RESEARCH

Absolute and Relative Black-White Disparities in Cancer Incidence and Survival in the United States, 2009-2014

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ABSTRACT

Progress has been made in reducing the overall burden of cancer among US adults. However, racial differences persist across multiple cancer types. This report shows absolute and relative inequalities in cancer incidence and survival among Blacks and Whites in the US. Data from the Surveillance Epidemiology and Ends Results database between 2009-2014 were used to generate age-adjusted estimates of absolute and relative Black-White differences in incidence and survival rates. In 2010-2014, the overall cancer incidence rate ratio (IRR) comparing Blacks to Whites was 1.03 (95% CI: 1.03-1.04), while the incidence rate difference (IRD) was 19.3 per 100,000 (95% CI: 17.5-21.1). During this period, the largest relative racial disparities in incidence were observed for Kaposi Sarcoma (Black vs. White IRR: 3.20, 95% CI: 2.80-3.40) and Melanoma of the skin (Black vs. White IRR: 0.04, 95% CI: 0.03-0.04), and in absolute terms it was prostate cancer (Black-White IRD per 100,000: 40, 95% CI: 39.3-40.9) and Skin cancer (Black-White IRD per 100,000: -35.1, 95% CI: -34.9, -35.1). In 2009-2014, the overall 5-year relative survival rate ratio (SRR) comparing Blacks to Whites was 0.92 (95% CI: 0.92-0.92), corresponding to a survival rate of 64.3% (95% CI: 64.0-64.6) among Blacks and 69.8 (95% CI: 69.7-69.9) among Whites. During this period, the cancer sites with the largest relative racial difference in survival were Mesothelioma (Black vs. White SRR: 1.82, 95% CI: 1.38-2.20) and oral cavity and pharynx (Black vs. White SRR: 0.54, 95% CI: 0.38-0.69). These findings indicate that racial disparities in cancer incidence and survival persist on the relative and absolute scale in the US. Further studies are needed to understand and address differential distribution of cancer-related risk factors, and improve access to high-quality and timely cancer treatment to enhance survival across racial groups.

KEYWORDS: cancer incidence; cancer survival; SEER; racial disparities

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INTRODUCTION

Cancer health disparities are defined by the National Cancer Institute (NCI) as adverse differences in cancer incidence, prevalence and mortality that exist among population subgroups in the United States[1]. Nearly 1.7 million new cancer cases and 596,000 cancer deaths occurred in the US in 2016[2]. These numbers reflect a 23% reduction in cancer deaths since the 1990s, attributable to the success of public health efforts focused on reducing smoking, and improving access to early detection and frontline treatment strategies[2]. However, these positive trends mask significant racial disparities in cancer incidence and mortality in the US[1-3], a trend that emerged in the 1970s and has become more pronounced in recent years[4]. The issue of cancer health disparities is highlighted in the NCI Annual Plan, which outlines a focus on improving understanding of the multifactorial causes of cancer health disparities[5]. Disparities in cancer constitute a unique public health problem because the gap between population sub-groups with the best and worse cancer outcomes represents theoretically avoidable diagnoses and deaths. Identifying the complex genetic, social (socio-economic status and access to healthcare), as well as behavioral factors associated with cancer risk and survival are critical to reducing the disproportional burden of cancer in all racial groups. Continuous assessment of the prevalence and magnitude of cancer disparities will provide valuable information to guide the allocation of effort and resources for specific cancer types, risk factors and racial groups to better understand and ultimately eliminate existing disparities. Using data from the population-based Surveillance Epidemiology and Ends Results (SEER), Black and White absolute and relative disparities in cancer incidence and survival by cancer site in the US in 2009-2014 are presented.

METHODS

Data from the National Cancer Institute SEER database (November 2016) submission was utilized for this analysis[6]. SEER is a population-based database that covers approximately 30% of the US population, and includes detailed clinical information on all incident cancer cases diagnosed in the following states/regions: Atlanta, Georgia; Connecticut; Detroit, Michigan; Hawaii; Iowa; New Mexico; San-Francisco-Oakland, California; Seattle, Washington; Utah; Los Angeles, California; San Jose-Monterey, California; rural Georgia; Greater California; Kentucky; Louisiana; Greater Georgia; and New Jersey. Age-adjusted incidence (2010-2014) and 5-year relative survival (2009-2014) rates for each first primary cancer site by race (Black and Whites) among individuals ages 20 years and older were obtained from SEER*Stat.

