Changes in Prostate Specific Antigen Screening and Prostate Cancer Diagnosis After Guideline Changes

Christopher J. Magnani, Kevin Li, Tina Seto, Kathryn M. McDonald, Douglas W. Blayney, James D. Brooks, Tina Hernandez-Boussard

Stanford University School of Medicine, Stanford, CA 94305

Objective

Evaluate the impact of the 2012 US Preventative Services Task Force (USPSTF) recommendation on:

1. Population level prostate-specific antigen (PSA) screening
2. Prostate cancer stage at diagnosis

Background

- Prostate cancer is the most common cancer among US men and most cases are identified as low grade with limited volume and low serum PSA.
- Widespread PSA screening increases diagnosis of low-risk cancers and has not been shown to decrease mortality
- In 2012 the USPSTF recommended against screening with PSA in all men, expanding a previous 2008 guideline recommending against screening in men > 75 years old.

Methods

- **Data source:** institutional electronic health records (EHR) linked to California Cancer Registry, 2008-2016.
- **Inclusion criteria:** previously undiagnosed men > 35 years old.
- **Exclusion criteria:** cancer diagnosis prior to screening date; missing demographics; unknown stage (if diagnosed). The policy implementation year (2012) was excluded as a 'washout' period.
- **Data Processing:** Quasi-experimental retrospective difference-in-differences design assessed PSA screening (exposure) relative to cholesterol (control) testing to adjusting for secular trends. Also adjusted for age, race, insurance, and comorbidities. Diagnostic stage was assessed by a chi-square test. Annual screening intervals were assessed independently for patient eligibility.
- **Outcomes:** Receipt of at least one screening test within an annual screening period; Stage at diagnosis ≤ 2.

Results

Figure 1. Unadjusted rates of PSA (exposure) and cholesterol (control) testing by age

