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**ORIGINAL ARTICLE**

## Determinants of Voluntary HIV/AIDS Counseling and Testing among Community College Students in the United States

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### ABSTRACT

**Background:** Human Immunodeficiency Virus (HIV) testing remains the best public health preventive strategy in the fight against HIV/AIDS. We assessed the factors that determined voluntary counseling and screening/testing for HIV among college students.

**Methods:** In this cross-sectional study, a purposeful sample of 189 college students was analyzed using three health belief model (HBM) variables as the theoretical framework.

**Results:** All the HBM variables were positively associated with intention to test for HIV, and with perceived benefits ( $p = 0.023$ ) having the strongest association.

**Conclusion and Global Health Implications:** The results of this study underscore the important factors that predict intention to screen for HIV among college students. Understanding the factors that influence intention for HIV testing is useful in formulating public health policies and in the design of programs and interventions aimed at increasing the number of people who get tested for HIV.

**Key words:** Acquired Immune Deficiency Syndrome (AIDS) • HIV Testing • Risky Sexual Behavior • Health Belief Model • HIV Counseling • HIV Screening

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### 1. Introduction

As the world enters four decades since the first case of the Human Immunodeficiency Virus (HIV) and the Acquired Immune Deficiency Syndrome (AIDS) was diagnosed, HIV and AIDS remain a major public health problem both in the United States (U.S.) and globally.<sup>[1]</sup> Worldwide, about 34 million people were living with HIV at the end of 2010.<sup>[2]</sup>

According to the United States Centers for Disease Control and Prevention (CDC), about 1.2 million individuals are infected with HIV, and about 312,000, or 26%, of this number are undiagnosed.<sup>[3]</sup> There are significant racial and ethnic disparities in the burden of HIV/AIDS in United States. For example, African Americans, more than any other ethnic group in the United States, bear the greatest burden of HIV/AIDS. The HIV prevalence rate among African Americans

is almost eight times higher than that of European Americans (1,715 per 100,000 vs. 224 per 100,000.<sup>[4]</sup> In 2007, African Americans constituted 13% of the U.S. population, however 51% of all HIV/AIDS cases diagnosed in United States were among African Americans.<sup>[5]</sup> According to the CDC, in 2008, out of the 42,439 newly diagnosed HIV infections in the 37 states and US dependent areas with confidential name-based reporting, 19% were Hispanics/Latinos.<sup>[5, 6]</sup> Most recent estimates from the CDC show that 61% of the estimated 48,000 new HIV infections in the United States occurred among gay and bisexual men.<sup>[4]</sup> In addition, CDC estimated that 14,110 out of the 35,962 people with an AIDS diagnosis in 2007 died from the diseases.<sup>[4]</sup>

Experts agree that HIV screening or testing is an integral and significant component of public health strategies to address prevention, treatment, and care for HIV/AIDS.<sup>[7]</sup> However, despite efforts to increase HIV testing and remove barriers that prevent people from taking HIV tests, the number of people testing for HIV remains low. According to CDC, one in five (or about 56,000) people living with HIV did not know that they were infected.<sup>[5]</sup> Particularly, as relating to this study, global and local surveillance data identify young adults aged 15-24 to be among the most-risky age group vulnerable to HIV infection in the United States and globally.<sup>[2, 8]</sup>

Although the CDC identifies them as among the vulnerable population, HIV testing among adolescents in general and college-aged students in particular remains low; moreover, those in this age bracket make up about 50% of latest cases.<sup>[9]</sup> Given the vulnerability of college-aged persons, in addition to the individual and population-level benefits of HIV testing, there is need for epidemiological studies rigorously exploring the factors that predict uptake of HIV testing among college students.<sup>[10]</sup> Specifically, this study explored the predictors as well as the social, demographic, and behavioral correlates of HIV testing seeking behavior among college students using the following three constructs of the health belief model (HBM): (a) perceived susceptibility, (b) perceived severity, (c) perceived benefits.<sup>[11]</sup>

## 2. Methods

This is a cross-sectional study that explored the factors that affect HIV screening among college students in Maryland. We collected primary data from a self-administered survey of eligible students which we analyzed to explore the association between HBM variables and HIV testing among the students. Data from this cross-sectional study were obtained from face-to-face surveys administered to eligible and self-consenting students at the college. The survey used a convenience sampling technique using a survey instrument developed by and used in identical settings.<sup>[12]</sup> Because the reasons for underutilization of HIV testing among college-aged students remain understudied, a cross-sectional study provides the opportunity to explore the unknown variables and thus use the results as the base for program planning and potential longitudinal studies or interventions studies.

