# Has there been an increase in the discussion of advantages and disadvantages for PSA screening of prostate cancer from 2000 to 2010?

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A thesis

Submitted in partial fulfillment of the

Requirements for the degree of

Master of Public Health

University of Washington

2012

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Program Authorized to Offer Degree:

School of Public Health, Department of Health Services

University of Washington

**Abstract**

Has there been an increase in the discussion of advantages and disadvantages for PSA screening of prostate cancer from 2000 to 2010?

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**Purpose:** Historically, men have received PSA tests in primary care without comprehensive discussions with their providers about the harms and benefits associated with cancer screening. We explore whether primary care providers have altered their discussion with their patients to discuss PSA screening in more detail following availability of evidence from two large screening trials about the potential harms of screening relative to its small absolute benefit.

**Methods**: Data among men over age 40 from the cancer supplement to the nationally representative National Health Interview Survey was analyzed for 3,596 men in 2000, and 4,702 men in 2010, representing 25.5 million and 43.6 million Americans, respectively.

**Results:** The age-standardized proportion of men reporting their provider engaged them in a discussion of PSA testing declined to 31.0% in 2010 from 38.0% in 2000 ($p<0.001$). More men reported receiving a PSA test in the past five years than reported having a discussion with their provider in both study periods, with the rate of testing declining to 44.4% in 2010 from 57.7% in 2000 ($p<0.001$). Testing rates and the frequency of discussions were highest among men over age 80, with 70.2% in 2010 reporting being tested in the past 5 years, and 49.5% indicating their doctor had discussed testing. Men in 2010 reported that 39.5% felt their provider recommended testing, 27.5% felt their providers discussed the advantage of PSA testing, while 14.1% indicated their providers discussed the disadvantages of testing.

**Conclusion:** Despite an increased emphasis to more fully inform men about the harms and benefits of PSA testing, the frequency of these discussions in primary care has declined. When discussions do occur, providers are much more likely to highlight the advantages of testing. PSA testing is declining; however, testing remains highest among older men for whom some guidelines recommend against testing.

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## Glossary

CaP ..... Prostate Cancer

ERSPC ..... European Randomized Study of Screening for Prostate Cancer

IHIS ..... Integrated Health Interview Series

NHIS..... National Health Interview Survey

PSA ..... Prostate Specific Antigen

USPSTF ..... United States Preventive Service Task Force

**Acknowledgements:**

I would like to thank Steve Zeliadt for his continuous support, help, and confidence through my time in school and time spent working on my thesis. Also, thank you to Daniel Lin for allowing me to grow within the Public Health field and giving me the opportunity to continue my education. Without his encouragement, I would not have been able to pursue my education. Thank you to the Executive Masters in Public Health program through the University of Washington for the acceptance into the program and standing by my side for the last two years. Finally, to Integrated Health Interview Series (IHIS) that sorted through the NHIS data to allow easy access to analyze the collected survey questions.

**Introduction:**

PSA screening is controversial as the small potential absolute mortality reduction may not outweigh the likely harms of screening, which include potentially diagnosing and treating a large number of men unnecessarily in order to prevent deaths from prostate cancer in relatively few patients.[1] Primary care providers have been encouraged to fully discuss the potential harms and benefits of screening and offer men the option of testing based on men's personal preferences.[2,3] The recent publication of two large prostate cancer screening trials[4,5] that did not demonstrate consistent findings for a reduction in mortality with PSA screening have further increased the PSA controversy.

Reports prior to the availability of results from the screening trials suggest that providers seldom discussed the potential harms and benefits of screening, although providers often encouraged screening and many men complied with these recommendations.[2,3] Guidelines were present prior to the release of the screening trials that recommended patient counseling. These included the American Cancer Society, American Medical Association, and the American College of Physicians recommends informed consent for screening only after discussion with patients regarding the risks and benefits.[6,7] However, men's primary providers often place an order for the PSA test without any discussion with the patient. It has been reported that approximately only a third of patients indicated having made an explicit decision to receive the PSA test.[8]

The purpose of this study is to determine whether the recent results from the screening trials,[4,5] and a renewed focus on the importance of promoting informed decision making

discussing the benefits and risks of screening,[9,10] have altered how providers discuss PSA testing with men.

## Methods:

### Source of Data

Data was obtained from the National Health Interview Survey (NHIS), which is a cross-sectional, nationally representative, household interview survey[11] conducted by the National Center for Health Statistics and Centers for Disease Control and Prevention.[12] This survey is used to monitor trends in illness and disability while tracking progression toward achieving national health objectives.[12] The methods for data collection have been described in detail previously.[12-15]

### Participant Sample

Data was analyzed from two periods, year 2000 and 2010, which are years when cancer screening supplemental questions were asked. In 2000, 38,633 households were interviewed (final response rate of 72.1%) representing over 274 million people across the nation.[14] In 2010, 34,329 households were interviewed (final response rate of 60.8%) representing over 304 million people across the nation.[15] Over the combination of these two years, we identified 15,423 adult males over the age of 40 who were included in the cancer screening supplement, 8,097 from 2000 and 7,326 from 2010. We excluded men who reported having been diagnosed with CaP (n=494) or other cancer besides skin cancer (n=551). Also, men who were severely limited in activities of daily living including bathing, eating, and getting in/out of bed without assistance were excluded from the analysis (n=240) because conversations about PSA testing may be considerably different than the general population. Finally, we excluded 3,043 men who were not asked detailed items about PSA screening because they responded as not having

heard of a PSA test, which was a skip pattern in the 2000 survey. In addition, 2,797 men who refused or were unable to respond to survey items about PSA testing in the last five years were excluded. These men were included in a sensitivity analysis as not having been tested to determine if this group influenced the study findings. The final study sample included 3,596 men in 2000 and 4,702 men from 2010 representing approximately 25.5 million and 43.6 million men respectively.

