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Association Between High Health Literacy, Doctor's Recommendation, and Prostate Cancer Screening Among Men in the United States

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Walden University
2024

Abstract

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MPH, Walden University, Minnesota, 2013

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Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Public Health

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Abstract

To efficiently identify and prevent the advancement of prostate cancer and decrease mortality rates, it is crucial to examine the impact of health literacy. Despite potential advantages associated with enhanced health literacy and early detection, the United States continues to witness a significant rise in both new prostate cancer cases and mortality rates, emphasizing the severity of the condition. However, it is unclear if those with high health literacy are discouraged from participating in prostate cancer screening due to the risks associated with screening. Based on the stimulus organism response model, 2016 Behavioral Risk Factor Surveillance System data were analyzed in this study using binary logistic regression and mediation analysis to investigate the connection between health literacy on 210,606 men aged 50 and above in the United States and their likelihood of screening as well to explore the mediating influence of doctor's advice on health literacy and prostate cancer screening. Factors considered included doctor's recommendations, age, income, and race. A significant association was found between high health literacy, doctor's advice, and prostate cancer screening. The findings showed that a positive correlation exists between not undergoing screening and the influence of a doctor's recommendation. White and Hispanic men are more likely to undergo screening than Blacks, other races, and multiracial men. The likelihood of screening was found to be 3 times higher in men aged 60–64 than in the 50–54 age range. Men with high incomes were found to screen more than those with lower incomes. These findings underscore the need to modify health policies and guidelines, especially for low-literate populations, to improve health outcomes and promote positive social change in health care services.

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Dedication

This research is dedicated to God, who has assisted me throughout challenging times, and to my late twin brother, Mr. Odinaka Udechukwu, whose memory inspires me. Finally, I would like to include my late parents, Mr. Cyril and Mrs. Edith Udechukwu, for instilling in me the spirit of persistence and desire to achieve anything I put my mind to.

Acknowledgments

I credited the success of this project to the careful oversight of my chair, Dr. Richard Palmer. Through texts, emails, and Zoom meetings, Dr. Palmer encouraged me to generate a high-quality and uniform project. All his input was graciously accepted and inspiring, and it pushed me to work more than I had initially planned. I appreciate you so much for always keeping me responsible for the project. I also want to express my profound appreciation to Dr. Claire Robb, the second committee member, for her significant assistance and mentorship while developing this dissertation. Her insightful feedback, encouragement, and expertise have been instrumental in shaping the direction of this research. I sincerely appreciate her steadfast commitment and unflinching passion for ensuring the success of this project.

I would also like to thank Dr. Shanna Barnett, my project director, who never wavered in her commitment to seeing that the project met the highest standards of Walden University. I cannot tell you how many times I sent you my prospectus, but each time, you made sure that it complied with the academic standards of Walden University. I am also grateful to Dr. Zin Htway and Dr. Reginald Taylor of the Office of Research and Doctoral Services (ORDS) for supporting this project in seeing the light of day. My student success and academic adviser, Laura Brodkey, thanks for your unwavering support and encouragement. I must express my heartfelt gratitude to Mr. Dan Fleischhacker, a senior editor and coordinator at Walden University. I greatly appreciate your effort in proofreading and editing my work expeditiously. To my son, Mr. Ifeanyi Akunna, and my siblings, whose love, prayers, and emotional support are unwavering.

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Section 1: Foundation of the Study and Literature Review

Introduction

Prostate cancer is a treatable form of cancer with a favorable outlook if identified at an early stage with prostate cancer screening methods, such as prostate-specific antigen (PSA) testing and digital rectal examination (Broderick, 2020). According to Broderick (2020), the 10-year relative survival rates (RSRs) of 3,104,380 men diagnosed in the United States between 2001 and 2017 with localized prostate cancer (i.e., Stages 1 and 2) were 97.2%: however, for those with metastatic prostate cancer (i.e., Stages 3 and 4), the RSRs dropped to 18.5%. In 2014, almost 3 million men in the United States were affected by prostate cancer, and in 2018, around 164,690 new cases were identified American Cancer Society (ACS) and National Cancer Institute (as cited in Basch et al., 2018). Prostate cancer is the second most common cause of cancer-related mortality in U.S. males behind lung cancer (ACS, n.d.).

Studies have shown a correlation between health literacy and early detection of prostate cancer screening (Broderick, 2020; Nguyen et al., 2021). Men with high health literacy are likelier to undergo prostate cancer screening than those with poor health literacy (Coughlin et al., 2020; Housten et al., 2021; Jamieson et al., 2022; Madeline et al., 2020). Additional variables influencing screening rates include age, race, and income level (Jamieson et al., 2022; Zhang et al., 2021). Specifically, White men with higher income levels have a greater propensity to undergo prostate cancer screening compared to men of color, those with lower income levels, and older individuals (Housten et al., 2021). Housten et al. (2021) determined that around 33% of males in the United States

had a low level of health literacy, which hinders their ability to effectively navigate the many stages of cancer care, such as screening, diagnosis, and treatment.

In this cross-sectional quantitative study using the Behavioral Risk Factor Surveillance System (BRFSS) data set, I examined the correlation between high health literacy, physician interjectory, and prostate cancer screening among men aged 50 and above in the United States. I aimed to determine whether these factors are associated, considering that one third of men have low health literacy while two thirds have high health literacy. If a more robust association can be found between high health literacy, doctor's advice, and the rate of prostate cancer screening, it may be possible to prioritize the low health-literate group, which has the potential to enhance the rate of screening among those with limited health literacy, facilitating early detection and improving the health outcomes of those who receive a positive diagnosis and resulting in significant and impactful social change among individuals with low health literacy.

Additional elements discussed in this section include the study's characteristics, the strategies employed to search for relevant literature, the theoretical framework utilized in the study, a comprehensive review of the literature, definitions, assumptions, scope and limitations, constraints, the importance of the study, a concise summary, and concluding remarks.

Background of the Study

Prostate cancer refers to the fast proliferation of cells or genetic alterations in the prostate, which is a gland in men responsible for producing seminal fluid that supports and transports sperm to the female reproductive organ (Sekhoacha et al., 2022).

According to Bergengren et al. (2022), it ranks as the second most prevalent form of cancer among males worldwide. Prostate cancer impacts individuals of various races, ethnicities, ages, educational backgrounds, and socioeconomic statuses (Zhang et al., 2021). It is more common among older men and more prevalent in developed regions, such as North and South America, Australia, Europe, and the Caribbean, compared to underdeveloped countries in Africa (Bergengren et al., 2022; Wang et al., 2022). The elevated number of reported cases of prostate cancer in industrialized nations, such as the United States, has been associated with a higher frequency of detection of cases by prostate cancer screening compared to underdeveloped countries where screening is seldom, resulting in undetected cases (Wang et al., 2022).

Comprehending and analyzing health information requires a certain degree of health literacy. Health literacy, the capacity to understand and use health-related information, can impact patient choices about disease prevention, such as prostate cancer screening, treatment, and control (Basch et al., 2018). Basch et al. (2018) found that those with a higher literacy level tend to have better health outcomes than those with lower literacy levels. In correlational research, Jamieson et al. (2022) determined that 40% of men aged 55 to 69 years old with low health literacy underwent screening for prostate cancer. On the other hand, 70% of men with intermediate health literacy and 92% of men with high health literacy had screening for prostate cancer.

Nevertheless, while prostate cancer screening offers advantages as an early detection method for prostate cancer, it is also linked with some hazards (Nguyen et al., 2021). The high occurrence of false positive results in higher PSA levels may be

attributed to benign hypertrophy, leading to excessive diagnosis and treatment that is detrimental to men over the age of 70 and provides no advantages to those under 70 (Nguyen et al., 2021). Based on data from the Centers for Disease Control and Prevention (CDC), the age-adjusted reported incidence of prostate cancer in the United States decreased from 155 to 105 cases per 100,000 men between 2003 and 2017, with a decreased screening rate (Broderick, 2020). Thus, there was an increase in the rate of metastatic prostate cancer from 4% to 8% in the same time frame attributed to late detection (Broderick, 2020). Therefore, the contentious nature of the screen necessitated that men exercise prudence before screening.

The complexities and contradictions surrounding the benefits and harms of PSA testing prompted the 2012 U.S. Preventive Services Task Force (USPSTF) recommendations, which were later updated in 2017 (Grossman et al., 2018). These recommendations advise men aged 55–69 to engage in discretionary measures and shared decision making (SDM) with their health care providers (Ilic et al., 2018; Nguyen et al., 2021). Nguyen et al. (2021) postulated that despite men with elevated health literacy linked to a heightened screening rate, there was a decline in the screening rate after engaging in SDM with their health care providers. By carefully considering the advantages and disadvantages in consultation with the health care practitioner, considering factors, such as age, family history, and lifestyle behavior, an individual may minimize the chances of undergoing unneeded treatments that may result in overtreatment.

While there are distinctions between SDM and doctor's (health care) recommendations, there is no research on the influence of health literacy level on a doctor's recommendation that resulted in whether to screen for prostate cancer. The current study filled this void by examining the relationship between health literacy, physician recommendation, and prostate cancer screening among men aged 50 and older in the United States. Determining the mediating effect of a doctor's recommendation on health literacy enables health care policymakers to increase prostate cancer screening awareness efforts by examining the doctor-patient relationship.

Problem Statement

Prostate cancer is a significant health issue that affects both educated and uneducated men, leading to illness and death (Schillinger, 2021). The level of health literacy plays a crucial role in determining whether men choose to undergo screening for this disease in the United States (Schillinger, 2021). The disagreement around the trade-off between the dangers and benefits of prostate cancer screening creates uncertainty on whether educated men choose to undergo screening for prostate cancer. Clearing up this uncertainty around whether highly literate men aged 50 and above undergo prostate cancer screening after receiving a doctor's recommendation in the United States could reduce the occurrence and mortality rate of prostate cancer in the United States among men.

According to Basch et al. (2018), over 3 million men in the United States were diagnosed with prostate cancer in 2014, and by 2030, it is projected that the number of men aged 65 and older with this illness will reach 72 million due to the projected increase

in men's lifespan and the fact that prostate cancer is often associated with age. The ACS reported that in 2022 there were about 268,490 newly diagnosed cases of prostate cancer and an expected 34,500 documented deaths (Leslie et al., 2023). ACS (n.d.) also noted that the typical age of initial diagnosis is approximately 67 years old, and 60% of prostate cancer cases occur in men aged 65 and over. In comparison, the disease is highly uncommon in males less than 40 years old but tends to be more aggressive when it affects younger men (ACS, n.d.; Leslie et al., 2023). The prevalence of prostate cancer has risen, but the mortality rate has steadily declined since 1992, coinciding with the widespread use of prostate cancer screening (Broderick, 2020; Leslie et al., 2023). Additionally, prostate cancer is more common among men of non-Asian and non-Hispanic ethnic backgrounds compared to European Americans, as shown in studies by Coughlin et al. (2020), Danan et al. (2021), and Leslie et al. (2023).

While specific studies have discovered a significant link between high health literacy and prostate cancer screening, while considering factors, such as age, race, income level, educational status, and SDM with health care providers, other studies have established a negative correlation between high health literacy and prostate cancer screening, favoring SDM instead (Chesser et al., 2016; Coughlin et al., 2020; Nguyen et al., 2021). The influence of doctor's advice on the correlation between the population with high health literacy and prostate cancer screening remains unexplored in existing research. The choice to undertake prostate cancer screening among literate male participants in the research may be impacted by variables outside their intellectual capacities and knowledge of prostate cancer, including their life experiences, such as

having family members or acquaintances diagnosed with or succumbed to prostate cancer, and the counsel offered by their health care practitioners. The current study concentrated on the knowledge deficit about health care practitioners' recommendations regarding the association between health literacy levels and prostate cancer screening.

Purpose of the Study

Multiple academic studies have consistently demonstrated a robust association between health literacy and the utilization of prostate cancer screening. (Coughlin et al., 2020; Grossman et al., 2018; Nguyen et al., 2021). Nevertheless, it is worth noting that there are contrasting perspectives suggesting that persons with high health literacy can have a more significant tendency to decline screening as a result of their perception of hazards connected with the screening (Grossman et al., 2018; Nguyen et al., 2021). The goal of this quantitative cross-sectional study was to investigate the outcome of the screening decision of men 50 years old and above in the United States with high literacy levels, considering whether their choice to screen or opt out was influenced by their literacy level or by the mediating effect of a doctor's recommendations, using age, race, and income level as predictors.

Research Questions and Hypotheses

The research questions and corresponding hypotheses for this study examining the relationship between high health literacy and prostate cancer screening using physician recommendation as a mediator with age, race, and income level as predicting factors were as follows:

RQ1: Is there an association between high health literacy and prostate cancer screening while controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States?

$H_0$1: There is no association between high health literacy and prostate cancer screening while controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States.

$H_1$1: There is an association between high health literacy and prostate cancer screening controlling while for a doctor's recommendation, age, race, and income among men 50 and above in the United States.

RQ2: Is there an association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States?

$H_0$2: There is no association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States.

$H_1$2: There is an association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States.

Theoretical Framework

Woodworth's stimulus-organism-response (SOR) model served as the theoretical basis for this study. Noble (1966) explained that the SOR model from 1929 depicts the psychology of human learning (the O) in the presence of a stimulus (the S) and an

outcome response (the R). It is a health behavioral and functionalist model and an evolution of Pavlov's classic response model, in which stimuli elicit two opposite responses, either approach or avoidance (Zhai et al., 2019).

The initial proposition of the SOR model was aimed to comprehend consumer behavior by positing that the buyer's awareness is influenced by marketing and environmental stimuli (PhD Assistance, 2021). At the same time, purchase choices are effectively made via the buyer's attributes and decision-making process (PhD Assistance, 2021). Mehrabian and Russel (1974, as cited in PhD Assistance, 2021), postulated three dimensions within the model that were derived on the assumption that emotional reactions to the surrounding environment include:

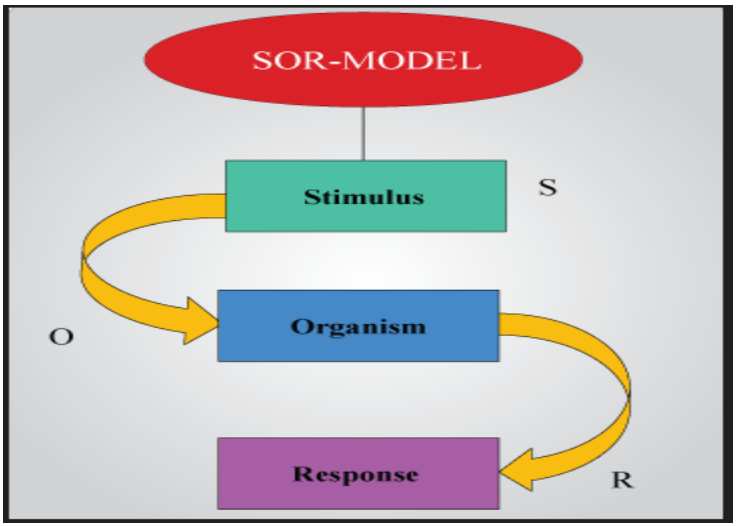
1. The measurement of pleasure derived from verbal assessments based on feelings, such as happiness, joy, or contentment, is possible.
2. The measurement of arousal may be achieved by verbal judgment, which entails assessing indicators, such as an individual's level of satisfaction or their degree of activity in a specific setting.
3. The prediction of dominance may be made by assessing the respondent's indication, which is shown by their readiness to exhibit dominating behavior and is influenced by the environmental context.

These dimensions were predicated on the premise that emotional states might influence each person within any setting (PhD Assistance, 2021). Over recent decades, the SOR model has emerged as a widely used paradigm that effectively integrates input, process, and outputs inside a unified model (PhD Assistance, 2021; Song et al., 2021).

The model significantly contributed to the comprehension of the factors influencing an individual's behavior, making it applicable in the context of addressing human behavior in health-related matters (Eiko, 2020; Pandita et al., 2021; PhD Assistance, 2021; Song et al., 2021). The SOR paradigm, as shown in Figure 1, is often used in academic research to investigate the connection between stimuli and responses as well as to explore how organisms mediate these interactions (PhD Assistance, 2021).

