



# **Pervasiveness of Prostate Cancer in Afro-American Men**

## **Pathology Paper**

Dr. Catherine Kemp  
Anatomy and Physiology  
February 10, 2017

Daniel James  
djames@andover.edu

This paper examines the increasing prostate cancer incidence amongst African-American males and addresses the many factors that play a role in this trend.

Daniel James II  
Biology 582: Anatomy and Physiology  
Dr. Catherine Kemp  
February 10, 2017

## **“Pervasiveness of Prostate Cancer in Afro-American Men”**

### **Abstract**

In this examination of increased prostate cancer incidence in African American men, I sought to address how factors such as race, class, and social stigma serve as integral components of addressing this issue, and most importantly, how failing to acknowledge differences between white and black male physiology leaves a historically unsound assumption unaddressed. The imperative need to address this issue and seek solutions for this disease lie in its pervasiveness in the African American community, as well as the traumatic effects that neglecting to address this problem have caused in the black community, specifically amongst its males. My approach to confronting this topic in writing this essay is to first establish the differences between white and black male physiology, and then show how neglecting to acknowledge these dissimilarities also exacerbate additional factors such as racial bias, and socioeconomic status. My studies have shown that an amalgamation of the aforementioned factors support an increase in prostate cancer incidence amongst black males. This implicates a need for change in the ways that prostate cancer is treated and diagnosed in black men as opposed to white men, and this rate of cancer incidence support a further inquiry into social factors that contribute to this increase prostate cancer incidence in black men as well.

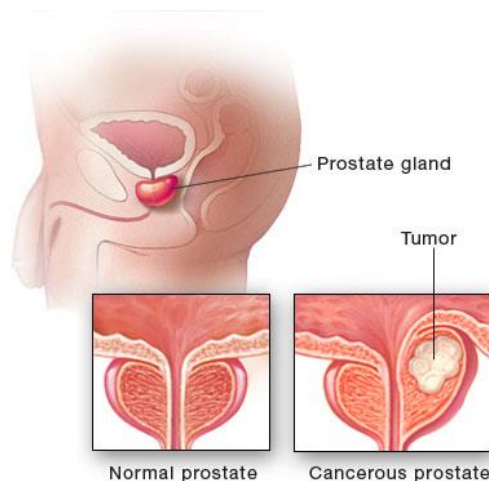
\*African Americans can also be referred to as Afro-Americans, as well as Black Americans. You will find these terms used interchangeably simply for variation throughout this essay. These three terms denote an ethnic group with ancestry tracing back to any of the black racial groups of Africa.

### **Introduction**

Prostate cancer is described as a disease that affects the prostate gland, an organ found only in males, that produces seminal fluid and assists in the transportation of sperm through the urethra to the penis (**The American Cancer Society, ,2016**). When the prostate gland's cells begin to grow uncontrollably, it causes an enlargement of the prostate gland cells in the body (**Mayo Clinic Staff, 2016**). Prostate cancer, undoubtedly, has multi-various symptoms: frequent urination, including nocturia [*an impulse to awaken while asleep and urinate*], difficulty maintaining a steady flow of urine, hematuria [*emitting blood in urine*], and also dysuria [*discomfort during urination*]. There are many existing risk factors that increase the chances of prostate cancer in men including age, genetic inheritance, as well as obesity (**Miller and Hafez, 2003**).

**\*The photo below depicts an image of prostate gland, as well as the image of a normal prostate juxtaposed against a cancerous one ("Prostate Cancer", 2016).**

**[Image provided by the Mayo Clinic]**



An Italian anatomist by the name of Niccolo Masa was credited with being the first to describe a gland in males commonly known as the prostate gland. Following his discovery of the prostate gland in 1536 came a formal illustration of the prostate in 1538, completed by a fellow anatomist named Andreas Vesalius. However, the first diagnosis of prostate cancer occurred almost three centuries later, when a surgeon named J. Adams noticed a hard malignant tumor present on the prostate organ of a patient during examination in 1853 (**Denmeade and Isaacs,**

**2002**). Since Adam's discovery in 1853, prostate cancer has been detected and diagnosed using methods such as biopsies and Gleason scores (**Yaghi, 2015**).