### 2.1. Population and sampling

#### 2.1.1. Overview of the community college

Primary data for this study were collected using a self-administered survey fielded among eligible and consenting students at a community college in the State of Maryland, in Northeastern United States. The college has a current student population of about 11,822 undergraduates enrolled in about 60 academic programs of study.<sup>[13]</sup> The median age of the student population is 28 years. The racial distribution is 8.4% white, 77.8% African-American, 3.9% Hispanic, and 9.8% others including Asian/Pacific Islander, American Indian, Nonresident Alien, and Unknown.<sup>[14]</sup> Approval for all data collection instruments in the study was obtained from the institutional review boards at Walden University, Minneapolis, and the community college.

#### 2.1.2. Sample size

The approximate calculation of the association between the dependent and independent variables of the study is given by the effect size.<sup>[15]</sup> Based on the study design, research questions, and hypotheses, the following assumptions were made for the purpose of calculating the appropriate sample size for the study. The study power will be set to .80; the independent

variables were set at six; and the effect size was set at .15. Thus, the G – Power statistical tool was used to generate a sample size of 104 which is likely going to provide sufficient power to find relationships if one exists. However, for this study, a sample size of 200 was used to compensate for nonresponse rates and for unreturned or voided questionnaires that were excluded from the analysis.

## **2.2. Data collection**

### *2.2.1. Recruitment of respondents and survey administration*

The study recruitment plan included several activities aimed at conducting the study ethically and protecting the rights of the study respondents. For example, we obtained prior approval to administer the study including Institutional Review Board (IRB) approval (IRB #: 01-17-12-0061840) for ethical consideration, collaborated with lecturers and presented an overview of the study to the students prior to administering the surveys.

In addition, we reviewed the rights of study participants regarding ethical issues such as protection of their privacy, their rights to withdraw from the study at any time, methods for ensuring anonymity, and the duration of the survey. As part of the IRB approval process, the community college authorities issued an introductory letter, documenting permission to conduct study for us to approach faculty in the classes to be surveyed.

### *2.2.2. Survey administration*

The survey was administered without the assistance of the community college students for actual handling and collation of completed questionnaires to avoid accidental disclosure of participant information. A total of 200 students were recruited from classrooms, notable college associations, the dining hall, and library. To ensure rapid survey administration, the questionnaires were distributed to students at the college's three campuses at Largo, Laurel, and University Town Center, Hyattsville, Maryland. Recruitment also targeted participants in student organizations, students' cafeteria as well as lecture rooms, and library. We used the random sampling strategy for this survey, and applied the

simple random sample method. This ensured that each participant was given an equal opportunity of being selected. It also minimized bias and simplified analysis of results. In order to justify fairness of selection for the study, the simple random sampling method ensured that randomness was maintained. Since the target population is a predominantly black population, the Principal Investigator (PI) ensured that out of every 10 questionnaires distributed, at least seven of them were African Americans, one of them was European American, one Hispanic, and one of the others included Asian/Pacific Islander. Thus, all races and other demographic factors were randomly accounted for. The overall data collection period lasted seven days, and each questionnaire took no more than 10 minutes to complete. A sealed box was provided to respondents to drop their completed questionnaires. Pen and pocket notebooks were given to respondents who completed and returned their questionnaires to the PI. All questionnaires were distributed and retrieved on the spot. The respondents were not given the opportunity to return questionnaires later. At the end of the data collection, the coordinator of the research project arranged with the PI on when to close-out and debrief the college representatives concerning method of dissemination of results.