Figure 1

The SOR Model



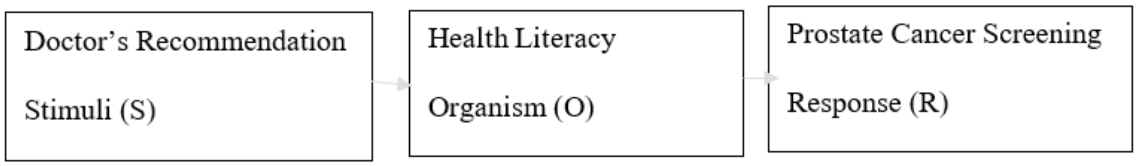
From "The introduction of Woodworth, (1929) proposed stimulus-organism-response model," by PhD Assistance, 2021 (https://www.phdassistance.com/blog/stimulus-organism-response-sor-model).

I applied the SOR model in this study, as shown in Figure 2, to examine the relationship between a stimulus of doctor's advice as a mediating and predicting factor and a response of prostate cancer screening of an organism's affective state or individual/population health literacy. In other words, how the sample of high health literate (i.e., the O) men of the BRFSS data set in the United States respond to prostate

cancer screening (i.e., the R), considering a doctor's recommendation (i.e., the S), age, income level, and race as predictors to answer RQ1 and the relational interaction of health literacy (i.e., the O), prostate cancer screening (i.e., the R), and mediation of doctor's recommendation (i.e., the S) to answer RQ2.

Figure 2

The SOR Model Framework in Relation to the Study



From "Psychological impact of covid-19 crises on students through the lens of Stimulus-Organism-Response (SOR) model," by S. Pandita, H. G. Mishra, and S. Chib, 2021, *Children and Youth Services Review,120* (https://doi.org/10.1016/j.childyouth.2020.105783).

Nature of the Study

In this quantitative secondary data analysis study, I employed binomial logistic regression and mediation analysis. The quantitative approach is used to analyze the relationships between variables and answer the study's theoretical questions and hypotheses, mainly when the variables are numerical and discrete (Creswell & Creswell, 2018). In qualitative research, the researcher plays a crucial role in watching participant behavior and analyzing data using inductive and deductive approaches (Creswell & Creswell, 2018). On the other hand, the quantitative method can handle large amounts of data collected through survey telephone interviews and is used to describe, explain, and forecast relationships between variables (Creswell & Creswell, 2018).

Due to the nature, size, and purpose of the research questions, I selected a quantitative cross-sectional design for examining the relationship between health literacy and prostate cancer screening, mediated by doctor's recommendation, and predicted by age, race, and income level among men 50 and older in the United States. In this study, secondary data from the 2016 BRFSS data set were used. The BRFSS is an annual collection of risk behavior and chronic disease information from adults 18 and older in all 50 states, the District of Columbia, and the three U.S. territories by the CDC (2016) under the auspices of the Department of Health using more than 400,000 telephone interviews. The BRFSS 2016 version, unlike the 2022–2023 version, included the optional health literacy module, a vital study variable. The sample population for the current study consisted of men older than 50 because men younger than 50 are less prone to prostate cancer. The extracted variables were as follows: prostate cancer screening (i.e., the dependent variable); health literacy (i.e., the independent variable); doctor's recommendation (i.e., the mediator); and age, race, and income (i.e., predictor variables).

Literature Search Strategy

To locate literature for this study, I accessed the following databases and search engines through the Walden University Library: BMC, Google Scholar, PubMed, PubMed Central, SAGE, and Science Direct. I reviewed 286 articles and used 94 articles for this study. The key search terms used were *health literacy*, *health education*, *prostate cancer*, *prostate cancer screening*, *prostate cancer antigen*, *race*, *age*, *income level*, *doctor's recommendation*, stimulus-*organism-response* (*SOR*) model, *behavioral risk factor surveillance system* (*BRFSS*), and *United States Preventive Services Task*

Force (*USPSTF*). As per the guidelines of Walden University, I used publications published within the last 5 years with a few exceptions. To mitigate the problem of the limited literature on health literacy and prostate cancer screening using the SOR paradigm, I reviewed other research articles using the SOR model for health prevention screening, such as COVID-19, to align prostate cancer screening as a preventative measure.

Theoretical Framework

Using models or theoretical frameworks in public health research verifies the study design and enhances the potential for generalizing findings to the broader population (Fernandez et al., 2019; Glanz et al., 2015; Kumar et al., 2022). The SOR model is used to examine the causal relationship between human behavior, such as prostate cancer screening, and many situational factors, including internal and external stimuli like doctor's recommendation, events, and agents, such as health literacy and social determinants (see Yang et al., 2021). In the model, it was posited that there is a reversal of the causal order, with organism factors preceding the stimulus (Young, 2016). In this framework, the environment's structure is not considered separate from the organism, and the organism's reaction is controlled by internal components (MacKinnon, 2011; Young, 2016). The sequence can be represented as O-S-R, indicating the influence of a doctor's advice on health literacy and prostate cancer screening. The model also includes the assumption that no variables linked to the variables in the mediation equations will be ignored; furthermore, the model presupposes low measurement errors (MacKinnon, 2011).

The SOR model has recently gained popularity in intervention and health prevention measures. Studies have demonstrated the influence of stimuli on the correlation between independent and dependent variables (Pandita et al., 2021; Song et al., 2022; Zhai et al., 2019). In the context of the current study, the choice to undergo prostate cancer screening may be influenced by the individual's degree of literacy in comprehending the potential dangers or risks involved, the information provided by the health care practitioner, or a combination of both factors. Nevertheless, I decided to use the SOR model to examine the various cause-and-effect relationships between health literacy and prostate cancer screening, which was achieved by including the third variable, the doctor's advice, as a mediator (see MacKinnon, 2011). I used the SOR model and mediation analysis to investigate how health literacy, doctor's recommendation, age, race, and income level predict prostate cancer screening. Utilizing the SOR model contributes to a broad perspective of the research procedures and enhances the depth of understanding regarding the examined subject (Kumar et al., 2022).

The three major constructs of the SOR model are the stimulus, organism, and response. In the context of the SOR model, stimuli relate to the physical, biological, or social environment in which an individual's behavior occurs (Noble, 1966; Pandita et al., 2021). In the current study, the environment of the patient and physician was the doctor's recommendation. The quality of health information health care providers provide can influence the environment, particularly in communicating with populations with limited

English proficiency, regardless of their health literacy (Canon-Ibanez et al., 2021; Diamond et al., 2019).

In the SOR model, the organism possesses abilities that include competency in knowledge and skills, which are essential aspects of overall performance (Noble, 1966; Pandita et al., 2021). The six primary characteristics of an organism include its behavioral tendencies, maximum potential, personal motivation, age, gender, and variety in perception and motor skills, referred to as health literacy in the current study (Noble, 1966; Pandita et al., 2021).

The response can be defined as an action or change in behavior that is quantified in terms of amplitude, frequency, and time (Noble, 1966; Pandita et al., 2021). These responses can vary in rigidity, flexibility, repeatability, and predictability, with the independent S variable systematically determining the dependent R variable of the prostate cancer screening in the current study. The influence of the stimulus, organism, and predicting factors of age, race, and income level on response yielded insights into RQ1, while the mediation of stimulus on the organism and the response addressed RQ2.

Literature Review Related to the Key Variables

Prostate Cancer Incidence

There is more detection of prostate cancer at an earlier stage in developed countries, such as Europe, the United States, Canada, and Australia, than underdeveloped countries due to greater awareness of prostate cancer, widespread use of PSA screening, and environmental and genetic components (Rawla, 2019). In contrast, underdeveloped countries have lower rates of prostate cancer awareness and PSA screening (Pernar et al.,

2019; Rawla, 2019; Wang et al., 2022). In the United States, in 2022 the National Program of Cancer Registries and the North American Association of Central Cancer Registries estimated 1,918,030 new cases of cancer and 609,360 cancer-related deaths (Siegel et al., 2022). The National Cancer Institute (2023) reported an anticipated incidence rate of prostate cancer of 113.4 cases per 100,000 individuals per year, along with a mortality rate of 18.8 deaths per 100,000 individuals per year, with over 3,343,976 males living with prostate cancer in 2020 in the United States.

Prostate Cancer Screening

Research has indicated a link between prostate cancer screening and better health outcomes (Brodrick, 2020). However, others have suggested that increased screening rates may be connected to a high risk of false positive results (Grossman et al., 2018; Housten et al., 2021; Madeline et al., 2021; Merriel et al., 2018; Nguyen et al., 2021). Because of the risk of overdiagnosis and subsequent unnecessary treatment resulting from false-positive screening, the USPSTF recommended that men consult their physicians before undergoing the PSA screening (Marks et al., 2021; Nguyen et al., 2021). The 2017 USPSTF suggestions included that men below 54 years old not screen, those between 55–69 carefully evaluate their risk factors and weigh them against the potential benefits of screening for prostate cancer, and those 70 years old and above refrain from undergoing prostate cancer screening (Ebell et al., 2018; Marks et al., 2021).

Health Literacy

Health literacy refers to an individual's capacity to understand and use health-related information and services to make educated decisions about their health within

contemporary systems (Magnani et al., 2018). The three fundamental components of health literacy are understanding health-related concepts with health care practices, the capacity to effectively process and utilize information presented in diverse formats on health, and actively engaging in self-management strategies and collaborating with health care providers to maintain optimal health (Liu et al., 2020). According to the National Assessment of Adult Literacy Survey findings, 36% of individuals in the United States exhibit below-basic health literacy levels that can be categorized as essential (Magnani et al., 2018). The stratification of prostate cancer screening in the United States correlates to health literacy level, with a 41% screening rate among the low health literacy population compared with 70% among the high health literate populations. Madeline et al. (2021) reported a 27.4% screening rate for the low health literate and 47.4% screening rate for the high health literate group.

However, due to the intricate nature of human behavior influenced by sociodemographic characteristics, health literacy should not be relied upon solely as a determinant for assessing the capacity to engage in prostate cancer screening (Ma & Richardson, 2022). The reason being that human behavior is complex and can be affected by various internal and external factors, such as sociodemographic characteristics, screening costs, health insurance, income, travel distance, the accessibility of screening facilities, and the attitudes of patients and clinicians. The potential influence of a physician's suggestion should not be underestimated when considering the relationship between high health literacy and prostate cancer screening in the United States.

Doctor's Recommendation

A doctor's recommendation involves the one-way communication of the doctor's advice to the patient, considering their medical history, symptoms, and diagnosis (CDC, 2023). Similarly, SDM is a collaborative process characterized by two-way communication, whereby the physician imparts all pertinent information to the patient, enabling both the patient and the providers to make educated choices (Bombard et al., 2018; Brown et al., 2022; CDC, 2023; Washington & Master, 2021). In SDM, both parties collaborate to choose the most optimal action based on the health literacy level of the patient's interpretation and beliefs (Magnani et al., 2018).

Health literacy level is crucial in effectively managing the information received from or shared with the health care provider. To explore the relationship between the SDM of prostate cancer screening and health literacy, Nguyen et al. (2021) observed that even though the high-health-literate population exhibited a higher screening rate of 42.2% compared to the low-health-literate population, the rate decline after elucidating concerns over the controversy surrounding the screening with the provider. Examining the influence of doctor's recommendations on the highly health-literate population's prostate cancer screening provided valuable insights into its effects on men with low literacy levels. Furthermore, it is essential to exercise caution regarding the widely recognized notion of health literacy as a significant indicator of prostate cancer screening; instead, it is advisable to focus also on the quality of information physicians provide to patients (Hsueh et al., 2021). This recommendation was particularly relevant in the current study with the substantial mediating influence of doctors' recommendations on the relationship between health literacy and prostate cancer screening.

Age

Age is a crucial and predictable aspect to consider when assessing health literacy and screening for prostate cancer. According to the 2003 National Assessment of Adult Literacy, 3% of individuals aged 65 and older possessed competent health literacy abilities (Chesser et al., 2016). Various age-related factors may contribute to the decline in health literacy in older persons (Chesser et al., 2016; Estebsari et al., 2020). When evaluating an older adult's health literacy on health preventative measures, such as prostate cancer screening, it is essential to consider the differences in the rate and severity of age-related changes across people based on race and wealth (Chesser et al., 2016). A decrease in an older adult's cognitive capacity may hamper their ability to understand and remember new subjects (Chesser et al., 2016). Physical disabilities, such as hearing and vision loss, may also reduce the capacity to comprehend health-related information (Chesser et al., 2016). Psychosocial variables, such as socioeconomic position and coping mechanisms, might harm the comprehension of health information (Chesser et al., 2016). Unfortunately, the increasing disparity in physical and cognitive capabilities between younger generations and older adults can result in feelings of shame and embarrassment, which can hamper effective communication channels and further complicate the health literacy of older adults regarding preventive measures (Chesser et al., 2016). Individuals with high health literacy may face challenges due to uncontrolled circumstances, such as hearing loss and decreased cognition (Chesser et al., 2016).

Race

Black men have significantly higher rates of both incidence and death from prostate cancer compared to White men (Chowdhury et al., 2022; Danan et al., 2021). Danan et al. (2021) noted an incidence and death rate of 175.2 and 37.9 per 100,000 respectively for Black men and 102.3 and 17.9 per 100,000 respectively for White men. Prostate cancer therapy was less accessible to Black men, and they face a longer interval between diagnosis and treatment due to socioeconomic factors (Chen et al., 2022; Lillard Jr., 2022; Malik et al., 2022). Additional factors contributing to disparities include cultural elements, such as skepticism towards the health care system; inadequate communication between physicians and patients; insufficient knowledge regarding treatment options for prostate cancer; apprehension towards receiving a prostate cancer diagnosis; institutional racism; and perception of societal stigma associated with the disease (Alshammari et al., 2021; Lillard Jr. et al., 2022; Malik et al., 2021). It is crucial to emphasize that these disparities are not associated with an individual's self-identified racial or ethnic background (Lepore et al., 2017). Even among the high literate immigrant population, those with limited English proficiency, challenges owing to cultural boundaries and belief systems was also considered a contributory factor to preventive health measures, such as prostate cancer screening (Muvuka et al., 2021).

Income Level

There has been a strong correlation between high socioeconomic position and high educational achievement, the primary factors influencing health literacy (Garcia-Cordina et al., 2019, as cited by Coughlin et al., 2020; Stormacq et al., 2019). Individuals with high socioeconomic status are more likely to have less difficulties in managing their

diseases and engaging in healthy activities, such as prostate cancer screening, than those with low socioeconomic status (Coughlin et al., 2020; Navarro-Carrillo et al., 2020). Consequently, they are less prone to advanced sickness, leading to delayed diagnosis, treatment, and worse outcomes (Coughlin et al., 2021). According to Wilkinson and Pickett (2010), a correlation exists between an individual's life expectancy, a by-product of health outcomes associated with income level and the zip code in which they reside.

In a study examining the connections and contentious socioeconomic factors such as income level and prostate cancer screening in the United States, Schillinger (2021) observed that numerous social, economic, political, structural, geographic, and historical elements improved health outcomes compared to low-income racial/ethnic minorities and individuals with limited English proficiency. In their 2019 study, Fleary et al. analyzed data from the 2013 United States Health Information National Trends Survey to investigate the relationship between income level, literacy rate, and health disparities. The study found that income explained 30 percent of the observed health disparities, while literacy rate accounted for 37%. Therefore, incorporating income as a predictor in a study examining the relationship between high health literacy, prostate cancer screening, and doctor's recommendation offers a more comprehensive viewpoint that encompasses the experiences of individuals from low-income and vulnerable populations.

Definitions

Definitions of the Key Variables of the Study

Chronological age (controlling variable): A construct characterized by diverse variations and operationalized through conceptual frameworks, such as active, resilient,

healthy, and successful aging (Menassa et al., 2023). Nevertheless, the World Health Organization has established a definition of age that focuses on maintaining a healthy state, wherein individuals possess the functional capacity to fulfill their requirements and make meaningful contributions to society within their surroundings (Menassa et al., 2023).

Doctor's recommendations (mediation variable): The physician's medical advice to the patient regarding measures to enhance health outcomes and maintain the patient-physician relationship (Noseworthy, 2019; Zhao et al., 2022).

Health literacy (independent variable): The ability of an individual to comprehend health-related information and services and use them to make informed choices about their health and modern system contexts, which has been shown to impact health outcomes significantly (Grossman et al., 2018; Qi et al., 2021).