Incidence and survival rates and 95% confidence intervals were calculated in SEER*Stat, age-adjusted to the 2000 US standard million population for each time period evaluated. Absolute measures of inequality in both incidence and survival were calculated as the difference of Black-to-White incidence and survival rates, while relative measures of inequality were calculated as the ratio of Black-to-White incidence and survival rates. This approach of reporting both absolute and relative racial differences in measures of health outcomes has been recommended by the National Cancer Institute for evaluating the burden and progress towards eliminating health disparities[7].

RESULTS

Between 2010 and 2014, the overall IRR comparing Blacks to Whites was 1.03 (1.03-1.04), corresponding to an age-adjusted incidence rate

of 610.6 per 100,000 among Blacks and 591.3 per 100,000 among Whites. Kaposi Sarcoma (IRR: 3.20, 95% CI: 2.80-3.40) and Melanoma of the skin (IRR: 0.04, 95% CI: 0.03-0.04) were sites with the largest relative incidence disparity (Fig 1). Blacks had higher IRR compared with Whites in 39 out of 101 cancer sites, while Whites had higher IRR than Blacks in 43 out of 101 cancer sites. In absolute terms, the overall incidence rate difference between Blacks and Whites was 19.3 per 100,000 (17.5-21.1), with prostate (40.1, 95% CI: 39.3-40.9) and skin cancer (-35.1, 95% CI: -34.9, -35.1) having the largest absolute incidence rate difference (Fig 2). Between 2009 and 2014, the overall SRR comparing Blacks to Whites was 0.92 (95% CI: 0.92-0.92), ranging from 0.54 (95% CI: 0.38-0.69) for Other oral cavity and pharynx to 1.82 (95% CI: 1.38-2.20) for Mesothelioma (Fig 3). Blacks had lower relative 5-year survival compared with Whites in 76 out of 99 cancer sites, while Whites had lower relative 5-year survival compared with Blacks in 20 out of 99 cancer sites. In absolute terms, there was a 5.5% (95% CI: -5.7, -5.3) lower survival among Blacks compared with Whites overall, ranging from -26.1% (95% CI: -31.9, -19.3) for Other oral cavity to 8.7% (95% CI: 5.6-11.1) for Other Endocrine including thymus (Fig 4). In 2010-2014, the cancer sites with at least a 2-fold greater incidence among Blacks compared with Whites were Kaposi Sarcoma, Myeloma and Uterus, and those with greater incidence among Whites compared with Blacks (> 5-fold) were Melanoma of the skin, Skin cancer, Lip cancer, Eye and Orbit, Testis and Ureter.

