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Recent trends in prostate cancer testing and incidence among men under age of 50

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ABSTRACT

Background: Information on prostate cancer testing and incidence among men under age 50 is scant. This study aims to describe trends of prostate cancer testing and incidence by demographic and clinical characteristics and identify potential correlations between prostate cancer testing and incidence. *Methods*: We examined prostate cancer testing and incidence rates among American men under age of 50 using data from the Behavioral Risk Factor Surveillance System (2002, 2004, 2006, and 2008) and data from the National Program of Cancer Registries and Surveillance, Epidemiology, and End Results programs (2001–2006). We conducted descriptive, logistic regression, and trend analyses using SUDAAN and SEER*Stat. *Results*: The prostate cancer incidence rate among black men was more than 2-fold that of white men. The overall prostate cancer incidence rate slightly increased from 2001 to 2006; however, the prevalence of prostate cancer testing declined over time. There was a borderline significant increase in prostate cancer incidence rate (APC = 3.5, 95% CI = 0.0, 7.0) for men aged 40–44. Well-differentiated prostate cancer incidence decreased significantly (APC = −24.7; 95% confidence interval (CI) = −34.9, −12.8) over time. *Conclusions*: We observed a large difference in prostate cancer incidence between blacks and whites under age 50. Similar patterns in prostate cancer testing and cancer incidence by race and ethnicity suggested prostate cancer testing might have influenced incidence to some extent in this young population. The different temporal patterns for prostate cancer testing and incidence, especially for men aged 40–44 years, suggested screening alone could not fully accounted for the increasing prostate cancer incidence rates. Decreasing trend of well-differentiated prostate cancer may be partially due to "Grade Inflation".

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Prostate cancer is the most commonly diagnosed non-skin cancer and the second leading cause of cancer death among American men [1]. Prostate cancer has long been considered as a disease of older men. However, in recent years more men have been diagnosed with prostate cancer at younger ages; the proportion of men aged 55 or younger at diagnosis increased from 2.3% between the years 1988 and 1991 to 9.0% between the years 2002 and 2003 [2]. A recent analysis of the Surveillance, Epidemiology, and End Results (SEER) dataset indicates that after the introduction of the PSA blood test around 1986, the most dramatic growth in prostate cancer incidence occurred in men aged 20–49 years [3]. This study suggested that this growth might be due to wide-spread use of prostate-specific antigen (PSA) test for screening [3]. To our knowledge, the recent prostate cancer incidence rates and trends for men under age of 50 have not been comprehensively described and the relationship between prostate cancer screening and cancer incidence in this young population has not been directly examined [2–5]. Combined data from CDC's National Program of Cancer Registries data (NPCR) and NCI's SEER data, representing nearly all the U.S. population, provide the best source of information on population-based cancer incidence for the nation [1]. In addition, CDC's Behavioral Risk Factor Surveillance System (BRFSS) data present great opportunity to assess nationwide use of prostate cancer screening tests (http://www.cdc.gov/BRFSS/). This study aims to better understand demographic and temporal variations in prostate cancer testing and incidence, clinical characteristics of prostate cancers, and identify potential correlations between prostate cancer testing and incidence in men under the age of 50.

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1. Materials and methods

1.1. Prostate cancer incidence from the NPCR and SEER data

Data on newly diagnosed prostate cancer cases were collected by population-based cancer registries affiliated with the NPCR or SEER programs using medical records as the source of information for clinical and demographic characteristics [6,7]. Data from 45 population-based cancer registries that met high-quality data criteria (http://www.cdc.gov/cancer/npcr/uscs/2006/technical_notes/criteria.htm) for all study years (2001–2006) were included in these analyses. Data from Arizona, Mississippi, Tennessee, Virginia, Washington DC, and Wisconsin were excluded because of not meeting these criteria. The final dataset covered 90.4% of the U.S. population. Cancer registries coded primary cancer site and histology data according to the third edition of the International Classification of Diseases for Oncology (ICD-O) [8]. In this analysis, prostate cancer cases were defined as men younger than 50 years who were diagnosed with a prostate cancer (ICD-O-3 site code C619) in the study areas from 2001 to 2006. Because nearly 99% of prostate cancers are uniformly adenocarcinoma, we further restricted prostate cancer cases to adenocarcinoma using following ICD-O-3 histology codes: 8140/3, 8141/3, 8143/3, 8147/3, 8211/3, 8251/3, 8255/3, 8260/3, 8261/3, 8262/3, 8263/3, 8310/3, 8322/3, 8323/3, 8480/3, 8481/3, 8550/3. We stratified the cases by age group (<40, 40–44, and 45–49 years), race (white, black, Asian/Pacific Islander [API], American Indian/Alaska Native [AIAN], and unknown), ethnicity (Hispanic and non-Hispanic), cancer diagnosis year, stage, grade, and U.S. Census region (Northeast, Midwest, South, and West). Stage of prostate cancer data spanned changes in SEER summary stage coding: SEER Summary Stage 2000 rules (http://seer.cancer.gov/tools/ssm/) for diagnosis year 2001–2003 and Collaborative Stage rules (http://web.facs.org/cstage/schemalist.htm) for diagnosis year 2004 onwards. We then combined these two staging systems and stage was classified into localized, regional, and distant diseases across all study years. Prostate cancer grade was determined by Gleason score. Information on Gleason's system can be found at http://training.seer.cancer.gov/prostate/abstract-code-stage/morphology.html. Since 2003, Gleason's score 7, which was previously coded as moderately differentiated cancer, has been coded as poorly differentiated cancer [9]. This grading change leads to an artificial shift to higher incidence of poorly differentiated cancers. To minimize the impact of this coding change on grade, we categorized the grade into 2 groups: well-differentiated and moderately/poorly/undifferentiated.