Income level (confounding variable): An individual's earning capacity, household living standard, and the operationalization of age-specific/population earnings that impact health outcomes and mortality disparities (Shi et al., 2021).

Prostate cancer screening (dependent variable): A commonly used test to detect prostate cancer using blood samples (Merriel et al., 2022). It is used interchangeably with prostate cancer screening.

Race (confounding variable): A categorization of human groupings based on similar physical characteristics considered typical among individuals with a common lineage (Merriam-Webster as cited by Flanagin et al., 2021).

Definitions of the Key Words of the Study

BRFSS: The collection of health risk behaviors and chronic disease questions by the CDC through the Department of Health using telephone interviews with 400,000 adult participants from all 50 states, the District of Columbia, and the three U.S. territories annually, making it the largest continuously administered health survey system globally (Marks et al., 2020).

Health care providers' recommendations: Health advice by various health care professionals, including physicians, nurses, pharmacists, physical therapists, occupational therapists, and other allied staff, to the patient to enhance health and well-being (Noseworthy, 2019). It is used synonymously with doctor's recommendations.

Organisms: The internal condition of a person's perception, emotions, and thought processes about health (health literacy), which affects final decisions and actions based on those decisions about health-related activities (Zhai et al., 2019).

PSA: A glycoprotein typically measured in ng/ml from a blood sample; the plasmatic tissue level is age-dependent, meaning it tends to grow as an individual age (Rawla, 2019).

Response: Information that conceals opinions that have the power to significantly affect or prevent collaborative learning, knowledge exchange, and health behavior activities (Zhai et al., 2019).

Socioeconomic status: A multifaceted and intricate concept encompassing several objective factors, such as income and educational attainment, as well as individuals'

subjective evaluations of their societal position (Navarro-Carrillo et al., 2020). The term is used interchangeably with an individual's income level.

Stimulus: Privacy concerns or a lack of control over transactions, such as sharing knowledge and information with others through social media platforms, people, or groups of persons (Zhai et al., 2019).

USPSTF: An impartial organization that provides evidence-based suggestions for preventive services to enhance the health of the country's population (Barry et al., 2023).

Assumptions

The 2016 BRFSS data set represents men over 50 from 13 U.S. states who participated in optional health literacy questionnaires. The data set was considered accurate due to its consistent use in previous studies and its representation of men across the United States. By excluding males younger than 50, the study focuses on older men's susceptibility to prostate cancer. A doctor's recommendation encompasses advice from various health care providers, including physicians, nurses, pharmacists, physical therapists, occupational therapists, nutritionists, and allied health care workers. Lastly, high health literacy includes both populations with strong and moderate literacy levels, facilitating straightforward data analysis and accounting for any inclusion or omission errors.

Scope and Delimitations

The uncertainty of whether men of chronological aged 50 and above with high health literacy in the United States followed their doctor's recommendation to screen for prostate cancer is the reason for this study. The sample population of 210,606 men above

50 out of 486,303 respondents of the secondary data explored the overreaching studies of health literacy correlation with prostate cancer screening. By segmenting highly health-literate men and the screening rate in lieu of a doctor's recommendation, the study depicted that screening uptake was based on the level of literacy and the interjection of healthcare providers attaining strong internal validity. The low-literate men who are most vulnerable to prostate cancer screening were excluded, provoking the nongeneralizability of the study and the inability to achieve external validity.

Limitations

Study limitations include design and methodological deficiencies that may influence the outcome and introduce bias to the conclusion of the research (Ross & Zaidi, 2019). Describing a research's limitations establishes its quality and scholarly validity (Tennant & Ross-Helmauer, 2020). Some of the limitations of the cross-sectional study include but are not limited to the inability to establish causal inference in across-sectional data. This is amplified by the size of the population, lack of capacity to quantify the occurrence, nonresponse bias, and nonparticipant self-report using secondary data (Wang & Cheng, 2020).

Significance

Numerous studies associate health literacy with early detection of prostate cancer via screening, with 100% 10-year RSR for early detection and 18.5% for late detection (Broderick, 2020; Coughlin et al., 2020; Housten et al., 2021; Jamieson et al., 2022). The incidence of significant known diseases in public health, such as polio, guinea worm, and the recent COVID-19, has been reduced, if not eradicated, due to aggressive health

literacy-equivalent health awareness. Prostate cancer will not be an exception, mainly since it is one of the curable malignancies with early detection through screening. Therefore, prostate cancer, one of the curable cancers, may be significantly reduced through screening education if the current study demonstrates a strong relationship between health literacy and prostate cancer screening rate, with physician's recommendation as a mediator and age, race, and socioeconomic status as predictors.

The findings provided vital information on whether high health literacy elicits prostate cancer screening and whether the influence of a doctor's recommendation makes individuals screened using age, race, and income as predictors. The study also depicted that a doctor's recommendation mediates prostate cancer screening and health literacy. The study recommended that health providers increase efforts to raise health awareness among the population with low health literacy as they are more amenable to health behavior change. Reducing the incidence of prostate cancer and instituting early detection screening may save lives, improve the quality of life for the affected population, and promote positive social change for males over 50 in the United States.

Summary and Conclusion

Besides race, age, and income, which impact prostate cancer screening rates, existing literature consistently shows a positive association between health literacy and prostate cancer awareness. However, this study distinguished the high health literacy population from the health literacy population to determine if a doctor's recommendation affects the willingness to undergo prostate cancer screening. I utilized the sample of 210,606 men from the 2016 BRFSS data set, the property of the CDC and the

Department of Health: an annual telephone interview on risk behavior and chronic diseases of adults over the age of 18 in all 50 states and three territories of the United States. The quantitative design regression and mediation analysis provided the requested information to bridge the knowledge divide between health literacy and prostate cancer screening and high health literacy and prostate cancer screening.

Furthermore, the research result serves as a crucial instrument for health care policymakers and public health practitioners in revising regulations about patient-provider contact. The outcomes and goal of the study are determined by carefully examining Section 2, which includes the introduction of the research design and data collection, as well as the justification for adopting this design. Deeper inside the section is the methodology, which outlines the target population, the variables' operationalization, and the data analysis strategy. The section concludes by addressing internal and external validity challenges, ethical procedures, and a summary.

Section 2: Research Design and Data Collection

Introduction

The aim of this quantitative study was to investigate the impact of a high degree of health literacy on the recommendations provided by physicians to men aged 50 and above in the United States about the choice to undergo prostate cancer screening. A significant amount of academic literature has consistently shown a robust association between health literacy and the use of prostate cancer screening (Coughlin et al., 2020; Housten et al., 2021; Jamieson et al., 2022). However, it is essential to acknowledge that there exist divergent viewpoints indicating that individuals with elevated health literacy may exhibit a greater inclination to reject screening due to their perception of possible risks associated with the screening process (Grossman et al., 2018; Nguyen et al., 2021). The primary objective of the current study was to examine the effects of literacy levels on the screening decisions made by males, specifically exploring whether their decision to undergo screening or decline it is influenced by their literacy level or not, using the mediating influence of a doctor's advice and predicting variables of age, race, income level, and doctor's recommendation.

In this section, I describe the study design employed and provide a rationale for its use. The methodology is also discussed, including identifying the target population, the sampling processes employed by the originator of the data set utilized, the operationalization of each variable, and the data analysis process. Furthermore, I explain threats to validity and the implementation of ethical processes before concluding with a summary and transitional statement to Section 3.

Research Design and Rationale

I used a cross-sectional research design to investigate the relationship between health literacy and prostate cancer screening using doctors' recommendations as a mediator and age, race, income level, and doctor recommendation as predictors among high health literate men aged 50 and above in the United States. In this study, health literacy was the independent variable; doctors' recommendations represented the mediator; prostate cancer screening was the dependent variable; and age, race, income, and doctor's recommendation were the predictor variables.

I selected the cross-sectional design because the BRFSS quantitative secondary data set was collected at one point in time. The cross-sectional design is used to assess the prevalence of a disease, phenomenon, or opinion in a population by selecting a study sample representing the population of interest and collecting data (Capili, 2022). Participants were classified as either having the outcome or phenomena of interest or not (Capili, 2022). Use of a cross-sectional design necessitated binomial regression and mediation analysis to address RQ1 and RQ2.

To address RQ1, I investigated the potential correlation between high health literacy and prostate cancer screening accounting for age, race, income level, and doctor's recommendation as predictors among males aged 50 and above in the United States. A binary logistic regression model was used to analyze the influence of the variables for this research question. I employed mediation analysis to investigate the association between high health literacy and prostate cancer screening

using a doctor's recommendation as the mediator. The goal of RQ2 was to ascertain if the mediation influences the screening decision among the target population.

Since the design relies on preexisting and stored secondary data, there were no resource limitations or restrictions. I used caution when examining the link between health literacy and prostate cancer screening overall because of uncertain variables beyond those that were under investigation.

Methodology

Definition of the Target Population and Population Size

In this study, I focused on a specific demographic: Males aged 50 and above residing in the United States who participated in BRFSS survey. From the BRFSS data source of 486,303 participants, 210,606 men above 50 years old were surveyed on their perceptions of comprehending health information provided by health care professionals, such as physicians and nurses. I segmented the 210,606 men based on their health literacy (i.e., very high, moderate high, moderate low, and very low) with a focus on those with high health literacy. Variation in literacy levels exists across different demographic factors, such as race, age, and income (Coughlin et al., 2021). Specifically, older adults, individuals with low income, and men from racial minority groups (including Blacks, Hispanics, and individuals of multiple races) exhibit higher rates of low health literacy (Chesser et al., 2016; Coughlin et al., 2020; Danan et al., 2021; Hooper et al., 2018). The disparity was particularly significant for the multiracial men with limited English proficiency (Schillinger, 2021).

Sampling Procedures of the Secondary Data Set

The CDC annually collects chronic health-related information and health risk preventive behavior from U.S. adults aged 18 and above using telephone interviews to create the BRFSS data set. Aside from age, other selection factors include being part of the English- and Spanish-speaking population and residing in private residences rather than institutionalized facilities, such as prisons and nursing homes (CDC, 2016). The CDC (2016) employed disproportionate stratified sampling and iterative proportional fitting to address the potential bias caused by uneven selection probabilities. I obtained the six variables of interest in the current study from the 2016 BRFSS data set following the completion of the Walden University Institutional Review Board (IRB) process. The groups in each variable were selected, merged, cleaned, and recoded to improve the data integrity to answer the research questions (see Arevalo et al., 2022).

Sample Size and Power Analysis Determination

The determination of statistical significance and practical significance in a study is contingent upon the magnitude of the sample size and effect size (Bhandari, 2023; Serdar et al., 2021). In the current study, I conducted a power analysis using G*Power 3.1.9.7 software on a Windows 10 operating system. The analysis was performed with a small effect size (absolute *p*) value of 0.1, a significance level (α) of 0.05, and a power (1-β error of probability) of 0.95, corresponding to a confidence interval of 95%. The output parameters indicate an overall sample size of 1,289, with a differential (*df*) of 1287 with a critical *t* value of 1.96, an actual power of .950086, and a noncentrality parameter δ of 3.6083517. Despite a modest effect size, an effect in the actual world remains

evident because a greater sample size of the dependent variable influences statistical significance (Bhandari, 2023).

Operationalization of Study Variables

In this study, there was one dependent variable, prostate cancer screening; one independent variable, health literacy; one mediator variable, a doctor's recommendation; and three predicting variables: age, race, and income. In the following subsections, I describe the variables and the methodologies used for the analysis.

Dependent Variable

I measured prostate cancer screening (PSATEST1) on a categorical nominal measurement scale with two categories: 1 = *Yes* to the question of "Have you EVER HAD a PSA test?" and 2 = *No* to the question of "Have you EVER HAD a PSA test?" Those who answered *Don't know*/*Not sure,* Refused *to Answer,* or those missing data were eliminated. The variable was recoded for the analysis as 0 = *No* (i.e., have not tested for PSA) and 1 = *Yes* (i.e., have tested for PSA). The *yes* with the higher value of 1 was the expected outcome.

Independent Variable

I measured health literacy *(*UNDRSTND) on a categorical nominal scale with four groups: 1 = *very easy,* 2 = *somewhat easy*, 3 = *somewhat difficult,* and 4 = *very difficult.* These responses answered the question: "How difficult is it for you to understand information that doctors, nurses, and other health professionals tell you?" Participants who responded 1 = *very easy* were the high health literate group, *somewhat easy* were the moderate high health literate group, *somewhat difficult* were the moderate

low health literate group, and *very difficult* were the low health literate group. The low health literate group were used as the reference or expected outcome cases measuring the other three observed categories.

Mediating Variable

I measured doctor's recommendation (PCPSARE1) on a categorical nominal scale with two groups: 0 = *Yes* to the question of "Has a doctor EVER recommended that you have a PSA test?" and 1 = *No* for the question. Respondents that answered *Don't know* and *Refused to answer* as well as those who were not asked because they were less than 50 years old or not male were eliminated. The reference group for the analysis was those who affirmed that they have never received doctor's recommendation coded as 1.

Confounding Variables

I measured age (_AGE80) as a numeric scale variable but transformed it to a nominal variable. The data set contained 13 age ranges coded 1 to 13 (i.e., 18–24, 25–29, 30–34, 35–39, 40–44, 45–49, 50–54, 55–59, 60–64, 65–69, 70–74, 75–79, and 80–99). The population below 50 years old (i.e., Codes 1 to 6) were eliminated, and those above 50 years old coded as 7 to 13 were recoded 1 to 7 as follows: 50–54 (1), 55–59 (2), 60–64 (3), 65–69 (4), 70–74 (5), 75–79 (6), and 80–99 (7). Code 1 was the reference case.

I measured race (_RACE_G1) on a categorical nominal scale of five groups: 1 = White-Non-Hispanic; 2 = Black-Non-Hispanic; 3 = Hispanic; and 4 = other race only, Non-Hispanic; and 5 = Multiracial, Non-Hispanic. The missing data of the race groups used for internet prevalence tables that answered the *Don't know*/*not sure*/*Refused* component question was eliminated. The reference group was the multiracial group.

Income (INCOME2) was measured on a continuous measurement scale denominated in U.S. dollars. The data set utilized a numerical scale to represent different income levels, but I converted the variable to a categorical variable. Specifically, the scale was as follows: 1 denoted those earning less than $10,000, 2 represented those earning less than $15,000, 3 corresponded to an income less than $20,000, 4 signified earnings less than $25,000, 5 denoted an income less than $35,000, 6 represented earnings less than $50,000, 7 corresponded to an income less than $75,000, and 8 signified an income of $75,000 or more used. Group 8 was used as the reference group in the analysis,

Data Analysis Plan

I employed binomial logistic regression analysis to address RQ1 and mediation analysis to address RQ2. The Exp(B) of the logistic regression measures the proportion of the dependent variable's variability that can be accounted for by the independent and predictor variables. (Laerd Statistics, n.d., Newsom, 2023). The variables estimated the chance of the dependent variable occurring by examining the impact of a single unit change in the independent variable while keeping the other predictor variables constant. The test also demonstrated the significance of each category in the reference group. In contrast, the Wald test contrasts the estimated parameters with their hypothesized values under the null hypothesis (Laerd Statistics, n.d.). The determination of the *t* value in the mediation analysis indicates the statistical significance of the independent variable's impact on the mediator, the mediating variable's influence on the dependent variable, and the combined effect of both the independent variable and the mediator on the dependent

variable (Jung, 2021). I used the statistical package for social sciences (SPSS) Version 28 for both analyses, employing a statistical significance level of 5% ($p < 0.05$) and a confidence interval of 95% (Cl 95%).

Assumptions of the Statistical Analysis

The primary objective of the current study was to examine the relationship between a dependent variable and the independent variables using binomial logistic regression and mediation analysis techniques. The use of these statistical tests necessitates verifying whether the designated variables meet the specified assumptions of these statistical tests to produce a reliable result (Laerd Statistics, n.d.). The assumptions associated with the binomial regression test were as follows:

Assumption 1: It is assumed that the dependent variable should be assessed using a dichotomous scale or categorized into two categories, such as "yes" and "no," "female" and "male," or "introvert" and "extrovert" (Laerd Statistics, n.d.). The current study's dependent variable, PSA screening, satisfied this condition due to its measurement in a binary format of "yes" and
"no."