Figure 1: Black vs. White Incidence Rate Ratios and 95% CI, SEER 2010-2014

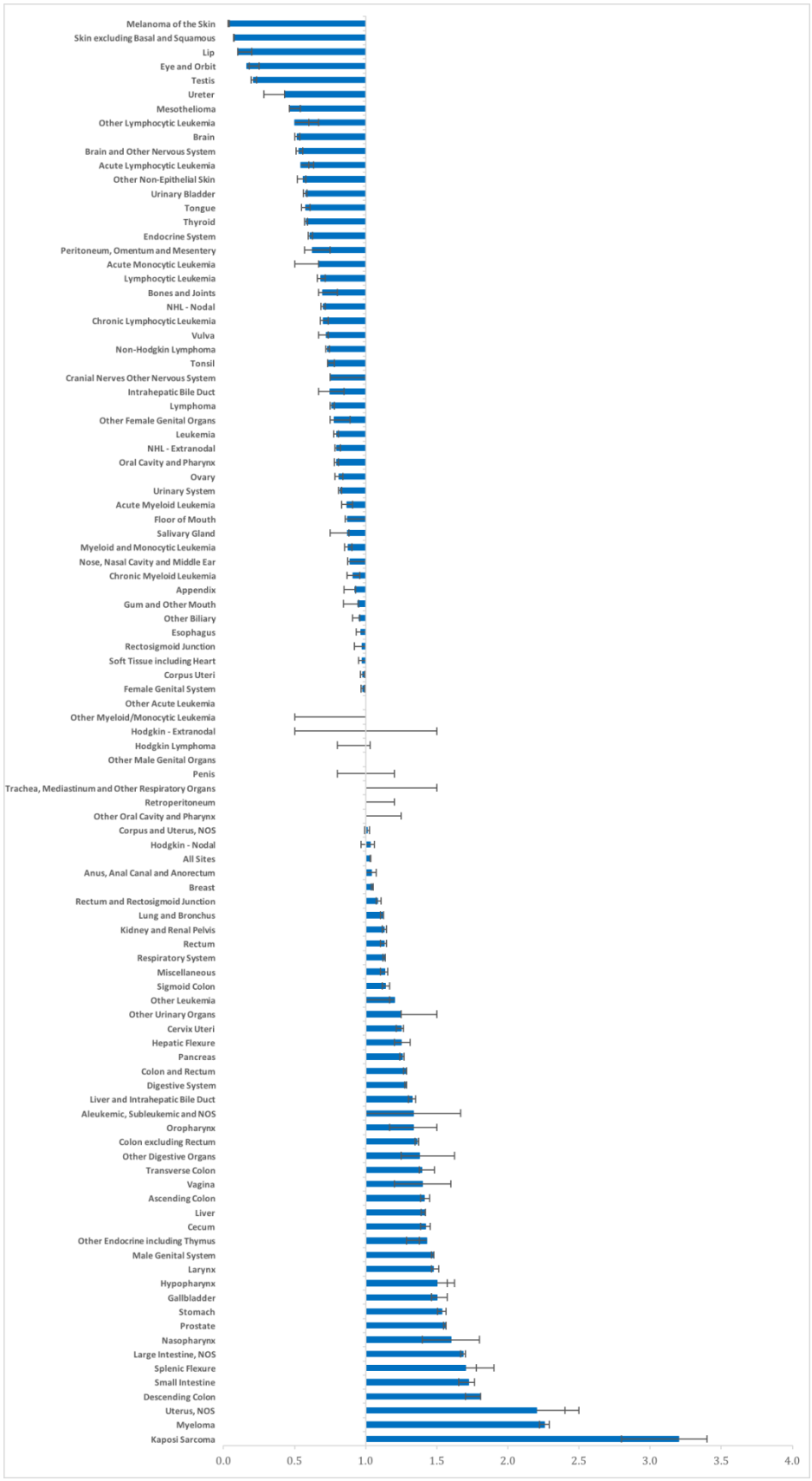


