

# Exploring the causes of discrepancies in prostate cancer incidence and mortality in White and Black men

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## Abstract

**Background:** Prostate cancer (PCa) is an over-proliferation of cells of the prostate gland. It is the most common male reproductive malignancy, with an incidence rate of 119.8 per 100,000 males in the United States. Studies have shown that the incidence and mortality rate of PCa varies depending on race. More specifically, it has been suggested by several studies that Black men are more likely to die and develop PCa than any other race, followed by White Men.

**Objectives:** To explore the underlying causes of discrepancies in PCa incidence and mortality in men. Specifically, its increased levels in Black men compared to White men in North America.

**Methodology:** A structured literature review was conducted using the PubMed database. Limits were applied to include only English peer reviewed articles from 2007 to 2017 to ensure the highest accuracy and relevancy of information. The following search terms were used to narrow the search: Prostate Cancer, Black, and White.

**Conclusion:** Efforts to minimize PCa racial disparities should focus on socioeconomic factors, rather than genetic or biological factors.

## Background

Prostate cancer (PCa) is the most common male reproductive malignancy and the major cause of cancer deaths<sup>1</sup>. Studies indicate that at least 1 in 7 men will develop PCa once during their lifetime and that 1 in 27 men of those with PCa will die<sup>2</sup>. Some of its risks factors are race, family history and most importantly age<sup>1,3</sup>. Therefore, it is well established that PCa is affected by genetic and environmental factors<sup>1</sup>. The incidence of PCa in 2014 in White men was 90 per 100,000, while in Black men it was 150 per 100,000<sup>4</sup>. Further, the mortality rate in Black men is 2.5 times higher than White men, resulting in a mortality of 39 per 100,000 and 19 per 100,000 respectively<sup>4</sup>. However, these rates vary between countries due to their access to oncologic care and prostate-specific antigen (PSA) screening<sup>1</sup>. Nonetheless, the survival of patients with PCa has improved over the years due to new health technology advancements<sup>1</sup>.

## Research Question

What are the causes of discrepancies in PCa incidence and mortality in White and Black men in North America?

