



Transdisciplinary Approaches to Ameliorating Racial Disparities in Prostate Cancer Outcomes

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Abstract

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Keywords

African American men; Health and race; Health disparities; Interdisciplinary research; Prostate – Cancer; Prostate cancer; Transdisciplinary research

Cover Page Footnote

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Abstract

Though prostate cancer is the second leading cause of cancer deaths among men in the US, it ranks first among African American men in terms of incidence, morbidity, and mortality. To address this and other complex health issues, some researchers advocate transdisciplinary research as a framework for analysis; however, few examples exist that indicate how the framework should be applied. This report uses prostate cancer outcomes as a paradigm to describe how such a framework can be used to identify determinants of racial disparities. By integrating diverse scientific disciplines, methods, and analytic approaches from psychology, sociology, epidemiology and genetics, health services, and information science, the environmental, behavioral, biological, sociological, and psychological factors that contribute to racial disparities can be identified. This framework can also be used to investigate the complex ways in which these factors interact and contribute to racial disparities in complex diseases like prostate cancer.

Key Words: transdisciplinary research, health disparities, prostate cancer

Introduction

Although rates of prostate cancer survival have increased and more than 90% of prostate cancer cases are now diagnosed in early or locally advanced stages, prostate cancer is the second leading cause of cancer mortality in men, accounting for nearly 30,000 deaths annually.¹ Rates of prostate cancer morbidity and mortality continue to be significantly higher in African American men than men from other ethnic and racial

groups.¹ For example, the age-adjusted incidence in African American men is 142.0 per 100,000 compared to 108.3 per 100,000 in Caucasian men.² Further, African Americans are most likely to be diagnosed at later stages and with more invasive disease,³⁻⁵ resulting in a two-fold difference between them and Caucasians in lifetime risk of prostate cancer mortality.^{2,6} This clear disparity, and the higher level of mortality relative to incidence, is of major public health importance and significant efforts are now being directed towards understanding the biological, behavioral, environmental, sociological, and psychological determinants of these disparities.

A survey of the published literature reveals that sociological, environmental, behavioral, biological, and psychological factors contribute to the series of events that unfold from prostate cancer screening to diagnosis, treatment, and clinical and psychological outcomes. However, the complex, dynamic interactions of these factors are not well understood. Considering these factors, and the ways in which they intersect in a transdisciplinary framework, may improve our understanding of their roles in influencing health outcomes in men diagnosed with prostate cancer and may also determine how differences in these factors lead to racial disparities in prostate cancer outcomes.

Transdisciplinary research is characterized by integrating the measures, methods, and theoretical perspectives from diverse scientific disciplines into a common conceptual framework for addressing a health issue or concern.^{7,8} This type of framework can be effective at addressing disparities in prostate cancer by simultaneously evaluating the effects of multiple determinants, especially those at different levels of analysis, on outcomes from disease.⁹ For instance, factors associated with the social environment (e.g., economic status, access to health care, and social isolation), the physical environment (e.g., location/type of residence, access to computer/online resources, or medical care setting), and individual-level variables (e.g., cultural beliefs and values, coping efforts) affect the entire continuum, from the practice of prostate cancer screening to the process of diagnosis and treatment to the quality of life during recovery. Put simply, these factors may affect whether a man submits to screening and, ultimately, his health outcome.

Psychological and behavioral factors—including attitudes, beliefs and practices concerning prostate cancer screening—may be associated with the probability that a man diagnosed with prostate cancer will have a poor outcome. For example, men who delay being screened, or whose tumors are diagnosed at more advanced stages, may have poorer prognoses than men who are screened regularly. The differential

between low- and high-quality treatment facilities and providers also may directly impact morbidity and mortality. Characteristics of prostate tumors may be dictated by biological events (including inherited genotypes) that may, in turn, predict the tumor's aggressiveness. Finally, the aggressiveness of prostate cancer tumors may influence psychological responses that affect quality of life.