Figure 2: Black vs. White Incidence Rate Difference and 95% CI, SEER 2010-2014

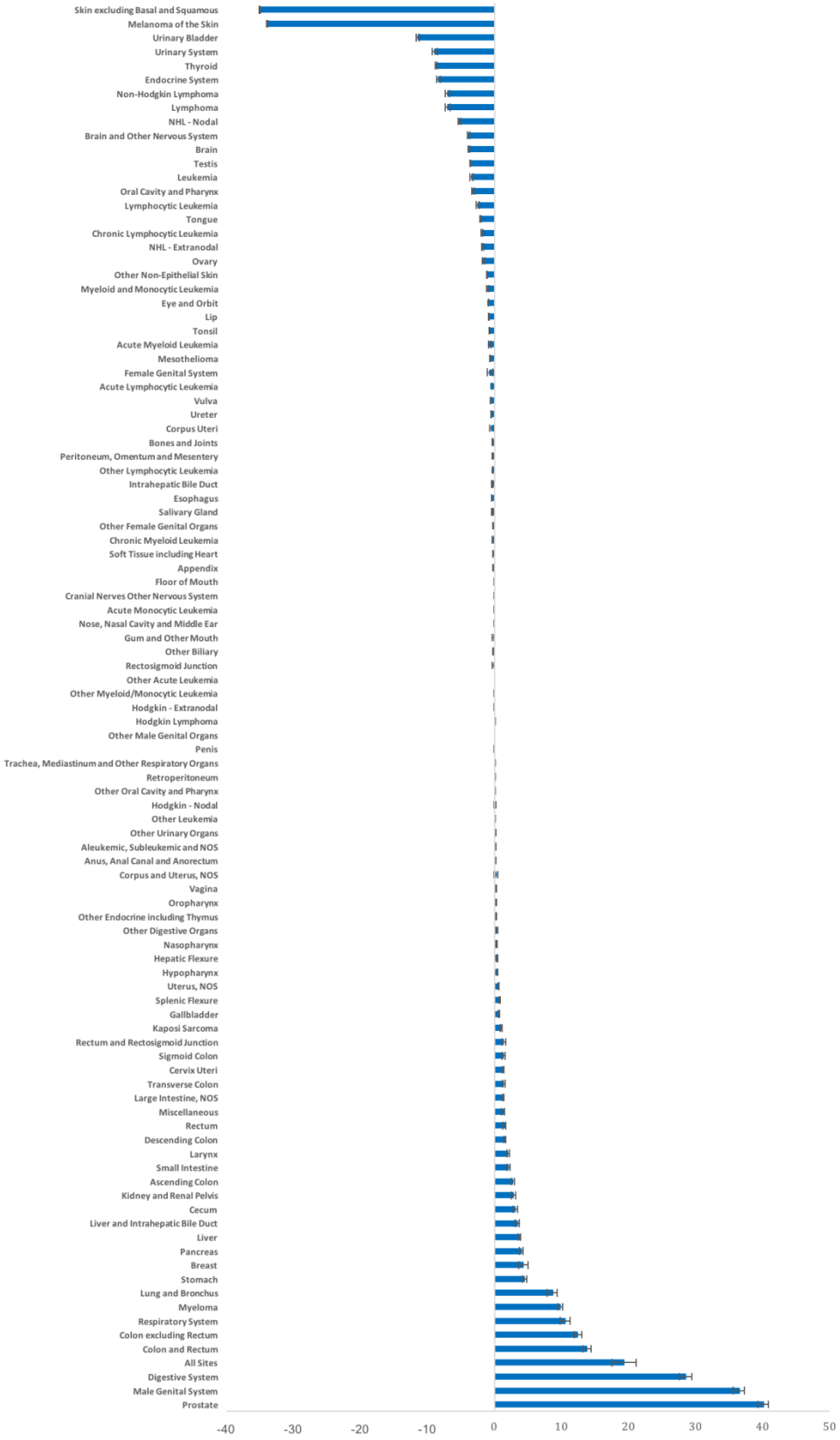


Figure 3: Black vs. White