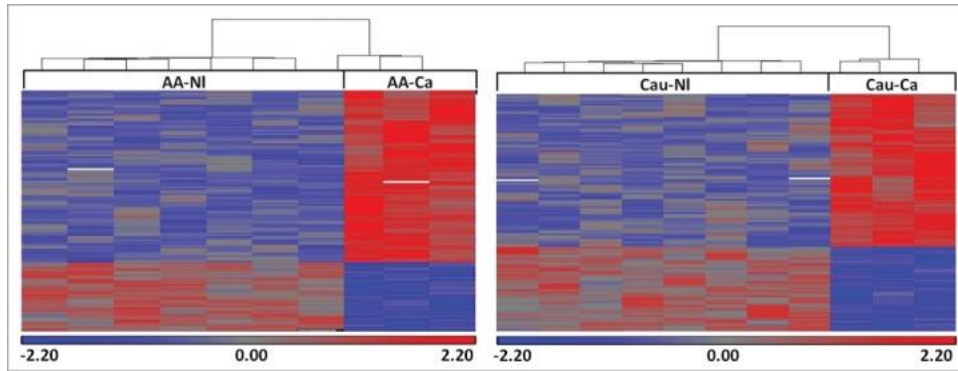
Since 1853, prostate cancer has become the most prevalent type amongst men, with over 180,000 men diagnosed annually, and an increasing mortality rate with over 31,000 deaths being accredited annually to this disease. However, further examination of this disease shows that the incidence of prostate cancer is 60% higher than that of white men, and the fatality rate is three times greater than that of white men (**Shenoy et al., 2016**). Research conducted by the Moffitt Cancer center supports factors such as socioeconomic status contributing to racial disparities in time between the initial diagnosis of this illness and the initial treatment (**Kelly et al., 2015**). Studies have also shown that the differences between white and black male physiology, specifically in gene methylation, androgen pathways receptors, as well as prostate tissue specific regulating cells, necessitate acknowledgement in diagnosis and treatment. These studies support racial disparities in prostate cancer fatality being linked to failure to acknowledge dissimilarities between white and black male physiology, as well as factors such as racial bias, socioeconomic status, and resulting social stigma in the black male community.

## **White vs. Black Male Physiology**

Understanding that there is a difference between the physiology of white males and African American males serves as a crucial part of grasping the increasing rate of prostate cancer incidence amongst black men. Howard University's Department of Biochemistry and Molecular Biology was one of the first to study the differences in DNA methylation in normal and tumor samples from prostate tissue in both African American men and white men. Studying the effects of DNA methylation is imperative in understanding genetic predisposition to cancer, because DNA methylation is strongly tied to the regulation of the genome structure modification. By adding a methyl group to CpG promoter sites, certain tumor suppressor genes are affected. Too much gene methylation, also known as hyper-methylation, is known to cause inactivation of tumor suppressor genes, and can lead to increased metastasis of cancer cells (**Kulis and Esteller, 2010**). They conducted this research in an attempt to study prostate cancer ethnic disparities, and how a biological predisposition to prostate cancer has contributed to this disparity. In this experiment,

