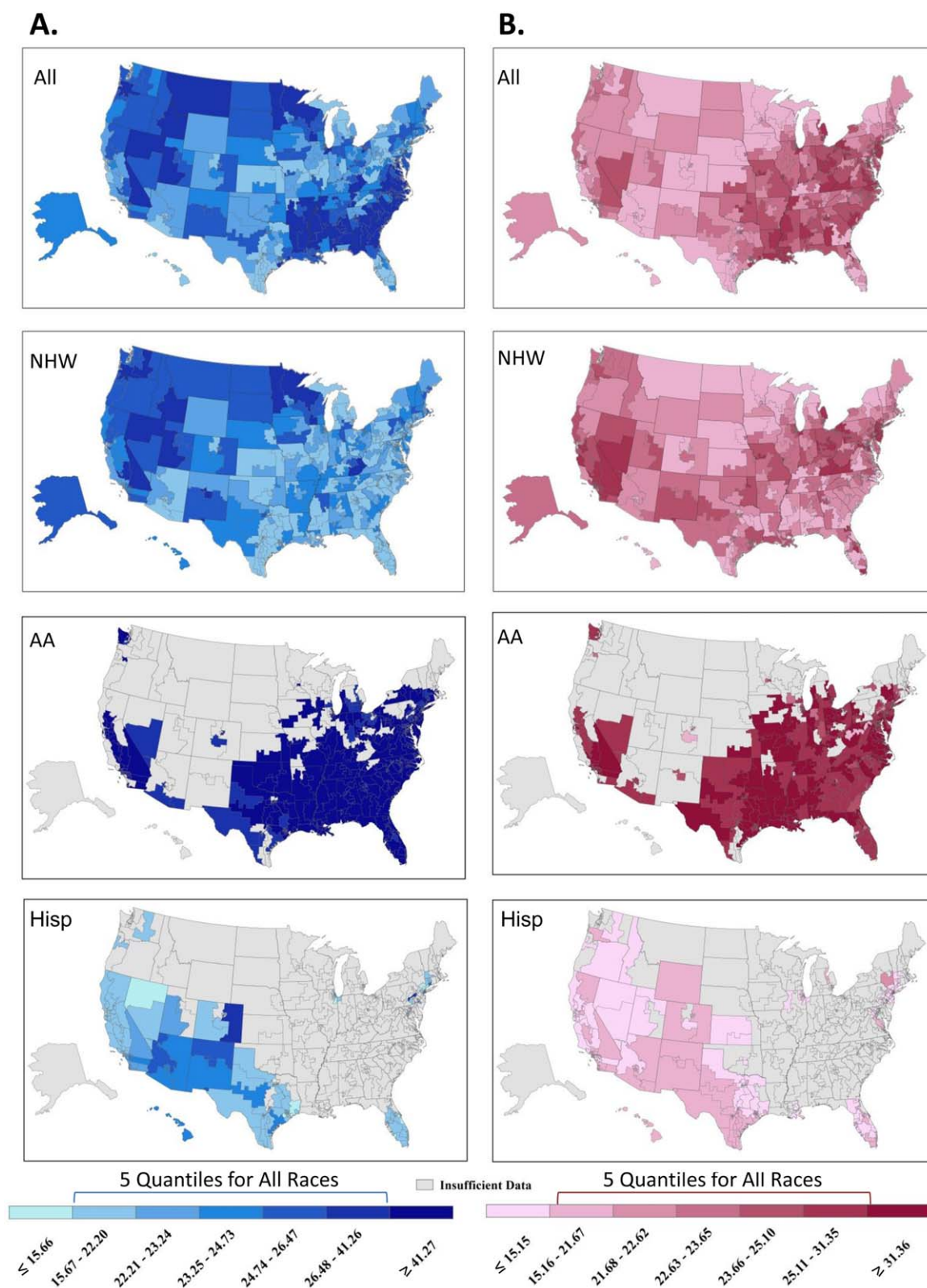


FIGURE 4. (A) Prostate Cancer Death Rates (per 100,000 Population) by Congressional District and Race/Ethnicity, 2002 to 2011. (B) Female breast cancer death rates (per 100,000 population) by congressional district and race/ethnicity, 2002 to 2011. AA indicates African American; Hisp, Hispanic; NHW, non-Hispanic white.

The distribution for lung and colorectal cancer death rates is similar to the overall pattern, with the lowest rates consistently noted in Utah (Figs. 2 and 3). However, for prostate

and breast cancers, while the highest rates remain scattered throughout the South, the lowest rates are in Hawaii, south Texas, and south Florida, and a clear geographic pattern is

less apparent (Fig. 4). Patterns also vary by race/ethnicity, albeit based on limited data. For example, the highest prostate cancer death rates are in the West and north central United States among non-Hispanic whites, but in the deep South among African Americans. Hispanics have the lowest rates except for relatively high colorectal cancer death rates in Wyoming, eastern Colorado, and northern New Mexico.

Discussion

Cancer death rates in CDs vary by almost 2-fold among both men and women and are consistently low in Mountain states and high in the South. The distribution in the risk of cancer death that we observed is generally similar to our previous report² and consistent with those based on more commonly used boundaries such as states or counties.^{6,7} The substantial variation noted in overall cancer death rates is primarily driven by economic, racial, and urban-rural disparities in access to care and risk factor prevalence. For example, low socioeconomic status is associated with higher rates of smoking and obesity and lower rates of cancer screening and receipt of high-quality treatment.