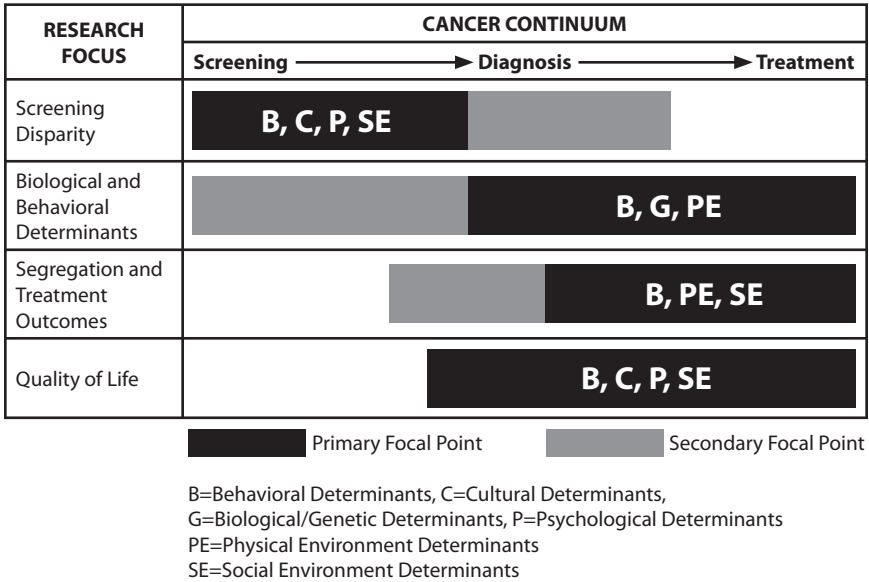
To date, a substantial amount of research has been conducted to characterize racial differences in prostate cancer and these studies have been critical to characterizing differences in prostate cancer morbidity and mortality between African American and Caucasian men. However, in most cases, determinants of racial differences in prostate cancer outcomes have been evaluated in isolation, without consideration of the ways in which behavioral, biological, environmental, sociological, and psychological factors may interact. Using a transdisciplinary framework, the Penn Center for Population Health and Health Disparities (CPHHD), funded by the National Cancer Institute, evaluated the complex ways in which sociological, physical, psychological, behavioral, and biological factors interact to contribute to racial differences in prostate cancer outcomes between African American and Caucasian men (Figure 1). The purpose of this report is to describe a framework that can be used to evaluate determinants of disparities in prostate cancer outcomes through transdisciplinary research, such as that being undertaken at the Penn CPHHD. We also discuss the implications of this approach for addressing disparities in prostate cancer morbidity and mortality.

Prostate Screening Disparity: Factors and Interventions

There is a clear disparity in prostate screening between Caucasian and minority (particularly African American) men. While the rates of annual screening have stabilized in the former, they have yet to do so in the latter.¹⁰ Considerable research has been devoted to explaining this disparity, mostly focusing on patients, but has yielded contradictory results.

There are at least two plausible explanations for the disparity in prostate cancer screening rates. The first is racial differences in knowledge, which has been shown to be an important predictor of screening participation.¹¹ African American men generally have poor knowledge of prostate cancer¹² and are less likely to identify the early symptoms of prostate cancer and the components of a prostate examination.¹³ Yet neither African American nor Caucasian men seem to understand their level of personal risk for prostate cancer,¹⁴ nor are they aware that African Americans are at greater risk for prostate cancer.¹⁵⁻¹⁷

Figure 1. Transdisciplinary Research to Address Racial Disparities in Prostate Cancer Outcomes



In both groups, poor knowledge about prostate cancer is correlated with low literacy and low educational level.¹⁸⁻²⁰ An additional correlate of knowledge, and subsequently, cancer survival, is socioeconomic status (SES). Stage of disease at detection is inversely correlated with income and insurance status,¹⁶ and younger men on Medicaid have the greatest risk of late-stage detection and death.²² Another correlate, literacy, is a strong predictor of participation in prostate screening.²⁰ Among men of lower SES, both African Americans and Caucasians exhibit lower literacy,²³ and this disparity is more pointed when one considers the disproportionate poverty burden that African American men experience.