Assumption 2: The presence of one or more independent variables, which might be either a continuous variable (i.e., interval or ratio) or a categorical variable (i.e., ordinal or nominal) was necessary. The independent and predictive factors in the current study included doctor's suggestion (nominal), race (nominal), health literacy (nominal), age (interval), and income (interval). Age and income were converted to nominal variable.

Assumption 3: The dependent variable consists of categories that are both mutually exclusive and exhaustive (Laerd Statistics, n.d.). In the current study, I fulfilled this requirement by ensuring that the dependent variable, PSA screening, was mutually exclusive, meaning that participants were either screened for PSA or not screened for PSA.

Assumption 4: There should be a linear relationship between each continuous independent variable and the logit-transformed dependent variable (Laerd Statistics, n.d.). This current study confirms this assumption by using the Box-Tidwell (1962) approach in SPSS to assess linearity, which aids in interpreting the findings (see Laerd Statistics, n.d.).

I discerned Assumptions #1, #2, and #3 from direct observation of the variables, as previously elucidated (see Laerd Statistics, n.d.). Meanwhile, as explained before, Assumption 4 can be subjected to empirical testing. Mitigating violations in statistical test assumptions may be achieved by ignoring outliers, accompanied by a reason for their inclusion, and by modifying nonnormal data (Laerd Statistics, n.d.).

The underlying premise of mediation analysis pertains to elucidating the processes via which exposure-outcome effects occur with the following assumptions:

Assumption 1: It is necessary for the variables of interest, including the dependent variable, independent variables, and mediator factors, to exhibit a linear connection; the linearity may be assessed by using a scatterplot in the SPSS software (Jung, 2021; Laerd Statistics, n.d.). In the current study, I examined the

correlation between doctor's recommendations for PSA screening and health literacy, building upon various research that has shown a clear association between health literacy and PSA screening (see Coughlin et al., 2020; Nguyen et al., 2021).

Assumption 2: Avoiding multicollinearity is crucial because it can result in interdependence among the independent variables and potentially biased outputs. In the current study, although the multicollinearity between the two independent variables, health literacy and doctor's recommendations, cannot be proven, the mediation test examined the direct and indirect effects of each independent variable separately without considering their interrelationship (see Jung, 2021).

Assumption 3: False outliers should not be allowed to be present in the data, and the distribution of the variables is assumed to resemble a normal distribution (Jung, 2021). As previously discussed, the assumption, if violated, may be addressed via data cleansing and treatment.

Assumption 4: It is necessary for the dependent, independent, and mediator variables to be measured using a continuous scale. In the current study, I measured the dependent variable, independent variable, and mediator variables on a nominal scale; however, it is possible to use dependent and mediator categorical variables in binary format and categorical independent variables (see Iacobucci, 2012 & Newsom, 2018).

Incorporating predicting factors such as race, age, and income level distinguished the potential advantages of the study's outcomes for the disadvantaged segment of the

population characterized by low income and poor literacy levels, specifically concerning decision-making about prostate cancer screening.

Threat to Validity

Threats to External Validity

External validity pertains to the degree to which the results of a research study may be generalized to a broader population in real-world situations (Lesko et al., 2020; Patino & Ferreira, 2018). It includes elements such as the clarity of reporting and biases in the samples obtained during data collection (Chen et al., 2022; Huebschmann et al., 2019). Due to the limitation of employing primary data that the researcher may manipulate, the present cross-sectional study faced external validity concerns arising from the BRFSS secondary data collection. The primary risk associated with the 2016 BRFSS data set was the decline in the response rate for landline telephone surveys, as cell phones were not widely used then (CDC, 2016). Additionally, eligible persons were excluded from the survey due to language barriers, as only English-speaking individuals were included in the criteria (CDC, 2016). The CDC (2016) reported addressing these threats by including cellular phones in the 2016 survey with the 2011 landline only survey. They calculated the response, cooperation, and refusal rates for the BRFSS using the standards set by the American Association of Public Opinion Research. They also used a weighting procedure to account for the new variables added to the dataset. The BRFSS remained the most often used dataset in public health research, particularly in preventive measures such as prostate cancer screening studies (Zahnd et al., 2019). Notably, none of the researchers have identified any issues with outcome

distortion caused by the external validity of this data set (Jamieson et al., 2022; Nguyen et al., 2021).

Threats to Internal Validity

Internal validity pertains to how effectively a research study establishes a cause-and-effect link, ensuring the accuracy and integrity of the survey. (Patino & Ferreira, 2018). The present cross-sectional research using the secondary data of 2016 BRFSS were susceptible to specific threats to internal validity, such as maturation, instrumentation, testing, selection bias, regression to the mean, social interaction, and attrition (Slocum et al., 2022). The BRFSS mandates rigorous methodological guidelines for the yearly data sets (CDC, 2016). Nevertheless, there needs to be assurance that the information from 2016 was gathered using well-recognized standardized and randomized techniques. The potential risk to internal validity emerged from the discrepancies in data resulting from diverse methodologies and was unfeasible to account for these changes using pre-existing secondary data in the present investigation. Hence, validating affirmative findings from this study using innovative, well-regulated research approaches, ideally with substantial sample size of 210,606 was crucial. The presence of predicting factors poses a possible risk to the study's internal validity. Nevertheless, efforts were made to intentionally uphold the statistical results as much as feasible to minimize the risks.

Ethical Procedures

Ethical procedures encompass a set of guiding principles that researchers adhere to prevent any infringement upon the ethical values of the population under study (Saleh

et al., 2021 & Tulchinsky, 2018). The significance of ethical guidelines is underscored by the intricate and multifaceted landscape of the 21st-century public and private health sectors, which span diverse disciplines (Tulchinsky, 2018). There is a growing recognition of the necessity to strictly adhere to ethical principles in these sectors (Saleh et al., 2021; Tulchinsky, 2018). Adherence is crucial for the well-being of the researchers and the individuals being studied (Tulchinsky, 2018). Several fundamental principles are outlined in the literature, including informed consent, confidentiality, respect for human rights, justice, and scientific integrity (Tulchinsky, 2018). Despite the availability of publicly accessible secondary data, such as the BRFSS, researchers at Walden University are required to adhere to ethical guidelines. As a result, researchers, including the writer, were expected to refrain from downloading the data until the IRB process was completed. This process involved submission of an IRB application form upon approval of the proposal.

The CDC and the U.S. Department of Health collect the BRFSS data set. The data are obtained through telephone interviews, utilizing a random digit dialing method that includes landlines and cell phones. The sampling design employed was stratified, allowing for the collection of health information from adults aged 18 years and above residing in the United States and its territories. Participation in the survey is voluntary (CDC, 2016). Collecting data about health-related risk behavior, chronic illnesses, and the use of preventative services such as cancer screening is conducted anonymously. Every state transmits data to the CDC for review and subsequent return. While some data are made available to the public, others are encrypted and need permission for access.

The present investigation aimed to examine the impact of health literacy on physicians' recommendations for males aged 50 and above in the United States. The research used the de-identified secondary data from the BRFSS data set, as previously indicated. Therefore, confidentiality, informed consent, respect for human rights, and justice were not considered. The presence of biases in the study's findings may arise from many factors, including the reliance on participant self-report, the lack of involvement in the study design and instrument selection, the unverifiable nature of the survey data, and the absence of peer review. These considerations raise concerns about the scientific integrity of the research. Nevertheless, comprehensive technique and meticulous design effectively addressed the concern above.

Summary

The reputable source of the data, BRFSS, validates the research's conclusion, to affirm the study's quality. The chapter provided a succinct historical explanation of six variables: prostate cancer screening, health literacy, physicians' advice, race, age, and income. The methodological section of the study emphasized the target population and the collaborative efforts between the CDC and each department of health in the United States. The G*Power software examined a narrow range of effect sizes, regardless of the result, owing to the substantial sample size of the population. The present study utilized SPSS for operationalization and data analysis, focusing on cleaning the secondary data, examining research topics, and testing hypotheses via binary regression, mediation analysis techniques, and interpreting the result from the output table to accept or reject the posed hypotheses. The chapter concluded by discussing several factors that may

compromise the study's validity and ethical considerations associated with the research. Section 3 showed the feasibility of all the tasks listed in Section 2, commencing with the study's objective, followed by the processes of accessing, presenting, and reporting the results derived from the examined variables of the BRFSS data set.

Section 3: Presentation of the Results and Findings

Introduction

In this study sought, I examined the decision-making process of high health-literate individuals aged 50 and above in the United States regarding prostate cancer screening, considering the influence of doctors' recommendations using age, race, and income level as predictors. Two research questions and their associated hypotheses guided this study:

RQ1: Is there an association between high health literacy and prostate cancer screening controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States?

$H_0$1: There is no association between high health literacy and prostate cancer screening while controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States.

$H_1$1: There is an association between high health literacy and prostate cancer screening controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States.

RQ2: Is there an association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States?

$H_0$2: There is no association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States.

$H_1$2: There is an association between high health literacy and prostate cancer screening when mediated by a doctor's recommendation among men 50 and above in the United States.

In this section, I provide the demographic characteristics of the sample study, descriptive statistics of the study variables, statistical assumptions, and application of statistical tests to evaluate the hypotheses. The findings are presented in the form of tables and figures. I conclude the section with a summary of the answers to the research questions and a transitional statement that connects this section to the discussions of the application to professional practice and the execution of social change in Section 4.

Accessing the Data Set for Secondary Analysis

The data for the study were from the 2016 BRFSS, a state-based, annual telephone survey on risk and health behavior practices, such as prostate cancer screening, in the United States (see CDC, 2016). The surveys were conducted quarterly, beginning in January, and the collected data were reviewed monthly to ensure a representative sample for monthly data collection (CDC, 2016). However, several states, including Minnesota, Mississippi, New Jersey, Virginia, and Wyoming, did not gather data for January, and Florida and the District of Columbia did not collect data from January to March. Additionally, the Virgin Islands did not collect data for January or July through October (CDC, 2016). This divergence would have disproportionately impacted statistical analyses that rely on monthly rather than annual data collection (CDC, 2016). The 2016 BRFSS survey recorded a median response rate of 47.7% for landline usage and 46.4% for cell phone usage across all states and territories (CDC, 2016). The study

sample had 321,939 (66.2%) participants over 50 years old as compared with 164,364 (33.8%) under the age of 50. Additionally, 210,606 (43.3%) of the sample consisted of men above 50, compared to the female and men under the age of 50 population of 275,697 (56.7%).

I obtained the BRFSS data set from the CDC websites following approval from the Walden University IRB to conduct this study (Approval No. 610995815 granted on 02-08-2024). The current study included six variables out of the 265 available in the BRFSS data set while maintaining the recommended inclusion and exclusion criteria from the previous section. Given that the study was exclusively focused on men, I excluded women through a filtering process, and men 50 years old and above were included in the analysis using the selective criteria in SPSS. The discrete missing value was employed to exclude instances where respondents indicated “"don't know/not sure” or “refused to answer” in the variables related to doctor’s recommendations, prostate cancer screening, health literacy, and income level. The variable of race did not contain any missing values.

Demographic Characteristics of the Sample

Among the 486,303 individuals surveyed, 210,606 (43.3%) were men aged 50 and above. Table 1 displays the demographic characteristics of these individuals categorized by their marital status, geographic region, type of home, insurance coverage, and access to cell phones and landlines. Among the respondents, 119,350 (56.7%) were married, 26,170 (12.4%) were divorced, 12,884 (6.1%) were widowed, 4,051 (1.9%) were separated, 39,602 (18.8%) were never married, and 7,139 (3.4%) were in an

unmarried pair. The population residing in each state's core urban areas was 13,582 (15.0%,) while 16,456 (7.8%) dwelled in the city's outskirts. Additionally, 13,895 (6.6%) lived in the suburban districts, 30,388 (14.4%) inhabited the rural regions, and 94,429 (48.8%) of the respondents lived in a private resident. The number of respondents that reported having access to health coverage was 191,421 (90.9%), while 18,161 (8.6%) stated that they did not have health insurance. Additionally, 43,656 (20.7%) of the respondents reported not having a cell phone, while 50,788 (24.1%) claimed to have only a cell phone. Among those with a cell phone, 40,672 (19.3%) confirmed having both a cell phone and a landline, while 75,632 (35.9%) stated that they do not have landline. The proportion of males aged 50 and older 210,606 (43.3%) accurately reflects the sample population. Additionally, more than half of these men are married, live in urban areas, have access to health coverage, and possess cell phones and landlines compared to the overall population.

Table 1

The Demographic Characteristics of the Study Sample

Characteristics		Frequency	Percent
Gender	Male	210,606	100
Marital status	Married	119,350	56.7
	Divorced	26,170	12.4
	Widowed	12,884	6.1
	Separated	4,050	1.9
	Never married	39,602	18.8
	Member of unmarried couple	7,139	3.4
	Missing	1,509	0.7
	Total	210,606	100.0
Metropolitan status code	Live in the center of the city	31,582	15.0
	Live outside the center of the city	16,456	7.8
	Live in the suburban	13,895	6.6
	Not live in the metropolitan	30,388	14.4
	Missing	118,285	56.2
			100.0
Private residence	Private residence	94,429	44.8
	Not private residence	15	0.0
	Missing	116,162	55.2
	Total	210,606	100.0
Have any health care coverage	Have health coverage	191,421	90.9
	Do not have health coverage	18,161	8.6
	Missing	1,024	0.8
	Total	210,606	100.0
Cell phone	Have a cell phone	43,656	20.7
	Do not have a cell phone	50,788	24.1
	Missing	116,162	44.8
	Total	210,606	100.0
Landline	Have landline	40,672	19.3
	Do not have landline	75,632	35.9
	Missing	116,304	55.2
	Total	210,606	100.0

Descriptive Statistics of the Sample

Table 2 presents the descriptive statistics of the sample variables of the study, which include the prostate cancer screening, health literacy, doctor's recommendation, age, race, and income level. Among the men who participated in the phone survey for prostate cancer screening, 56,160 (26.7%) said they had never undergone prostate cancer screening, while 87,341 (41.5%) reported having screened at least once. Using the question of how easy to understand health information from health care professional to measure health literacy, 23,217 (11.0%) reported having very high health literate level, 12,632 (6.0%) said they have moderate high health literacy levels, 2,267 (1.1%) described themselves as having moderate low health literacy, and 463 (.2%) were those with very low health literacy. For the question of whether a doctor has ever recommended prostate cancer screening, 81,628 (38.8%) affirmed, while 63,249 (30.0%) said they had never received a doctor's recommendation. For the age group variable, 18,806 (8.9%) were between 50–54, 22,129 (10.5%) were between 55–59 years, 24,378 (11.6%) were between 60–64 years, 24,077 (11.4%) were between 65–69 years, 17,894 (8.5%) were between 70–74 years, 11,953 (5.7%) were between 75–79, and 13,670 (6.5%) were between 80–99 years. Of all participants, 77,699 (36.9%) participants did not answer the age question. For race, 159,360 (75.7%) were White, 14,866 (7.1%) were Black, 17,151 (8.1%) were Hispanic, 10,381 (4.9%) were other races, and 4,401 (2.1%) were multiracial respondents. Also included in the analysis was the income: 7,143 (3.4%) respondents earned less than $10,000 annually, 7,709 (3.7%) earned less than $15,000 annually.11,484 (5.5%) earned less than $20,000 annually, 14,771 (7.0%) respondents

earned less than $25,000 annually, 18,361 (8.7%) respondents earned less than $35,000 annually, 26,396 (12.5%) respondents earned less than $50,000 annually, 30,613 (14.5%) respondents earned less than $75,000 annually, and 64,779 (30.8%) respondents earned more than $75,000 annually.