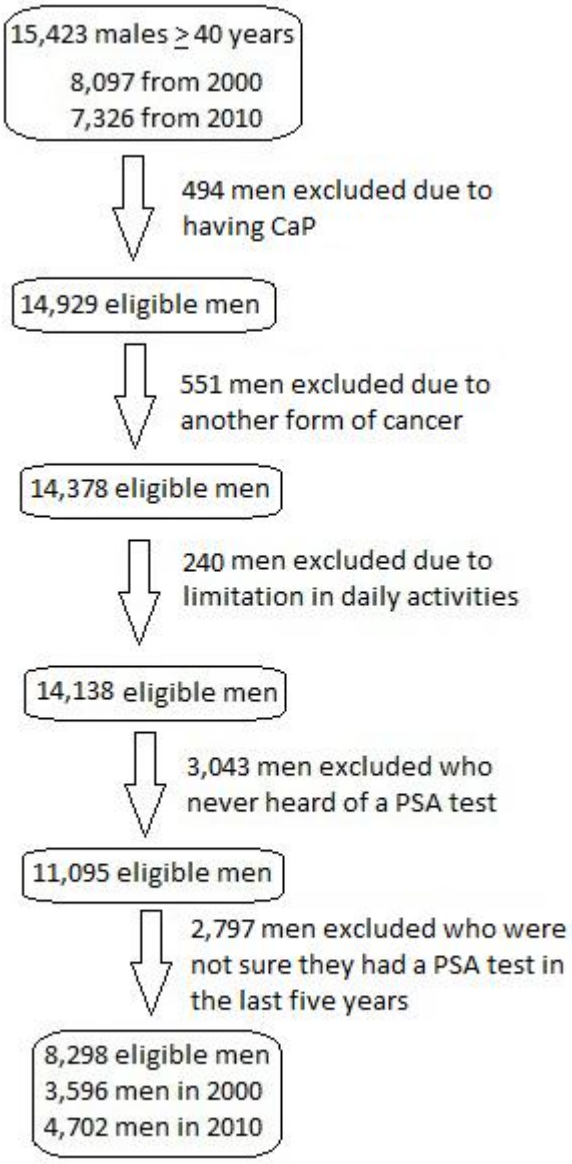


Figure 1. Eligibility flow chart

Data Elements

Screening rates in 2000 and 2010 were compared using subjects' self-report of receiving at least one PSA test in the last five years. In 2000, subjects were asked a two-part series of questions about PSA screening. First, they were asked if they had heard of the test. For those who had heard of the test, they were asked multiple items about testing history, and one item about whether they had a discussion about PSA with their doctor: "Did the doctor discuss the advantages and disadvantages of [the PSA test] with you before doing it?."[16] In 2010, all men over age 40 were asked about PSA testing, including details about past testing histories, an item about whether their doctor recommended testing, and 3 items about any discussions they had with their provider including: a) "Before you had the PSA test did a doctor ever talk with you about the advantages of it?"; b) "Before you had the PSA test did a doctor ever talk with you about the disadvantages of it?" c) "Before you had the PSA test did a doctor ever tell you that some experts disagree about whether men should have PSA tests".[17] For all discussion variables, subjects who were uncertain or not able to respond "yes" were categorized as "no".

In order to compare testing rates in 2000 to 2010, we reviewed the testing history data to identify whether the responder indicated they had received a test in the prior 5 years in any of the testing history items. To compare the frequency of provider discussions in 2010 which included three items, with 2000 where a single item was asked, we categorized subjects in 2010 as having a discussion about advantages and disadvantages of testing if they responded "yes" to any of the three items, as this would be most similar to the intent of the of single item from the 2000 survey.

Testing and discussion frequencies were examined by subject age, race, ethnicity, education, and other demographic factors. Each subject's family history of cancer was assessed from available survey items in the cancer supplement, which was grouped by any family history of prostate cancer, family history of another cancer, or no reported family history. Additional behavioral characteristics were also examined including self-reported health status, smoking history and alcohol history. Alcohol history was categorized using NHIS definitions as lifetime abstainer with fewer than 12 drinks ever consumed in the subject's lifetime, former drinker with no drinks in the past year, and current drinker with at least one drink in the past year.

**Analysis:**

All analyses used NHIS sampling weights to account for the weighted multistage, clustered design to ensure appropriate variance estimates were maintained.[14,15] Analyses were conducted in Stata version 12.1 (Stata, College Station, TX) using the original population from both survey years of 84,184 male and female subjects, with the "subpop" survey command to restrict to the eligible male subgroup allowing for appropriate inclusion of the sample strata. Descriptive statistics compare demographic characteristics between respondents in 2000 and 2010 (Table 1). Multivariate adjusted risk regression using a logistic regression model was used to estimate the adjusted probability of PSA testing for the 2000 and 2010 cohorts accounting for differences in demographic characteristics between the two periods (Table 2).[18] Using these adjusted probabilities, we compared PSA testing and discussion rates in 2000 and 2010 for each demographic subgroup (e.g. men age 50-59 in 2000 with men age 50-59 in 2010). The reported probabilities for each group adjust for all other potential differences in population characteristics across the time periods at the overall population mean balanced across the two time periods (Table 2).

Using available data from 2010 about details of provider discussions, we examined whether the frequency of men reporting receiving a recommendation, or reporting having a discussion of the advantages, disadvantages, or controversy of PSA varied by demographic factor (Table 3). Four separate multivariate logistic regression models were fit for each outcome. In order to more easily interpret the outcomes across demographic groups, we report the adjusted proportions for each outcome using the same method as above, adjusting for the remaining covariates.[18]

The completed surveys were publically available online with respondent's individually identifiable information removed. The use of this data was determined to not involve human subjects by the Human Subjects Review Committee at the University of Washington.