A second explanation for the disparity in screening rates is the presence of various barriers to screening experienced disproportionately by African American men.²⁴ These can be characterized as physical barriers such as access to screening^{21, 25} or lack of transportation,²⁶ or psychological barriers such as attitudes and beliefs that manifest as screening avoidance behavior.²⁷ Beliefs and attitudes toward prostate screening have been studied extensively in African American men, and several themes have emerged from this research that may explain these differences. One such theme is fatalism—the belief that prostate cancer is unavoidable or that diagnosis is tantamount to a death sentence.²⁸⁻³⁰ A related attitude is optimism that prostate cancer is not a problem until

one is symptomatic.^{30,31} A second theme is fear of screening procedures and outcomes,³² which nurtures negative perceptions toward screening.³⁰ Several studies have found that, even when African American men are knowledgeable about prostate cancer, they fear treatment or outcome to the extent that they avoid screening.^{28,29,32} Related themes of shyness and embarrassment, may²⁶ or may not³⁰ be associated with screening behavior, but they have been shown to explain the belief that a digital rectal exam (DRE) is not necessary, which subsequently provides a rationale for avoiding screening.³³ A final theme is mistrust of the medical establishment.^{29,30} In general, African American men perceive that their access to health care is limited.³⁴ Compared to Caucasians, African American men have reported that they are less likely to see a physician when they are sick.³⁰ Yet, when asked for their preference, African American men are more likely to seek prostate cancer screening in private appointments rather than mass screening settings.³⁵ African Americans are also more likely to be screened if they understand, and believe in, the screening procedure.³⁶ This, in turn, may be affected by the practitioner's own knowledge of screening, which in inner-city settings has been shown to be inconsistent.³⁷

Although use of screening for prostate-specific antigen (PSA) has not been specifically evaluated by patient–physician racial concordance, difficulty establishing effective relationships and communication with providers, or lack of cultural competence,³⁸ may be an additional barrier to prostate cancer screening among African American men. Prior studies have shown that racial concordance with physicians is associated with greater satisfaction, higher ratings of care, and more favorable assessments of participatory behaviors among physicians.^{39,40} Recent work has also shown that health care visits are less patient-centered with African Americans.⁴¹ The paucity of African American physicians prevents most African American men from having a racially concordant relationship with their physician which may lead to further avoidance behavior.

All of these themes are manifest in screening avoidance behaviors, such as procrastination and refusal, which may well be justified if men do not know the type of practitioner to visit for screening, do not know where to go for screening, do not know how to make an appointment, forget to make an appointment, or have a work schedule that conflicts with physicians' office hours.^{25,42} However, African American men generally are willing to participate in annual prostate screening if it is available, convenient, and recommended by their practitioner.^{17,29,40} The latter point concerns the quality of the patient–provider relationship

and is critical to explaining further why men do or do not participate in screening.

Men most likely to be screened are those whose doctors discuss screening with them, those who know someone with cancer, are in the middle socioeconomic strata, are married (or have another female family member who supports screening), have at least a high school education, or are affiliated with a church or other religious entity.^{30, 43-45} However, only 67% of men aged 50–74 who were screened for prostate cancer report that their practitioner ever discussed prostate cancer screening tests.⁴⁶ Furthermore, as many as 34% of physicians do not discuss screening for prostate cancer with their patients, usually due to lack of intention to order the test or confusion or controversy about the test's detection accuracy.⁴⁷ Practitioner reticence with regard to prostate screening discussions excludes the patient from what should be a shared process in a potentially complex decision.^{48,51}

Transdisciplinary Approaches to Addressing Disparities in Screening

To address these issues, transdisciplinary research must examine the degree of disparity in screening discussions between African American and Caucasian patients and their physicians. This type of research should integrate qualitative and quantitative methods to identify communication barriers and facilitators to prostate cancer screening among patients and providers. Because patient and provider factors are both important to screening behaviors, research also must incorporate constructs from diverse theoretical models of health behavior. For example, investigators at the Penn CPHHD are conducting semi-structured interviews with men and chart-stimulated interviews with physicians to ascertain beliefs and attitudes—and among physicians, practices—that may indicate disparities in the frequency and quality of these discussions. In addition, analysis of patient encounters in primary care practices is being conducted to evaluate the ability of patients to recall the details of what they discussed with their physician about prostate cancer screening. To facilitate the development of interventions that reduce disparities in prostate cancer screening, this research incorporates conceptual frameworks of individual and physician behavior related to disease prevention (e.g., Systems Model of Preventive Care)⁵² to identify the most important factors to address. The psychosocial and behavioral factors that contribute to patient–physician screening discussions are integrated into a comprehensive intervention delivered in health care settings. The information obtained as a result highlights how discussions about options for early detection can be more effective.