## Methods

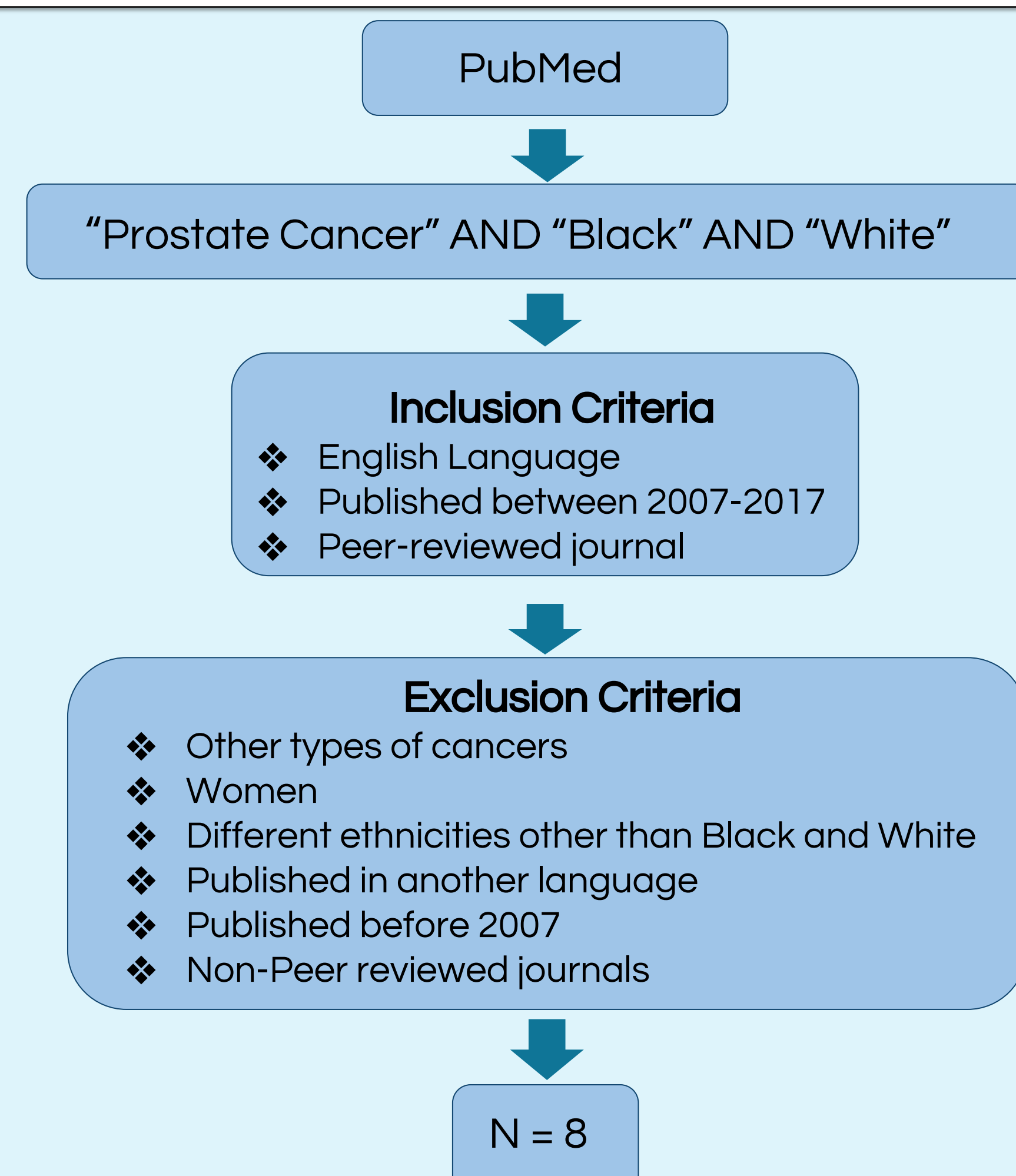


Figure 1. Methodology of literature review of the causes of discrepancies in prostate cancer incidence and mortality in White and Black men

## Results

Study Design and Authors	Population Studied	Measurements and Statistical Analyses	Study Findings
A cross-sectional analysis by <b>Albano et al. (2007)</b> <sup>5</sup>	- 137,708 deaths of PCa from NCHS database using the ICD-10 - White: n=118,255 - Black: n=22,670	- Cancer death rates in Black and White men with 12 or fewer/more years of education were analysed using relative risk (RR) estimates	- Higher education resulted in a decrease in mortality of PCa among Blacks - Racial disparities in PCa mortality can be attributed to access to medical care, lack of health insurance, exposure to cancer risk factors (smoking, obesity), work conditions, wealth, and cancer screening frequency
A retrospective cohort study by <b>Carpenter et al. (2011)</b> <sup>10</sup>	- 18,067 men from SEER database between 1994-2002 - White: n=15,219 - Black: n=2,848	- Multivariate logistic regression was used to examine associations between race, screening interval, and cancer stage at diagnosis	- Blacks had longer PSA screening intervals than Whites - Controlling for PSA screening interval resulted in reduced relative odds of advanced PCa in blacks, to the point of being no longer being statistically different to that of Whites
A cross-sectional analysis by <b>Cheng et al. (2009)</b> <sup>11</sup>	INCIDENCE - 98,484 men from SEER database between 1998-2002 Mortality - 8,997 men from SEER database between 1991-2001	- SES quintile-specific incidence and mortality rate ratios (RR)	- Blacks had higher PCa mortality rates than Whites when adjusted for age and SES - Higher PCa incidence can be attributed to variation in access and utilization of health services, such as PSA testing - Lower mortality rates in higher levels of SES can be attributed to lifestyle and environmental factors
A systematic review by <b>Kheirandish et al. (2011)</b> <sup>6</sup>	- 25 studies (19 cross-sectional, 6 cohort)	- Pubmed and Medline databases - Literature search of English peer reviewed studies relevant to prostate cancer risk, incidence, prevalence or mortality, and race	- Environmental factors such as SES and diet influence PCa incidence rate - Equal access to urological services can result in equal PCa treatment and prevention outcomes - Although possible genetic mutations have been identified, this area needs further exploration
A meta-analysis study by <b>Robbins et al. (2007)</b> <sup>7</sup>	- 122,374 men from SEER database between 1995-2004 - White: n=108,067 - Black: n= 14,307	- Prognostic factors of Black and White men were compared using Student t test or Pearson chi-square test - Proportional hazards assumption for Black and White men were confirmed using Kaplan-Meier plots of survival (S) versus time (T) - The effect of race on survival was assessed using the Cox proportional hazards model	- Blacks were more likely to be diagnosed with PCa at a later stage than Whites, which leads to poorer survival - Racial disparities can be attributed to PCa screening awareness, access to screening programs, health insurance status
A cross-sectional analysis by <b>Schwartz et al. (2009)</b> <sup>12</sup>	- 8,679 Detroit-area men between 1988-1992 - White: n=1,930 - Black: n=6,749	- Mantel-Haenszel chi-square statistics were used to compare the distributions of demographic and clinical characteristics in blacks and whites - Cox regression was used to estimate hazard ratio of death from any cause and death from PCa	- Blacks were more likely to receive non-surgical treatment compared to Whites - Blacks have poorer PCa survival rates than Whites - Blacks receive fewer definitive PCa treatment (ie. surgery) after diagnosis compared to Whites
A retrospective cohort study by <b>Taksler et al. (2012)</b> <sup>8</sup>	- 77,038 men from SEER database between 1995-2005 - White: n=1,930 - Black: n=6,749	- Racial differences were tested using Pearson chi-square or student t test	- Older Black men receive less frequent PSA screening, more advanced tumors, and have lower SES, which can partly explain their higher PCa mortality rate - Accounting for these factors still leaves a large difference in mortality rate between Blacks and Whites
A retrospective cohort study by <b>Taksler et al. (2013)</b> <sup>9</sup>	INCIDENCE - 906,381 men from SEER database between 2000 and 2009 - White: n= 773,964 - Black: n= 132,417 MORTALITY - 288,874 men from NVSS database - White: n=239,689 - Black: n=49,185	- Racial differences were tested using Student t test or Pearson chi-square test - Multivariate regression was used to study the association between UC index and PCa incidence and mortality	- Blacks often lack the ability to obtain minimum RDA of vitamin D from sunshine due to dark skin tone which can partly explain their higher PCa incidence rate - However, racial differences in PCa incidence and mortality rates decreased for both Whites and Blacks in countries with higher UV radiation from sunshine

