African American race, crime rates, and treatment receipt among men diagnosed with prostate cancer

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Background

- Compared to Whites (W), African American (AA) men with prostate cancer (PCa) are more likely to be diagnosed at a later stage (Marlow 2010) and are less likely to receive treatment (Onukwugha 2011; Cross 2008).
- There is a debate in the literature as to whether these differences are related to patient preferences or physician decision making.
- The debate tends to ignore the role of environment, which influences both patients and physician decision making.
- Environmental factors such as crime rates have been shown to affect the individual's health and quality of life. One potential pathway is that fear of crime reduces physical activity (Roman 2008) and increases feelings of depression and /or isolation (Stafford, 2007). Perceptions of safety are particularly important to older populations in terms of factors that impact their willingness to leave their home to engage in physical activity (King 2008).
- Individuals living in high crime areas may be less likely to receive treatment if crime reduces their willingness to travel outside their home to receive treatment.

Objectives

We evaluated the role of county-level crime in mediating AA/W disparities in treatment receipt among elderly men diagnosed with metastatic (AJCC stage IV M1) PCa.

Methods

- **Study inclusion and exclusion criteria:**

o AJCC stage IV M1 prostate cancer from 2000 and 2007
o Age 66+ at the time of diagnosis
o Continuously enrolled in Medicare Parts A and B for the 12 months before PCa diagnosis
o Continuously NOT enrolled in an HMO for the 12 months before PCa diagnosis
o No history of cancer within 5 years prior to the prostate cancer diagnosis
o Excluded anyone with unknown diagnosis month
o Prostate cancer not found on autopsy or death certificate

Each individual enters at diagnosis and leaves dataset due to death, loss of Parts A&B coverage, HMO enrollment, or alive at end of follow-up (12/31/2009).

- **Variables of interest:**

o Treated $\equiv \begin{cases} 0 \ \textit{No reciept of ADT, chemotherapy or radiation therapy} \\ 1 \ \textit{Reciept of ADT, chemotherapy or radiation therapy} \end{cases}$
o Non-Hispanic African-American: an indicator for a non-Hispanic AA patient.
o Crimes against person: factor score based on analysis of county-level crime statistics

- **Statistical analysis:**

Analyses were stratified by whether or not the patient visited a specialist (i.e., urologist, medical oncologist, or radiation oncologist) at any time following diagnosis.

➢ *County-level data:*

o Data from the United States census provided an array of measures used to examine poverty, educational attainment, crime, facilities, services, transport mobility, access to telephone.
o Crime, facilities, and services: counties were characterized based on whether or not the value of the county-level measure exceeded the 90th percentile value for that measure.
o Poverty, educational attainment, transport mobility, access to telephone: counties were characterized using an indicator for whether or not the value of the county-level measure exceeded the 75th percentile value for that measure.
o Factor analyses were used to generate factor scores for crime, services, and facilities using measures. Higher values corresponded to an increasing level of the factor.

➢ Descriptive statistics provided information (for the full sample, the AA sample, and the W sample) regarding patient and county-level characteristics.

➢ Logistic regression with and without an adjustment (i.e. using generalized estimating equations) for cluster-level variation based on the patient's county of residence at diagnosis was used to estimate odds ratios for the receipt of treatment.

➢ Modified Poisson regression was used to estimate rate ratios for treatment receipt.

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Tables and Figures

Table 1: Descriptive statistics (N=5,458)