Table 2

Descriptive Statistics of the Sample Table

Variables	Frequency	Percent
PSA test		
Have not tested for PSA	56,160	26.7
Have tested for PSA	87,341	41.5
Missing	67,105	31.8
Total	210,606	100.0
How difficult to understand health information		
Very easy	23,217	11.0
Somewhat easy	12,632	6.0
Somewhat difficult	2,267	1.1
Very difficult	463	0.2
Missing	172,027	81.7
Total	210,606	100.0
Ever received Dr's recommendation		
Yes	81,628	38.8
No	63,249	30.0
Missing	65,729	31.2
Total	210,606	100.0
Age		
50-54	18,806	8.9
55-59	22,129	10.5
60-64	24,378	11.6
65-69	24,077	11.4
70-74	17,894	8.5
75-79	11,953	5.7
80-99	13,670	6.5
Missing	77,699	36.9
Total	210,606	100.0
Race		
White	159,360	75.7
Black	14,866	7.1
Hispanic	17,151	8.1
Other race only	10,381	4.9
Multiracial	4,401	2.1
Missing	4,447	2.1
Total	210,606	100.0
Income ($)		
Less than 10,000	7,143	3.4
Less than 15,000	7,709	3.7
Less than 20,000	11,484	5.5
Less than 25,000	14,771	7.0
Less than 35,000	18,361	8.7
Less than 50,000	26,396	12.5
Less than 75,000	30,613	14.5
More than 75,000	64,779	30.8
Missing	29,350	13.9
Total	210,606	100.0

Results

RQ1

The primary goal of this research inquiry was to establish the influence of high health literacy, doctor's recommendation, age, race, and income level on prostate cancer screening decision using binary logistic regression test. I thoroughly examined and verified the assumptions of binary logistic regression to ensure the correct interpretation of the results and the development of appropriate guidelines. These assumptions encompassed the two potential responses or dependent variable results: whether to screen for prostate cancer (see Laerd Statistics, n.d.). Additionally, use of binary logistic regression assumes that the observation variable (i.e., health literacy) is independent and that the survey originated from the same source (see Laerd Statistics, n.d.). Furthermore, use of this type of analysis assumes no multicollinearity among the predictor variables of age, race, and income because they are unrelated and there were no extreme outliers (see Laerd Statistics, n.d.).

The number of cases selected for the analysis was 19,622 (9.3%) of the 210,606 cases in the sample. The expected outcome to which the events predicting the odds of screening for prostate cancer were the respondents who affirmed having screened for prostate cancer, coded as 1, while those who declined ever screened for prostate cancer were coded as 0. The omnibus test model coefficients' Goodness-of-fit statistics indicated that the model effectively describes the data compared to the null model, indicating a solid fit on a degree of freedom of 21, chi-square = 11,315.337, and significance p = .000. The Hosmer and Lemeshow contingency confirmed that the model fits with

negligible disparities between the observed and expected models. Nagelkerke's R^2 an adjusted Cox and Snell R^2 version indicated that 62.0% of the criterion variable variation can be linked to the model's predictor variables.

This model classified high literate men screening for prostate cancer with an 87.0% accuracy rate. The prediction included a specificity (true negative rate) of 82.6% (i.e., the highly literate men that will not screen for prostate cancer even with a doctor's recommendation) and a sensitivity (true positive rate) of 89.0%, indicating the proportion of cases correctly classified as falling into the target group. To compare the observed with the expected outcome of the dependent variable, I selected the first cases of the categorical independent variable as the reference group, which served as the baseline group for comparison. The *p* values predicted for the health literacy categories measuring the difficulty of understanding health information were below .005.

Table 3 displays information about the variables analyzed with the binary logistic regression.

Table 3

Variables in the Equation of Binary Logistic Regression

							95% C.I.for EXP(B)	
		B	S.E.	Wald	*df*	Sig.	Exp(B)	Lower	Upper
Step 1[a]	Health information comprehension			43.288	3	< .001			
	Health information comprehension (1)	-.194	.050	15.090	1	< .001	.824	.747	.908
	Health information comprehension (2)	-.525	.097	29.400	1	< .001	.592	.490	.715
	Health information comprehension (3)	-.594	.200	8.781	1	.003	.552	.373	.818
	Ever received doctor's advice (1)	-3.751	.049	5,902.175	1	.000	.023	.021	.026
	Final Age group			936.109	6	< .001			
	Final Age group (1)	.630	.074	72.606	1	< .001	1.878	1.625	2.171
	Final Age group (2)	1.198	.075	252.261	1	< .001	3.313	2.858	3.841
	Final Age group (3)	1.677	.080	440.744	1	< .001	5.349	4.574	6.256
	Final Age group (4)	1.879	.091	423.210	1	< .001	6.545	5.472	7.827
	Final Age group (5)	2.178	.107	416.071	1	< .001	8.830	7.162	10.885
	Final Age group (6)	2.233	.100	499.737	1	< .001	9.325	7.667	11.342
	New race group			32.199	4	< .001			
	New race group (1)	-.014	.077	.034	1	.854	.986	.849	1.146
	New race group (2)	.470	.096	23.932	1	< .001	1.600	1.326	1.932
	New race group (3)	-.361	.149	5.838	1	.016	.697	.520	.934
	New race group (4)	.045	.240	.035	1	.851	1.046	.654	1.675
	New Income level			282.118	7	< .001			
	New Income level (1)	.186	.143	1.711	1	.191	1.205	.911	1.593
	New Income level (2)	.032	.133	.059	1	.809	1.033	.796	1.340
	New Income level (3)	.224	.130	2.947	1	.086	1.250	.969	1.614
	New Income level (4)	.330	.126	6.855	1	.009	1.391	1.087	1.781
	New Income level (5)	.596	.122	23.740	1	< .001	1.814	1.428	2.306
	New Income level (6)	.914	.122	56.354	1	< .001	2.495	1.965	3.167
	New Income level (7)	1.154	.116	98.226	1	< .001	3.171	2.524	3.984
	Constant	.881	.123	51.104	1	< .001	2.413		

[a.] Variable(s) entered on Step 1: Health information comprehension: very easy (reference), somewhat easy (1), somewhat difficult (2), very difficult (3). Ever received doctor's advice: *yes* (reference), *no* (1) Final Age group: 50-54 (reference), 55–59 (1), 60–64 (2), 65–69 (3), 70–74 (4), 75–79 (5), 80-99 (6), New race group: White (reference): Black (1), Hispanic (2), other race only (3), multiracial (4). New Income level: < $10,000 (reference), < $15,000 (1), < $20,000 (2), < $25,000 (3), < $35,000 (4), < $50,000 (5), < $75,000 (6), > $75,000 (7).

This indicates statistical significance about the expected screening for prostate cancer among all categories of health literacy. Moreover, the odds ratio (Exp B) in all the categories were less than 1 (0.824 for moderate health literacy, 0.592 for moderate low, and 0.552 for very low health literacy) in comparison to high health literacy group. This means a change in odds percentage of -17.6% for moderate high, -40% for moderate low, and -45% for very low. Men with moderate high health literacy has a 17.6% reduction in screening for prostate cancer than not screen. Alternatively, there is 82.4% chances of screening for prostate cancer among high health literacy group than moderate health literacy showing that the likelihood of men screening for prostate cancer is lower in the categories of moderately low and very low health literacy men compared to men with high health literacy.

For doctor's recommendation with 0.023 odds, there is a 97.7% reduction in the odds of screening for prostate cancer among those who affirmed receiving doctor's advice than those who never received doctor's recommendation. All age groups are statistically significant indicating positive predictive relationship between age and screening for prostate cancer. The log odds ratio of all the age groups affirmed the positive associations with the positive and greater than one values. However, there are greater odds of screening as age increases. For instance, for every unit change in year, the likelihood of screening for prostate cancer increases by a factor of 1.8 times among men 55-59 than the 50-54 age group. White and Hispanics races are likely to screen for prostate cancer than Black, other race, and multiracial men.

There is 1.4% likelihood that the Black race will not screen as much as the White race. For income, there is a positive relationship between screening for prostate cancer and those who earned above $35,000. For every increase in dollars earned, the odds of falling into the target group (screening for prostate cancer) increases by 3.2 times among those who earned more than $75,000 than those who earned less than $10,000. The less than $50,000 income earners are 1.8 times more likely to screen for prostate cancer than the men that earned less than $10,000.

Testing the null and alternate hypothesis using the lower and upper band of confidence interval, the health literacy including the high literate group, doctor's recommendation and other race, shows the possibility that the probability of screening for prostate cancer does changes with the variables, supporting the null hypothesis and rejecting the alternate predicting. However, income and age though significant but does not indicate relationship with prostate cancer screening.

Binary logistic regression was used to examine whether an association exists between high health literacy, doctor's recommendations, and prostate cancer screening considering age, race, and income level. A preliminary analysis suggested that the assumption of multicollinearity in all the variables was met (tolerance = 0.96, Variable in inflation -VIF = 1.1 for a threshold of 3). An inspection of standardized residual values reveals that there were outliers due to the categorical independent and predictor variables, but cases were all used in the study. The model was statistically significant, $X^2(21, N = 19{,}622) = 11315.337$, $p = .000$, indicating that the model effectively determined the influence of high health literacy and other predictor variables on the decision to have

prostate cancer screening. The model further explained between 44% (Cox & Snell R^2) to 62% (Nagelkerke's R^2) of the variance that are accounted for in the dependent variable of screening for prostate cancer. Additionally, it correctly predicted the outcome in 87.0% of the cases, with a sensitivity of 89.0% and a specificity of 82.6%.

The output revealed a correlation between prostate cancer screening, high health literacy, doctor's recommendation, age, income, and race. The link between screening for prostate cancer, doctor's recommendation and health literacy predictor is robust, hence rejecting the null hypothesis of no association. The likelihood of undergoing prostate testing increases with age.

RQ2

The second study inquiry was to determine whether a doctor's recommendations affect the association between high health literacy and prostate cancer screening. A logistic regression was employed to conduct a mediation analysis. The dependent variable (Y) was prostate cancer screening, the independent variable (X) was high health literacy, and the mediating variable (M) was a doctor's suggestion. To establish a substantial mediation impact of M on X and Y, it is necessary for the following four steps or pathways to show significance through regression analysis:

Step 1: X predicting Y to test path c (direct effect) $Y = B_0 + B_1X + e$

Step 2: X predicting M to test path a (indirect effect) $M = B_0 + B_1X + e$

Step 3: M predicting Y to test path b (indirect effect) $Y = B_0 + B_1M + e$

Step 4: X and M predicting Y (Total effect) $Y = B_0 + B_1X + B_2M + e$

where:

B_0 is the coefficient for constant

B_1 is the coefficient for X

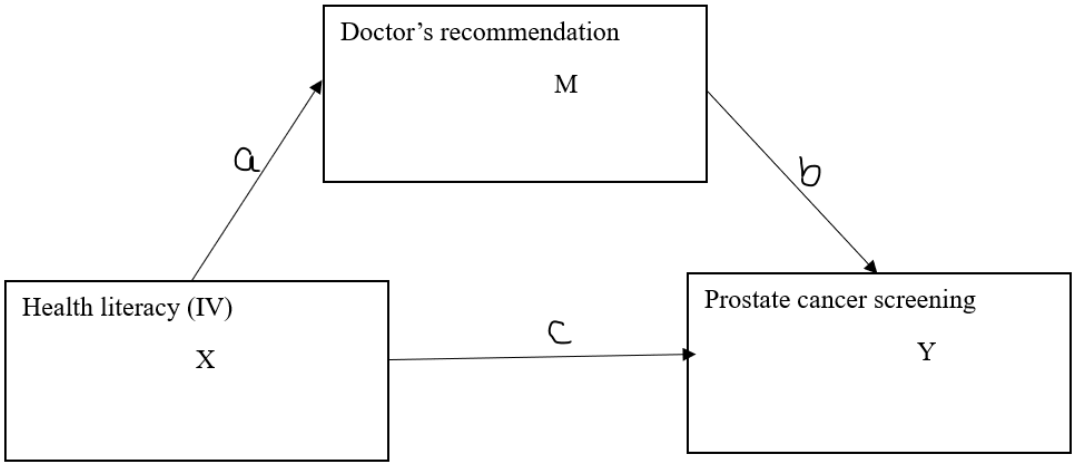
B_2 is the coefficient for M

e is the error term or residual in the regression equation (Iacobucci, 2012; Newsom, 2018).

The assumptions of the mediation were scrutinized and validated to ensure accurate interpretation of the findings and the formulation of suitable recommendations. The initial assumption is that the three variables should be measured on a continuous scale. However, Iacobucci (2012) and Newsom (2018) have specified that it is acceptable for all the variables to be categorical as long as Y and M are in a binary format of yes/no or 1/0. The second premise posits that multicollinearity must be absent among the variables (MacKinnon, 2011). The third assumption posits a causal relationship between X, M, and Y, as Iacobucci and Newsom stated. In this study, Y and M were presented in binary format. The absence of multicollinearity has been established in the analysis of RQ1, but the phrase "causal effect" is employed less strictly in scientific research. While the study did demonstrate a positive correlation between the three variables, it is essential to note that the influence of one variable on another does not necessarily imply a cause-and-effect relationship.

Figure 3

Mediation Model



The four paths, X on Y (c), X on M (a), M on Y (b), and X and M on Y (ab), were analyzed using SPSS software. The results are presented in Table 4.

Table 4

Variable in Equation of Logistic Regression

n								95% Cl for Exp(B)	
	Variables	*B*	S.E.	Wald	*df*	Sig.	Exp(B)	Lower	Upper
Step 1	High health literacy	.275	.018	244.012	1	< .001	1.317	1.270	1.365
	Constant	-.855	.030	807.339	1	< .001	.425		
	a. variable(s) entered on step 1: Health literacy								
Step 2	High health literacy	.231	.018	162.411	1	< .001	1.260	1.216	1.306
	Constant	-.621	.030	441.314	1	< .001	.537		
	a. variable(s) entered on step 2: Health literacy								
Step 3	Doctor's recommendation	3.974	.017	527.098	1	< .000	3.208	1.472	2.997
	Constant	-2.484	.013	543.030	1	< .000	.083		
	a. variable(s) entered on step 3: doctor's recommendation								
Step 4	High health literacy	.245	.028	79.173	1	< .001	1.278	1.251	1.349
	Doctor's recommendation	3.817	.037	539.792	1	< .000	4.489	4.294	4.928
	Constant	-2.739	.051	261	1	< .000	.065		
	a. variable (s) entered on step 4: High health literacy, Doctor's recommendation								

The significant *p* value <.001 for the direct, indirect, and total effect of the X, M, and Y variables established the claim that doctor's recommendation had mediating influence on the relationship between high health literacy and prostate cancer screening. Utilizing a doctor's suggestion as an intermediary for individuals with a high level of health literacy and their decision to undergo prostate cancer screening can lead to favorable outcomes for men who are at risk of developing prostate cancer.

Summary

The RQ1 established that men with a high level of health literacy are more inclined to undergo prostate cancer screening. In contrast, they are less likely to do so when a doctor's recommendation is considered. Considering the categorical variables, the analysis results highlight the strength and direction of the relationships and the odd ratio concerning prostate cancer screening among men above 50 in the United States. For RQ2, the study using logistics regression on mediation analysis revealed that the doctor's recommendation mediates the relationship between health literacy and prostate cancer screening. The direct (path c), indirect (a and b), and total effect (path c, a, and b) were significant at $p < .001$. Utilizing a doctor's recommendation as an intermediary helps to connect the knowledge of health and the choices about prostate cancer screening, thus enhancing the overall health outcomes for men who are susceptible to prostate cancer. The study also depicted the effects of age, race, and income level. The study's conclusions were aligned with past investigations, as emphasized in the interpretations and findings part of Section 4. The study incorporated limitations and provided recommendations for future researchers. The study concluded with the implications for

professional practice and its potential to bring about good social change at the individual, family, organizational, and policy levels.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

In this study, I investigated the relationship between health literacy, doctor's recommendations, and prostate cancer screening among men over 50 years old in the United States. Despite a decrease in the mortality rate of prostate cancer, the prevalence rate remains high in spite of widespread health knowledge and positive health habits, such as prostate cancer screening (Broderick, 2020; Nguyen et al., 2021). The primary aim of this study was to investigate the influence of health literacy levels on men's decision-making regarding prostate cancer screening because a higher level of health literacy is associated with a greater comprehension of the potential risks, benefits, and uncertainties related to screening (see Broaderick, 2020; Coughlin et al., 2020; Grubb et al., 2018; Housten et al., 2021). In the second component of the study, I examined the influence of a doctor's recommendation because it plays a critical role in influencing patients' individual decisions. My objective was to explore the relationship between health literacy and prostate cancer screening in more detail, going beyond the typical interventions and outcomes to the underlying mechanisms and causal consequences, with the doctor's advice as a mediator. The third objective of this study was to examine how age, race, and income influence high health literacy, doctor's recommendations, and how these characteristics affect screening rates. The fourth objective was to augment the understanding of prostate cancer screening choices, provide guidance for policymaking, and foster favorable health results among men aged 50 and above in the United States.