## **3. Data and Statistical Analyses**

Data analysis was conducted using STATA for windows version 11.0.<sup>[16]</sup> Data analysis involved three distinct stages—the univariate, bivariate, and multivariate analyses. In the univariate analysis, the STATA's "describe" command was used to conduct exploratory analyses. Results of the exploratory analyses were evaluated to identify data distribution, summary statistics, and frequency table. The sociodemographic variables in the survey were analyzed and proportions obtained using numbers and percentages.

For the Bivariate analysis, the STATA command "tabulate, independent variable, dependent variable, chi" command was used to analyze and examine the relationship between the dependent categorical and the independent categorical variables. It must be noted that the Pearson chi square test used in this analysis

to analyze the relationship between the categorical variables (HBM constructs, and sociodemographics) on the dependent variables—HIV testing—is the most suited test especially when the variables are categorical as in the present study.<sup>[17]</sup>

For our multivariate analysis, we conducted three logistic regression models testing the independent and the joint effects of the relationship between the dependent variable and the independent variables tested as sociodemographics and HIV testing (model 1); HBM constructs and HIV testing (model 2); and sociodemographics, HBM constructs, and HIV testing (model 3).

## 4. Results

### 4.1. Univariate statistics

The univariate analysis (Tables 1 and 2) showed that there was a high understanding of the perceived benefits of voluntary HIV testing and counseling both for prevention of infection and for personal well-being. Regarding the HBM construct of perceived benefits, the data indicated that about 77% of the respondents agreed that HIV testing makes people feel better, while 60% of them agreed that HIV testing helps to prevent infection with the virus that causes AIDS. Regarding perceived susceptibility, 52% of the respondents disagreed that they were not likely to contract HIV. The data showed that the participants have an excellent knowledge of the perceived severity of HIV epidemic. About 91% of the respondents agreed that HIV/AIDS is a severe health problem, while 89% agreed that HIV/AIDS is a disease with significant consequences. Turning to the study's dependent variable, the majority of the students reported that they have tested for HIV (63%). Out of those who reported that they have ever tested for HIV, 59% reported that they have tested more than once. A majority of the study respondents were African American (79%), younger than 40 years in age (97%), single (86%), heterosexual (70%), and sexually active (68%).

### 4.2. Bivariate analysis

The results of the bi-variate analysis (Tables 3 and 4) provide insight into the unadjusted relationship between voluntary HIV testing and

**Table 1: Descriptive statistics of health belief model (HBM) constructs and HIV testing among students in a community college**

Variables	HIV testing Total (N=189)
	N (%)
<b>HBM construct of perceived benefits: HIV test makes people feel better</b>	
Strongly disagree	12 (6.35)
Disagree	5 (2.65)
Neutral	26 (13.76)
Agree	46 (24.34)
Strongly agree	100 (52.91)
<b>HBM construct of perceived benefits: HIV test helps prevent HIV infection</b>	
Strongly disagree	18 (9.52)
Disagree	29 (15.34)
Neutral	29 (15.34)
Agree	32 (16.93)
Strongly agree	81 (42.86)
<b>HBM construct of perceived susceptibility: I am not likely to contract HIV</b>	
Strongly disagree	30 (15.87)
Disagree	22 (11.64)
Neutral	38 (20.11)
Agree	36 (19.05)
Strongly agree	63 (33.33)
<b>HBM construct of perceived susceptibility: Without HIV test, I may be positive without knowing</b>	
Strongly disagree	35 (18.52)
Disagree	36 (19.05)
Neutral	46 (24.34)
Agree	38 (20.11)
Strongly agree	34 (17.99)
<b>HBM Construct of Perceived Severity: HIV/AIDS is a severe health problem</b>	
Strongly disagree	5 (2.65)
Disagree	3 (1.59)
Neutral	10 (5.29)
Agree	35 (18.52)
Strongly agree	136 (71.96)

(Contd...)