Variable	Mean or %
FULL SAMPLE* (N=5,458)	
Patient-level	
Receipt of ADT, chemotherapy, or XRT	78%
Receipt of ADT	74%
No medical claims in 12 months pre-diagnosis	12%
CCI=0	53%
CCI=1	19%
CCI=2+	16%
Hospitalization or walking aid or SNF or oxygen use or wheelchair use in 12 month pre period	26%
Visit to primary care physician 12 months before diagnosis	68%
County-level	
Crime against person_factor1	0.007
Crime against property_factor2	0.011
Generalized crime against person_factor3	0.015
Facilities_factor4	0.059
Services_factor5	0.069
Percent Population below poverty level 1999 (1 if >75th percentile)	28%
Educational attainment - persons 25 years and over completing less than 9th grade 2000 >75th pcntl	24%
Occupied housing units with no vehicles available 2000 (sample) >75th pcntl	27%
Occupied housing units with no telephone service available for 2000 (sample) >75th pcntl	27%
African American sample (N=844)	
Patient-level	
Receipt of ADT, chemotherapy, or XRT	↓66%
Receipt of ADT	↓62%
No medical claims in 12 months pre-diagnosis	↑22%
CCI=0	↓45%
CCI=1	16%
CCI=2+	18%
Hospitalization or walking aid or SNF or oxygen use or wheelchair use in 12 month pre period	28%
Visit to primary care physician 12 months before diagnosis	↓60%
County-level	
Crime against person_factor1	↑0.837
Crime against property_factor2	↑0.157
Generalized crime against person_factor3	↑0.306
Facilities_factor4	0.078
Services_factor5	-0.130
Percent Population below poverty level 1999 (1 if >75th percentile)	↑49%
Educational attainment - persons 25 years and over completing less than 9th grade 2000 >75th pcntl	24%
Occupied housing units with no vehicles available 2000 (sample) >75th pcntl	↑58%
Occupied housing units with no telephone service available for 2000 (sample) >75th pcntl	↑52%
White sample (N=4,392)	
Patient-level	
Receipt of ADT, chemotherapy, or XRT	↑80%
Receipt of ADT	↑76%
No medical claims in 12 months pre-diagnosis	↓11%
CCI=0	↑55%
CCI=1	20%
CCI=2+	15%
Hospitalization or walking aid or SNF or oxygen use or wheelchair use in 12 months pre period	25%
Visit to primary care physician 12 months before diagnosis	↑69%
County-level	
Crime against person_factor1	↓-0.148
Crime against property_factor2	↓-0.027
Generalized crime against person_factor3	↓-0.045
Facilities_factor4	0.071
Services_factor5	0.106
Percent Population below poverty level 1999 (1 if >75th percentile)	↓24%
Educational attainment - persons 25 years and over completing less than 9th grade 2000 >75th pcntl	24%
Occupied housing units with no vehicles available 2000 (sample) >75th pcntl	↓19%
Occupied housing units with no telephone service available for 2000 (sample) >75th pcntl	↓23%

*Includes W non-Hispanic, AA non-Hispanic, and other race/ethnicity groups
↓: this value is lower than the value for the full sample
↑: this value is higher than the value for the full sample
SNF: Skilled Nursing Facility
CCI: Charlson Comorbidity Index
ADT: androgen deprivation therapy
XRT: radiation therapy

Figure 1: Crime factor vs. race (row percent)

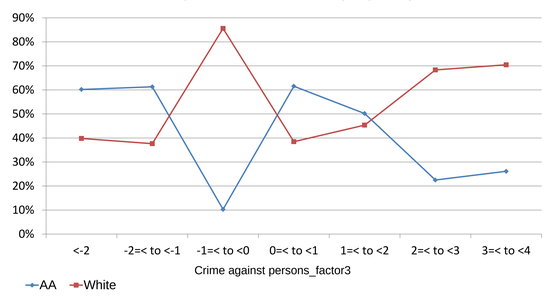

Figure 2: Crime factor vs. receipt of either ADT or chemo or XRT post-diagnosis, by race (row percent)

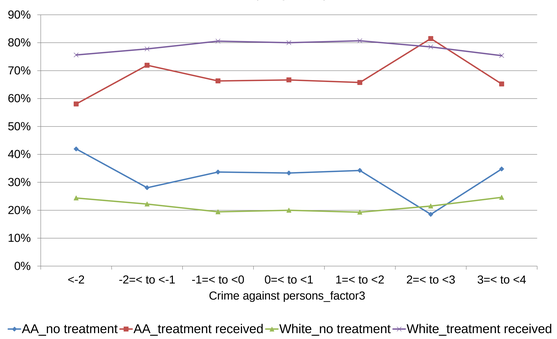

Table 2: Logistic regression models of treatment receipt, stratified by specialist visit during follow up period (N=5,458)