**Results:**

Demographic characteristics are described in Table 1. Changing demographic trends in the U.S. were reflected in the demographic patterns of subjects across the study period. Subjects in 2010 were slightly younger with a mean age of 54.5 years (s.e. 0.30) compared to the cohort in 2000 with a mean age of 55.8 years (s.e. 0.22). Additionally, subjects in 2010 were more likely to be black, Asian, or Hispanic, been born outside of the U.S., residing in Western states, and obese. Men in 2010 had poorer health status, had slightly lower educational levels, and were more likely to be uninsured.

The proportion of men who reported having a PSA test in the last five years after standardizing for age and other demographic differences was lower in 2010, 44.4% compared to 57.7% in 2000 ($p<0.001$) (Table 2). PSA testing was lower for all demographic subgroups in 2010 compared to 2000 ($p<0.001$) (Table 2). The largest difference was among men age 50-59, who had testing rates that were over 15% lower in 2010 compared to 2000. The smallest difference was among men over the age of 80, who had testing rates that were 11.5% lower in 2010 compared to 2000.

Testing rates varied by demographic characteristics. Older men, especially men over age 80, were the most likely group to have been tested in the previous five years during both calendar periods, with 70.2% in 2010 reporting having a test in the past years. Blacks were slightly more likely than other racial groups to be tested (61.6% in 2010), and subjects who reported a family history of prostate cancer were also more likely to be tested (57.7% in 2010). Notably, there was very little difference in testing rates by health status in either period.

The proportion of men who reported having a discussion of the advantages and disadvantages of PSA testing with their physician, after standardization for age and other demographic differences over time, was lower in 2010 (31.0%) compared to 2000, (38.0%, $p<0.001$). Similar to the proportion of men who received a PSA test in the last five years, the frequency of discussing the advantages and disadvantages of PSA testing in 2010 was lower compared to 2000 across almost all demographic subgroups.

Again, men over the age of 80 years were more likely to report that their doctors explained the advantages and disadvantages of PSA screening compared to younger men in both calendar years. Discussion of PSA testing did not vary based on men's health status. Men who self-reported themselves in fair/poor health had the highest frequency of discussion (32.1%) while men reported in good health had the lowest perception of discussion with their physician (30.0%). Education was strongly associated with increased frequency of provider discussions. Men with a college education were more like to report having a discussion in 2010 (36.0%) compared to men with less than high school education (21.4%) and men with high school education (27.0%). Men with a family history of CaP (46.0%) were also more likely to report receiving information from their doctor regarding PSA testing compared to men with no family history of cancer (36.2%).

Additional details about the type of discussions men had with their provider were available in the 2010 survey (Table 3). Overall, men reported their doctors were more likely to discuss the advantages of PSA testing (27.5%) compared to its disadvantages (14.1%). Approximately 10.6% of men reported their doctor explained the controversy of the test, while 39.5% of men indicated their doctor recommended the PSA test. Notably, all men over age 60,

even those over age 80, reported similar frequencies of being recommended PSA testing, ranging approximately between 62% to 63%. Blacks felt they were more likely to be notified of the disadvantages (22.4%) and advantages (33.5%) than the other surveyed racial groups, but were just as likely to receive recommendations of testing from their physicians compared to white men (40.1% black to 40.0% white). Married men were more likely to discuss the advantages (28.7%), disadvantages (15.0%), controversy (11.2%) and receive a recommendation to get tested (40.7%) compared to unmarried men. Education was strongly associated with the likelihood of discussions, especially discussions about disadvantages and controversy. Men with a family history of CaP also reported a higher likelihood of all types of discussions compared to men with no family history of CaP or other types of cancer.

**Discussion:**

Evidence from the long awaited randomized trials of prostate cancer screening revealed that the relative tradeoffs between the potential benefits and harms of PSA testing is complex and that men should be informed about these tradeoffs before receiving testing. The data from the NHIS provide an initial examination of how providers are responding to the availability of this complex evidence. We had expected to see an increase in discussions between men and their providers; however, providers appear to be discussing PSA less than ever before. In 2000, 24% of men 40-49, 42% of men 50-59, 49% of men 60-69, 53% of men 70-79, and 58% of men 80+ reported discussing PSA testing with their doctor. In 2010, these rates dropped to 18%, 34%, 40%, 45%, and 50% respectively.

The results from our study reveal details of what men report discussing with their provider. Specifically, men indicate their providers are much more likely to highlight the advantages of testing (29.5%) compared to its disadvantages (14.1%) or the controversy about PSA (10.6%). This information appears in contradistinction to the frequency of men indicating their doctors recommend testing (39.5%) and the frequency of men receiving testing (44.4%). Whether these practice patterns are a reflection of physician beliefs regarding the relative benefits over the risks is unknown, however, clearly there appears to be a preconception towards continuation of PSA screening despite the sustained controversy over the past decade. Patients may request PSA testing against their doctor's recommendations stating when they look back on the experience of cancer screening, 100% were glad they had the initial CaP screening with 89% stated they will continue PSA screening at the same rate or more frequently in the future.[19]

Patients over the age of 80 are still among the largest group to receive CaP screening against the updated recommendations of United States Preventive Service Task Force (USPSTF) in 2008.[20] In general, the common principle is to not screen elder gentleman as encouraged by USPSTF determining there were no additional benefits to cancer screening over the age of 75 and may increase the harms to these patients.[20] In contrary, Scosyrev concluded that men over the age of 75 were more likely to present with very advanced disease, had a greater risk of death from CaP despite higher death rates from competing causes, and contributed more than half of all CaP deaths.[21] Age alone should not highly influence the doctor's decision of PSA testing but also considering the patient's comorbidities as a factor of recommending CaP screening or not. With additional follow-up to the European Randomized Study of Screening for Prostate Cancer (ERSPC) trial, if the mortality difference continues to grow, the number needed to treat to save a life with PSA screening will decrease.[22]

Over the past decade, several studies have reported that men are not informed about PSA screening, often receiving testing without any discussion by their providers. Within the Veterans Affairs setting, a similar conclusion was reported showing two-thirds of men recalled having the PSA test while 47% reported discussing its advantages and disadvantages.[25] These practice patterns suggest reflexive PSA testing in this population and are not indicative of informed decision making.