Biological and Behavioral Predictors of Prostate Cancer

While prostate cancer screening plays an important role in identifying men with disease, a sizeable proportion of prostate tumors may exist without producing symptoms.⁵³⁻⁵⁵ Only a few factors thought to be involved in prostate cancer etiology explain the large variations in prostate cancer rates observed between African American and Caucasian men. Diet, alcohol, and smoking are common exposures implicated in prostate cancer risk and may also vary substantially across racial or ethnic groups. The association of increased prostate cancer risk with dietary fat consumption is fairly consistent across studies.⁵⁶ Similarly, smoking and alcohol have biologically plausible roles in prostate cancer etiology based on their ability to modify hormone metabolism.^{57, 58} While many early studies found no link with smoking, more recent evidence from a large cohort study provides some support for this hypothesis.⁵⁹ In contrast, this same study found no association with alcohol consumption.

Genotypes represent another major class of factors thought to be involved in prostate cancer etiology that may differ across populations. For example, the allele frequencies in candidate prostate cancer susceptibility genes such as CYP3A4 and SRD5A2⁶⁰ differ substantially by race. However, the racial differences in genotype frequency have yet to explain the observed racial differences in risk. This is an important area of ongoing research. A combination of environmental exposures and inherited genotype may likely explain prostate cancer risk and variability in risk across racial or ethnic groups. Genotype information may affect disease outcome through at least two different means. First, inherited genotype data may influence the natural history of disease by acting directly in tumor etiology. For example, inherited genotypes may influence tumor histopathology including the stage or grade of disease, the rate of disease progression, or the propensity for metastasis. Second, inherited genotype may influence an individual's response to either chemoprevention or the pharmacological treatment of disease. For example, inherited genotypes may influence the bioavailability of a chemopreventive or chemotherapeutic agent, or it may predict the occurrence of toxicities that may influence an individual's cumulative timing or dose of exposure. Some genes could conceivably affect natural history and treatment response.

Testosterone is a major determinant of prostate growth and differentiation.⁶¹ Numerous lines of evidence support the role of androgen metabolism in prostate cancer etiology. Circulating levels of androgens have been reported to be higher in populations at increased

prostate cancer risk, including African American men,⁶² and lower in populations at decreased prostate cancer risk, including Chinese men.⁶³ Although serum levels of testosterone do not correlate well with prostate cancer risk,^{64, 65} serum levels of DHT and other testosterone metabolites do correlate with prostate cancer risk.^{62, 64, 65} Abundant clinical evidence relates androgens to the growth and development of prostate cancers. Androgen ablation in men with hormone-sensitive prostate cancers reduces tumor size and decreases the associated disease burden.^{61, 66} This suggests that the disposition of testosterone may be important in determining prostate cancer risk. Testosterone bioavailability is determined in part by a number of pathways. These include cytochrome P450 IIIA4, encoded by CYP3A4; the 3 α - and 3 β -hydroxysteroid dehydrogenases, encoded by HSD3A and HSD3B2; and the cytochrome P450 CYP19 (aromatase). Androgen disposition pathways that may affect the bioavailability of testosterone may also affect the growth and differentiation of prostate tumors. Each of the major pathways of testosterone disposition is regulated by the activity of at least one cloned gene with known polymorphic variation. In most cases, genotypic variability also correlates with relevant phenotypes or disease etiology.

Transdisciplinary Approaches to Linking Genetic and Environmental Factors in Prostate Cancer

Knowledge of genetic biomarkers related to prostate cancer has the potential to improve our understanding of disparities in cancer etiology, prognosis, and treatment. The identification of genetic risk factors that lead to cancer disparities may hallmark modifiable exposures or circumstances that could result in improved cancer detection, prevention, or treatment strategies. Similarly, prostate cancer disparities may result from innate biological susceptibility in conjunction with environmental exposure that accumulate over time to increase prostate cancer risk. These environments may include individual diet, lifestyle, smoking or other exposures, but could also extend to unfavorable social, environmental, or health care influences that affect prostate cancer outcomes differently in African American men than Caucasian men.