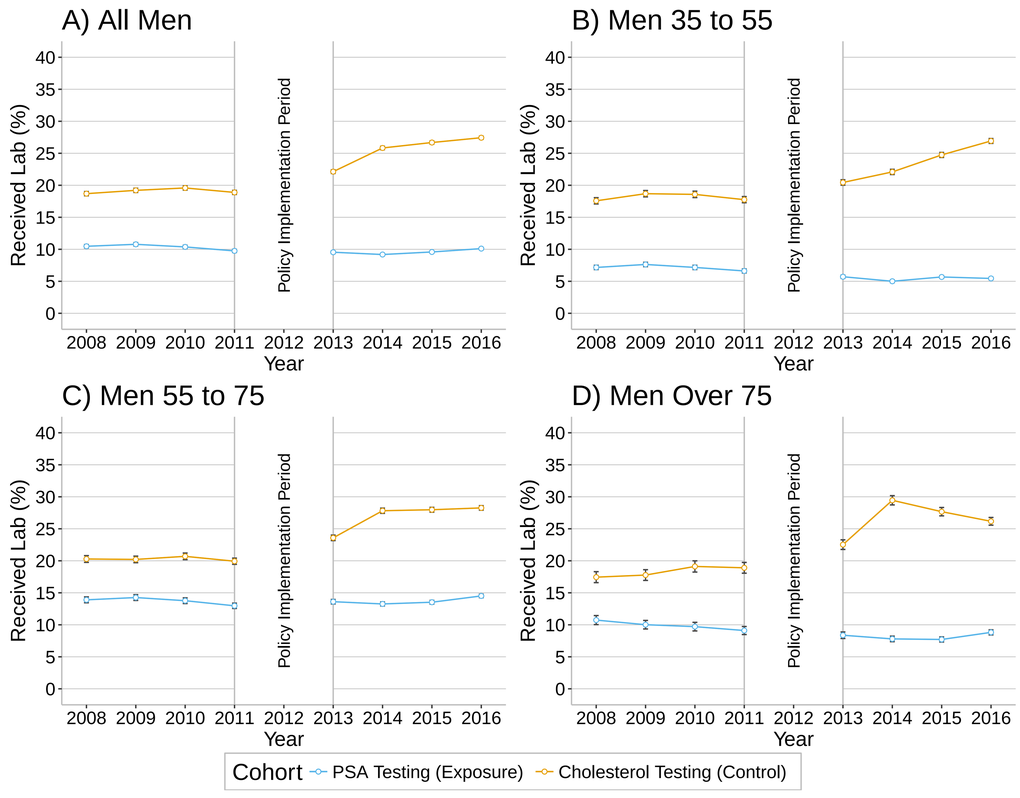

Table 1. Study demographics

	Prepolicy n = 222,220	Postpolicy n = 444,630	Difference
Mean age, years	58.3	59.1	0.8(0.7,0.8)
Charlson comorbidity	1.1	1.2	0.1(0.1,0.1)
Age bracket, %			
35 – 55 years old	42.5	39.4	-3.1(-3.4,-2.9)
55 – 75 years old	43.3	45.9	2.6(2.4,2.9)
> 75 years old	14.2	14.7	0.5(0.3,0.7)
Race, %			
White	53.9	53.9	-0.1(-0.3,0.2)[a]
Asian	11.2	14.0	2.8(2.7,3.0)
Black	2.5	3.8	1.2(1.2,1.3)
Hispanic	9.3	8.9	-0.4(-0.5,-0.3)
Other or unknown	23.0	19.4	-3.6(-3.8,-3.4)
Insurance, %			
Medicare	38.4	34.1	-4.3(-4.5,-4.0)
Medicaid	4.0	5.2	1.2(1.1,1.3)
Private	45.6	47.1	1.5(1.2,1.7)
Other or unknown	12.0	13.6	1.7(1.5,1.8)

NOTE: all p < 0.001, except [a] = p of 0.59; confidence intervals are 95%

Table 2. Changes in PSA screening by age

Age Group	PSA (Exposure), % Pre-	Post-	Unadjusted Difference	Cholesterol (Control), % Pre-	Post-	Unadjusted Difference	Diff-in-diff Modeled Estimate, %
All Men	10.3	9.6	-0.7 (-0.9,-0.5)	19.1	25.9	6.8 (6.6,7.0)	-7.4 (-7.6,-7.1)
35–55 y	7.1	5.5	-1.6 (-1.8,-1.4)	18.1	23.9	5.8 (5.5,6.1)	-7.3 (-7.6,-6.9)
55–75 y	13.7	13.8	0.1 (-0.2,0.4)	20.3	27.2	6.9 (6.6,7.2)	-6.9 (-7.3,-6.5)
> 75 y	9.9	8.2	-1.7 (-2.1,-1.3)	18.3	26.7	8.4 (7.8,8.9)	-9.8 (-10.5,-9.1)

NOTE: all p < 0.001; confidence intervals are 95%

Table 3. Changes in prostate cancers at early stage

Age Group	Total No. Prepolicy	Total No. Postpolicy	Percent Prepolicy	Percent Postpolicy	Unadjusted Difference
All Men	2,572	1,397	79.0	63.4	-15.7 (-18.6,12.7)
35–55 y	332	125	80.4	65.0	-15.4 (-24.3,-6.5)
55–75 y	1,895	935	78.5	63.1	-15.4 (-18.8,-12.0)
> 75 y	345	149	80.3	63.5	-16.8 (-25.3,-8.2)

NOTE: all p < 0.001; confidence intervals are 95%

Conclusions

- PSA testing decreased among males aged 35 and older following the 2012 USPSTF guideline changes, with a concurrent decline in the proportion of prostate cancers diagnosed at early stage.
- PSA screening declined overall by 7.4% relative to cholesterol, and men over 75 had the largest decrease of 9.8%. Screening decreased by 6.9% in men 55-75 and by 7.3% in men 35-55 (all p < 0.001).
- The proportion of cancers diagnosed at early stage declined across all age groups nearly uniformly. All men saw a decline of 15.7%, while both men 35-55 and 55-75 had declines of 15.4%. Men over 75 have the largest decline of 16.8% (all p < 0.001).

Discussion

- Despite controversy over the 2012 USPSTF recommendation against screening, PSA testing declined in all age groups, suggesting guideline adherence.
- The guidelines are associated with a reduced number of prostate cancer diagnoses with a smaller proportion of cancers diagnosed at early stage.
- The decline in early stage cancers is consistent with ongoing attempts to reduce overtreatment.
- Further work is needed to determine if guidelines have impacted mortality or the burden of treatment related comorbidities like urinary incontinence and sexual dysfunction.

Research reported in this presentation was supported by the National Cancer Institute of the National Institutes of Health under Award Number R01CA183962. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. C. Magnani was supported by the Stanford University MedScholars program,