Survival Rate Ratios and 95% CI, SEER 2009-2014

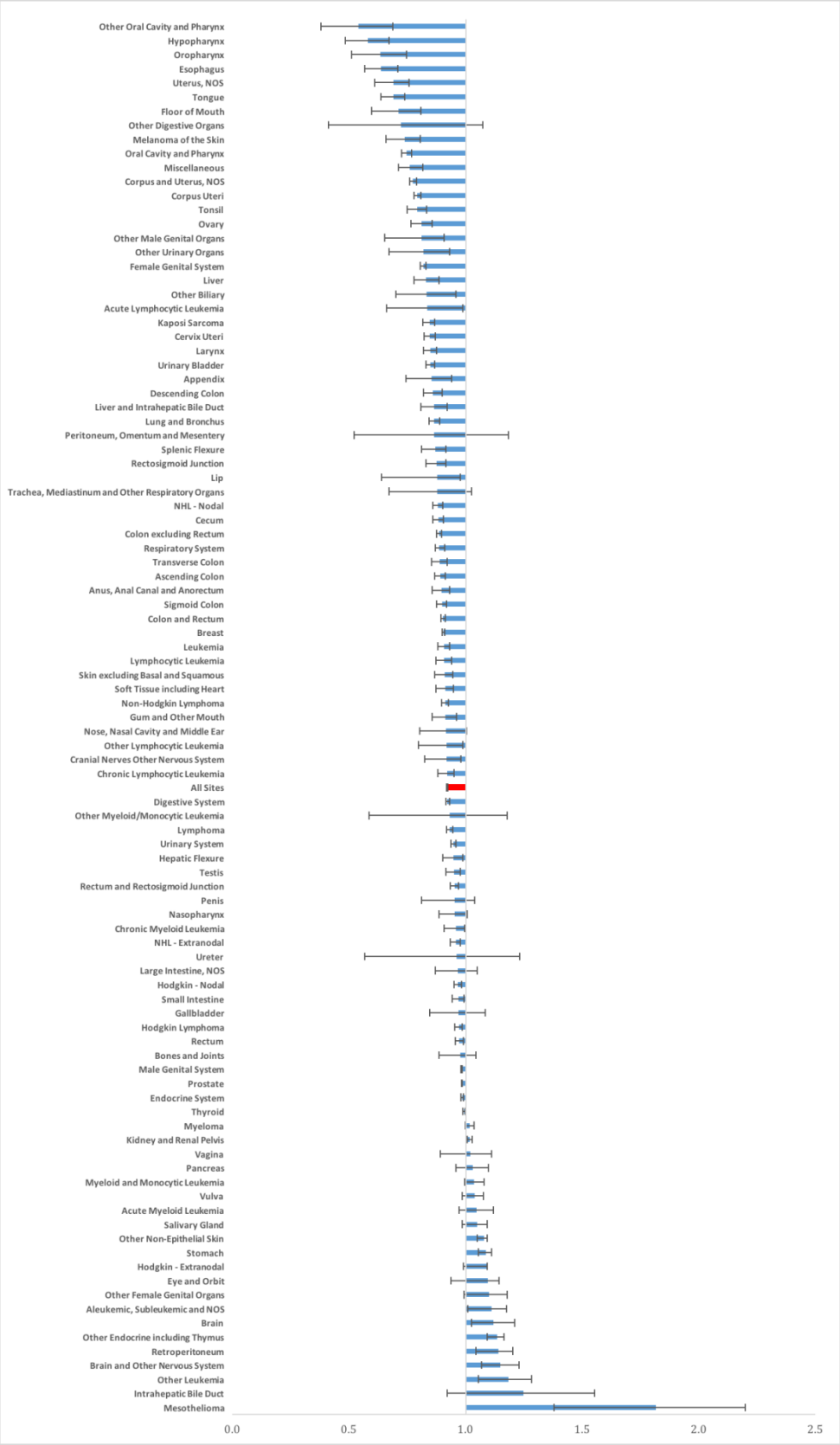
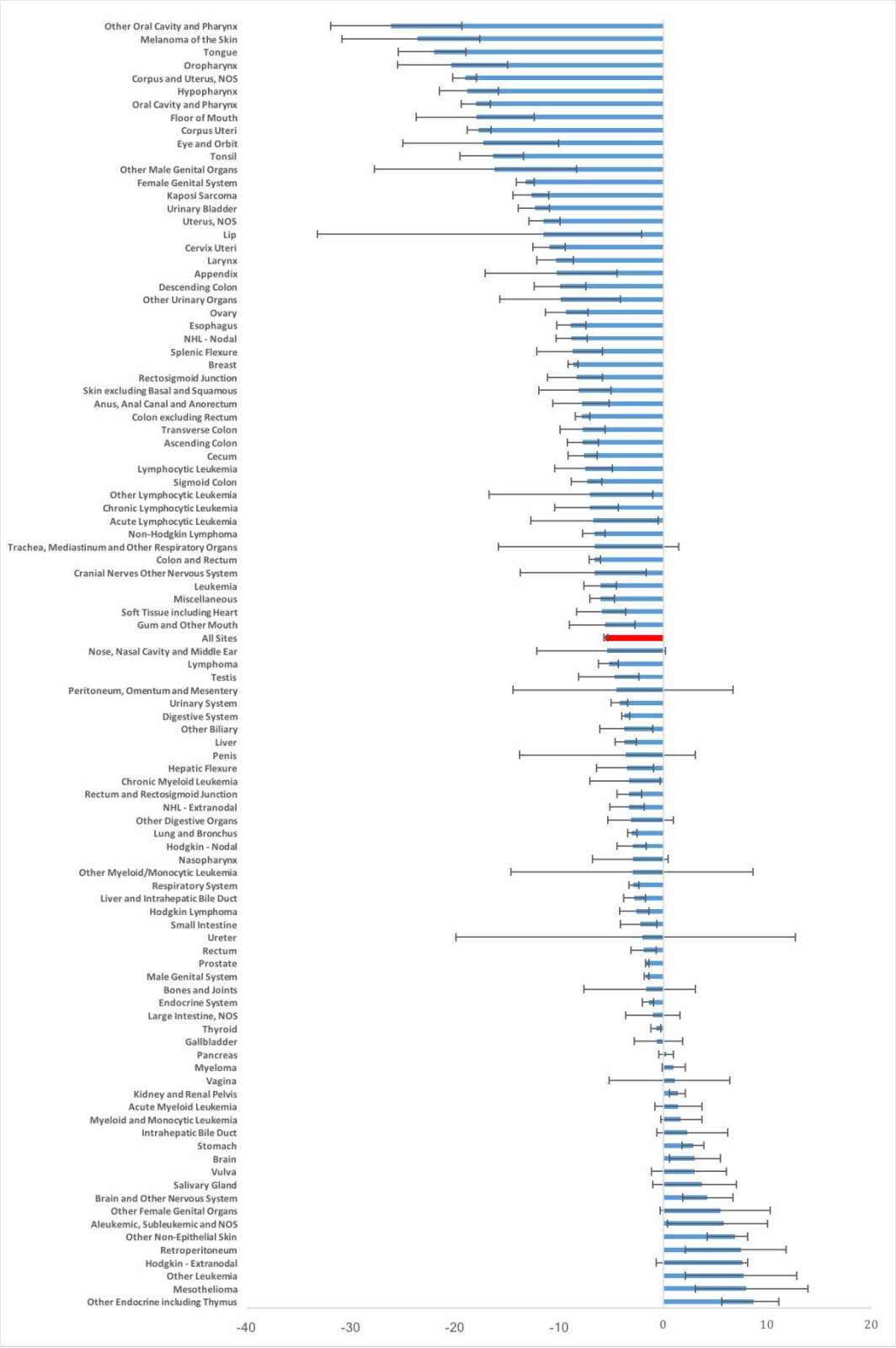