this team of biologists utilized three matched pairs of normal and prostate cancer tissue samples from who from African American male and white male organ donors. However, in order to gather data regarding the varying methylated CpG sites (place in the nucleotide sequence where cytosine and guanine is separated by only one phosphate) in normal and prostate cancer tissue samples in black and white men, they used a technological device known as an Infinium Assay (**Devaney, 2016**). This device is used to collect numerical methylation data at a CpG site (**Illumina, 2017**). After selecting donor samples to test, this team used a method known as clustering, which made the comparison of genomic methylation level at CpG sites easier. Clustering from both Caucasian and African American indicated differences in individual prostate tissue samples. Despite the individual differences that occurred, however, the normal tissue samples from both African American men and white men grouped themselves, and the cancerous prostate tissue from black and white men clustered together as well. In other words, major differences were identified between the normal and the cancerous tissue sample groups, which consisted of black and white males, but major homogeneity existed within the individual groups of normal and cancerous tissue samples. As a result, huge comparisons were made between the CpG promoter sites of both African American and white men, which showed differentially methylated patterns in the genomes of these two races. This means that although the gene expression in African American and white males did not correlate with their DNA methylation changes in prostate tissue samples, DNA methylation could, in fact, increase the difference in aggressiveness of prostate cancer in African American males versus white males (**Devaney, 2016**). This experiment, in fact, supported a higher rate of methylation changes in black men as opposed to white men.

**\*An image of the clustering analysis of methylation findings from the Partek Genome software (Devaney, 2016). This clustering analysis shows the similarities within sample groups of African American cancerous tissues, for example, but there are different clustered patterns between the AA prostate cancer tissue and the Caucasian cancer tissue, indicating a difference in the DNA methylation patterns. This is a similar trend that can be seen for the normal tissue sample clustering between black and white men.**



One of The Howard University Department of Biochemistry and Molecular Biology's principal objectives in conducting this research is to demonstrate that differences in the genome of African American's versus white men biologically predisposes black men to a higher rate of prostate cancer. Furthermore, this research provides those responsible for diagnosing this illness with more insight into the genetics of black men, and demonstrates that the way prostate cancer has been diagnosed and treated necessitates further reevaluation.

Another study supported primarily by the Dillard Health Disparities Center attempted to examine the racial disparities in prostate cancer incidence between black and white men, based upon examining the effects of androgen receptor mutations on the black male body, and how this leads to higher rates of prostate cancer incidence in black men. Androgen receptors, in the male body, are proteins that play a key role in the sexual development of males, and most importantly, the development of the prostate gland. In this study, the effects of androgen receptor mutations or androgen activity on prostate cancer metastasis were studied, and therefore, this experiment focused on the prevalence of prostate cancer incidence amongst black men being linked to androgen receptor mutations (**Koochekpour, 2014**). In order to do so, this team of scientists compared the androgen receptor mutations in both African American men and white males, and they found that androgen receptor mutations were found at a higher rate in black men (**Koochekpour, 2014**). They used prostate tissue, both malignant and benign, and examined them for evidence of androgen receptor residual staining (**Koochekpour, 2014**). Ultimately, they discovered more AR staining present in African American male nuclei, yielding a higher rate of androgen receptor expression (**Koochekpour, 2014**). These results supported an increase in the metastasis of prostate cancer in black men as opposed to white men.

Now we have been able to establish both DNA methylation as a physiological difference between black and white men, as well as androgen receptor mutation. These two studies serve as a way of demonstrating that biological differences between black and white men serves as an integral component of the rate of prostate cancer incidence within the black male demographic, and that scientific research consistently is demanding that we amend the old methods of diagnosis and treatment of illness. An article published by Platform SINC states that the use of the white male body as the universal model for human beings presents a huge problem for study of anatomical physiology with regards to race, as well as for females (**Plataforma SINC, 2008**). This article also indicates that many scientists have described the white male body as the “apex” of evolution, which is in fact an untrue statement (**Plataforma SINC, 2008**). Using the white male body as the physiological template for examination, diagnosis, and treatment of illnesses have led to misconceptions concerning pathology, and reveals the racialized patterns that exist in the scientific community, as well as in the American populace as a whole.