Two research questions guided this study. In this section, I provide my interpretation of the findings.

Interpretation of the Findings

In this study, I examined if an association existed between high health literacy and prostate cancer screening controlling for a doctor's recommendation, age, race, and income among men 50 and above in the United States. These results indicated a strong positive correlation between men with high health literacy, receiving a doctor's suggestion, and choosing to undergo prostate cancer screening. The group with a high level of health literacy was 1.3 times more inclined to undergo screening for prostate cancer. In contrast, the inclination to screen decreased by a factor of 4.5 when the physician interfered. I found that doctors' recommendations significantly mediated the relationship between good health literacy and prostate cancer screening. The results also revealed that the probability of men undergoing screening for prostate cancer increases with age. Additionally, I found that individuals from White and Hispanic populations are more likely to undergo screening compared to Blacks, individuals from other races, and multiracial men. Furthermore, the findings showed that there is a positive correlation between greater income levels and the possibility of screening for prostate cancer.

Multiple studies have shown that individuals with a high level of health literacy are more inclined to undergo prostate cancer screening than those with low health literacy (Beyer et al., 2023; Canon-Ibanez et al., 2021; Liu et al., 2020). According to Nguyen et al. (2021), 70.3% of the 12.4 million men who underwent prostate cancer screening classified as having a high level of health literacy against 29.7% of those with low health

literacy. The current study indicated that, from the study sample size of 210,606, 89.0% of high-health-literate men might be more likely to screen for prostate cancer than the low-health-literate men. In contrast, Madeline et al. (2020) observed a 47.4% higher rate of prostate cancer screening among men with high health literacy compared to a 27.4% rate among men with low health literacy.

Unlike earlier studies that examined screening decisions across various levels of health literacy, the current study focused exclusively on high health literate men to identify their inclination towards prostate cancer screening. According to Nguyen et al. (2021), the rate of screening declines when SDM is employed, particularly following a discussion of the drawbacks or potential risks associated with screening among those with a high level of health literacy. I arrived at a comparable finding but employed doctor's advice instead of SDM as a trigger to behavioral response. No other scholarly works have examined the application of this predictor in the context of prostate cancer screening. The utilization of medical advice as the intermediary was likewise distinctive in this investigation.

Prostate cancer has a more significant impact on Black men compared to White men, primarily because of their lower incidence of screening (Lillard et al., 2022). As a result, Black men are 2.2 times more likely to die from prostate cancer than White men, and this has been attributed to late detection, more aggressive disease progression, and higher mortality rates (Lillard et al., 2022). According to Ma and Richardson (2022), prostate cancer is most prevalent among men aged 75 and above. The authors also noted a strong correlation between low income and a lower incidence of screening for this

disease. I found that individuals who identify as White or Hispanic are more likely to have prostate cancer screening compared to individuals who identify as Black, belong to other racial groups, or are multiracial. The current study findings also indicated that men with an income below $35,000 are less inclined to undergo screening than those with an income above $35,000.

The use of the SOR model in the current study, while not frequently employed in health intervention studies, was motivated by examining the much-debated subject of health literacy and prostate cancer screening. I investigated the correlations between high health literacy; doctor's advice; and predictive characteristics, such as age, race, and income. Additionally, I sought to explore the role of a doctor's recommendations as a trigger to find novel insights about the variables and predictors under investigation. The utilization of the SOR model in addressing RQ1 revealed a more profound understanding of the interconnectedness between high health literacy; doctors' recommendations; and predictive characteristics, such as age, race, and income level, regarding prostate cancer screening. This made the SOR model the most suitable choice for the theoretical framework of the study. The predictors stimulated both high health literacy and prostate cancer screening, resulting in the extraction of diverse knowledge about the researched variables. The threshold for prostate cancer screening was determined to be $35,000, below which individuals are unlikely to undergo screening and above which persons are more likely to undergo screening.

The utilization of SOR in the current study yielded data on the propensity of prostate cancer screening among the health-literate White and Hispanic population in

comparison to their Black, other racial, and mixed counterparts. Thus, it is possible to direct efforts towards different racial groups, particularly those who are disadvantaged, while constructing health programs and creating health policy. Including stimulus factors through mediation will allow health care and public health businesses to focus their efforts and resources on the neediest population.

Limitations of the Study

I identified several limitations to this study. The first limitation was the self-reported measures of the secondary data used, which can be subject to recall bias and social desirability bias and may affect the accuracy and validity of the findings. The second limitation was the selection bias of the respondents of BRFSS data set, which could affect the result of the findings. The third limitation was the use of predicting variables, like age, race, and income level. Different categories of factors can pose different impacts on the observed associations (Assimon, 2021). It is unclear whether high health literacy leads to increased adherence to doctor's recommendations or if adherence to doctor's recommendations improves health literacy. The fourth limitation was the complexity of measuring the health literacy construct that goes beyond reading and comprehension skills. Existing measures might not fully capture the multidimensional nature of health literacy, potentially leading to an underestimation of its impact on prostate cancer screening behaviors (Washington & Masters, 2021). The fifth limitation involved the inability to determine the clinical importance accurately. Although there are proven links between health literacy and prostate cancer screening habits, it is still uncertain how these connections translate into practical implications for

patient care. Studies have frequently prioritized the identification of relationships, neglecting the evaluation of interventions aimed at enhancing health literacy or doctor-patient communication regarding prostate cancer screening (Skivington et al., 2021; Walters et al., 2020). Consequently, it was challenging to ascertain whether enhancing health literacy increases compliance with medical advice and improves patient outcomes.

Recommendations for Future Research

Health literacy plays a significant role in determining health outcomes and is essential for the population's overall well-being. Since a doctor's recommendation does not influence the highly health-literate population, as determined by this study, further investigation is necessary to assess the influence of physicians' recommendations for prostate cancer screening in populations with limited health literacy, focusing mainly on language barriers, cultural beliefs, and technical jargon. I recommend analyzing these factors' influence on the communication and techniques utilized by healthcare practitioners when interacting with low-health literate and disadvantaged populations. These populations have a higher susceptibility to being diagnosed with prostate cancer at an advanced stage in comparison to individuals with high health literacy (Nguyen et al., 2021).

The lack of symptoms in prostate cancer has been a significant factor contributing to the delayed detection of the disease in both high- and low-health-literate men in the United States (Broderick, 2020). Moreover, the disagreement around the elevated screening risk, resulting from a high proportion of false positive results, overdiagnosis, unneeded treatment, and side effects, further complicates the matter and generates

misunderstanding among men (Grossman et al., 2018; Grubb, 2018). Additional research is urgently required to simplify these complexities. There is a pressing need for the scientific community to explore alternative tests to PSA and digital rectal examination to enhance the accuracy and consistency of testing processes.

Implications for Professional Practice and Social Change

Professional Practice

Based on the findings of this study, my primary suggestion for individuals in the private and public health sectors is that men, regardless of their literacy level, should engage in a substantive conversation with their health care practitioner about the advantages, dangers, and uncertainties related to prostate cancer screening. It is crucial to prioritize screening for prostate cancer in men who are at risk, such as men over the age of 40, men with low health literacy, men of color, men with low incomes, and those who have a first-degree relative diagnosed with prostate cancer. Since I found that the likelihood of not screening increases with age, it is crucial for health care providers to consider these considerations when addressing screening with their patients. Furthermore, individuals who are not at risk, particularly those patients under 50 years old, should not be disregarded, especially if they display risk factors. The health care industry should address the disagreement surrounding the screening risk, particularly with the issue of high false positive findings. Additionally, it is essential to set the frequency of screening for both at-risk and not-at-risk men. Providers should base their screening recommendations on the man's overall health, any health changes, and his preferences and values.

Utilizing a cross-sectional quantitative design and employing the BRFSS data facilitated the current study of the correlation between high health literacy, physician's endorsement, and prostate cancer screening, while accounting for factors such as age, race, and income level. The study included a carefully selected group of 210,606 men aged 50 years old and above in the United States with a high health literacy level. This diverse sample significantly improved the capacity to apply the study findings to the broader population. Use of the SOR model suggested that a doctor's recommendation, which is an external stimulus, affects the internal psychological state of the individual (i.e., health literacy), which in turn influences behavioral reactions, such as prostate cancer screening. Empirical evidence indicated that men with higher literacy levels are more likely to undergo screening and less likely not to. Age, race, and income level influence their decision to screen.

Additionally, the doctor's recommendation dissuades men with high health literacy from prostate cancer screening; therefore, health industries should use caution when developing related guidelines, particularly for men with limited health literacy. The current study underscores the significance of health literacy in influencing decisions for prostate cancer screening and emphasizes the necessity for customized communication tactics to enhance health outcomes.

Positive Social Change

The study's impact on positive social change at the individual level involves enhancing men's health literacy, thereby enabling them to make well-informed decisions about prostate cancer screening, which leads to increased awareness of the significance of

screening, resulting in prompt detection and improved health outcomes. Addressing the issue of low health literacy can reduce gaps in screening rates among various demographic groups based on age, race, and poverty. Effective communication about health decisions is advantageous for families because health literacy promotes open and informed conversations among family members, fostering mutual comprehension, support, and a greater likelihood of prioritizing preventative health actions. At an organizational level, having a clear grasp of patients' health literacy enables health care providers to customize their communication, ensuring patients fully understand the potential risks and advantages of screening. Health literacy-aware policies can improve patient participation, decrease the number of needless tests, and encourage the use of evidence-based interventions. At the social and policy level, officials can utilize the current study findings to create health literacy guidelines. These guidelines should be explicit, concise, and easily understandable by a wide range of people. Public health initiatives can prioritize enhancing health literacy by implementing focused educational programs that could result in higher rates of screening. Addressing health literacy promotes health equity by ensuring equitable access to knowledge and resources. To summarize, applying this study's results will benefit individuals, families, health care organizations, public health organizations, and society by promoting informed health decision making and decreasing inequalities, leading to improved preventive practices for prostate cancer screening.

Conclusion

This study highlighted the significance of considering health literacy and doctors' recommendations when it comes to prostate cancer screening. By examining age, race, and income as factors that can predict outcomes, I discovered a favorable correlation between high health literacy and higher screening rates. Nevertheless, doctors' advice also influenced the decision to screen for prostate cancer. These findings highlight the necessity of customized communication tactics and recommendations to maximize screening outcomes. Enabling men with varying levels of health literacy to have educated conversations with their health care providers can result in improved rates of prostate cancer screening. Addressing deficiencies in health literacy is crucial for fostering favorable health results.

References

Alshammari, S., Alojayri, R., Almuhid, F., Alotaibi, O., Alqahtani, M., & AlGhamdi, A. (2021). The association between the knowledge on prostate cancer screening with the beliefs and behaviors of Saudi men attending King Khalid Hospital. *Journal of Family Medicine and Primary Care, 10*(12), 4423-4430. https://doi.org/10.4103/jfmpc.jfmpc_828_21

America Cancer Society. (n.d.). *Key statistics for prostate cancer.* https://www.cancer.org

Arevalo, M., Brownstein, N. C., Whiting, J., Meade, C. D., Gwede, C. K., Vadaparampil, S. T., Tillery, K. J., Islam, J. Y., Giuliano, A. R., & Christy, S. M. (2022). Strategies and lessons learned during cleaning of data from research panel participants: Cross-sectional web-based health behavior survey study. *Journal of Medical Internet Research, Formative Research, 6*(6), e35797. https://doi.org/10.2196/35797

Assimon, M. (2021). Confounding in observational studies evaluating the safety and effectiveness of medical treatment. *Journal of Kidney 360, 2*(7), 1156-1159. https://doi.org/10.34067/KID.0007022020

Barry, M. J., Wolff, T. A., Pbert, L., Davidson, K. W., Fan, T. M., Krist, A. H., Lin, J. S., Mabry-Hernandez, I. R., Mangione, C. M., Mills, J., Owens, D., & Nicholson, W. K. (2023). Putting evidence into practice: An update on the United States Preventive Services Task Force methods for developing recommendations for preventive services. *Annals of Family Medicine, 21*(2), 165-171.

https://doi.org/10.1370/afm.2946

Basch, C. H., MacLean, S. A., Fera, J., Garcia, P., & Basch, C. E. (2018). Readability of prostate cancer information online: A cross-sectional study. *American Journal of Men's Health*, *12*(5), 1665-1669. https://doi.org/10.1177/1557988318780864

Bergengren, O., Matsoukas, K., Pekala, K. R., Fainberg, J., Mungovan, S. F., Bratt, O., Bray, F., Brawley, O., Luckenbaugh, A. N., Mucci, L., Morgan, T. M., & Carlsson, S. V. (2023). 2022 update on prostate cancer epidemiology and risk factors- A systematic review. *Journal of European Urology*, *84*(2), 191-206. https://doi.org/10.1016/j.eururo.2023.04.021

Beyer, K., Remmers, S., Van Hemelrijck, M., Roobol, M. J. & Venderbos, L. D. F. (2023). A literature review to understand health literacy in men with prostate cancer on active surveillance. *Translator Andrology Urology*, *12*(5), 779-789. https://doi.org/10.21037/tau-22-732

Bhandari, P. (2023). *What is effect size and why does it matter?* https://scriber.com/statistics/effect-size/

Bombard, Y., Baker, g. r., Orlando, E., Fancott, C., Bhatia, P., Casalino, S., Onate, K., Denis, J., & Pomey, M. (2018). Engaging patient to improve quality care: A systematic review. *Implement Science, 13*(1), e98. https://doi.org/10.1186/s13012-018-0784-z

Broderick, J. M. (2020). Incidence of metastatic prostate cancer on the rise. *Journal of Oncology*, *34*(11). https://doi.org/10.46883/ONC.2020.3411.0460

Brown, L., Harvey, G., & Stacey, D. (2022). Understanding how and under what

circumstances decision coaching works for people making healthcare decisions: A realist review. *BMC Medical Informatics and Decision-Making*, *22*(1), p.265. https://doi.org/10.1186/s12911-022-02007-0

Cano-Ibanez, N., Zolfaghari, Y., Amezcua-Prieto, C., & Khan, S. K. (2021). Physician-patient language discordance and poor health outcomes: A systematic scoping review. *Frontiers Public Health*, *9*(1). https://doi.org/10.3389/fpubh.2021.629041

Capili, B. (2021). Overview: Cross-sectional studies. *American Journal of Nursing*, *121*(10), 59-62. https://doi.org/10.1097/01.NAJ.0000794280.73744.fe

Center for Disease Control and Prevention, (2023). *Advisory Committee on Immunization Practices (ACIP) shared clinical decision-making recommendations.* National Center for Immunization for Respiratory Diseases. https://www.cdc.gov/vaccines/acip/acip-scdm-faqs.html

Center for Disease Control and Prevention. (2016). *BRFSS survey data information.* https://www.cdc.gov/brfss/annual_data/annual_2016.html

Chen, S., Keglovits, M., Devine, M., & Stark, S. (2022). Sociodemographic differences in respondents' preferences for survey formats: Sampling bias and potential threats to external validity. *Archives of Rehabilitation Research and Clinical Translation*, *4*(1). https://doi.org/10.1016/j.arrct.2021.100175

Chesser, A. K., Woods, K. N. K., Smothers, k. & Rogers, N. (2016). Health literacy and older adults: A systemic review. *Gerontology and Generic Medicine*, *2*(1). https://doi.org/10.1177/2333721416630492

Chowdhury-Paulino, I. M., Ericsson, C., Vince Jr., R., Spratt, D. E., George, D. J., &

Mucci, L. A. (2022). Racial disparities in prostate cancer among Black men: Epidemiology and outcome. *Prostate Cancer and Prostatic Disease*, *25*(1), 397-402. https://doi.org/10.1038/s41391-021-00451-z

Coughlin, S. S., Vernon, M., Hatzigeorgiou, C., & George, V. (2020). Health literacy, social determinants of health, and disease prevention and control. *Journal of Environmental Health Science*, *6*(1), 3061. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7889072/

Cresswell, J. W. & Cresswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publication Inc.