The geographic patterns for lung cancer are strikingly similar to those for all cancers combined, reflecting the preponderance of smoking-related cancers and their continued toll on human health.^{8,9} Locations of high overall cancer mortality also have higher tobacco production, higher smoking prevalence, and less knowledge among residents about the relationship between smoking and cancer.¹⁰ Not surprisingly, Southern states (with the highest overall cancer mortality rates) have also lagged behind in funding and

implementing tobacco control programs and policies and have the lowest cigarette excise taxes in the nation (eg, \$0.37 in Georgia vs \$4.35 in New York).¹¹

The economic costs of cancer are sobering. National expenditures for cancer care are projected to reach 158 billion US dollars by 2020,¹² with state costs predicted to increase by an average of 72% from 2010 to 2020.¹³ Investment in cancer prevention and treatment can help curtail this cost explosion. For example, a program that expanded colorectal cancer screening in Delaware has saved the state \$8.5 million annually through the prevention of cancer and reduction in costs associated with treating early-stage versus late-stage disease.¹⁴ Ironically, despite the increasing number of patients diagnosed each year and the need for more research to further progress against the disease through new discoveries, political commitment to research funding has evaporated. As a result, promising clinical trials have been halted, and some of the brightest minds in scientific research have been forced to leave the field.¹⁵

Conclusions

The spatial pattern of US cancer death rates by CD complements other geographic studies and provides a basis for targeted legislation to improve cancer control nationwide. The enormous variation in the risk of cancer death reflects the large influence of behavioral and environmental factors, many of which are modifiable. Increased awareness and public dialogue about unnecessary disparities in cancer occurrence can help to prompt action, inform resource allocation, and reduce the cancer burden. ■

References

1. Measurement of progress against cancer. Extramural Committee to Assess Measures of Progress Against Cancer. *J Natl Cancer Inst.* 1990;82:825-835.
2. Hao Y, Ward EM, Jemal A, Pickle LW, Thun MJ. U.S. congressional district cancer death rates. *Int J Health Geogr.* 2006;5:28.
3. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2015. *CA Cancer J Clin.* 2015;65:5-29.
4. Surveillance, Epidemiology, and End Results (SEER) Program. SEER*Stat Database: Mortality-All COD, Total US (1969-2011) <Katrina/Rita Population Adjustment>-Linked To County Attributes-Total US, 1969-2012 Counties. Bethesda, MD: National Cancer Institute, Division of Cancer Control and Population Sciences, Surveillance Research Program, Surveillance Systems Branch; 2014; underlying mortality data provided by the National Center for Health Statistics, 2014.
5. Burnett KD. 2010 Census Briefs: Congressional Apportionment. Washington, DC: US Census Bureau; 2011.
6. Naishadham D, Lansdorp-Vogelaar I, Siegel R, Cokkinides V, Jemal A. State disparities in colorectal cancer mortality patterns in the United States. *Cancer Epidemiol Biomarkers Prev.* 2011;20:1296-1302.
7. Singh GK, Williams SD, Siahpush M, Mulhollen A. Socioeconomic, rural-urban, and racial inequalities in US cancer mortality: part I-all cancers and lung cancer and part II-colorectal, prostate, breast, and cervical cancers. *J Cancer Epidemiol.* 2011;2011:107497.
8. Stewart SL, Cardinez CJ, Richardson LC, et al; Centers for Disease Control and Prevention (CDC). Surveillance for cancers associated with tobacco use-United States, 1999-2004. *MMWR Surveill Summ.* 2008;57:1-33.
9. Jacobs EJ, Newton CC, Carter BD, et al. What proportion of cancer deaths in the contemporary United States is attributable to cigarette smoking? *Ann Epidemiol.* 2015; 25:179-182.e1.
10. Finney Rutten LJ, Augustson EM, Moser RP, Beckjord EB, Hesse BW. Smoking knowledge and behavior in the United States: sociodemographic, smoking status, and geographic patterns. *Nicotine Tob Res.* 2008;10:1559-1570.
11. Orzechowski and Walker Consulting Firm. The Tax Burden on Tobacco: Historical Compilation. Vol 47. Washington, DC: The Tobacco Institute; 2012.
12. Mariotto AB, Yabroff KR, Shao Y, Feuer EJ, Brown ML. Projections of the cost of cancer care in the United States: 2010-2020. *J Natl Cancer Inst.* 2011;103:117-128.
13. Trogon JG, Tangka FK, Ekwueme DU, Guy GP Jr, Nwaise I, Orenstein D. State-level projections of cancer-related medical care costs: 2010 to 2020. *Am J Manag Care.* 2012;18:525-532.
14. Grubbs SS, Polite BN, Carney J Jr, et al. Eliminating racial disparities in colorectal cancer in the real world: it took a village. *J Clin Oncol.* 2013;31:1928-1930.
15. American Society of Clinical Oncology. Federally funded cancer research: the key role of the National Cancer Institute. asco.org/advocacy/federally-funded-cancer-research-key-role-national-cancer-institute-0. Accessed June 5, 2015.