To develop strategies that identify candidates for morbidity- and mortality-avoidance interventions, transdisciplinary research must examine the influences of biological, behavioral, and environmental determinants of prostate cancer treatment outcomes. To address this issue, investigators at the Penn CPHHD are evaluating of the effect of androgen metabolism on biochemical relapse-free survival in African American and Caucasian men who undergo prostatectomy. This research is also examining the relationship between genes involved in

immune surveillance and differences in histopathological characteristics of prostate cancer tumors between African American and Caucasian men. Studies of this type will provide novel information on the interactive effects of prostate cancer screening behaviors and candidate genotypes on biochemical relapse-free survival in African American and Caucasian men diagnosed with prostate cancer. Multi-level analyses are also being conducted to characterize the relationships among race, physical environment, and genotypes associated with prostate cancer to identify men who are at greatest risk for developing prostate cancer and experiencing poor outcomes. Because prostate cancer mortality is preventable if tumors are detected at an early stage, the ability to identify high-risk individuals for screening or prevention strategies based on genotype, behavioral, and environmental factors could have a major impact on the public health burden of this disease.

Segregation and Racial Disparities in Prostate Cancer Treatment

There are three primary approaches for management of localized prostate cancer: radical prostatectomy, radiation therapy, and watchful waiting.⁶⁷ Radical prostatectomy involves removal of the entire prostate through either a retropubic or perineal (nerve-sparing) approach. Prostatectomy is generally performed by urologists, although general surgeons may also perform these surgeries.⁶⁸ Prostatectomy requires inpatient hospitalization. Radiation therapy can either involve external beam radiation treatment of the prostate or placing radiation implants in the prostate, which is also known as brachytherapy. Radiation treatment is performed under the direction of a radiation oncologist in radiation oncology facilities, which may be hospital-based or free-standing.

African American men are significantly more likely than Caucasian men to undertake watchful waiting than aggressive therapy for localized prostate cancer.⁶⁹⁻⁷¹ One analysis of SEER-Medicare data found that 38% of Caucasian men with early stage prostate cancer were managed with watchful waiting compared to 49% of African American men with early stage disease.⁷⁰ Most of this difference derives from differential use of prostatectomy as African American and Caucasian men are generally found to have similar rates of radiation therapy.^{60, 72} Rates of prostatectomy are substantially lower among African American than Caucasian men.⁷²⁻⁷⁶ In one analysis of localized prostate cancer in SEER-Medicare data, 27.7% of Caucasian men underwent prostatectomy compared to 17.2% of African American men.⁷⁰ In contrast, a higher proportion of African American than Caucasian men are treated with

hormone therapy (14 % vs. 11%).^{72, 77} Furthermore, African American men have been found to be more likely to undergo inpatient orchiectomy than Caucasian men.⁷⁸

Despite the many studies documenting differences in treatment and outcomes between African American and Caucasian men with prostate cancer, there has been relatively little progress made in understanding the causes of these differences. Most analyses have found that differences in treatment and mortality persist after adjusting for individual factors such as stage, grade, and socioeconomic status.^{70, 79–81} Several analyses suggest these factors may explain only 30% to 50% of the difference in prostatectomy use between African American and Caucasian men.⁷⁰ Some experts have suggested that mortality differences can be explained by lower rates of aggressive treatment.⁸² However, the lack of clear data demonstrating lower mortality through aggressive treatment has led others to question this conclusion. The US has a pressing need to understand how the social environment contributes to racial disparities in prostate cancer, especially with respect to access to quality treatment for disease.

Residential segregation and distrust of health care providers are increasingly recognized as important factors in the health of African Americans. Prior research has identified several pathways by which segregation may affect health, including effects on socioeconomic deprivation, neighborhood resources, exposure to violence, and access to medical care. A strong correlation has been shown between cancer outcomes and hospital and provider characteristics, prevalent distrust of research/teaching hospitals among African Americans, and links between residential segregation and racial alienation. Residential segregation seems to correlate with worse prostate cancer outcomes among African American men; the effect of segregation contributes to racial disparities in outcomes, and this effect may be mediated partly via differential use of low-quality hospitals and providers.