## Discussion

### Key Findings

- The discrepancies in PCa incidence and mortality in White and Black men can be divided into several categories.
- Socioeconomically, Black men have lower socioeconomic status (SES) than White men in general<sup>5,6</sup>. This, along with having less education<sup>5</sup>, insurance<sup>5,7</sup>, and worse work conditions<sup>5</sup> is associated with more advanced tumors<sup>8</sup>, as well as higher incidence and mortality rates in Blacks<sup>5</sup>.
- In terms of personal factors, studies suggest that Blacks are exposed to more cancer risk factors like smoking, obesity, and high risk diets compared to Whites<sup>5</sup>. Genetically, Blacks receive less vitamin D, which is a PCa risk factor, due to having increased melanin. However its effects are minimal<sup>9</sup>. Additionally, there is a possibility that genetic factors may be involved, however, more research is needed<sup>6</sup>.
- Blacks also have fewer protective factors with regards to PCa. Studies suggest that Black men receive less frequent PSA testing<sup>5,8,10</sup>, more late stage diagnosis than early stage<sup>7</sup>, less access to healthcare<sup>3,7,11</sup>, and more non-surgical treatments compared to White men<sup>12</sup>. These factors all increase the risk of PCa.
- Accounting for these factors, it is believed that differences in treatment relating to socioeconomic disparity accounts for the racial discrepancies in PCa incidence and mortality rates in White and Black men, rather than genetic differences<sup>6</sup>.

### Limitations

- Categorization by race is challenging because it is confounded by various factors such as social class. These confounders may not be measured with equal validity across racial groups.
- The definition of White and Black are not well defined among studies. It is unclear whether participants self-identified or were sorted according to judgement of the researchers. Thus, a standardized definition would be helpful for decreasing bias.

### Future considerations

- There remains a lack of knowledge in the genetic differences between racial groups in regards to PCa.
- The socioeconomic differences between Black and White men with PCa should be considered in a clinical setting. For example, healthcare workers should be aware that Blacks are more likely to have less insurance, thus being more likely to refuse expensive treatment.
- Future health research should focus on increasing the the equal access of PCa diagnostic test and definitive treatment availabilities for all people.

## Conclusion

Both incidence and mortality of PCa in Black men are higher than in White men mainly due to factors relating to socioeconomics. Genetic factors may play a role, but more research is needed. In order to improve PCa outcomes, treatment disparities should be addressed, as well as other factors associated with SES disparity.

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