**Table 1: (Continued)**

Variables	HIV testing Total (N=189) N (%)
<b>HBM construct of perceived severity: HIV/AIDS is a disease with significant consequences</b>	
Strongly disagree	5 (2.65)
Disagree	5 (2.65)
Neutral	10 (5.29)
Agree	29 (15.34)
Strongly agree	140 (74.04)
<b>Participation in HIV testing: Ever tested for HIV</b>	
No	69 (36.51)
Yes	120 (63.49)
<b>Participation in HIV testing: Number of times tested for HIV</b>	
1	43 (40.95)
2 or more	62 (59.05)

counseling and the HBM constructs among the college students surveyed. Regarding the HBM construct of perceived benefits, 50% of the people who said they agreed with the statement that “HIV test makes people feel better” are more likely to voluntarily test for HIV ( $\chi^2 (1, N=189) = 0.689, p<0.05$ ). Respondents who agree that HIV testing helps prevent HIV infection (42%) were more likely to test for HIV ( $\chi^2 (1, N=189) = 5.195, p<0.05$ ). The data also indicate that survey respondents who perceive HIV as a severe health problem (57%) were more likely to test for HIV ( $\chi^2 (1, N=189) = 0.087, p<0.05$ ).

**4.3. Multivariate analysis**

We performed multivariate analyses, using logistic regression models, in order to determine relationship among the variables of interest. Odds ratios and 95% confidence intervals were obtained and level of significance was set at  $\alpha \leq 0.05$ .

The final model of the study (Table 5) indicates that the HBM constructs were strong predictors of higher odds of testing for HIV. Respondents who agreed that HIV test makes people feel better had 27% higher odds of testing for HIV in the final model

**Table 2: Descriptive statistics of selected demographics and HIV testing among college students**

Variables	HIV testing Total (N=189) N (%)
<b>Age</b>	
18–28	166 (87.83)
29–39	17 (9.0)
40–50	3 (1.59)
51+	2 (1.06)
No response	1 (0.53)
<b>Gender</b>	
Male	88 (46.56)
Female	100 (52.91)
Other	1 (0.53)
<b>Race</b>	
African American	149 (78.84)
Hispanic/Latino	12 (6.35)
Asian American	9 (4.76)
White/Caucasian	5 (2.65)
Native American	2 (1.06)
Other	15 (6.35)
<b>Marital status</b>	
Single	16 (86.24)
Married	11 (5.82)
Divorced	3 (1.59)
Other	12 (6.35)
<b>Sexual orientation</b>	
Heterosexual	133 (70.37)
Gay	9 (4.76)
Bisexual	3 (1.59)
Other	13 (6.88)
No answer	31 (16.67)
<b>Sexually active</b>	
Yes	129 (68.25)
No	46 (24.34)
No answer	14 (7.41)

compared to their counterparts who disagreed. Respondents who agreed that HIV test prevents HIV infection had about 210% higher odds of testing compared to those who did not agree that HIV test helped prevent infection with the virus. Although the final model shows that those who agreed that HIV

**Table 3: Bivariate analysis of the association between health belief model (HBM) constructs, and HIV testing among students in a community college**

Variables	HIV testing Total (N=189)			
	No N(%)	Yes N(%)	$\chi^2$	p-value<0.05
<b>HBM construct of perceived benefits: HIV test makes people feel better</b>				
Disagree	18 (10)	25 (13)	0.688	0.407
Agree	51 (27)	95 (50)	0.688	0.407
<b>HBM construct of perceived benefits: HIV test helps prevent HIV infection</b>				
Disagree	35 (19)	41 (22)	5.194	0.023*
Agree	33 (17)	80 (42)	5.194	0.023*
<b>HBM construct of perceived susceptibility: I am not likely to contract HIV</b>				
Disagree	33 (17)	57 (30)	0.002	0.966
Agree	36 (19)	63 (33)	0.002	0.966
<b>HBM construct of perceived susceptibility: Without HIV test, I may be positive without knowing it</b>				
Disagree	45 (24)	72 (38)	0.506	0.477
Agree	24 (13)	48 (25)	0.506	0.477
<b>HBM construct of perceived servery: HIV/AIDS is a severe health problem</b>				
Disagree	6 (3)	12 (6)	0.087	0.77
Agree	63 (33)	108 (57)	0.087	0.77
<b>HBM construct of perceived servery: HIV/AIDS is a disease with significant consequences</b>				
Disagree	8 (4)	12 (6)	0.105	0.75
Agree	61 (32)	108 (57)	0.105	0.75

\*\*Significant,  $p < 0.01$ ;  $\chi$ =chi square test

was a severe health problem had 176% higher odds of testing for HIV compared to their counterparts who disagreed, those who agreed that HIV was a disease with significant consequences had 85% lower odds of testing for HIV.