Danan, E. R., White, K. M., Partin, M. R., & Wilt, T. J. (2021). Reactions to recommendations and evidence about prostate cancer screening among White and Black male veterans. *American Journal of Men's Health*, *15*(3). https://doi.org/10.1177/15579883211022110

Diamond, L., Izquierdo, K., Canfield, D., Matsoukas, K., & Gany F. (2019). A systematic review of the impact of patient-physician non-English language concordance on quality of care and outcomes. *Journal of General Internal Medicine*, *34*(1), 1591-1606. https://doi.org/10.1007/s11606-019-04847-5

Ebell, M., Thai, T. N., & Royalty, K. J. (2018). Cancer screening recommendations: An international comparison of high-income countries. *Public Health Reviews*, *39*(7). https://doi.org/10.1186/s40985-018-0080-0

Eiko, I. F. (2020). Theories and Models: What they are, what they are for, and what they are about. *An International Journal for the Advancement of Psychological Theory*,

31(4), 336-344. https://doi.org/10.1080/1047840X.2020.1854011

Estebsari, F., Dastoorpoor, M., Khalifehkandi, Z. R., Nouri, A., Mostafaei, D., Hosseini, M., Esmaeili, R., & Aghababaeian, H. (2020). The concept of successful aging: A review article. *National Center for Biotechnology Information*, *13*(1), 4-10. https://doi.org/10.2174/1874609812666191023130117

Fernandez, M. E., Ruiter, R. A., Markham, C. M., & Kok, G. (2019). Intervention mapping: Theory-and evidenced-based health promotion program planning: Perspective and examples. *Frontiers in Public Health*, *7*(209). https://doi.org/10.3389/fpubh.2019.00209

Flanagin, A., Frey, T., Christiansen, S. L. & Bauchner, H. The reporting of race and ethnicity in medical and science journals. *JAMA*, *325*(11), 1049-1052. https://doi.org/10.1001/jama.2021.2104

Fleary, S. A. & Ettiene, R. (2019). Social disparities in health Literacy in the United States. *Health Literacy Research and Practice*, *3*(1), e47-e52. https://doi.org/10.3928/24748307-20190131-01

Glanz, K., Rimer, B.K., & Viswanath, K. (2015). *Health behavior: Theory, research, and practice* (5th ed.). Jossey-Bass.

Grossman, D. C., Curry, S. J., Owens, D. K., Bibbins-Domingo, K., Caughey, A. B., Davidson, K. W., Doubeni, C. A., Ebell, M., Epling Jr, J. W., Kemper, A. R., Krist, A. H., Kubik, M., Landefeld, C. S., Mangione, C. M., Silverstein, M., Simon, M. A., Siu, A. L., & Tseng, C. (2018). Screening for prostate cancer. US Preventive Services Task Force recommendation statement. *Journal of* American

Medical Association, *319*(18),1901-1913. https://doi.org/10.1001/jama.2018.3710

Grubb, R. L. (2018). Prostate Cancer: Update on early detection and new biomarkers. *The Journal of the Missouri State Medical Association*, *115*(2), 132-134. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6139871/

Hooper, G. L., Allen, R. S., Payne-Foster, P., & Oliver, J. S. (2018). A qualitative study to determine barriers for prostate cancer screening in rural African American men. *Journal Article of Urologic Nursing*, *37*(6), 285-291. https://doi.org/10.7257/1053-816X.2017.37.6.285

Housten, A. J., Gunn, C. M., Paasche-Orlow, M. K., & Basen-Engguist, K. M. (2021). Health literacy intervention in cancer: A systemic review. *Journal of the American Association for Cancer Education*, *36*(2), 240-252. https://doi.org/10.1007/s13187-020-01915-x

Hsueh, L., Hirsh, A. T., Maupome, G., & Stewart, J. C. (2021). Patient-provider language concordance and health outcomes: A systematic review, evidence map, and research agenda. Journal of SAGE Publication, *78*(1), 3-23. https://doi.org/10.1177/1077558719860708

Huebschmann, A. M., Leavitt, I. M., & Glasgow, R. E. (2019). Making health research matter: A call to increase attention to external validity. *Annual Review of Public Health*, *40*, 45-63. https://doi.org/10.1146/annurev-publhealth-040218-043945

Iacobucci, D. (2012). Mediation analysis and categorical variables: The final frontier. *The Consumer Psychology*, 582-594. https://doi.org/10.1016/j.jcps.2012.03.006

Ilic, D., Djulbegovic, M., Jung, J. H., Hwang, E. C., Zhou, Q., Cleves, A., Agoritsas, T.,

& Dahm, P. (2018). Prostate cancer screening with prostate antigen (PSA) test: A systematic review and meta-analysis. *BMJ*, *362*(1). https://doi.org/10.1136/bmj.k3519

Jamieson, S. C., Mallory, C. W., Jivanji, D. R., Perez, A, Castro, G., Barengo, N. C., Pereira, J., & Nieder, A. M. (2022). The role of health literacy in prostate cancer screening. *Journal of Urology*, *163*(1), 112-118. https://doi.org/10.1016/j.urology.2020.05.100

Jung, S. J. (2021). Introduction to mediation analysis and examples of its application to real-world data. *Journal of Preventive Medicine and Public Health*, *54*(3), 166-172. https://doi.org/10.3961/jpmph.21.069

Kumar, K., Roberts, C., Finn, G. M., & Chang, Y. (2022). Using theory in health professions education research: A guide for early career researchers. *BMC Medical Education*, *22*(601). https://doi.org/10.1186/s12909-022-03660-9

Laerd Statistics. (n.d.). *Features and assumptions in SPSS statistics.* https://statistics.laerd.com/features-assumptions.php

Lepore, S. J., Nair, R. G., Davis, S. N., Wolf, R. L., Basch, C. E., Thomas, N., Shmukler, C., & Ullman, R. (2017). Patient and physician factors associated with undisclosed prostate cancer screening in a sample of predominantly immigrant Black men. *Journal of Immigrant and Minority Health*, *19*(3), 1343-1350. https://doi.org/10.1007/s10903-016-0468-1

Lesko, C. R., Ackerman, B., Webster-Clark, M., & Edwards, J. K. (2020). Target validity: Bringing treatment of external validity in line with internal validity.

Journal of Current Epidemiology Report, 7(3), 117-124. https://doi.org/10.1007/s40471-020-00239-0

Leslie, S. W., Soon-Sutton, T. L., Ri, A., Sajad, H., & Siref, L. E. (2023). *Prostate cancer.* National Institute of Health. https://www.ncbi.nlm.nih.gov/books/NBK470550/

Lillard Jr., J. W., Moses, K. A., Mahal, B. A. & George, D. J. (2022). Racial disparities in Black men with prostate cancer: A literature review. *Journal of Clinical National Cancer Research*, *128*(21), 3787-3795. https://doi.org/10.1002/cncr.34433

Liu, C., Wang, D., Liu, C., Jiang, X. W., Chen, H., Ju, X., & Zhang, X. (2020). What is health literacy? A systematic review and qualitative synthesis. *Family Medicine and Community Health*, *8*(2), e000351. https://doi.org/10.1136/fmch-2020-000351

Ma, Z. & Richardson, L. C. (2022). Cancer screening prevalence and associated factors among United States adults. *Journal of Preventive Chronic Disease*, *19*(1), e220063. https://dx.doi.org/10.5888/pcd19.220063

MacKinnon, D. P. (2011). Integrating mediators and moderators in research design. *Journal of Research on Social Work Practice*, *21*(6), 675-681. https://doi.org/10.1177/1049731511414148

Madeline, C. R., Sammon, J. D., Nguyen, D., Kilbridge, K. L., Herzog, P., & Trinh, Q. (2020). The relationship between health literacy and non-recommended cancer screening. A*merican Journal of Preventive Medicine*, *60*(2), E69-E72. http://dx.doi.org/10.1016/j.amepre.2020.08.018

Magnani, J. W., Mujahid, M. S., Aronow, H. D., Cene, C. W., Dickson, V. V., Havranek, E., Morgenstern, L. B., Paasche-Orlow, M. K., Pollak, A., & Willey, J. Z. (2018). Health literacy and cardiovascular disease: Fundamental relevance to primary and secondary prevention: A scientific statement from the American Heart Association. *Circulation*, *138*(2), e48-e74. https://doi.org/10.1161/CIR.0000000000000579

Malik, N., Roberts, L., Alemi, Q., Casiano, C. A. & Montgomery, S. (2022). Ethnic differences among Black men in prostate cancer knowledge and screening: A mixed- methods study. *Journal of Racial Ethnic Health Disparities*, *9*(3), 874-885. https://doi.org/10.1007/s40615-021-01027-2

Marks, J. S., Mokdad, A. H., & Town, M. (2021). The Behavioral Risk Factor Surveillance System: Information, relationships, and influence. *American Journal of Preventive Medicine*, *59*(6), 773-775. https://doi.org/10.1016/j.amepre.2020.09.001

Marzban, S., Najafi, M., Agolli, A., & Ashrafi, E. (2018). Impact of patient engagement on healthcare quality: A scoping review. *SAGE Journal of Patient Experience*. https://doi.org/10.1177/23743735221125439

Menassa, M., Stronks, K., Khatami, F., Diaz, Z. M. R., Espinola, O. P., Gamba, M., Itodo, O. A., Buttia, C., Wehrli, F., Minder, B., Velarde, M. R., & Franco, O. H. (2023). Concepts and definitions of healthy aging: A systematic review and synthesis of theoretical models. *Journal of eClinical Medicine*, *56*(1), e101821. https://doi.org/10.1016/j.eclinm.2022.101821

Merriel, S. W. D., Funston, G., & Hamilton, W. (2018). Prostate cancer in primary care. *Advance Therapy, 35*(9), 1285-1294. https://doi.org/10.1007/s12325-018-0766-1

Merriel, S. W. D., Pocock, L. Gilbert, E., Creavin, S., Walter, F. M., Spencer, A., & Hamilton, W. (2022). Systematic review and meta-analysis of the diagnostic accuracy of prostate-specific antigen for the detection of prostate cancer in symptomatic patients. *BMC Medicine*, *20*(54), e02230. https://doi.org/10.1186/s12916-021-02230-y

Muvuka, B., Combs, R. M., Ayangeakaa, S. D., Ali, N. M., Wendel, M. L., & Jackson, T. (2020). Health literacy in African American communities: Barriers and strategies. *Health Literacy Research and Practice, 4*(3), e138-e143. https://doi.org/10.3928/24748307-20200617-01

National Cance Institute. (2023). *Cancer statistics facts: Prostate cancer, surveillance, epidemiology, and end results program*. https://seer.cancer.gov/statfacts/html/prost.html

Navarro-Carrillo, G., Alonso-Ferres, M. Moya, M., & Valor-Segura, I. (2020). Socioeconomic status and psychological well-being: Revising the role of subjective socioeconomic status. *Journal of Frontier, American Psychological Association*, *11*(1303), 15. https://doi.org/10.3389/fpsyg.2020.01303

Newsom, J. (2023). Testing mediation with regression analysis. Structural equation modeling. *Journal of Consumer Psychology.* https://web.pdx.edu/~newsomj/semclass/ho_mediation.pdf

Nguyen, D.D., Trinh, Q.D., Cole, A.P., Kilbridge, K. L., Mahal, B. A., Hayn, M., Hasen,

M., Han, P. K. J., & Sammon, J. D. (2021). Impact of health literacy on shared decision making for prostate-specific antigen screening in the United States. *Journal of America Cancer Society*, *127*(2), 249-256. https://doi.org/10.1002/cncr.33239

Noble, C. E. (1966). SOR and the psychology of human learning. *Psychological Reports*, *18*(3), 923-943. https://doi.org/10.2466/pr0.1966.18.3.923

Noseworthy, J. (2019). The future of care-preserving the patient-physician relationship. *The New England Journal of Medicine*, *381*(23), 2265-2269. https://doi.org/10.1056/NEJMsr1912662

Pandita, S., Mishra, H. G., Chib, S. (2021). Psychological impact of covid-19 crises on students through the lens of Stimulus-Organism-Response (SOR) model. *Children and Youth Services Review*,*120*. https://doi.org/10.1016/j.childyouth.2020.105783

Patino, C. M., & Ferreira, J. C. (2018). Internal and external validity: Can you apply research study results to your patients? *Journal of Brazilian Pulmonology*, *44*(3), e183. https://doi.org/10.1590/S1806-37562018000000164

Peng, S., Hadzic, B., Danner, M. & Ratsch, M. (2024). Panic consumption under health emergencies: The mediating role of risk perception. *Journal of Public Health*. https://doi.org/10.1007/s10389-023-02188-6

Pernar, C. H., Ebot, E. M., Wilson, K. M., & Mucci, L. A. (2019). The epidemiology of prostate cancer. *Perspectives in Medicine*, *8*(12), e030361. https://doi.org/10.1101/cshperspect.a030361

PhD Assistance. (2021). *Stimulus-organism-response (SOR) model.*

https://www.phdassistance.com/blog/stimulus-organism-response-sor-model/

Qi, S., Hua, F., Xu, S., Zhou, Z., & Liu, F. (2021). Trends of global health literacy research (1995-2020): Analysis of mapping knowledge domains based on citation data mining. *PLoS ONE*, *16*(8), e0254988. https://doi.org/10.1371/journal.pone.0254988

Rawla, P. (2019). Epidemiology of prostate cancer. *World Journal of Oncology*, *10*(2), 63-89. https://doi.org/10.14740/wjon1191

Ross, P. T., & Zaidi, N. L. B. (2019). Limited by our limitations. *Journal of Perspectives on Medical Education, 8*(4), 261-264. https://doi.org/10.1007/s40037-019-00530-x

Saleh, B. M., Aly, E. M., Hafiz, M., Gawad, R. M. A., El Kheir-Mataria, W. A., & Salama, M. (2021). Ethical dimensions of public health actions and policies with special focus on covid-19. *Journal of Frontiers of Public Health, 9*. https://doi.org/10.3389/fpubh.2021.649918

Schillinger, D. (2021). Social determinants, health literacy, and disparities: Intersections and controversies. *Health Literacy Research and Practice*, *5*(3), e234-e243. https://doi.org/10.3928/24748307-20210712-01

Sekhoacha, M., Riet, K., Motloung, P., Gumenku, L., Adegoke, A., & Mashele, S. (2022). Prostate cancer review: Genetics, diagnosis, treatment options, and alternative approaches. *Journal of Molecules, 27*(17), e5730. https://doi.org/10.3390/molecules27175730

Serdar, C. C., Cihan, M., Yücel, D. & Serdar, M. A. Sample size, power and effect size

revisited: Simplified and practical approaches in pre-clinical, clinical and laboratory studies (2021). *Biochemical Medicine*, *31*(1), E010502. https://doi.org/10.11613/BM.2021.010502

Shi, J., Tarkiainen, L., Martikainen, P., & van Raalte, A. (2021). The impact of income definitions on mortality inequalities. *Journal of Social Science of Medicine Population Health*, *15*(1). https://doi.org/10.1016/j.ssmph.2021.100915

Siegel, R., Miller, K. D., Fuchs, C. H., Jemal, A. (2022). Cancer Statistics, 2022. *American Cancer Society Journal*, *72*(1), 7-33. https://doi.org/10.3322/caac.21708

Skivington, K., Matthews, L., Simpson, S. A., Craig, P., Baird, J., Blazeby, J. M., Boyd, K. A., French, D. P., Mclntosh, E., Petticrew, M., Rycroft-Malone, J., White, M. & Moore, L. (2021). A new framework for developing and evaluating complex interventions: Update of medical research council guidance. *Biomedical Medical Science Journal*, *374*, n2061. https://doi.org/10.1136/bmj.n2061

Slocum, T.A., Joslyn, P. R., Nichols, B., & Pinkelman, S. (2022). Revising an analysis of threats to internal validity in multiple baseline designs. *Journal of Perspectives in Behavioral Science, 45*(3), 681-694. https://doi.org/10.1007/s40614-022-00351-0

Song, S., Yao, X., & Wen, N. (2021). What motivates Chinese consumers to avoid information about the covid-19 pandemic? The perspective of the stimulus-organism-response model. *Journal of Information Process Management*, *58*(1). https://doi.org/10.1016/j.ipm.2020.102407

Tennant, J. P., & Ross-Hellauer, T. (2020). The limitations to our understanding of peer-

review. *Research Integrity and Peer Review*, *5*(6). https://doi.org/10.1186/s41073-020-00092-1

Tulchinsky, T. H. (2018). Ethical issues in public health. *Case Studies in Public Health*, 277-316. https://doi.org/10.1016/B978-0-12-804571-8.00027-5

Walters, R., Leslie, S. J., Polson, R., Cusack, T. & Gorely, T. (2020). Establishing the efficacy of interventions to improve health literacy and health behaviors: A systematic review. *Journal of Biomedical Medical Center*, *20*(1040), 1471-2458. https://doi.org/10.1186/s12889-020-08991-0

Wang, L., Lu, B., He, M., Wang, Y., Wang, Z., & Du, L. (2022). Prostate cancer incidence and mortality: Global status and temporal trends in 89 countries from 2000 to 2019. *Frontiers in Public Health*, *10*(1), e8811044. https://doi.org/10.3389/fpubh.2022.811044

Wang, X. & Cheng, Z. (2020). Cross-sectional studies: Strengths, weaknesses, and recommendation. *Journal of Chest*, *158*(1), S65-S71. https://doi.org/10.1016/j.chest.2020.03.012

Washington, S. L. & Master, V. A. (2021). Health literacy and shared decision making in prostate cancer screening: Equality versus equity. *Journal of American Cancer Society*, *127*(2), 161-321. https://doi.org/10.1002/cncr.33235

Wilkinson, R. & Pickett, K. (2010). *The spirit level. Why greater equality makes society stronger.* Bloomsbury.

