

# Rural Cancer Control: Bridging the Chasm in Geographic Health Inequity

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## An Uneven Landscape: Geographic Disparities in Cancer Burden and Underlying Factors

Studies have shown time after time that where people live can affect what diseases they get, how they die, and when they die (1–6). In 2017, about 15% of the U.S. population, about 46 million people, lived in rural areas. Although geography alone cannot predict cancer risk, it can impact prevention, screening, diagnosis, and treatment opportunities. The articles in this special *CEBP* Focus issue on rural cancer control explore geographic disparities across the cancer control continuum in several distinct rural communities and map out potential paths to reach geographic health equity (7–12).

Cancers of the female breast, prostate, lung, and colorectal cancers are the most common cancers in the United States, in both rural and metropolitan areas (6). However, people who live in rural areas, compared with people who live in the metropolitan areas, tend to have lower incidence rates for several cancer types that could be detected through screening and diagnostic imaging services (e.g., female breast, prostate, thyroid, and kidney cancers), but higher incidence rates for smoking-related cancers (e.g., lung and bladder cancer) and human papillomavirus (HPV)-related cancers (e.g., cervix cancer). Death rates are higher in persons residing in rural than metropolitan areas for many cancer types, particularly those amenable to primary prevention [e.g., lung cancer (Fig. 1A) and cervical cancer (Fig. 1B)], screening and early detection (e.g., colorectal cancer; Fig. 1C), quality cancer treatment and cancer survivorship care (e.g., prostate cancer, Fig. 1D). Moreover, progress in reducing cancer death rates for all cancers combined and for most common cancers has been slower in rural than in urban areas, further widening the disparity in mortality (Fig. 2).

Factors contributing to slower progress and higher burden of cancer in rural areas are multifactorial and include economic, social, and structural barriers. Persons residing in rural areas were more likely to live below the Federal poverty level (16%) than those residing in metropolitan areas (12%) and less likely to have medical insurance (13% vs. 10%; Fig. 3A; ref. 13), potentially limiting access to the recommended preventive, early detection, and treatment services (14–16). Prevalence of

cigarette smoking, obesity, and physical inactivity, common risk factors for many cancer types (17), were higher among residents of rural areas than among residents of metropolitan areas (Fig. 3B; refs. 13, 18). Comprehensive tobacco prevention and control programs are proven to reduce smoking prevalence (19, 20); however, tobacco control efforts such as smoke-free policies, excise taxes on tobacco products, and accessibility to smoking cessation resources tend to be lower in rural areas compared with metropolitan areas (13). Vaccination uptake rates for HPV among adolescent boys and girls were lower in rural areas than in metropolitan areas, potentially impacting future cancer burden, (Fig. 3C; ref. 21) despite the availability of the vaccine to children to low-income families at no cost through a Federal program, Vaccines for Children (22). However, vaccination rates for hepatitis B virus among children were high (>90%) in both rural and metropolitan areas (Fig. 3C), suggesting that barriers other than cost may impact low HPV vaccination rates. According to data from the 2015 National Health Interview Survey, the prevalence of receiving recommended screening tests for female breast, colon and rectum, and cervical cancers (Fig. 3D) were lower in persons residing in rural areas than among residents of metropolitan areas (13). Lower adherence to screening could be due to factors such as barriers to transportation to screening facilities, unaffordable screening tests, insufficient number of local screening facilities, or shortage of trained personnel, such as radiologists (6, 23). Persons residing in rural areas may be less likely to receive guideline concordant treatments. For example, receipt of radiotherapy for patients with breast cancer residing in the NCI's Surveillance, Epidemiology, and End Results program was lower for rural (62.1%) than urban (69.1%) patients (24). There are fewer primary healthcare providers and specialists in rural areas that may limit access to timely and high-quality prevention, early detection, treatment, and survivorship care services.