#### 4.4. Perceived susceptibility and HIV testing

There was an association between perceived susceptibility and HIV testing among the students. However, the direction of this association varied for each of the two survey questions exploring the respondents' perceived susceptibility and likelihood to test for HIV. As would be expected, there was a negative association between perceived susceptibility and HIV testing when the respondents were asked to respond to the question "It is not

likely that I will contract HIV." Those who agreed with this statement had 13% lower odds of testing for HIV than those who disagreed with it. A negative association was expected because the goal of public health is to heighten the risk perception of susceptibility to HIV and thus increase people's likelihood to seek HIV testing. However, there was a negative, but unexpected, association between perceived susceptibility and HIV testing for the second question that tested the association between perceived susceptibility and HIV testing. For this question, respondents were asked, "Without HIV testing, I may be positive but unaware of my status." In the second model testing the association between this HBM construct and the question, those who agreed had 28% higher odds of testing for HIV

**Table 4: Bivariate analysis of the association between selected demographic characteristics, and HIV testing among college students**

Variables	HIV testing Total (N=189)			χ <sup>2</sup>	p-value<0.05
	No N (%)	Yes N (%)			
<b>Sex</b>	<b>N=189</b>				
Male	37 (20)	51 (27)		4.032	0.13
Female	30 (16)	70 (37)		0.492	
Other	1 (0.5)	0 (0)		2.31	
<b>Age</b>					
18–28	65 (34)	101 (53)		5.004	0.29
29–39	3 (2)	14 (7)		3.54	0.89
40–50	1 (0.5)	2 (1)		1.710	0.83
51 and above	0 (0)	3 (2)		0.220	0.88
<b>Marital status</b>					
Single	60 (32)	103 (55)		3.082	0.38
Married	3 (2)	8 (4)		1.092	0.52
Divorced	0 (0)	3 (2)		0.650	0.52
Other	6 (3)	6 (3)		0.880	0.88
<b>Race</b>					
African American	48 (25)	101 (53)		9.273	0.10
Hispanic/Latino	5 (3)	7 (4)		0.411	0.02
Asian American	7 (4)	2 (1)		0.113	0.22
White/Caucasian	3 (2)	2 (1)		0.297	0.61
Native American	1 (0.5)	1 (0.5)		0.685	0.52
Other	5 (3)	7 (4)		0.411	0.52
<b>Sexual orientation</b>					
Heterosexual	45 (24)	88 (47)		2.290	0.68
Gay	3 (2)	6 (3)		0.774	0.94
Bisexual	2 (1)	1 (0.5)		0.328	0.28
Other	6 (3)	7 (4)		0.362	0.411
No answer	13 (7)	18 (10)		0.300	0.45
<b>Sexually active</b>					
Yes	26 (14)	103 (54)		50.064	0.00*
No	36 (19)	10 (5)		50.381	0.18
No answer	7 (4)	7 (4)		49.566	0.03*

\*\*Significant, p<0.01; χ=Chi square test

compared to those who disagreed with the assertion positing a positive association.

#### 4.4. Perceived severity and HIV testing

There was a positive association between perceived severity of HIV and HIV testing among the respondents. When asked to react to the statement

“HIV is a severe health problem,” respondents who agreed had 176% higher odds of testing for HIV compared to those who disagreed (Model 3, Table 5). Unfortunately, for the second arm of the question on perceived severity, this association was negative. Although there was a high agreement among the respondents that HIV disease is a disease with

**Table 5: Association between selected sociodemographic factors, HBM constructs, and HIV testing among students in a community college**