	Sample with no specialist visit post-diagnosis (N=1,126)		Sample with specialist visit post-diagnosis (N=4,332)	
Variables*	**Unadjusted**	**Adjusted**	**Unadjusted**	**Main effects**
African-American, non-Hispanic	0.57 (0.37 - 0.83)**	0.75 (0.46 - 1.22)	0.45 (0.34 - 0.59)**	0.45 (0.32 - 0.66)**
Other		0.50 (0.16 - 1.55)		1.32 (0.6 - 2.91)
White, non-Hispanic (ref)				
Factor 1: Crime against person		0.90 (0.67 - 1.16)		1.09 (0.89 - 1.32)
Factor 2: Crime against property		0.88 (0.72 - 1.06)		0.97 (0.83 - 1.14)
Factor 3: Generalized crime against person		0.96 (0.79 - 1.15)		1.19 (1.02 - 1.40)*
Married		1.48 (1.08 - 2.02)*		1.46 (1.14 - 1.88)**
Not married (ref)				
Poorly or un- differentiated tumor		2.86 (2.07 - 3.95)**		1.72 (1.34 - 2.20)**
Well or moderately differentiated tumor (ref)				
CCI = missing		0.32 (0.19 - 0.56)**		0.34 (0.23 - 0.53)**
CCI = 1		0.83 (0.54 - 1.28)		0.64 (0.46 - 0.9)*
CCI = 2+		0.72 (0.43 - 1.19)		0.51 (0.36 - 0.74)**
CCI = zero (ref)				
Age 70-74		0.53 (0.28 - 1.01)		0.69 (0.41 - 1.16)
Age 75-79		0.65 (0.36 - 1.18)		0.45 (0.28 - 0.73)*
Age 80-84		0.55 (0.31 - 0.98)*		0.45 (0.27 - 0.73)*
Age 85+		0.47 (0.27 - 0.83)**		0.28 (0.17 - 0.45)**
Age <70 (ref)				
Hospitalization or walking aid or SNF or oxygen use or wheelchair use in 12 month pre period		0.73 (0.48 - 1.09)		0.59 (0.43 - 0.8)**
No hospitalization, SNF, walking aid, wheelchair, or oxygen use in 12 month pre-period (ref)				
Visit to PCP in 12 months before PCa diagnosis		1.61 (1.06 - 2.44)*		1.26 (0.91 - 1.74)
No visit to primary care physician in 12 months before PCa diagnosis (ref)				
Proportion (mean centered) speaking English not well or not at all in census tract		0.996 (0.976 - 1.016)		0.98 (0.97 - 0.99)**
Median income (standardized) for the census tract		1.14 (0.92 - 1.4)		0.95 (0.82 - 1.11)
Model fit statistics				
c-statistic		0.73		0.74
Hosmer Lemeshow statistic (p-value)		7.1 (0.53)		11.5 (0.17)

*Additional covariates include: medicaid state buy-in, rural/urban residence, SEER region, diagnosis year and the following county-level fixed effects: number of facilities, number of services, poverty, low education, households with no telephone, households with no vehicle

Table 3: Adjusted odds and rate ratios of treatment receipt for African American patients compared to White patients, across levels of county-level crime

AA effect across levels of Generalized Crime against Person	**Logistic regression (Odds ratio)**	**Cluster-adjusted Logistic regression (Odds ratio)**	**Modified Poisson (Rate ratio)**
Lowest crime level	0.91 (0.38 - 2.2)	0.91 (0.4 - 2.06)	0.96 (0.89 - 1.04)
Q1 crime level from AA sample	0.48 (0.33 - 0.71)**	0.48 (0.34 - 0.70)**	0.94 (0.90 - 0.97)**
Q1,Q2,Q3 crime level from White sample	0.46 (0.32 - 0.68)**	0.46 (0.33 - 0.66)**	0.94 (0.90 - 0.97)**
Avg crime level from White sample	0.45 (0.31 - 0.65)**	0.45 (0.32 - 0.63)**	0.94 (0.90 - 0.97)**
Avg crime level from AA sample	0.41 (0.28 - 0.60)**	0.41 (0.3 - 0.57)**	0.93 (0.90 - 0.97)**
Q3 crime level from AA sample	0.28 (0.15 - 0.53)**	0.28 (0.17 - 0.46)**	0.92 (0.88 - 0.96)**
Highest crime level	0.14 (0.04 - 0.55)**	0.14 (0.05 - 0.41)**	0.90 (0.81 - 0.99)**
Model fit statistics: main effects only			
AIC	2099.1116		
AICC	2100.2595		
BIC	2411.2798		
QIC		2077.2976	117918.7592
QICu		2099.181	117922.3204
Model fit statistics: main effects + interaction terms			
AIC	2099.3786		
AICC	2100.6216		
BIC	2424.2883		
QIC		2076.2239	117868.6374
QICu		2099.4478	117869.5417