There are several pathways by which segregation may lead to worse health outcomes for African Americans.⁸³ To some extent, they parallel the pathways described by Nancy Krieger for the effect of discrimination on health.⁸⁴ Individual socioeconomic status is a powerful predictor of health.⁸⁵ By leading to African American economic deprivation, residential segregation may lead to adverse health outcomes among African Americans. Neighborhood socioeconomic resources are linked to health outcomes in many studies.^{86–88} Economic disinvestment in highly segregated areas may reduce services and infrastructure such as municipal services, fire and police protection, and public

transportation.⁸⁹ Residential segregation may increase harmful social and physical exposures, such as violence, hazardous materials, and tobacco and alcohol advertising,^{90–95} and may also directly affect the availability of resources and services, including health care facilities, exercise facilities, pharmacies and supermarkets.^{96–98}

Distrust of health care providers and institutions, and particularly research or teaching institutions, among African Americans is widely recognized.^{99,100} This distrust has been traced to the long and significant history of unethical treatment of African Americans in the US health care system, beginning with experimentation on slaves and including infamous episodes such as the Tuskegee Syphilis Experiment.^{101–103} The AIDS epidemic has contributed to health care-related distrust among African Americans, with stories in African American newspapers and other forums arguing that AIDS represents an attempt by white America to eliminate the African American population.¹⁰⁴ Studies have found that distrust represents a significant barrier to participation in research, use of research-related facilities, and several specific types of medical care among African Americans.^{105,106} Furthermore, anecdotal reports suggest that distrust of medical research leads many African American patients to prefer community hospitals and avoid high-volume and/or teaching hospitals, where the quality of care may be greater.

Transdisciplinary Approaches to Understanding Environmental Determinants of Prostate Cancer Outcomes

In order to better elucidate the relationship between racial segregation, health care, and disparities in prostate cancer outcomes, transdisciplinary research should be undertaken to bring together multiple constructs and data sources to test the hypothesis that segregation at the city level is associated with lower-quality health care among African American men with prostate cancer. Investigators at the Penn CPHHD are using primary data sources such as Medicare claims data to define the cohort of men 65 years and older with incident prostate cancer in the US in 1999, to measure their health care including the types of treatment, and to assess certain outcomes including complications of treatment and survival. In addition, Medicare data are being linked to American Medical Association and American Hospital Association information about medical care providers to the cohort, and to the US Census data about the characteristics of the cities where these patients live, including the level of racial residential segregation. Stage at presentation is being determined through predictive modeling and by linking to state cancer registry data when available. By describing the extent to which racial disparities in prostate cancer treatment are

correlated with segregation and differences in provider/hospital quality, findings from this type of transdisciplinary research will provide insight into the relative contributions of personal preference, health care access, and discrimination to this difference. This type of multilevel data set creates a rich resource for investigating how social and physical environment interact with health care utilization and quality to affect health outcomes for men with prostate cancer.

Determinants of Ethnic Differences in Quality of Life

Increasingly, issues concerning the quality of survivorship are being recognized as important outcomes following prostate cancer diagnosis and treatment; however, limited efforts have been made to understand factors that contribute to quality of life (QOL) in ethnic and racial minority cancer patients.^{107, 108} Recent research has shown that the patient's ethnic background is an important factor in QOL among prostate cancer patients; after controlling for socioeconomic factors, treatment type, and prognostic indicators, African American men reported significantly lower levels of QOL compared to Caucasian men following prostate cancer diagnosis.^{109, 110} Ethnicity is a marker for other factors that more adequately explain quality of life; when evaluated in isolation of other factors, ethnicity does not provide information on the causes of these disparities. Treatment and prognostic indicators are likely to contribute to ethnic differences in QOL; however, African Americans report significantly lower levels of physical, psychological and functional health status compared to Caucasians after controlling for these variables.^{109, 110} Because men are diagnosed with, receive treatment for, and recover from the effects of prostate cancer treatment within the general context of their lives, factors other than clinical indicators should be considered in order to understand the etiology of ethnic differences in QOL outcomes among men affected with disease.

Cultural factors are increasingly being recognized as having an important impact on cancer outcomes in ethnically diverse populations. Culture is defined as the beliefs, values, and practices that are shared by members of an ethnic or racial group.^{111, 112} Religion and spirituality are among the cultural beliefs and values that may be important to ethnic differences in QOL among African American and Caucasian men following prostate cancer diagnosis and treatment. In one study, these factors were positively associated with health-related QOL among African American and Hispanic breast, colon, lung, and head and neck cancer patients.¹¹³ This finding is consistent with a recent review on spirituality, culture, and cancer that demonstrated that African American

