Trends in Prostate Cancer Incidence Rates and Prevalence of Prostate Specific Antigen Screening by Socioeconomic Status and Regions in the United States, 2004 to 2013

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Abbreviations and Acronyms

NH = nonHispanic

NHIS = National Health Interview Survey

PM = predicted marginal

PSA = prostate specific antigen

RR = rate ratio

SEER = Surveillance, Epidemiology and End Results

SES = socioeconomic status

USCS = United States Cancer Statistics

USPSTF = United States Preventive Services Task Force

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Purpose: To our knowledge it is unknown whether decreases in the prevalence of prostate specific antigen screening and prostate cancer incidence rates following the USPSTF (United States Preventive Services Task Force) recommendations against routine prostate specific antigen screening are similar across socioeconomic groups and United States census regions.

Materials and Methods: We analyzed incidence rates and prostate specific antigen screening prevalence by age, race/ethnicity, disease stage, United States region and area level socioeconomic status. Annual percent changes were examined for changes in rates with time. The predicted marginal probability and 95% CIs were calculated to estimate changes in prostate specific antigen screening.

Results: Incidence rates in men 50 years old or older decreased in all race/ethnic, regional and socioeconomic status groups. From 2007 to 2013 the overall incidence rates for localized cancer significantly decreased 7.5% per year (95% CI −10.5−−4.4) at ages 50 to 74 years and 11.1% per year (95% CI −14.1−−8.1) at ages 75 years or greater. In contrast, the incidence of distant stage cancer significantly increased 1.4% per year (95% CI 0.3−2.5) from 2008 to 2013 at ages 50 to 74 years but stabilized from 2011 to 2013 at ages 75 years or greater at 5.1% per year (95% CI −3.4−14.4). Distant stage disease rates increased with increasing poverty level at ages 50 to 74 years but not at 75 years or greater.

Conclusions: The prostate cancer incidence of early stage disease decreased in men 50 years old or older while the rate of distant stage disease slightly increased in men 50 to 74 years old following USPSTF recommendations against routine prostate specific antigen screening. Further studies with additional years of data are needed to substantiate our findings and monitor the effects of the late stage disease increase on prostate cancer mortality rates.

Key Words: prostatic neoplasms, prostate-specific antigen, mass screening, socioeconomic factors, mortality

The USPSTF recommended against routine PSA screening of men 75 years old or older in 2008 and men of all ages in 2012.[1,2] The ACS® (American Cancer Society®) and AUA (American Urological Association) recommend informed decision making for screening, and patient consultation about the risks and benefits of PSA screening in men with at least 10 years of life expectancy.[3] Several studies associate the USPSTF recommendations

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against routine PSA screening with reductions in the prevalence of PSA screening and early stage incidence rates in men 50 years old or older in the United States.[4–8] Recent data suggest that rates of advanced stage disease remained unchanged in men 50 years old or older between 2012 and 2013.[6] Other studies show a significant increase in distant metastases at diagnosis in men 75 years old or older.[9] Despite reported decreases in incidence and PSA testing to our knowledge it is unknown whether changes in PSA screening and stage specific incidence rates following the USPSTF recommendation are similar across races/ethnicities, socioeconomic groups and United States Census regions.

This report describes recent trends in stage specific prostate cancer incidence rates and PSA screening prevalence by age, race/ethnicity, United States Census region and area level SES. In this study we examined recent trends in prostate cancer incidence rates and the prevalence of routine PSA screening by area level socioeconomic status and region. In addition, we examined the incidence of late stage disease by United States region and area level SES.

METHODS

Prostate cancer incidence data on 2004 to 2013 were obtained from the official USCS population based data set and defined using ICD-O-3 site code C61.9. USCS contains state based cancer incidence data reported to the CDC (Centers for Disease Control and Prevention) NPCR (National Program of Cancer Registries) or the NCI (National Cancer Institute) SEER Program. Together these 2 federal systems provide cancer incidence data for 100% of the United States population.[10] Population coverage varies annually depending on the states' ability to meet USCS publication criteria. This report covers 96.5% of the United States population with the exclusion of Nevada, Kansas and Minnesota because they did not meet publication criteria for all study years or did not include county level data. Cases were excluded if they were verified by autopsy or death certificate and not microscopically confirmed.

Analyses were performed using SEER*Stat, version 8.3.2 (https://seer.cancer.gov/seerstat/). We report the incidence rates and 95% CIs by age group (all ages, and less than 50, 50 to 74 and 75 years or greater), race/ethnicity (NH Caucasian, NH African American, Hispanic, NH American Indian/Alaska Native or NH Asian/Pacific Islander), geographic region (Northeast, Midwest, South and West), county level poverty status or percent living below the federal poverty level (less than 5%, 5% to 9%, 10% to 19% and 20% or greater) and SEER Summary stage (localized, regional, distant and unstaged).[11] With the exception of age specific rates the rates were age adjusted to the 2000 United States standard population with 19 age groups (Census P25-1130). Household incomes below the federal poverty threshold were classified as poverty. We combined SEER Summary Stage 2000 and collaborative staging systems to create stage categories. Incidence rate data on the most recent 5 years (2009 to 2013) were stratified by demographic and clinical characteristics. Joinpoint Trend Analysis Software, version 4.3.1.0 (https://surveillance.cancer.gov/joinpoint/) was used to examine rate changes with time (2004 to 2013). The annual percent change and the average annual percent change were considered statistically significant at $p < 0.05$. Using the Tiwari method the incidence RR and the corresponding 95% CIs were calculated to compare relative changes in late stage incidence by geographic location with South as the referent and county level poverty status with less than 5% poverty as the referent. We also calculated the incidence rate, 95% CI and rate trend in men younger than 50 years.

NHIS data on 2005, 2008, 2010 and 2013 were used to estimate the rate of self-reported PSA screening in the last year for men 50 to 74 and 75 years old or older. NHIS is a national cross-sectional household survey of noninstitutionalized adults in the United States.[12] Male sample adults 40 years old or older were asked whether they underwent PSA screening as part of a routine examination, due to a problem or for other reasons. For our analysis we estimated the proportion of men who reported undergoing a PSA test in the last year as part of a routine examination. PSA screening was stratified by race/ethnicity (NH white, NH black, Hispanic and NH other); United States Census region (Northeast, Midwest, South and West); the percent of the federal poverty threshold (less than 139%, 139% to 250%, 251% to 400% and greater than 400% of poverty). The federal poverty category is based on Medicaid expansion to adults with an annual income below 138% of the federal poverty level pursuant to the Patient Protection and Affordable Care Act.[13,14] PSA screening data collected in 2005 were used as the baseline since the survey was administered before USPSTF screening guideline changes (in 2008). Using SAS-callable SUDAAN®, version 9.3.2 we calculated PM RRs and 95% CIs[15] to estimate changes in PSA screening rates between survey years (eg 2008 vs 2005).

RESULTS

A total of 1,963,206 prostate cancer cases were diagnosed in the United States between 2004 and 2013 (supplementary table 1, http://jurology.com/). From 2009 to 2013 a higher incidence was observed in African American men (184.3/100,000), in residents in the Northeast region (131.4), in counties with low poverty (128.9) and in men 75 years old or older (459.0). From 2007/2008 through 2013 incidence rates decreased by at least 6% per year in all categories of age, region and county level poverty ($p < 0.05$). Compared to other racial/ethnic groups the incidence rates decreased earlier in Caucasian men. Between 2009 and 2013 the incidence rate of localized cancer was 93.0/100,000 and for distant stage disease it was 5.4/100,000. Rate trends showed significantly decreasing rates of localized disease while rates of regional and distant stage disease