Yang, R., Lu, Z., Gu, X., & Dai, B. (2021). The effect of an information support program on self-efficacy of prostate cancer patients during hormonal therapy. *Asia-Pacific*

Journal of Oncology Nursing, 8(6), 639-652. https://doi.org/10.4103/apjon.apjon-2138

Young, G. (2016). Stimuli-organism-response model: SORing. In *Unifying causality and psychology*. Springer, 699-717. https://doi.org/10.1007/978-3-319-24094-7_28

Zahnd, W., Askelson, N., Vanderpool, R. C., Stradtman, L., Edward, J., Farris, P. E., Petermann, V., & Eberth (2019). Challenges of using nationally representative, population-based surveys to assess rural cancer disparities. *Journal of Preventive Medicine, 129*. https://doi.org/10.1016/j.ypmed.2019.105812

Zhai, X., Wang, M., & Ghani, U. (2019). The stimulus-organism-response paradigm in online learning: An empirical study of students' knowledge hiding perceptions. *Journal of Interactive Learning Environments*, *28*(5), 586-601. https://doi.org/10.1080/10494820.2019.1696841

Zhang, A. C., Rasul, B., Golden, A., & Feuerstein, M. A. (2021). Incidence and mortality trends of metastatic prostate cancer: Surveillance, epidemiology, and end results database analysis. *Cancer Urology Associate Journal*, *15*(12), E637-E643. https://doi.org/10.5489/cuaj.7173

Zhao, J., Jull, L., Finderup, J., Smith, M., Kienlin, S. M., Rahn, A. C., Dunn, S., Aoki, Y., Brown, L., Harvey, G., & Stacey, D. (2022). Understanding how and under what circumstances decision coaching works for people making healthcare decisions: A realist review. Medical informatics and decision-making. *BMC*, *22*(1), 265-272. https://doi.org/10.1186/s12911-022-02007-0

Appendix A: Policy Brief Memo

The main objective of this study is to examine the correlation between high health literacy, recommendations from doctors, and prostate cancer screening among men aged 50 years and older in the United States. I analyzed these factors to investigate the widely recognized correlation between health literacy and prostate cancer screening. This involves categorizing those with high health literacy to prevent marginalizing those with low health literacy. The study also examines the influence of doctor's recommendations on this relationship.

Prostate cancer continues to be a severe issue of public health, impacting a large number of men in the United States. Despite improvements in screening technologies, there are still differences in health literacy, age, race, and income level that contribute to disparities in prostate cancer outcomes. The existing policy encourages men aged 55 to 69 to make an informed decision about screening after engaging in a comprehensive discussion with their primary care physicians regarding the potential risks and benefits of the screening (Grossman et al., 2018). The United States Preventive Services Task Force advises against prostate cancer screening for men aged 70 and older (Grossman et al., 2018). However, the American Cancer Society (n.d.)., suggests that men should begin discussing cancer screening at age 50, and those at high risk, such as Black men and men with a first-degree relative diagnosed with prostate cancer, should start the discussion at age 45 (Grossman et al., 2018). These policies fail to sufficiently tackle the complex obstacles experienced by men, resulting in missed chances for early detection and timely intervention.

Therefore, my study suggests initiating conversations about prostate cancer starting at the age of 40, as this research has shown that older men are more inclined to have prostate cancer screening compared to younger men. The age criteria for screening should be simplified, similar to the approach used for breast cancer screening in women, in order to prevent confusion and reduce the screening rate decline in men. The study shows a positive link between high health literacy and prostate cancer screening. However, there is a negative link between a highly health-literate population and prostate cancer screening due to false positive results and the involvement of physicians. Therefore, focusing on individuals with low health literacy is essential in changing how physicians communicate with them. Implementing a policy for an advanced language translator, which utilizes artificial intelligence and state-of-the-art technology, will enhance immediate communication between healthcare providers and low-health literate and multiracial men.

Some root causes of men not screening for prostate cancer include disparities in health literacy, unclear and conflicting recommendations regarding the appropriate age for screening, controversy surrounding prostate cancer screening due to alleged high rates of false positive results, and limited access to and affordability of screening due to socioeconomic factors. My study emphasizes the importance of reevaluating prostate cancer screening policies by addressing gaps in health literacy, offering clear recommendations, and promoting equal access. These measures can increase early detection rates and ultimately improve health outcomes for men. Policymakers should consider these findings to facilitate significant transformation and prioritize the welfare

of men, not only limited to those over the age of 50 or with high levels of health literacy, but men in general in the United States to foster social change.

Appendix B: Community Health Intervention Plan: Enhancing Prostate Cancer Screening Through the Lens of High Literate Men

Aim of the Study and Problem to be Addressed

The main objective of my study is to enhance prostate cancer screening rates among men aged 50 years and above in the United States by utilizing the correlation between high health literacy and doctor's recommendations. This intervention plan aims to improve early detection, minimize disparities, and ultimately prevent loss of life. The primary issue that needs to be tackled is the fact that prostate cancer continues to pose substantial health challenges to men despite the progress made in screening technologies. Several factors contribute to effective utilization, such as high health literacy among men who are aware of the significance of regular screening or the possible advantages.

Additionally, conflicting suggestions from healthcare practitioners and inconsistent counsel create uncertainty and indecisiveness. Insufficient health literacy and a lack of comprehension regarding screening alternatives and associated risks hinder the ability to make educated decisions.

Summary of my Study Findings

The main findings of my research indicate that a strong level of health literacy is essential, as it increases the likelihood that men will actively seek information, comprehend the advantages of screening, and actively participate in preventive healthcare. Additionally, the study found that men with high health literacy are less likely

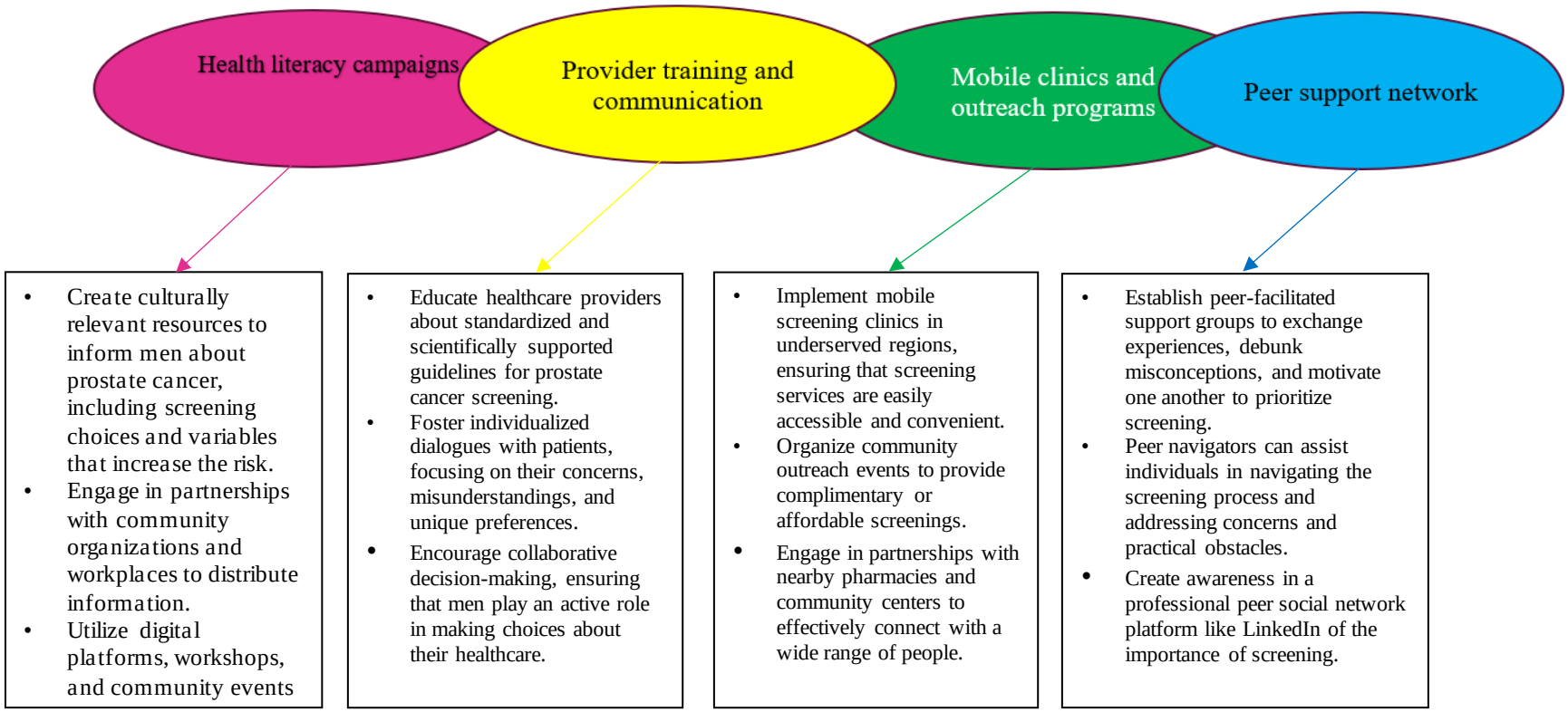
to rely on clear and personalized doctor recommendations to make informed decisions. My study also found ongoing differences in screening rates based on race, socioeconomic status, and geographic location. This highlights the importance of implementing focused interventions on a community bases.

Intervention Strategies

Based on these findings, I propose the following intervention strategies as shown in figure B1.

Figure B1

Community Intervention Strategies of Prostate Cancer Screening



Information from "Health literacy interventions in cancer: A systematic review," by A. J. Housten, C. M. Gunn, M. K. Paasche-Orlow, and K. M. Base-Engquist, 2021, *Journal of American Association for Cancer Education, 36*(1), 240-252 (https://doi.org/10.1007/s13187-020-01915-x). "Health literacy and shared decision making in prostate cancer screening: Equality versus equity," by S. L. Washington III, and V. A. Master, 2020, *Journal of the American Cancer Society*, 249-56 (https://doi.org/10.1002/cncr.33235).

Target Population

- The intervention strategies I propose will have a wide range of benefits, including but not limited to the following population:
- Men 50 years old or older with high literacy: Through raising consciousness, offering explicit suggestions, and bridging the gaps in health literacy.
- Underserved Communities**:** My strategies will also be relevant in regions with restricted availability of healthcare resources, where they can help bridge the gap in prostate cancer care.
- Racial and Ethnic Groups: It is targeting racial and ethnic groups that are disproportionately impacted by prostate cancer, specifically focusing on minority populations.

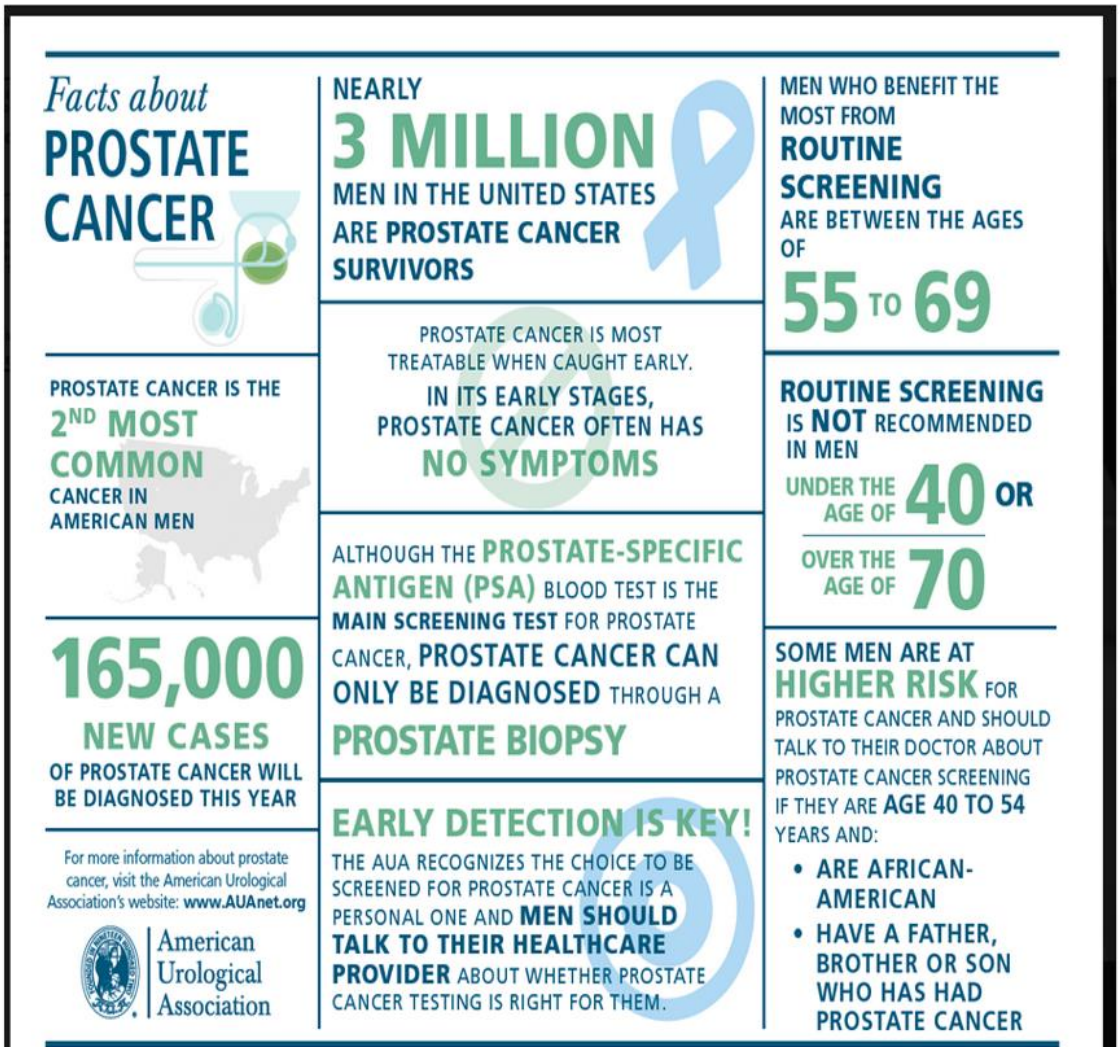
Conclusion

This community health intervention seeks to address disparities, empower men, and convert prostate cancer screening into a proactive and well-informed decision. Through collective effort, we can diminish inequalities, preserve lives, and foster a more healthful future for our societies.

Appendix C: Fact Sheet on Prostate Cancer Screening

Figure C1

Fact Sheet on Prostate Cancer Screening



Fact Sheets. *OSF HEALTHCARE*. (n.d.). https://newsroom.osfhealthcare.org/finding-clarity-in-confusion-about-prostate-cancer-screening/