There may be several reasons that provider-patient discussions appear to be declining. Given the increased complexity of the available evidence[1-3,10] and controversy about how to interpret the contaminated findings of the U.S. screening trial with the European trial,[4,5] physicians might lack the knowledge about PSA testing or may be undecided on the effects of

PSA testing to feel empowered to appropriately discuss testing with patients.[2] Importantly, patient expectations likely influence what is discussed and recommended during a visit,[19] as the questionnaire does not capture patient-initiated screening. Provider behavior is influenced by perceived community standards of care and concerns about malpractice liability.[3] For example, recommending and performing testing is often perceived as necessary to avoid potential lawsuits if a cancer develops that could have potentially been detected by screening.[26] Additionally, as the complexity of the PSA screening discussion increases, so have time pressures. It can be difficult for a physician to adequately educate their patient about the natural history of CaP, steps in the screening process, advantages and disadvantages of screening, and answer the patient's questions within the standard 20 minute office visit in addition to addressing the routine primary care patient health issues.[8]

Although the NHIS survey is a large nationally represented sample, there are several limitations to using this data source longitudinally between 2000 and 2010. The survey design differed between the two study periods, with screening questions only being asked in 2000 to men if they indicated they had heard of the PSA test, while screening questions were asked of all men over age 40 in 2010. Although the data presented for 2000 represent the best possible comparison group to 2010, the difference in how the questions were asked may have led to the observed decline in the proportion of men in 2010 reporting their providers discussed PSA screening and the decline in testing rates. The response rate in 2000 was 72% compared to 60.4% in 2010. It is possible that response bias differs across the study years. An additional limitation is that the data are self-reported by perceptions of what was discussed by their providers and may not reflect the actual discussion that occurred. We also note that the survey

was administered independently of care activities and may have occurred many months after the discussion occurred. It is possible that recall immediately following a visit would better capture what was discussed during the visit.

**Conclusion:**

Despite an increased emphasis to more fully inform men about the harms and benefits of PSA testing, the frequency of discussions in primary care has declined. When discussions do occur, providers are much more likely to only highlight the advantages of testing. Furthermore, more men reported receiving a PSA test in the past five years than reported having a discussion with their provider. Overall PSA testing is declining; however, testing remains highest among older men for whom some guidelines recommend against testing.

Table 1. Characteristics of Male Responders to Cancer Screening Supplemental Questions by Survey Year

| | 2000 | | 2010 | | |
|---|---|---|---|---|---|
| Characteristic | Unweighted (N) 3,596 | Weighted Population Represented 25,457,176 | Unweighted (N) 4,702 | Weighted Population Represented 43,585,541 | p-value¥ |
| Age, years, % | | | | | |
| 40-49 | 1202 | 35.6% | 1744 | 39.2% | <0.001 |
| 50-59 | 1076 | 30.4% | 1397 | 30.5% | |
| 60-69 | 711 | 18.6% | 963 | 19.4% | |
| 70-79 | 491 | 12.7% | 442 | 8.1% | |
| ≥80 | 116 | 2.7% | 156 | 2.7% | |
| Race, % | | | | | |
| White | 3037 | 87.1% | 3664 | 85.1% | <0.001 |
| Black | 385 | 8.3% | 680 | 9.3% | |
| Asian | 87 | 2.8% | 344 | 5.4% | |
| Other | 87 | 1.7% | 14 | 0.2% | |
| Hispanic, % | | | | | |
| No | 3255 | 94.1% | 3887 | 87.3% | <0.001 |
| Yes | 341 | 5.9% | 815 | 12.7% | |
| Born in the US, % | | | | | |
| No | 405 | 9.9% | 1088 | 18.3% | <0.001 |
| Yes | 3191 | 90.1% | 3614 | 81.8% | |
| Region of residence, % | | | | | |
| Northeast | 717 | 20.7% | 790 | 18.0% | 0.003 |
| North Central/Midwest | 842 | 25.4% | 10035 | 24.0% | |
| South | 1299 | 35.0% | 1717 | 34.9% | |
| West | 738 | 18.9% | 1160 | 23.1% | |
| Marital status, % | | | | | |
| Married | 2480 | 81.0% | 3060 | 77.4% | <0.001 |
| Previously married | 774 | 13.0% | 1097 | 14.9% | |
| Never married | 342 | 6.1% | 545 | 7.7% | |
| Education, % | | | | | |
| 8th grade or less | 185 | 3.8% | 353 | 5.6% | 0.005 |
| High school | 1262 | 35.1% | 1592 | 32.7% | |
| Some college | 915 | 25.5% | 1215 | 26.0% | |
| College degree | 1216 | 35.6% | 1526 | 35.8% | |
| Self-reported health status, % | | | | | |
| Excellent | 1121 | 32.1% | 1291 | 28.8% | 0.009 |
| Very good | 1291 | 36.4% | 1617 | 36.1% | |
| Good | 932 | 25.2% | 1416 | 28.3% | |
| Fair/Poor | 252 | 6.4% | 378 | 6.8% | |
| Health insurance coverage status, % | | | | | |
| Not covered | 294 | 7.1% | 845 | 15.8% | <0.001 |
| Covered | 3302 | 92.9% | 3857 | 84.2% | |
| Usual place of care, % | | | | | |
| No | 361 | 9.3% | 787 | 15.5% | <0.001 |
| Yes | 3235 | 90.7% | 3915 | 84.5% | |
| Family history of cancer, % | | | | | |
| No family history | 1882 | 51.5% | 2658 | 54.0% | 0.044 |
| Family history of prostate cancer | 272 | 8.0% | 308 | 6.6% | |
| Family history of other cancer | 1442 | 40.5% | 1736 | 39.5% | |
| Body Mass Index, $kg/m^2$, % | | | | | |
| <=25.0 | 1049 | 29.0% | 1184 | 23.6% | <0.001 |
| >25.0 & <=30.0 | 1753 | 47.9% | 2149 | 45.9% | |
| >30.0 & <=40.0 | 732 | 21.2% | 1233 | 27.4% | |
| >40.0 | 51 | 1.5% | 109 | 2.6% | |
| Unknown | 11 | 0.3% | 27 | 0.5% | |