Figure 4: Black vs. White Survival Rate Difference and 95% CI, SEER 2009-2014



DISCUSSION

Cancer remains a leading cause of morbidity and mortality among US adults, and while progress has been made on the 'war against cancer', significant gaps remain in incidence and mortality by race. This persistent disparity in the US often constitutes a public health failure, signifying inequitable access to primary (risk reduction), secondary (screening and early detection) and tertiary (timely, high-quality treatment) prevention strategies, or may reflect underlying differences in etiology of specific cancers e.g. higher risk of skin cancer observed among Whites compared with Blacks. While the fundamental causes of cancer disparities are multifactorial and complex, they include aspects of genetic, epigenetic, molecular, behavioral and social factors. Racial differences in cancer outcomes may operate through differential access to cancer prevention strategies, prevalence of mediating risk factors such as sun exposure, obesity and diabetes, and/or distribution of chronic inflammation, metabolic and/or immune-related biological changes that play a key role in tumorigenesis and prognosis. Critically, the interplay between race, social and biological factors in predicting cancer risk and outcomes remains poorly understood. Targeted strategies to reduce incidence of specific cancers are critical, which requires better understanding of racial differences in risk and prognostic factors e.g. HIV and HPV infection linked with Kaposi Sarcoma and Oral/Cervical cancers, and exposures to environmental carcinogens linked with Mesothelioma. Research studies characterizing how multiple risk factors interact to differentially impact cancer outcomes by race, and identifying effective and targeted prevention and treatment strategies remain scarce and inadequate for the magnitude of the problem. Precision therapies and genomics targeting specific pathways in cancer are heralded as the next frontier in cancer care; however, population-based approaches to reduce racial differences in cancer risk and survival, and inclusion of racially diverse populations in precision medicine trials, are critical to ensure equitable access to these benefits.

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Author contribution

Dr. Akinyemiju had full access to the data in the study and takes responsibility for the integrity of the data and accuracy of the data analysis

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Conflict of interest

The authors declare that no competing or conflict of interests exist. The funders had no role in study design, writing of the manuscript, or decision to publish.

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