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Urologic Oncology: Seminars and Original Investigations ▮ (2016) ▮▮▮–▮▮▮

UROLOGIC ONCOLOGY

Original article

# Predictors of prostate cancer screening using Andersen's Behavioral Model of Health Services Use

Motolani E. Ogunsanya, B.Pharm., M.S.*, Shan Jiang, Ph.D., Andrew V. Thach, M.S., Benita A. Bamgbade, Pharm.D., Carolyn M. Brown, Ph.D.

*Health Outcomes and Pharmacy Practice Division, The College of Pharmacy, The University of Texas at Austin, Austin, TX*

Received 17 February 2016; received in revised form 2 June 2016; accepted 21 June 2016

**Abstract**

**Purpose:** The purposes of the study were to examine the prevalence of prostate cancer screening (PCS) in the United States and to identify predictors of PCS guided by Andersen's Behavioral Model of Health Services Use (ABM).

**Methods:** PCS rates were analyzed in men (aged $\geq$40 y) using 2014 data from the Behavioral Risk Factor Surveillance System. Descriptive analysis was conducted using sampling weights to determine the prevalence of PCS (i.e., had a prostate-specific antigen test). Multiple logistic regression within the framework of ABM was used to identify predictors of PCS. The ABM variables of predisposing (e.g., age), enabling (e.g., health insurance), and need (e.g., comorbidities) comprised the independent variables.

**Results:** Among the 131,415 men, 62.4% ($N$ = 82,014) reported that they had a prostate-specific antigen test in the last 2 years. Among predisposing factors, age, education, income, and employment status were significantly associated with undergoing PCS. Informed decision-making process, health care coverage, regular health care provider, and length of time since last routine checkup were significant enabling factors. Health care provider recommendation and previous cancer diagnosis were significant need factors.

**Conclusions:** Most older men in the United States had previously engaged in PCS. Several ABM variables were predictive of PCS and should be considered when developing future strategies to encourage PCS in at-risk men with the recommended life expectancies. Such strategies should also ensure that the decision to undergo PCS is an informed process between patients and their health care providers.


*Keywords:* Prostate cancer; PSA testing; Screening; Andersen's Behavioral Model

## 1. Introduction

Prostate cancer screening (PCS) by prostate-specific antigen (PSA) and digital rectal examination (DRE) have been shown to reduce prostate cancer mortality in both randomized controlled studies [1] and case-control studies [2]. Despite these positive results associated with PCS [3,4], screening remains controversial. The American Cancer Society endorses PCS annually only after the benefits and limitations of PCS have been outlined to the patients, and suggests that men in higher-risk groups should receive this information between age 40 and 50 years [5]. Conversely, the United States Preventive Services Task Force recommends against routine PSA screening in men of any age or racial group because the risks associated with PCS outweigh its benefits [6].

Given that PCS may be beneficial for some (e.g., men at high risk) and less beneficial for others (e.g., older men with limited life expectancies), it important to understand the patterns of PCS uptake and the factors associated with uptake.

### 1.1. Conceptual framework

Most of the previous studies examining factors associated with PCS have been descriptive and have lacked a theoretical basis. Previous studies have identified having a regular source of care, having higher income, having a positive family

* Corresponding author. Tel.: +1-512-471-8509; fax: +1-512-471-8762.
*E-mail addresses:* tmadedipe@utexas.edu (M.E. Ogunsanya).

http://dx.doi.org/10.1016/j.urolonc.2016.06.016
1078-1439/

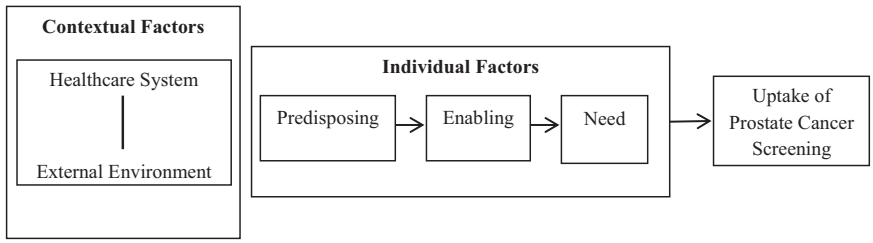


Fig. Andersen's Behavioral Model of Health Services Use (ABM).

history, receiving physician recommendation, being older and married, and having interaction with a health care provider to be the factors associated with PCS [7,8]. Given that PCS is influenced by a myriad of factors, the use of a multifactorial, theoretical model may aid in the development of strategies that would promote uptake among men at highest risk. Thus, this study used the Andersen's Behavioral Model of Health Services Use (ABM) [9] (Fig.) an established, multilevel model that uses both individual and contextual factors associated with health care use. The model has been used extensively in several studies to examine relationships between predisposing (e.g., age), enabling (e.g., income), and need for care (e.g., disease severity) factors and their effects on health care use [10–12]. In this study, factors found to be significantly associated with PCS could be used to guide future PCS interventions and counseling. Our objectives were to examine the prevalence of PCS in the United States and to identify the predictors of PCS using ABM as a guiding framework.

## 2. Methods

### 2.1. Data extraction and study design

Data were extracted from the 2014 Behavioral Risk Factor Surveillance System (BRFSS) database to examine the prevalence of PCS and to identify its predictors. The data set contains interviews with adults conducted through landline and cellular telephones from 50 states, the District of Columbia, Guam, and Puerto Rico. The 2014 BRFSS data used weights linked to each observation to adjust for participants who refused to participate in the survey (non-response bias) and those without landline or cellular telephones (noncoverage bias), and to also adjust for oversampling of underserved minority groups. This weighting methodology was used in our study to adjust for the 2 biases and to extrapolate our findings to the entire U.S. population.

To be included in the study, respondents had to be men, older than 40 years and had to have a definite response on the survey item regarding PSA testing within the past 2 years. A cutoff point of 40 years was chosen for this study, because the American Cancer Society recommends that the discussion about prostate cancer should take place at the age of 40 years for men considered to be at high risk (those with more than 1 first-degree relative who had prostate cancer at an early age) [5]. To accomplish the selection step, we used variable "_RFPSA21: Male respondents aged 40+ who had a PSA test in the past 2 years." Individuals were excluded if they left the question blank, answered "Don't know/Not Sure," were less than 40-year old, or were women. Furthermore, individuals were excluded if they had a screening test because they were told that they had prostate cancer.

## 3. Model and study variables

### 3.1. Dependent variable

The dependent variable was PCS using PSA. PSA screening was chosen as a proxy for PCS, because it is the most recommended method of screening for prostate cancer and also because of the unavailability of DRE history in the BRFSS 2014 data set. The variable was dichotomously scored (yes or no) and based on the question "Male respondents aged 40+ who had a PSA test in the past 2 years." The Table includes a description of study variables.

### 3.2. Independent variables

The predisposing variables were age, marital status, race/ethnicity, education, income, and employment status. The enabling variables were informed decision-making process with health professional, health care coverage, regular source of care, and length of time since the last PSA test. The need variables were health care professional recommendation of PSA, physical activity frequency, history of heart attack and cancer, smoking status, and perception of health. Owing to uneven cell sizes and missing data, some multicategory variables were collapsed to create more meaningful and interpretable categories.

### 3.3. Statistical analysis

Descriptive statistics were used to assess the characteristics of patients. Logistic regression with *Proc Surveylogistic* command was used to determine the relationships between ABM variables and PCS. The SAS 9.4 version was used to conduct the weighting process and analyses.