Table 1 continued

| | | | | | |
|---|---|---|---|---|---|
| Alcohol use, % | | | | | |
| Lifetime abstainers | 468 | 13.0% | 594 | 10.8% | 0.071 |
| Former drinkers | 584 | 15.8% | 784 | 15.7% | |
| Current drinkers | 2524 | 70.7% | 3293 | 72.9% | |
| Drinking status unknown | 20 | 0.6% | 31 | 0.6% | |
| Smoking status, % | | | | | |
| Current | 702 | 18.5% | 913 | 18.4% | <0.001 |
| Former | 1412 | 38.9% | 1393 | 30.5% | |
| Never | 1482 | 42.6% | 2396 | 51.1% | |

¥ Chi-square test for differences between survey years.

Table 2. Frequency of Subjects Receiving a PSA Test in the Last 5 Years and Discussing PSA Testing with their Doctor by Survey Year

| | Frequency of PSA Testing in Past 5 Years | | | Frequency of Doctor Discussing PSA Testing | | |
|---|---|---|---|---|---|---|
| Characteristic | 2000 | 2010 | p-valueα | 2000 | 2010 | p-valueβ |
| Overall, % | 57.7% | 44.4% | <0.001 | 38.0% | 31.0% | <0.001 |
| Age, Years, % | | | | | | |
| 40-49 | 35.9% | 22.4% | <0.001 | 23.5% | 18.0% | <0.001 |
| 50-59 | 62.6% | 46.8% | <0.001 | 41.9% | 34.1% | <0.001 |
| 60-69 | 78.0% | 65.2% | <0.001 | 48.6% | 40.4% | <0.001 |
| 70-79 | 81.0% | 69.3% | <0.001 | 52.9% | 44.7% | <0.001 |
| ≥80 | 81.7% | 70.2% | <0.001 | 57.7% | 49.5% | 0.008 |
| Race, % | | | | | | |
| White | 57.6% | 44.2% | <0.001 | 37.6% | 30.6% | <0.001 |
| Black | 61.6% | 48.4% | <0.001 | 44.6% | 37.2% | <0.001 |
| Asian | 51.4% | 38.1% | <0.001 | 32.5% | 26.0% | 0.027 |
| Other | 67.5% | 54.8% | <0.001 | 45.9% | 38.4% | 0.130 |
| Hispanic, % | | | | | | |
| No | 58.0% | 44.6% | <0.001 | 37.9% | 30.8% | <0.001 |
| Yes | 55.6% | 42.3% | <0.001 | 39.7% | 32.6% | 0.002 |
| Born in the US, % | | | | | | |
| No | 55.6% | 42.2% | <0.001 | 37.5% | 30.5% | <0.001 |
| Yes | 58.1% | 44.8% | <0.001 | 38.1% | 31.1% | <0.001 |
| Region of residence, % | | | | | | |
| Northeast | 57.9% | 44.5% | <0.001 | 37.3% | 30.3% | <0.001 |
| North Central/Midwest | 55.9% | 42.5% | <0.001 | 36.5% | 29.5% | <0.001 |
| South | 60.4% | 47.2% | <0.001 | 40.7% | 33.5% | <0.001 |
| West | 55.4% | 42.0% | <0.001 | 36.0% | 29.1% | <0.001 |
| Marital Status, % | | | | | | |
| Married | 58.4% | 45.1% | <0.001 | 38.8% | 31.7% | <0.001 |
| Previously married | 57.2% | 43.8% | <0.001 | 36.6% | 29.6% | <0.001 |
| Never married | 50.8% | 37.5% | <0.001 | 31.0% | 24.6% | 0.002 |
| Education, % | | | | | | |
| 8th grade or less | 51.6% | 38.2% | <0.001 | 27.3% | 21.4% | 0.010 |
| High school | 52.3% | 38.9% | <0.001 | 33.7% | 27.0% | <0.001 |
| Some college | 58.6% | 45.2% | <0.001 | 37.9% | 30.8% | <0.001 |
| College degree | 62.7% | 49.5% | <0.001 | 43.4% | 36.0% | <0.001 |