## **Contributing Societal Factors**

The trends regarding racial disparities in prostate cancer between black and white men can also be accredited to the racial discrepancies between initial diagnosis and treatment of prostate cancer. This happens also to correlate with other factors such as socioeconomic and cultural factors. A study released by the Korean Continence Society addresses the racial disparities in prostate cancer treatment. This study was conducted with the objective of finding how different types of cancer treatments are offered to different races, and how higher incidence and mortality rates correlate. In this Selenium and Vitamin E Cancer Prevention Trial, a team of scientists attempted to use selenium and vitamin E as a preventative medicinal antidote to see if there would be a decrease in prostate cancer incidence. Consistently younger black men were found to be diagnosed with prostate cancer more than white men, and the stage at which they received care correlated to their socioeconomic status. They also found that cancer screening was more common in white men than black men, which also correlated heavily with factors of income. Similarly, when it comes to treatment of this disease, African Americans were found to

receive delays in treatment of their cancer, and they were geared toward receiving the similar sorts of treatments, such as external beam radiation therapy, and androgen deprivation therapy. Unlike black males, white males tended to receive prostatectomies. In a different study discouraging the use of prostate-specific antigen testing, also known as PSA testing, Dr. Laurel Trantham reports that almost 25% of African Americans did not receive PSA testing for almost a year after receiving their prostate cancer diagnosis. PSA testing is an examination that can measure the amount of prostate antigen [*foreign invaders in the body that are specific its location*] in the blood. If the amount of PSA in the prostate is severely high, this could indicate bacterial infections and of course, prostate cancer (**National Cancer Institute, 2017**). She also reported that the chances of white men receiving a PSA exam after receiving their initial diagnosis was higher than that of black men (**Pietro et al., 2015**). As aforementioned, factors concerning socioeconomic factors, including education and income, play an integral role in both the incidence of prostate cancer in black men.

Both of these studies shed light on how socioeconomic status often plays hand in hand with racial bias, even when it comes to preventative health measures. Failure to provide black American men with the same health facilities and medical treatments as their white counterparts has widened the disparity between their stage of diagnosis, their reception of treatment, as well as the black male's rate of prostate cancer incidence. The focal point of this inquisition has been the role that the healthcare system plays in tailoring the plan of treatment to suit the needs of the patient, and how often their refusal to acknowledge the disadvantages that many face in society is a result of the systematic subjugation of minority groups. Historically in the United States of America, African Americans, specifically males, have succumbed to ills of systematic oppression, which includes the huge gaps that exists between black men and other ethnicities. This includes their access to education, income, and health insurance, which has often been restricted, resulting in being unable to afford an adequate level of healthcare, and specifically treatment options when it comes to diseases such as prostate cancer. It is impossible to examine the racial disparities existing in prostate cancer incidence without examining the racial and socioeconomic bias that resides within the healthcare system, a system that ultimately reveres the privilege of white males, and denies black men the access to these advantages.



## Conclusion

The pervasiveness of prostate cancer amongst black men can be credited to scientist's use of white male physiology as a template for study of the body of the black male (**Plataforma SINC, 2008**), including other auxiliary factors such as racial bias (**Pietro et al., 2015**), as well as socioeconomic factors, significantly contribute to the incidence of prostate cancer amongst men of African descent. This issue has been one that has been often forgotten due to a lack of evidence, but is still one that needs to be addressed. This can be accredited to our society's deliberateness in working to dismantle the gender inequality in scientific study, but their subsequent negligence to acknowledge racial discrimination that exists in the study of scientific research, which brings me to the point of why I chose to explore the narrative of the African-American man. During the process of researching for this essay, it dawned on me that studying the trends amongst all minority men is unfeasible for two reasons: One being that the length of time provided to complete this research restricts the number of demographics that could be explored, and secondly, deciding to explore the disease of prostate cancer was a decision that relied on fact that people of African descent have historically succumbed to systematic oppression in the US, and that the narrative of the African American seems to be limited to illnesses such as hypertension or diabetes, which seemingly always has a stereotypical label of an unhealthy lifestyle attached. Being able to explore pathology from a lens of scientific research helped provide a full picture of the narrative of black male health. The outstanding evidence for the higher incidence of prostate cancer in African-American men presented in this essay reflects multiple biological factors as well as societal factors, and has pervaded the lives of many African American communities, and continues to violently take the lives of many African-American men as a result.