Q1: 25th percentile; Q2: median; Q3: 75th percentile

Results

- Application of the inclusion and exclusion criteria resulted in 5,458 patients.
- Average age in the sample was 78 y, 81% were W and 15% were AA.
- **22% of men diagnosed with M1 PCa did not receive androgen deprivation therapy (orchiectomy or luteinizing hormone-releasing hormone), chemotherapy, or radiation therapy at any time during follow up**: 34% among AA and 20% among White men.
- The proportion of men who did not receive any treatment (22%) varied with whether or not the patient visited a cancer specialist following diagnosis: 7% vs. 78%; p<0.001.
  - o Proportion not receiving treatment among those with at least one specialist visit post-diagnosis (7%) varied according to AA/non-AA race: 13% vs. 6%; p<0.001.
  - o Proportion not receiving treatment among those with no specialist visit post-diagnosis (78%) varied according to AA/non-AA race: 85% vs. 76%; p=0.003.
- **AA men live in counties with higher levels of crime, facilities, services, individuals below poverty level, individuals with less than 6th grade education, households with no telephone, households with no vehicle (Table 1, Figure 1).**
- **Among individuals with no specialist visit following diagnosis with M1 disease (Table 2):**
  - o There was no AA/W disparity in treatment receipt.
  - o Pre-diagnosis contact with a primary care physician was statistically significantly associated with higher odds of treatment receipt.
  - o The covariate-adjusted odds of treatment receipt were lower among African Americans compared to Whites (Tables 2 and 3) and varied with the level of the county-level generalized crime factor against persons.
  - o The covariate-adjusted rate of treatment receipt was lower among African Americans compared to Whites but did not differ by the level of the county-level generalized crime factor against persons (Table 3).

Discussion

- In seeking to understand race disparities in treatment receipt, it may be important to consider the role of community characteristics (e.g. crime levels) in determining willingness to travel outside the home to seek and receive treatment.
- Among individuals with a post-diagnosis specialist visit:
  - o We find that AA with stage IV M1 disease were statistically significantly less likely to receive any treatment including androgen deprivation therapy, radiation therapy, or chemotherapy.
  - o **The disparity in treatment receipt was lowest among individuals living in low crime counties and increased in monotonic fashion as we considered individuals living in counties with higher crime levels (Table 3)**.
  - o We also find that AA live in counties with higher levels from crime.
  - o Results suggest that crime against persons may affect patients' decisions related to treatment receipt despite the diagnosis of metastatic disease and that crime against persons may in part explain differences between AA and White patients in terms of the likelihood of treatment receipt.
- The use of the county as the area level may be most appropriate for representing the level at which resource allocation decisions regarding the provision of public services are made. However, from the individual's perspective, the county may be too broad an area for examining the role of crime and, if true, would lead to a dampened effect in our models for treatment receipt.

Conclusions

- More than one-third of African American patients with metastatic prostate cancer do not receive any treatment, including hormone therapy. This is compared to one-fifth of White patients with M1 disease. The disparity persists despite specialist contact following diagnosis with metastatic disease.
- Primary care physician contact prior to PCa diagnosis was particularly important for treatment receipt among those with no specialist contact following PCa diagnosis.
- Among those with specialist contact post-diagnosis, results suggest that crime characteristics may help explain AA/White differences in the likelihood of treatment receipt. Additional research at smaller area-levels will be needed to further investigate the potential role of crime in exacerbating AA/White disparities in treatment receipt.
- Crime levels may proxy for other community characteristics thus a better understanding of the role of community-level factors in mediating treatment-related decision making among individuals with specialist contact can help guide service delivery aimed at reducing the AA/W treatment gap among men diagnosed with metastatic disease.

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