Table 2 continued

| | | | | | | |
|---|---|---|---|---|---|---|
| Self-reported health status, % | | | | | | |
| Excellent | 57.5% | 44.2% | <0.001 | 38.4% | 31.3% | <0.001 |
| Very good | 57.5% | 44.2% | <0.001 | 38.3% | 31.2% | <0.001 |
| Good | 58.1% | 44.8% | <0.001 | 37.0% | 30.0% | <0.001 |
| Fair/Poor | 58.2% | 44.9% | <0.001 | 39.2% | 32.1% | <0.001 |
| Health insurance coverage status, % | | | | | | |
| Not covered | 51.2% | 37.8% | <0.001 | 32.7% | 26.1% | 0.066 |
| Covered | 58.6% | 45.1% | <0.001 | 38.6% | 31.4% | <0.001 |
| Family history of cancer, % | | | | | | |
| No family history | 55.0% | 41.5% | <0.001 | 36.2% | 29.3% | <0.001 |
| Family history of prostate cancer | 70.2% | 57.7% | <0.001 | 46.0% | 38.4% | <0.001 |
| Family history of other cancer | 59.2% | 45.7% | <0.001 | 38.9% | 31.8% | <0.001 |
| Body Mass Index, $kg/m^2$, % | | | | | | |
| <=25.0 | 56.3% | 42.9% | <0.001 | 37.8% | 30.8% | <0.001 |
| >25.0 & <=30.0 | 57.8% | 44.5% | <0.001 | 37.5% | 30.5% | <0.001 |
| >30.0 & <=40.0 | 59.7% | 46.5% | <0.001 | 40.0% | 32.8% | <0.001 |
| >40.0 | 52.8% | 39.5% | <0.001 | 29.5% | 23.3% | 0.083 |
| Unknown | 35.7% | 23.9% | 0.096 | 28.1% | 22.1% | 0.237 |
| Alcohol use, % | | | | | | |
| Lifetime abstainers | 54.8% | 41.4% | <0.001 | 35.2% | 28.4% | <0.001 |
| Former drinkers | 57.4% | 44.1% | <0.001 | 39.5% | 32.3% | <0.001 |
| Current drinkers | 58.3% | 45.0% | <0.001 | 38.2% | 31.1% | <0.001 |
| Drinking status unknown | 54.2% | 40.9% | <0.001 | 38.7% | 31.6% | 0.146 |
| Smoking status, % | | | | | | |
| Current | 55.7% | 42.1% | <0.001 | 35.5% | 28.7% | <0.001 |
| Former | 61.3% | 47.9% | <0.001 | 38.0% | 30.9% | <0.001 |
| Never | 56.3% | 42.7% | <0.001 | 39.0% | 31.8% | <0.001 |
| Usual place of care, % | | | | | | |
| No | 38.8% | 26.2% | <0.001 | 20.5% | 15.6% | 0.004 |
| Yes | 60.4% | 46.6% | <0.001 | 40.2% | 32.7% | <0.001 |

α Comparing proportion tested in the last five years in 2000 to proportion in 2010

β Comparing proportion of men whose doctor discussed PSA testing in 2000 proportions in 2010

Table 3. Probability that survey respondents in 2010 believed they discussed the advantages, disadvantages, recommendations, and controversy of PSA testing with their physicians.

| | Doctor discussed the advantages of PSA | | | Doctor discussed the disadvantages of PSA | | | Doctor recommended PSA | | | Doctor discussed the controversy of PSA | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Characteristic | Odds Ratio | P-ValueΩ | Adjusted Probability of Discussion | Odds Ratio | P-Value€ | Adjusted Probability of Discussion | Odds Ratio | P-Value£ | Adjusted Probability of Discussion | Odds Ratio | P-Value≠ | Adjusted Probability of Discussion |
| Overall, % | | <0.001 | 27.5% | | <0.001 | 14.1% | | <0.001 | 39.5% | | <0.001 | 10.6% |
| Age, years, % | | | | | | | | | | | | |
| 40-49 | 0.4 | <0.001 | 15.6% | 0.4 | <0.001 | 8.1% | 0.3 | <0.001 | 17.8% | 0.5 | <0.001 | 5.9% |
| 50-59 | Ref | - | 30.9% | Ref | - | 16.2% | Ref | - | 42.1% | Ref | - | 11.8% |
| 60-69 | 1.4 | 0.006 | 37.8% | 1.3 | 0.079 | 19.8% | 2.5 | <0.001 | 61.6% | 1.1 | 0.372 | 13.2% |
| 70-79 | 1.4 | 0.013 | 38.4% | 1.2 | 0.281 | 18.8% | 2.6 | <0.001 | 62.5% | 1.5 | 0.037 | 16.4% |
| ≥80 | 1.4 | 0.117 | 38.2% | 1.1 | 0.812 | 17.1% | 2.8 | <0.001 | 63.4% | 2.6 | 0.001 | 24.6% |
| Race, % | | | | | | | | | | | | |
| White | Ref | - | 27.3% | Ref | - | 13.4% | Ref | - | 40.0% | Ref | - | 10.4% |
| Black | 1.4 | 0.005 | 33.5% | 2.0 | <0.001 | 22.4% | 1.0 | 0.965 | 40.1% | 1.2 | 0.251 | 12.4% |
| Asian | 0.7 | 0.149 | 21.9% | 1.0 | 0.971 | 13.3% | 0.6 | 0.001 | 30.0% | 1.0 | 0.889 | 10.8% |
| Other | 0.5 | 0.550 | 16.0% | 0.7 | 0.817 | 10.2% | 0.2 | 0.348 | 15.0% | 1.0 | N/A | N/A |
| Hispanic, % | | | | | | | | | | | | |
| No | Ref | - | 27.4% | Ref | - | 14.2% | Ref | - | 40.0% | Ref | - | 10.6% |
| Yes | 1.1 | 0.520 | 29.1% | 0.9 | 0.711 | 13.4% | 0.7 | 0.078 | 34.7% | 1.0 | 0.952 | 10.4% |
| Born in the US, % | | | | | | | | | | | | |
| No | Ref | - | 27.3% | Ref | - | 14.1% | Ref | - | 38.7% | Ref | - | 9.6% |
| Yes | 1.0 | 0.907 | 27.6% | 1.0 | 0.993 | 14.1% | 1.1 | 0.728 | 39.6% | 1.1 | 0.615 | 10.7% |
| Region of residence, % | | | | | | | | | | | | |
| Northeast | Ref | - | 27.3% | Ref | - | 15.4% | Ref | - | 41.2% | Ref | - | 11.0% |
| North Central/Midwest | 1.0 | 0.881 | 27.0% | 0.7 | 0.018 | 11.1% | 0.9 | 0.336 | 38.9% | 0.9 | 0.512 | 10.0% |
| South | 1.1 | 0.593 | 28.6% | 0.9 | 0.623 | 14.5% | 1.0 | 0.854 | 40.8% | 0.9 | 0.592 | 10.2% |
| West | 1.0 | 0.778 | 26.6% | 1.0 | 0.911 | 15.6% | 0.8 | 0.057 | 36.6% | 1.0 | 0.856 | 11.3% |
| Marital status, % | | | | | | | | | | | | |
| Married | Ref | - | 28.7% | Ref | - | 15.0% | Ref | - | 40.7% | Ref | - | 11.2% |
| Previously married | 0.8 | 0.071 | 25.3% | 0.7 | 0.004 | 10.9% | 0.8 | 0.037 | 36.8% | 0.7 | 0.009 | 7.9% |
| Never married | 0.5 | <0.001 | 17.4% | 0.6 | 0.014 | 10.0% | 0.5 | <0.001 | 30.4% | 0.7 | 0.173 | 8.5% |
| Education, % | | | | | | | | | | | | |
| 8th grade or less | Ref | - | 12.4% | Ref | - | 10.5% | Ref | - | 29.4% | Ref | - | 4.9% |
| High school | 2.0 | 0.001 | 21.3% | 1.2 | 0.555 | 11.9% | 1.1 | 0.572 | 31.6% | 1.4 | 0.311 | 6.6% |
| Some college | 3.1 | <0.001 | 28.5% | 1.4 | 0.275 | 13.5% | 2.2 | 0.003 | 42.5% | 1.9 | 0.044 | 8.7% |
| College degree | 4.1 | <0.001 | 34.2% | 1.8 | 0.032 | 16.6% | 2.5 | <0.001 | 45.2% | 3.7 | <0.001 | 15.5% |