Variables	HIV testing Total (N=189)		
	Model 1 (HIV testing and sociodemographics)	Model 2 (HIV testing and HBM constructs)	Model 3 (HIV testing, sociodemographics, and HBM constructs)
Sociodemographics	OR (95% CI)	OR (95% CI)	OR (95% CI)
<b>Sex</b>			
Male	1.00 (Reference)		1.00 (Reference)
Female	1.72 (0.79-3.79)		3.92 (1.37-11.24)**
<b>Sexual orientation</b>			
Heterosexual	1.00 (Reference)		1.00 (Reference)
Gay	1.39 (0.16-12.21)		1.02 (0.07-14.25)
Bisexual	0.16 (0.01-3.15)		0.10 (0.00-3.07)
Other	0.52 (0.11-2.40)		0.85 (0.13-5.41)
No answer	1.48 (0.48-4.53)		1.54 (0.35-6.70)
<b>Sexual activity status</b>			
Sexually active	1.00 (Reference)		1.00 (Reference)
Not sexually active	0.06 (0.02-0.16)**		0.02 (0.00-0.10)**
No answer	0.22 (0.06-0.76)**		0.13 (0.03-0.66)**
Other	0.42 (0.09-1.89)		0.37 (0.56-2.44)
<b>Age group</b>			
18–28	1.00 (Reference)		1.00 (Reference)
29–39	4.54 (0.77-26.80)		7.84 (0.72-85.13)
<b>Marital status</b>			
Single	1.00 (Reference)		1.00 (Reference)
Married	1.02 (0.15-6.83)		1.70 (0.21-13.88)
<b>Race</b>			
African American	1.00 (Reference)		1.00 (Reference)
Hispanic/Latino	0.90 (0.19-4.25)		2.61 (0.48-14.27)
Asian American	0.11 (0.02-0.89)**		0.11 (0.01-1.27)
White/Caucasian	0.30 (0.03-2.35)		0.31 (0.03-3.06)
Native American	1.25 (0.02-93.44)		2.40 (0.01-523.36)
Other	1.21 (0.26-5.54)		2.49 (0.27-22.61)
<b>HBM constructs</b>			
HIV test makes people feel better		0.99 (0.43-2.26)	1.27 (0.38-4.19)
HIV test prevents HIV infection		2.09 (1.04-4.21)**	3.11 (1.05-9.19)**
Not likely to contract HIV		0.87 (0.45-1.71)	0.71 (0.26-1.95)
Without HIV test, may be positive but unaware of status		1.28 (0.63-2.60)	0.87 (0.33-2.35)
HIV severe health problem		0.74 (0.20-2.80)	2.76 (0.45-17.00)
HIV disease with significant consequences		0.75 (0.20-2.82)	0.15 (0.12-1.28)
It is easy to get HIV test		1.43 (0.55-3.70)	0.58 (0.15-2.21)

(Contd...)



**Table 5: (Continued)**

Variables	HIV testing Total (N=189)		
	Model 1 (HIV testing and sociodemographics)	Model 2 (HIV testing and HBM constructs)	Model 3 (HIV testing, sociodemographics, and HBM constructs)
It is difficult to get HIV test		0.34 (0.12-1.01)**	0.25 (0.06-0.98)**
Lack of time to get HIV test		1.04 (0.24-4.45)	1.05 (0.16-6.90)
Not tested, dislike for needles		1.86 (0.56-6.24)	2.51 (0.47-13.37)
Test after sex with casual partner		0.67 (0.32-1.38)	0.69 (0.26-1.86)
Test after sex with steady partner		1.48 (0.64-3.39)	1.50 (0.49-4.55)

OR=Odds Ratio; CI=Confidence Interval; \*\*Significant, P<0.05

significant consequences (Table 5), the association became negative when this construct was considered in the presence of demographic factors. When this response was adjusted, the odds of testing for HIV among those who acknowledged that HIV has significant consequences was 85% lower compared to their counterparts who disagreed with the statement (Table 5).

#### 4.5. Perceived benefits and HIV testing

There was a strong association between the HBM construct of perceived benefits and HIV testing. To test the respondent's perception of the benefits of HIV testing, the survey asked the respondents whether they agreed with the statements that "HIV test makes people feel better" and "HIV test prevents HIV infection." For both questions, there was a strong and positive association between perceived benefits and HIV testing. Respondents who agreed that HIV testing makes people feel better had 27% higher odds of testing for HIV compared to their counterparts who disagreed with the statement. Respondents who agreed that HIV testing helps prevent HIV infection had 211% higher odds of testing for HIV than their counterparts who disagreed with the statement.