We used annual population estimates as denominators to calculate age-adjusted incidence rates. Rates were suppressed when fewer than 16 cases were reported in a specific category to maintain confidentiality and avoid presenting unstable data. All rates were listed per 100,000 men and were age-adjusted to the 2000 U.S. standard population by the direct method. Age-adjusted rates, overall annual percentage changes (APCs) from 2001 to 2006, and the corresponding 95% confidence intervals (CI) were calculated using SEER*Stat version 6.6.2 (http://www.seer.cancer.gov/seerstat). Statistical significance for trends was determined by testing the hypothesis that the APC was equal to zero.

1.2. Prostate cancer testing prevalence from the BRFSS data

We used data from the BRFSS to characterize the use of prostate cancer testing: either PSA test or digital rectal exam (DRE). The BRFSS is an ongoing, state-based, random-digit dialed telephone survey of the noninstitutionalized U.S. civilian

Table 1
Demographic and clinical characteristics of prostate cancer by age in men under age 50, the United States, NPCR/SEER 2001–2006.

	0–49		0–39		40–44		45–49	
	Count	%	Count	%	Count	%	Count	%
Total[a]	29,176	100.0	551	1.9[d]	5509	18.9[d]	23,116	79.2[d]
White[b]	20,990	71.9	368	66.8	3807	69.1	16,815	72.7
Black[b]	6818	23.4	143	26.0	1445	26.2	5230	22.6
AIAN[b]	107	0.4	–	–	20	0.4	86	0.4
API[b]	319	1.1	–	–	56	1.0	255	1.1
Non-Hispanic[c]	27,273	93.5	509	92.4	5093	92.4	21,671	93.7
Hispanic[c]	1903	6.5	42	7.6	416	7.6	1445	6.3
Northeast	7166	24.6	134	24.3	1404	25.5	5628	24.3
Midwest	6286	21.5	117	21.2	1126	20.4	5043	21.8
South	9967	34.2	212	38.5	1935	35.1	7820	33.8
West	5757	19.7	88	16.0	1044	19.0	4625	20.0
2001	4376	15.0	77	14.0	850	15.4	3449	14.9
2002	4910	16.8	101	18.3	918	16.7	3891	16.8
2003	4801	16.5	91	16.5	884	16.0	3826	16.6
2004	4773	16.4	86	15.6	875	15.9	3812	16.5
2005	4917	16.9	103	18.7	951	17.3	3863	16.7
2006	5399	18.5	93	16.9	1031	18.7	4275	18.5
Well differentiated	491	1.7	–	–	98	1.8	381	1.6
Moderately/poorly/undiff	27,850	95.5	524	95.1	5265	95.6	22,061	95.4
Ungraded	835	2.9	–	–	146	2.7	674	2.9
Localized	22867	78.4	418	75.9	4364	79.2	18085	78.2
Regional	4332	14.8	66	12.0	772	14.0	3494	15.1
Distant	886	3.0	29	5.3	165	3.0	692	3.0
Unstaged	1091	3.7	38	6.9	208	3.8	845	3.7

AIAN indicates American Indian/Alaska Native; API, Asian/Pacific Islander; Undiff, undifferentiated.

[a] Data are from 45 population-based cancer registries that participate in the National Program of Cancer Registries (NPCR) and/or the Surveillance, Epidemiology, and End Results (SEER) Program and meet high quality data criteria. These registries cover 90.4% US population for 2001–2006.

[b] Unknown race and race groups other than white, black, AI/AN, API are not listed but included in the total case count.

[c] Hispanic origin is not mutually exclusive from race categories (white, black, AIAN, API).

[d] Row percentage.

'–' Indicates that the statistic is not displayed because there were fewer than 16 cases.