## References

- "About Prostate Cancer." *Prostate Cancer UK*. N.p., n.d. Web. 26 Jan. 2017. <http://prostatecanceruk.org/prostate-information/about-prostate-cancer>.
- Bosch AN, Goslin BR, Noakes TD, and Dennis SC. "Physiological Differences between Black and White Runners during a Treadmill Marathon." *European Journal of Applied Physiology and Occupational Physiology*. U.S. National Library of Medicine, n.d. Web. 12 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pubmed/2289500>.
- Brawley, Otis. "Prostate Cancer Screening; Is This a Teachable Moment?" *Prostate Cancer Screening; Is This a Teachable Moment?* N.p., n.d. Web. 12 Jan. 2017. <https://jnci.oxfordjournals.org/content/101/19/1295.full?sid=ffc19100-0b9b-467c-afea-11ff07afa005>.
- Denmeade, Samuel R., and John T. Isaacs. "A History of Prostate Cancer Treatment." *Nature Reviews. Cancer*. U.S. National Library of Medicine, May 2002. Web. 07 Feb. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4124639>.
- Devaney, JM, S. Wang, P. Furbert-Harris, V. Apprey, M. Ittmann, B-D Wang, J. Olender, NH Lee, and B. Kwabi-Addo. "Genome-wide Differentially Methylated Genes in Prostate Cancer Tissues from African-American and Caucasian Men." *Epigenetics*. Taylor & Francis, Apr. 2015. Web. 26 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4622564>.
- Farrell, James, Gyorgy Petrovics, David G. McLeod, and Shiv Srivastava. "Genetic and Molecular Differences in Prostate Carcinogenesis between African American and Caucasian American Men." *International Journal of Molecular Sciences*. Molecular Diversity Preservation International (MDPI), Aug. 2013. Web. 26 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3759870>.
- Gusev, A. ."Atlas of Prostate Cancer Heritability in European and African-American Men Pinpoints Tissue-specific Regulation." *Nature Communications*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27052111>.
- "Infinium Methylation Assay." *Infinium Methylation Assay | Interrogate Single CpG Sites*. N.p., n.d. Web. 08 Feb. 2017. <https://www.illumina.com/technology/beadarray-technology/infinium-methylation-assay.html>.
- Kelly SP, Rosenberg PS, Anderson WF, and Andreotti G. "Trends in the Incidence of Fatal Prostate Cancer in the United States by Race." *European Urology*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27476048>.
- Kinlock BL, Thorpe RJ, Howard DL, and Bowie JV. "Racial Disparity in Time Between First Diagnosis and Initial Treatment of Prostate Cancer." *Cancer Control : Journal of the Moffitt Cancer Center*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27009456>.
- Koochekpour, Shahriar, Erick Buckles, Mojgan Shourideh, SiYi Hu, Dhyan Chandra, Jovanny Zabaleta, and Kristopher Attwood. "Androgen Receptor Mutations and Polymorphisms in African

American Prostate Cancer." *International Journal of Biological Sciences*. Ivyspring International Publisher, 2014. Web. 26 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4062957>.

Krok-Schoen JL, Fisher JL, Baltic RD, and Paskett ED."White-Black Differences in Cancer Incidence, Stage at Diagnosis, and Survival among Adults Aged 85 Years and Older in the United States." *Cancer Epidemiology, Biomarkers & Prevention: A Publication of the American Association for Cancer Research, Cosponsored by the American Society of Preventive Oncology*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27528599>.

Kulis M., and Esteller M."DNA Methylation and Cancer." *Advances in Genetics*. U.S. National Library of Medicine, n.d. Web. 23 Feb. 2017. <https://www.ncbi.nlm.nih.gov/pubmed/20920744>.