#### 4.6. Social/Demographic factors and HIV testing

There were associations between social and demographic characteristics and HIV testing. These associations were both positive and negative. For

example, we found that in terms of race, Hispanic/Latino respondents had 161% higher odds of testing for HIV compared to their counterparts and the highest for all races reported in the study. Respondents aged between 29-30 years had over 300% higher odds of testing for HIV compared to their counterparts of other age groups. Being sexually inactive was negatively associated with HIV testing. The findings indicated that sexually inactive respondents had 98% lower odds of testing for HIV compared to their counterparts who were sexually active (Table 5).

## 5. Discussion

This was an original study using quantitative cross-sectional survey to evaluate the associations between participation in HIV testing and the constructs of the Health Belief Model (HBM) among students in a community college. We investigated whether the HBM constructs of perceived benefits, perceived susceptibility, and perceived severity were associated with HIV testing among the respondents. It should be noted that HBM is one of the theories for studying human behavior in public health. According to Payne et al (2009), HBM has been one of the leading theories in public health given its ability to show the individual perception of benefits, severity, and ability to address the dangers of risky behavior through action.<sup>[18]</sup>

The study results indicate that, in general, there is a strong association between the HBM constructs and HIV testing. For example, those who reported

perceived benefits of HIV testing had 27% and 11% higher odds of testing for HIV than those who had lower perceived benefits of HIV testing. This association was positive. Similarly, there was a positive relationship between perceived severity of HIV to HIV testing among the respondents. When asked to react to the statement, "HIV is a severe health problem," respondents who agreed had 176% higher odds of testing for HIV compared to those who disagreed. Unfortunately, for the second arm of the question on perceived severity, there is a marked agreement among the respondents that HIV disease is a disease with significant consequences. However, when this response was adjusted, the odds of testing for HIV among those who acknowledged that HIV has significant consequences was 85% lower compared to their counterparts. This result is consistent with the findings of Gao et al. (2000), who reported a positive outcome of their HBM construct of perceived severity, where the respondents agreed that HIV/AIDS was a serious disease.<sup>[19]</sup> This presents an opportunity for public health education, awareness, and education within this population so that acknowledgement of the magnitude of the epidemic could be followed by action.

Our study provides actionable data that will be necessary for planning and implementing programs to address HIV prevention among college-aged students. The study provides critical information that can be used in addressing the health needs of students about HIV and other sexually-transmitted diseases. For example, this study has the potential to positively impact social change because it presents information that will be necessary for education leaders, public health officials, and community-based organizations to understand more robust methods for implementing public health programs aimed at increasing HIV testing.

This study is a cross-sectional study from which it is generally ineffective for ascertaining temporal relationships or to determine the direction of events. It is therefore necessary to conduct a longitudinal study that provides information on the same variables over a long time so the results could be compared over time. A survey like this, for example, can be completed as part of the registration process

for new students, where the same questions could be fielded every year to ascertain the varying risk-taking behaviors of cohorts of students that enter the school.

## 6. Conclusion and Global Health Implications

One of the key tenets of public health and health promotion programs with regards to reducing the burden of HIV/AIDS epidemic is increasing the number of people who are aware of their HIV status and reducing the number of people who are unaware of their status.<sup>[20]</sup> Those who know their status are more likely to protect themselves and even among those who are positive, awareness of status has been shown to decrease transmission of the virus among seropositive partners.<sup>[20]</sup> According to the CDC, out of about 1,178,350 persons who are infected with HIV in the United States, more than 942,680 number of people know their status.<sup>[21]</sup> In the US, the cost of treatment and management of the HIV/AIDS epidemic was estimated at 11.6 billion per year in 2005 alone.<sup>[22]</sup> It is recommended that planners be overly optimistic to forestall inflationary impacts on funding. However, even if such measures were applied here, it is possible that the costs of HIV-related care to the federal government could have doubled by 2015 fiscal year. Given that HIV testing is the mainstay of prevention messaging, it behooves public health professionals and agencies to use actionable information such as presented in this study in the design of programs at community level aimed at increasing HIV testing in the community and the country.

### Compliance with Ethical Standards

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