Table 3 continued

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Self-reported health status, % | | | | | | | | | | | | |
| Excellent | Ref | - | 28.2% | Ref | - | 15.0% | Ref | - | 37.9% | Ref | - | 11.1% |
| Very good | 1.0 | 0.662 | 27.4% | 0.9 | 0.417 | 13.8% | 1.1 | 0.245 | 39.9% | 0.9 | 0.668 | 10.6% |
| Good | 0.9 | 0.362 | 26.5% | 0.8 | 0.140 | 12.6% | 1.1 | 0.321 | 39.8% | 0.8 | 0.202 | 9.4% |
| Fair/Poor | 1.1 | 0.754 | 29.1% | 1.3 | 0.226 | 18.0% | 1.3 | 0.119 | 42.5% | 1.2 | 0.547 | 12.7% |
| Health insurance coverage status, % | | | | | | | | | | | | |
| Not covered | Ref | - | 24.0% | Ref | - | 11.5% | Ref | - | 35.7% | Ref | - | 6.7% |
| Covered | 1.3 | 0.142 | 27.9% | 1.3 | 0.224 | 14.4% | 1.3 | 0.096 | 39.9% | 1.8 | 0.045 | 10.9% |
| Family history of cancer, % | | | | | | | | | | | | |
| No family history | Ref | - | 25.7% | Ref | - | 14.1% | Ref | - | 35.9% | Ref | - | 9.9% |
| Family history of prostate Cancer | 1.7 | <0.001 | 36.0% | 1.3 | 0.205 | 17.2% | 2.5 | <0.001 | 52.0% | 1.4 | 0.154 | 12.8% |
| Family history of other cancer | 1.2 | 0.081 | 28.2% | 1.0 | 0.651 | 13.5% | 1.4 | <0.001 | 41.8% | 1.1 | 0.282 | 11.0% |
| Body Mass Index, kg/m$^2$, % | | | | | | | | | | | | |
| <=25.0 | Ref | - | 28.5% | Ref | - | 14.1% | Ref | - | 38.8% | Ref | - | 10.1% |
| >25.0 & <=30.0 | 0.9 | 0.293 | 26.5% | 0.9 | 0.582 | 13.2% | 1.1 | 0.653 | 39.6% | 1.1 | 0.503 | 11.0% |
| >30.0 & <=40.0 | 1.0 | 0.832 | 28.9% | 1.2 | 0.321 | 16.0% | 1.1 | 0.355 | 40.8% | 1.1 | 0.698 | 10.7% |
| >40.0 | 0.7 | 0.263 | 22.8% | 0.6 | 0.289 | 9.5% | 0.7 | 0.209 | 33.0% | 0.6 | 0.317 | 6.4% |
| Unknown | 0.7 | 0.614 | 23.5% | 0.5 | 0.504 | 8.2% | 0.2 | 0.031 | 17.1% | 0.7 | 0.665 | 7.3% |
| Alcohol use, % | | | | | | | | | | | | |
| Lifetime abstainers | Ref | - | 25.3% | Ref | - | 11.9% | Ref | - | 36.4% | Ref | - | 9.0% |
| Former drinkers | 1.2 | 0.204 | 28.8% | 1.3 | 0.247 | 14.3% | 1.2 | 0.382 | 38.8% | 1.1 | 0.658 | 9.8% |
| Current drinkers | 1.1 | 0.348 | 27.6% | 1.3 | 0.163 | 14.5% | 1.3 | 0.135 | 40.1% | 1.3 | 0.233 | 10.9% |
| Drinking status unknown | 0.8 | 0.620 | 21.5% | 0.3 | 0.171 | 4.5% | 0.6 | 0.209 | 27.4% | 1.9 | 0.299 | 15.2% |
| Smoking status, % | | | | | | | | | | | | |
| Current | Ref | - | 24.9% | Ref | - | 10.5% | Ref | - | 37.1% | Ref | - | 9.4% |
| Former | 1.2 | 0.167 | 27.8% | 1.3 | 0.093 | 13.2% | 1.3 | 0.011 | 42.2% | 1.0 | 0.946 | 9.3% |
| Never | 1.2 | 0.123 | 28.1% | 1.6 | 0.005 | 15.8% | 1.1 | 0.526 | 38.5% | 1.3 | 0.174 | 11.7% |
| Usual place of care, % | | | | | | | | | | | | |
| No | Ref | - | 13.6% | Ref | - | 7.5% | Ref | - | 19.8% | Ref | - | 6.9% |
| Yes | 2.9 | <0.001 | 29.3% | 2.2 | <0.001 | 14.9% | 3.9 | 0.096 | 42.0% | 1.7 | 0.027 | 10.9% |

Ω Comparing proportion of men whose doctor discussed the advantages of PSA testing in 2010 based on sociodemographics of patients.