## Bridging the Gap: Stories from the Field

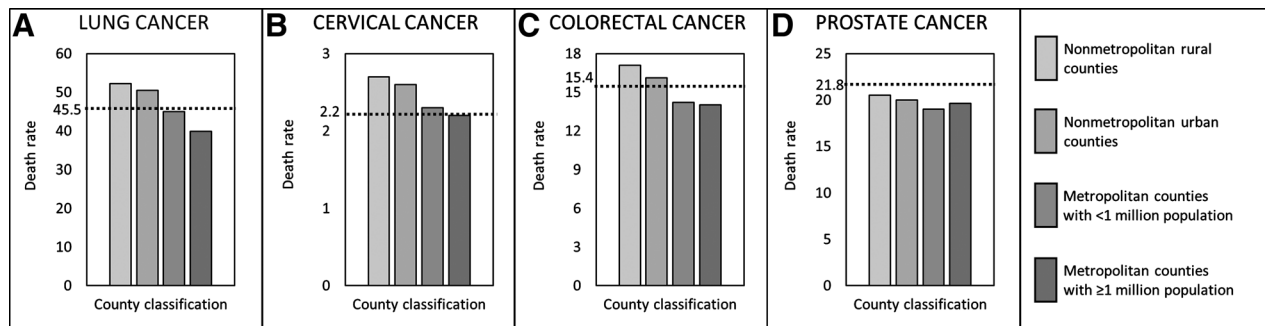
In this special *CEBP* Focus issue, six articles share new insights into cancer disparities in rural communities. An article by Zahnd and colleagues examines cancer incidence rates and trends by demographic, geographic, and socioeconomic characteristics based on a multistate database, covering 93% of the U.S. population, and confirms that cancer rates associated with modifiable risks, such as tobacco use and HPV infection, and some preventive screening modalities were higher in rural areas compared with urban areas (7). Zahnd and colleagues underscore the utility of such large and generalizable databases for monitoring the cancer burden in rural communities and other under-served populations to inform further research and public health efforts. Ross and colleagues examined progress in reducing lung cancer death rates among women from 1990 to 2015 by county, and found that although lung cancer death rates steadily decreased in most counties, they increased until the late 2000s in several rural

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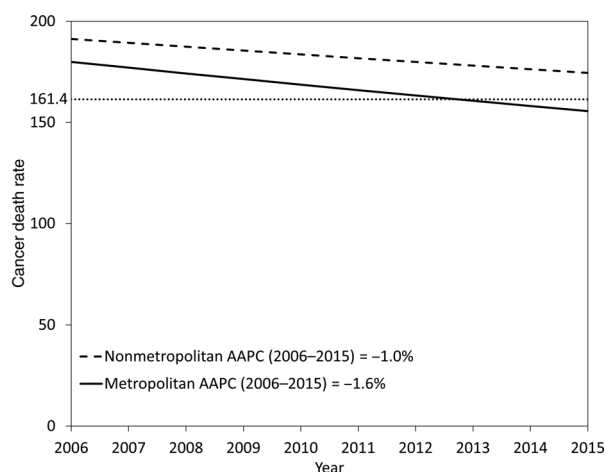
**Figure 1.**

Healthy People 2020 objectives for cancer and average annual death rates (per 100,000 persons, age-adjusted to the 2000 U.S. standard population) from selected cancers (**A**, lung cancer; **B**, cervical cancer; **C**, colorectal cancer; **D**, prostate cancer) by county classification—United States, 2011–2015. Healthy People 2020 objectives for cancer death rates are indicated with a dotted line (ref. 13). Counties were identified using the United States Department of Agriculture Economic Research Service 2013 vintage rural–urban continuum code, which categorizes nonmetropolitan counties by degree of urbanization and adjacency to a metro area, and metropolitan counties by the population size of their metro area (<https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>; ref. 6).

counties in Appalachia and the Midwest, widening the geographic inequities in lung cancer mortality (8). The authors noted that these geographic areas are characterized by weak tobacco control policies such as low excise tax on cigarettes and lack of comprehensive smoke-free policies banning smoking in all workplaces, restaurants and bars, and called for intensifying local tobacco control policies.

Paskett and colleagues conducted a year-long church-based diet and exercise intervention trial with input from the community to reduce obesity in Appalachia (9). The authors found that participants who actively participated and attended more education sessions about physical activity and healthy diet were more likely to lose weight. However, the authors reported that only a third of participants regularly attended educational

sessions and noted the need for more in-person contact to increase the impact of the intervention. Nevertheless, this trial demonstrates the importance of social gatherings such as churches as a vehicle to motivate healthy behaviors in rural and other underserved communities. Briant and colleagues showcased the benefits of using culturally tailored interventions to improve health awareness, knowledge, and behavior; their study showed that *promotor(a)*-led "home health parties" increased the use of fecal occult blood test screening from 51% to 80% among Hispanic men and women living in rural Washington State (10). McDougall and colleagues studied colorectal cancer survivors in New Mexico and found that those who lived in rural areas were more likely to experience financial hardship and less likely to adhere to recommended follow-up care, highlighting the importance that place plays in affordable, accessible survivorship care (11). To examine the associations of neighborhood characteristics in Missouri with treatment and outcomes of ductal carcinoma *in situ*, Zhang, Liu, and colleagues used census tract–level socioeconomic deprivation and rural–urban commuting area codes to define rurality; although differences in treatment, but not outcome, were found, the authors suggest that larger studies using nuanced definitions of rurality are needed to refine our understanding the contribution of place to outcome (12). It is noteworthy that the definition, location, and composition of "rural" differ across the United States and these may affect the interpretation of the study findings included in this special issue.