cancer patients are more likely to report higher levels of religiosity and may have greater spiritual needs compared to Caucasian cancer patients.¹¹⁴ Other work has shown that needs for religious and spiritual support are high following breast cancer diagnosis¹¹⁵ and several studies have shown that these needs may be greater among African American than Caucasian women.^{116, 117} Religious and spiritual beliefs and practices may have beneficial effects regardless of the type of cancer with which one has been diagnosed. Musick et al.¹¹⁸ found that religious activity was associated with lower levels of depressive symptoms among elderly African Americans and Caucasians diagnosed with colon, breast, and lung cancer; the effects of religious activity on depression were stronger for African Americans than for Caucasians. A recent study also found that African American men were significantly more likely than Caucasian men to report that faith contributes to good health.¹¹⁹ Despite the importance of religious beliefs and spiritual faith in cancer recovery, limited information is available regarding how these factors or other cultural beliefs and values influence quality of life among African American and Caucasian men diagnosed with prostate cancer.

Recent work has suggested that stressors such as environmental demands may contribute to the greater incidence of prostate cancer among African American men. For instance, Ellison et al.¹²⁰ suggest that environmental stressors such as life stress, racism, and discrimination may have a deleterious impact on physiological (e.g., immune functioning, cardiovascular reactivity) and behavioral (e.g., coping efforts, dietary behaviors, smoking) responses to prostate cancer. Research in other disciplines has supported this conceptual framework^{121, 122} and a recent study found that greater perceptions of life stress were associated significantly with abnormal PSA results in a sample composed primarily of Caucasian men.¹²³ It is likely that general life stressors, that may include actual and perceived racial discrimination, have a similar association with PSA levels in African American men. Previous research has shown that mental health and QOL are adversely affected by perceptions of racism and discrimination in African Americans. For example, elderly African American men reported greater perceptions of institutional racism (e.g., differential treatment due to social or institutional policies¹²⁴) than did elderly African American women, and in both groups, perceived racism was associated with lower levels of QOL.¹²⁵ Another study found that both lifetime and daily experiences of perceived discrimination were associated significantly with increased distress and depression among African Americans and Caucasians.¹²⁶ However, perceptions of lifetime and daily discrimination were significantly higher among African Americans than among Caucasians.

Thus, while it is likely that environmental stressors, such as perceptions of life stress, contribute to poorer physical outcomes among African American and Caucasian men, these stressors, as well as perceptions of discrimination, are likely to have a more negative impact on QOL outcomes among African American men.¹²⁷ However, the contributions of life stress or other socio-environmental stressors to QOL have not yet been examined in African American and Caucasian men diagnosed with prostate cancer.

Transdisciplinary Approaches to Identifying Determinants of Racial Differences in Quality of Life

Several conceptual models have been developed to explain QOL among individuals diagnosed with cancer. For example, according to the Transactional Model of Stress and Coping (TMSC),^{128–130} individuals may engage in a series of cognitive strategies to assess the level of threat or stress associated with cancer diagnosis and treatment (primary appraisal) and to evaluate their ability to cope with or manage these effects (secondary appraisal). These appraisal processes give rise to coping efforts that are aimed at either problem management or emotional regulation. The TMSC model has been tested extensively in prior studies on the psychological impact of breast cancer diagnosis and treatment;^{131–135} however, few studies have used this conceptual framework to evaluate QOL following prostate cancer diagnosis and treatment. Likewise, even though prior work has shown that ethnicity, cultural beliefs and values, and environmental factors (e.g., perceptions of racial discrimination) may influence cognitive processes and coping efforts,^{134, 136–139} limited information is available regarding the effects of these factors on psychological and behavioral factors, or how these mechanisms contribute to QOL among men diagnosed with prostate cancer.

Transdisciplinary studies can develop a better understanding of the contextual factors that contribute to racial differences in QOL following prostate cancer diagnosis and treatment by conducting prospective longitudinal research to identify cultural, psychological, environmental, and behavioral factors that contribute to emotional, physical, and social functioning in African American and Caucasian men who are diagnosed with prostate cancer. Within this type of research, evaluation of biological markers of prostate cancer (e.g., PSA level, Gleason score, stage of disease) and the medical settings in which men receive care must be integrated into psychological models used to understand stress and coping processes following disease onset. Actively involving community stakeholders in research activities by using community-based

participatory research methods is also critical for ensuring that findings can be applied effectively in community settings.^{140, 141}