Li J, Thompson TD, Richards TB, and Steele CB. "Racial and Ethnic Differences in Health Behaviors and Preventive Health Services Among Prostate Cancer Survivors in the United States." *Preventing Chronic Disease*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27442995>.

Orom H, Sharma C, Homish GC, Underwood W. "Racial Discrimination and Stigma Consciousness Are Associated with Higher Blood Pressure and Hypertension in Minority Men." *Journal of Racial and Ethnic Health Disparities*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27800597>.

Pietro GD, Chornokur G, Kumar NB, and Davis C. "Racial Differences in the Diagnosis and Treatment of Prostate Cancer." *International Neurourology Journal*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27915474>.

Plataforma SINC. "Medical Textbooks Use White, Heterosexual Men as A 'Universal Model'." ScienceDaily. ScienceDaily, 17 October 2008. [www.sciencedaily.com/releases/2008/10/081015132108.htm](http://www.sciencedaily.com/releases/2008/10/081015132108.htm).

Powell, Isaac J., Greg Dyson, Susan Land, Julie Ruterbusch, Cathryn H. Bock, Steve Lenk, Mehsati Herawi, Richard Everson, Craig N. Giroux, Ann G. Schwartz, and Aliccia Bollig-Fischer. "Genes Associated with Prostate Cancer Are Differentially Expressed in African American and European American Men." *Cancer Epidemiology, Biomarkers & Prevention : A Publication of the American Association for Cancer Research, Cosponsored by the American Society of Preventive Oncology*. U.S. National Library of Medicine, May 2013. Web. 26 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4097306>.

"Prostate Cancer." *Mayo Clinic*. N.p., n.d. Web. 07 Feb. 2017. <http://www.mayoclinic.org/diseases-conditions/prostate-cancer/basics/definition/con-20029597>.

"Prostate Carcinoma Presentation, Diagnosis, and Staging: An Update Form the National Cancer Data Base." *Cancer*. U.S. National Library of Medicine, n.d. Web. 07 Feb. 2017. <https://www.ncbi.nlm.nih.gov/pubmed/12973840>.

"PSA Test - National Library of Medicine - PubMed Health." *National Center for Biotechnology Information*. U.S. National Library of Medicine, n.d. Web. 23 Feb. 2017. <https://www.ncbi.nlm.nih.gov/pubmedhealth/PMHT0025306>.

Shenoy, Divya, Satyaseelan Packianathan, Allen M. Chen, and Srinivasan Vijayakumar. "Do African-American Men Need Separate Prostate Cancer Screening Guidelines?" *BMC Urology*. BioMed Central, 2016. Web. 22 Feb. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4862049>.

Vidal AC, Chen Z, Howard LE, and Moreira DM. "Racial Differences in Prostate Inflammation: Results from the REDUCE Study." *Oncotarget*. U.S. National Library of Medicine, n.d. Web. 15 Dec. 2016. <https://www.ncbi.nlm.nih.gov/pubmed/27494864>.

"What Is Prostate Cancer?" *American Cancer Society*. N.p., n.d. Web. 06 Feb. 2017. <https://www.cancer.org/cancer/prostate-cancer/about/what-is-prostate-cancer.html>.

*Wikipedia*. Wikimedia Foundation, n.d. Web. 26 Jan. 2017. [https://en.wikipedia.org/wiki/Prostate\\_cancer#Cell-of-origin](https://en.wikipedia.org/wiki/Prostate_cancer#Cell-of-origin).

Yaghi, Mohand Deeb, and E. O. Kehinde. "Oral Antibiotics in Transrectal Prostate Biopsy and Its Efficacy to Reduce Infectious Complications: Systematic Review." *Urology Annals*. Medknow Publications & Media Pvt Ltd, 2015. Web. 12 Jan. 2017. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4660689/>.