Geographic Variation in the Effect of Prostate-Specific Antigen Testing on Treatment Receipt for Early-stage Prostate Cancer among Elderly Men

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Background

- Several studies have evaluated the influence of individual-level characteristics on treatment in early-stage (localized) prostate cancer.
- There is limited research on the impact of area-based socioeconomic and health services supply factors on treatment receipt among men diagnosed with localized prostate cancer.

Research Objective

To examine the impact of geographic characteristics on the likelihood of receiving treatment among Medicare-eligible older men.

Methods

Study Eligibility

- Men aged 65 years and above
- Diagnosed with incident localized/regional Prostate cancer between 2004 and 2007
- With continuous fee-for-service Medicare coverage

Study Design

- Retrospective cohort study

Outcome

- Treatment within 24 months of diagnosis: watchful waiting, active surveillance, radiation therapy, radical prostatectomy, cryotherapy and ADT

Individual Characteristics

- Age, year of diagnosis, marital status, SEER region, urban/rural location, race/ethnicity, Gleason grade, Clinical tumor classification
- Prostate-specific antigen (PSA) testing
- Comorbidities
- Colon cancer screening and influenza vaccinations

Methods

Area-level Characteristics

- County-level socioeconomic characteristics: Employment, education, poverty, income, housing, ownership, and living crowdedness
- County-level health services characteristics: All health care personnel, facilities, and services

Data Sources

- Surveillance, Epidemiology, and End Results (SEER)-Medicare, US Census, County Business Pattern data, Area Health Resource Files.

Statistical Analysis

- Descriptive statistics
- Cluster-specific logistic regression models
- Geographic variation in Prostate cancer treatment was assessed using
  - Random intercept/slope models,
  - Variance partition coefficients, and
  - Caterpillar plots of predicted proportions of men undergoing expectant management (watchful waiting/active surveillance) in counties after adjusting for individual and county-level characteristics.
- Approved by the University of Maryland Institutional Review Board (Approval No.: HCR-HP-00049426-4)

Results

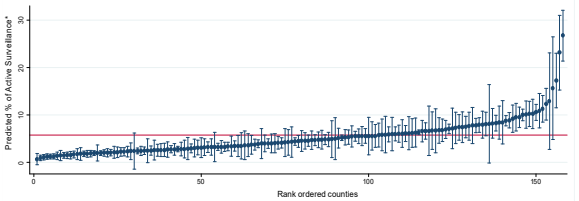
Table 1. Sample characteristics

Variable	Full sample (N= 35,362)	
	N	%
Individual-level characteristics		
Race		
White non-Hispanic	27,367	77.39
African American	3,015	8.53
Other	4,980	14.08
Age at diagnosis		
70-74	16,440	46.49
75-79	10,649	30.11
80-84	5,931	16.77
85+	2,342	6.62
Married	22,961	64.93
Annual PSA-testing 5 years before diagnosis		
4 or more times	16,456	46.54
2 or 3 times	11,010	31.14
0 or 1 times	7,896	22.33
Colon cancer screening		
1 or more times over 5 years	5,881	16.63
No screening over 5 years	29,481	83.37
Clinical Characteristics		
Clinical tumor classification at diagnosis		
T1	17,021	48.13
T2	16,578	46.88
T3/T4	1,743	4.93
Unknown	20	0.06
Charlson comorbidity index [b] (1 year before diagnosis)		
Zero	21,862	61.82
One	7,816	22.10
Two or higher	4,833	13.67
Missing	851	2.41
County-level characteristics		
Socio-economic status		
Low	6,512	18.42
2	6,903	19.52
3	6,680	18.89
4	6,546	18.51
High	8,721	24.66
Health services supply		
Low	5,251	14.85
2	6,431	18.19
3	5,882	16.63
4	9,125	25.80
High	8,673	24.53

Table 2. Multilevel logistic regression models for receipt of expectant management controlling for individual and county-level characteristics (N=35,362; Treat=28,191; Expectant management= 7,171)

Variables	Fully adjusted OR (95% CI)
Race	
White non-Hispanic	Reference
African American	1.23 (1.10, 1.37)*
Other [b]	1.33 (1.21, 1.45)*
Age at diagnosis	
70-74	Reference
75-79	1.74 (1.63, 1.87)*
80-84	2.65 (2.44, 2.86)*
85+	3.68 (3.29, 4.09)*
Charlson comorbidity index	
Zero	Reference
One	1.01 (0.94, 1.09)
Two or higher	1.16 (1.06, 1.26)*
County-level	
Socio-economic status	
High	Reference
4	1.04 (0.82, 1.31)
3	1.15 (0.93, 1.43)
2	1.12 (0.92, 1.38)
Low	1.15 (0.92, 1.43)
Health services supply	
High	Reference
4	1.02 (0.77, 1.35)
3	1.21 (1.00, 1.48)**
2	1.23 (1.02, 1.48)*
Low	1.32 (1.09, 1.59)*
Number of counties	158

Figure 1. Caterpillar plot illustrating county-level variation in the predicted proportion of Medicare eligible older men undergoing expectant management (active surveillance or watchful waiting)[1] across 158 SEER-covered counties shown in rank order together with 95% confidence intervals (N=35,362, Expectant management=7,171; Treatment=28,191)



*Predicted proportion of Medicare eligible older men receiving active surveillance in 158 counties with at least 14 patients after adjusting for patient and county characteristics, and clustering at the county level.

The model was adjusted for individual demographic, clinical characteristics, other preventive health behavior, rural location and county-level socioeconomic and health services supply characteristics. The x-axis shows the 158 counties ordered from smallest to largest proportion receiving active surveillance. Average percentage across all counties was 5.7% (shown by the horizontal red line).

Discussion

- Contextual characteristics and geographic variability can have a significant impact on treatment decisions.
- High intensity of pre-diagnosis annual PSA testing, higher tumor grade (T2/T3/T4) and older age were associated with treatment.
- Race, county-level socioeconomic and health services supply were associated with treatment.
- There was significant geographic variation in use of expectant management and specifically active surveillance across the SEER covered counties.
- Geographic variation suggests that treatment decisions are also based on contextual factors at the county level.

Conclusions

- Geographic location and geographic characteristics influence the uptake of treatment for early-stage prostate cancer among Medicare beneficiaries.
- Disparities based on socioeconomic and health services supply characteristics highlight targets for further research.

Acknowledgements

This research was funded by National Institutes of Health at the National Cancer Institute Grant U01CA199284. The content of this article reflect the views of the authors. The funders had no role in the design of the study; analysis, and interpretation of the data; the writing of the manuscript; and the decision to submit the manuscript for publication.

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