Investigators at the Penn CPHHD are using this transdisciplinary approach to identify determinants of racial differences in quality of life following prostate cancer diagnosis. An important aspect of this research is that the study goals and research design were developed collaboratively with the Philadelphia Chapter of the National Black Leadership Initiative on Cancer (NBLIC), and this research is being implemented and evaluated collaboratively with NBLIC members.¹⁴² This project is guided by the Transactional Model of Stress and Coping and considers prostate cancer diagnosis and treatment, including biological markers of disease, as the key stressors that activate the cognitive appraisal and coping processes that are antecedents to QOL. This research will evaluate how ethnicity, cultural beliefs and values, and environmental stressors may mitigate the influence of biological factors (e.g., stage of disease, Gleason score) and psychological mechanisms (e.g., cognitive appraisals, coping efforts) on QOL in newly diagnosed African American and Caucasian men. Studies that consider these QOL effects on African American and Caucasian men newly diagnosed with prostate cancer have yet to be undertaken. By incorporating biological and contextual factors into the application of the TMSC, this research will identify potential targets for intervention that could be addressed through psycho-educational approaches designed to facilitate stress reduction and increase confidence to cope with treatment-related side effects.

Discussion

Despite significant efforts, there continues to be significant gaps in our knowledge of the factors that predict ethnic differences in prostate cancer outcomes between African American and Caucasian men. Transdisciplinary research is needed to understand the complex ways in which biological, sociological, behavioral, environmental, and psychological factors contribute to racial differences in prostate cancer screening, access to treatment, survival following diagnosis, and quality of life during recovery. Transdisciplinary research is defined as science in which diverse disciplines, methods, and analytic approaches are integrated to address a common empirical question.^{7, 9, 143} While a substantial number of studies have evaluated ethnic and racial differences in prostate cancer incidence and mortality, utilization of early detection strategies, and quality of life in men diagnosed with disease, few transdisciplinary research efforts have been undertaken to

evaluate the complex ways in which multiple determinants contribute to racial differences in outcomes following prostate cancer diagnosis among African American and Caucasian men. For example, the same multi-level analysis methods used to examine the relationship between residential segregation and access to prostate cancer treatment also can be applied to evaluate the combined effects of genotype and individual-/neighborhood-level environments on prostate cancer outcomes and to understand how quality of life may differ among African American and Caucasian men based on individual level factors (e.g., self-reported income) and environmental characteristics (e.g., percent poverty) reported at the Census level.

Transdisciplinary collaboration is prerequisite to comprehensive understanding of disparities between African American and Caucasian men in terms of prostate cancer outcomes. Though such multidisciplinary work may yield improvements in the prevention and management of disease, the findings revealed through this approach are likely to generate some complex issues. For example, even though research findings may clarify the etiology of racial differences in prostate cancer survival and mortality, linking ethnicity with genetic risk information may have adverse ethical, legal, and social implications.¹⁴⁴ ¹⁴⁵ Alternatively, even though the relationship between racial segregation and access to treatment may identify men at risk for reduced-quality prostate cancer treatment, such information may further stigmatize individuals who live in these areas and may also adversely affect health care providers. Since physicians are given wide berth with respect to prostate cancer screening—ranging from offering both the PSA and DRE annually¹⁴⁶ to no recommendation for screening,¹⁴⁷—their receptivity to behavioral interventions in a clinical setting to improve communication about early detection for prostate cancer is unclear. Though information about determinants of racial differences in quality of life may help identify men in greatest need of psychological support following prostate cancer diagnosis and treatment, receptivity to intervention programs is unknown. To ensure effective translation of the findings generated through transdisciplinary research, efforts also must focus on developing and disseminating educational outreach programs to enhance awareness about the disease or condition and to ensure that at-risk communities and public health officials are aware of the findings being generated.

An important goal of transdisciplinary science is to address complex issues by integrating diverse disciplines and methods to address a common goal. Innovative approaches are required to address racial

disparities in prostate cancer outcomes. Here, transdisciplinary research is uncovering the biological, behavioral, psychological, sociological, and environmental determinants of racial differences in prostate cancer outcomes between African American and Caucasian men. The Penn CPHHD is using this framework to understand the complex ways in which these factors contribute to racial differences in prostate cancer screening, access to treatment, and treatment outcomes. By integrating diverse disciplines and methods in psychology, health services, epidemiology, sociology, and information sciences to understand the factors that contribute to racial differences in prostate cancer outcomes, transdisciplinary research designed to identify determinants of disparities can be used as the basis for future research to improve outcomes in medically underserved populations.

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