€ Comparing proportion of men whose doctor discussed the disadvantages of PSA testing in 2010 based on sociodemographics of patients.

£ Comparing proportion of men whose doctor discussed the recommendations of PSA testing in 2010 based on sociodemographics of patients.

≠ Comparing proportion of men whose doctor discussed the controversies of PSA testing in 2010 based on sociodemographics of patients.

**References:**


1. Moyer VA, on behalf of the USPSTF. Screening for Prostate Cancer: U.S. Preventive Services Task Force Recommendation Statement. Annals of internal medicine 2012;157:120-34.
2. Ross LE, Richardson LC, Berkowitz Z. The effect of physician-patient discussions on the likelihood of prostate-specific antigen testing. Journal of the National Medical Association 2006;98:1823-9.
3. Purvis Cooper C, Merritt TL, Ross LE, John LV, Jorgensen CM. To screen or not to screen, when clinical guidelines disagree: primary care physicians' use of the PSA test. Preventive medicine 2004;38:182-91.
4. Andriole GL, Crawford ED, Grubb RL, 3rd, et al. Prostate cancer screening in the randomized Prostate, Lung, Colorectal, and Ovarian Cancer Screening Trial: mortality results after 13 years of follow-up. Journal of the National Cancer Institute 2012;104:125-32.
5. Schroder FH, Hugosson J, Roobol MJ, et al. Prostate-cancer mortality at 11 years of follow-up. The New England journal of medicine 2012;366:981-90.
6. Chan EC, Sulmasy DP. What should men know about prostate-specific antigen screening before giving informed consent? The American journal of medicine 1998;105:266-74.
7. Task Force Recommends Against Routine Prostate Cancer Screening. 2012. (Accessed August 6, 2012, at http://www.cancer.org/Cancer/news/News/task-force-recommends-against-routine-prostate-cancer-screenin.)
8. Allen JD, Othus MK, Hart A, Jr., Mohllajee AP, Li Y, Bowen D. Do men make informed decisions about prostate cancer screening? Baseline results from the "take the wheel" trial. Medical decision making : an international journal of the Society for Medical Decision Making 2011;31:108-20.
9. PCF Responds to U.S. Preventive Services Task Force Recommendation on PSA Screening. 2011. (Accessed August 02, 2012, at http://www.pcf.org/site/c.leJRIROrEpH/b.7790173/k.8F47/PCF_Responds_to_US_Preventive_Services_Task_Force_Recommendation_on_PSA_Screening.htm.)
10. Wheeler DC, Szymanski KM, Black A, Nelson DE. Applying strategies from libertarian paternalism to decision making for prostate specific antigen (PSA) screening. BMC cancer 2011;11:148.
11. Prevention CfDCa. 2010 National Health Interview Survey (NHIS) Public Use Data Release. In: Services USDoHaH, ed.; 2011.
12. About the National Health Interview Survey. Centers for Disease Control and Prevention, 2011. (Accessed December 29, 2011, at http://www.cdc.gov/nchs/nhis/about_nhis.htm.)
13. Drazer MW, Huo D, Schonberg MA, Razmaria A, Eggener SE. Population-Based Patterns and Predictors of Prostate-Specific Antigen Screening Among Older Men in the United States. Journal of Clinical Oncology 2011;29:1736-43.
14. 2000 National Health Interview Survey (NHIS) Public Use Data Release. 2000. (Accessed April 4, 2012, at ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2000/srvydesc.pdf.)
15. 2010 National Health Interview Survey (NHIS) Public Use Data Release. Centers for Disease Control and Prevention, 2010. (Accessed April 4, 2012, at ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2010/srvydesc.pdf.)
16. Module NC. Cancer 2000 Module - Cancer Screening. NHIS; 2000 November 7, 2001.
17. Questionnaire N. 2010 NHIS Questionnaire - Cancer Screening. NHIS; 2010 April 18, 2011.
18. Kleinman LC, Norton EC. What's the Risk? A simple approach for estimating adjusted risk measures from nonlinear models including logistic regression. Health Serv Res 2009;44:288-302.
19. Schwartz LM, Woloshin S, Fowler FJ, Jr., Welch HG. Enthusiasm for cancer screening in the United States. JAMA : the journal of the American Medical Association 2004;291:71-8.

20. United States Preventive Task Force. Screening for prostate cancer: U.S. Preventive Services Task Force recommendation statement. Annals of internal medicine 2008;149:185-91.
21. Scosyrev E, Messing EM, Mohile S, Golijanin D, Wu G. Prostate cancer in the elderly: frequency of advanced disease at presentation and disease-specific mortality. Cancer 2012;118:3062-70.
22. Loeb S, Vonesh EF, Metter EJ, Carter HB, Gann PH, Catalona WJ. What is the true number needed to screen and treat to save a life with prostate-specific antigen testing? Journal of clinical oncology : official journal of the American Society of Clinical Oncology 2011;29:464-7.
23. Hoffman RM, Couper MP, Zikmund-Fisher BJ, et al. Prostate cancer screening decisions: results from the National Survey of Medical Decisions (DECISIONS study). Archives of internal medicine 2009;169:1611-8.
24. Hoffman RM, Lewis CL, Pignone MP, et al. Decision-making processes for breast, colorectal, and prostate cancer screening: the DECISIONS survey. Med Decis Making 2010;30:53S-64S.
25. McFall SL. US men discussing prostate-specific antigen tests with a physician. Annals of family medicine 2006;4:433-6.
26. Merenstein D. A piece of my mind. Winners and losers. JAMA : the journal of the American Medical Association 2004;291:15-6.