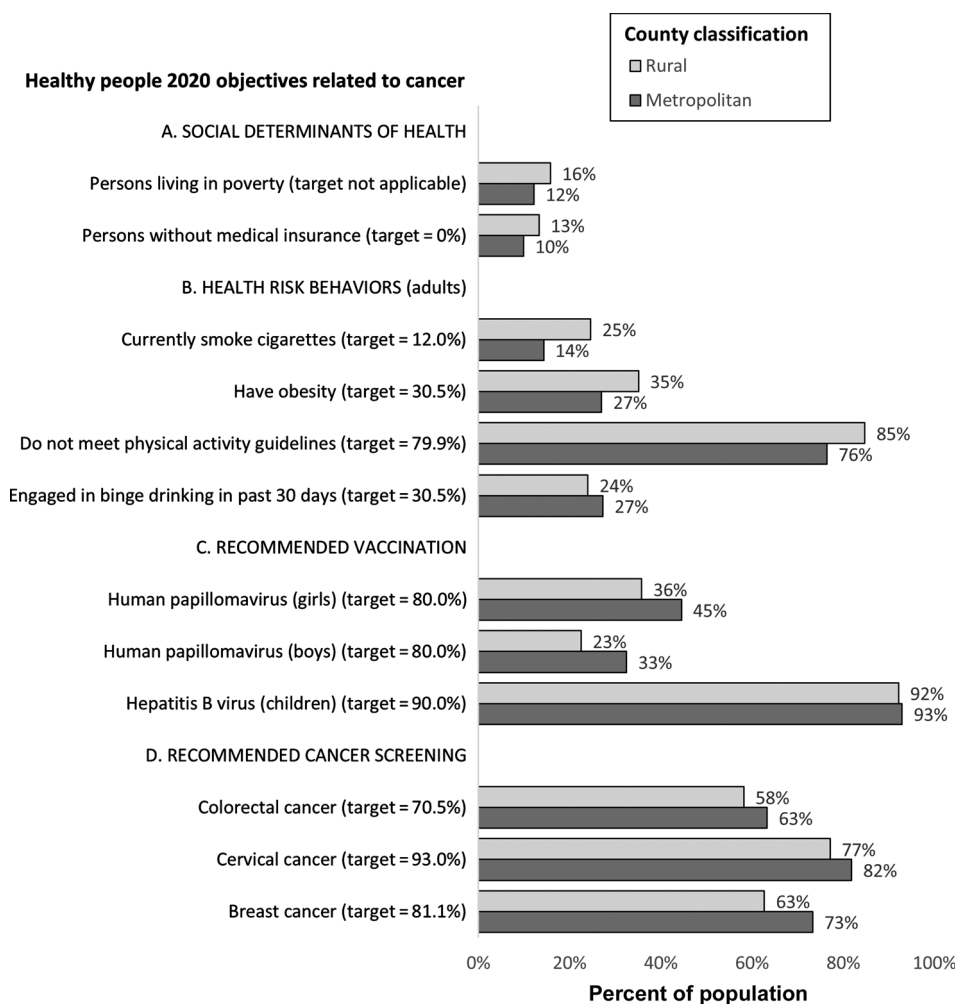


**Figure 2.**

Trends in cancer death rates (per 100,000 persons, age-adjusted to the 2000 U.S. standard population) from 2006 to 2015 in U.S. rural (nonmetropolitan) and metropolitan counties. The Healthy People 2020 objective for cancer death rate is indicated with a dotted line (ref. 13). Average annual percent change (AAPC) in rates calculated using joinpoint regression was used to describe trends. (ref. 6).

## Conclusion

The articles in this special issue describe disparities in cancer risk, screening, treatment, and outcome that exist in several different rural populations, confirming that not all communities in the United States have benefited from advances in cancer prevention and control. These articles also describe novel approaches to promote physical activity, healthy eating habits, and colorectal cancer screening in rural areas through community participation, which could inform future studies and public health efforts to promote healthy behaviors and environments. Bridging the chasm in geographic health inequity requires such



**Figure 3.** Healthy People 2020 objectives related to cancer, including social determinants of health, health risk behaviors, recommended vaccination against cancer-causing viruses, and recommended cancer screening. Data for most indicators are from the 2015 or 2016 National Health Interview Surveys reported in the Healthy People 2020 database (ref. 13); data for poverty are from the 2016 Current Population Survey (ref. 13); data for obesity prevalence are from the 2016 Behavioral Risk Factor Surveillance System (ref. 18) and data for vaccination rates are from the 2015 National Immunization Survey (ref. 21).

targeted, culturally appropriate, and sustainable interventions to improve access to primary prevention, early detection, and treatment services (23).

**Disclosure of Potential Conflicts of Interest**

No potential conflicts of interest were disclosed.

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