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The Influence of Excessive Alcohol Consumption, Gender, Age, Enrollment Status and Academic Class on Risky Sexual Behavior Among Predominantly Black College Students

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Abstract

This study examined the effect of excessive alcohol consumption, gender, age, enrollment status, and academic class on risky sexual behavior among Predominantly Black College (PBC) students. Survey of PBC students aged 18 and above was conducted to obtain their opinion about the consumption of various alcohol beverages (i.e., beer, wine, and hard liquor), and their involvement in risky sexual behavior. Exploratory factor analysis identified items measuring the consumption level of each type of alcohol beverage with an acceptable internal consistency. Confirmatory factor analysis (CFA) was performed to: (a) identify the factorial structure of the orthogonal measurement model; (b) determine the significance and magnitude of effect of the alcohol consumption measures on the risky sexual behavior measures; and (c) test the fit of the measurement and structural model to the data. The CFA produced an alcohol-related risky sexual behavior model causal model with good psychometric properties. Beer and hard liquor consumption emerged as having large positive and significant effects on risky sexual behavior; and wine consumption had no meaningful effect on sexual behavior among the PBC students. As for the effect of the control variables in the model on risky sexual behavior, gender had a large effect on risky sexual behavior with female college students being more likely to engage in risky sexual behavior after consuming alcohol than their male counterparts. Academic class had a moderate but significant effect on risky sexual behavior, with lower class students being more likely to engage in risky sexual behavior from alcohol consumption than upper class students. Age had a moderate, but insignificant influence on alcohol-related risky sexual behavior, with older students more likely to engage in risky sexual behavior than younger students. Wine consumption, enrollment status, and age had no meaningful effect on risky sexual behavior. These findings are, for the most part, consistent with previous research. Collectively, the findings suggest that to reduce alcohol-related risky sexual behavior on PBC campuses more attention should be given to controlling excessive consumption of hard liquor and beer, especially among female and lower class students.

Keywords

Excessive Alcohol Consumption, Binge Drinking, Confirmatory Factor Analysis, Structural Equation Modeling, Risky Sexual Behavior, Predominantly Black College

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1. Introduction

Excessive alcohol consumption commonly referred to as binge drinking among college students in the United State has become a major public health concern [1, 2]. Binge drinking is a pattern of alcohol consumption that brings the blood alcohol concentration (BAC) level to 0.08% or more [2]. A major consequence of binge drinking among college students is engagement in risky sexual behavior. Risky sexual behavior refers to the indiscriminate forms of having sexual intercourse that place a person at risk for unintended pregnancy, sexually transmitted infection (STI), sexual violence, or other adverse outcomes [3]. This behavior include having sex without a condom, having numerous or casual sex partners, having sex with a stranger, and having sex while under the influence of alcohol [4]. College life, with its greatly expanded opportunities for self-governance and independence among students, provides an important new context in which young people learn to manage their sexual relationships [4, 5]. However, research indicate that although excessive alcohol consumption is prevalent among the general population as a whole, binge drinking on a college campus places students at more elevated chance of engaging in risky sexual behavior than outside the college environment, which can be attributed, for the most part, to limited supervision [6]. For example, in the United States, it is estimated that each year over 696,000 students between the ages of 18 and 24 are sexually assaulted by other students who have been drinking, and more than 97,000 students in this same age range are the victims of date rape [6]. Moreover, comparative research between college and university students and non-college persons found that college students tend to engage in alcohol-related risky sexual behavior more often than the broader population as a whole [7, 8, 9]. Furthermore, evaluative research has shown variation in excessive alcohol-related risky sexual behavior by gender and age groups. For example, Wechsler, Dowdall, Davenport, and Castillo, found that women who drank five drinks were significantly more likely to experience adverse behavioral outcome than men who drank at a similar level [10].

Various theories have been advanced to understand the psychological and cognitive mechanisms through which excessive alcohol consumption leads to risky sexual behavior. These theories include: alcohol-related sexual expectancies [11, 12], alcohol myopia [13] or propensity for sensation-seeking [14], and psychosocial theory [15]. Reliance on these theories, researchers have sought to establish the psychological and socio-cognitive mechanisms that contribute to alcohol-related risky sexual behavior. Three major findings have emerged from these studies. First, individuals who consume excessive amount of alcohol are more likely than their less alcohol consumption counterparts to engage in a pattern of risky decision-making about sex partners, such as, in having more sex partners [16, 9], having unplanned sex [17, 18], and having sex with casual and new partners [19, 20, 16, 21]. Fromme and colleagues [22] suggest that risky partner choices are attributed, in part, to alcohol's acute disinhibiting effects and lowered risk perceptions with new sex partners. Complementing these studies and observations are findings from recent studies showing that alcohol consumption inhibits an individual's self-monitoring behavior, thus increasing the person's likelihood of engaging in casual sex, sex with multiple partners, or unprotected sex [23]. Second, students who are intoxicated from excessive alcohol consumption less likely use condoms than those students who consume less alcohol [20, 7, 24]. Chesson and colleagues [25] found that students who drink more heavily were at greater risk for sexually transmitted infections from unprotected sexual intercourse. Third, a positive correlation has been established between a belief that alcohol consumption enhances sexual arousal and performance, and alcohol-related risky sexual behaviour [26].

Complementing these research findings are numerous gender-specific studies on female students in the United States that found a strong positive correlation between alcohol consumption and risky sexual behaviour [27, 28, 29, 30, 31]; and longitudinal studies that found a strong association between excessive drinking and lifetime tendency to engage in risky sexual behavior, including multiple sex partners and unprotected sexual intercourse [32].

To prevent excessive drinking of alcohol by young people on college campuses, the United States Congress passed the National Minimum Purchase Act in 1984, which raised the minimum age requirement to purchase alcohol from 18 to 21 years [33]. This Act required state and local governments to adopt policies to control excessive alcohol consumption on college campuses. As a result, many universities and colleges in the United States are now engaged in some form alcohol abuse prevention programs. Two decades later, over 90% of colleges and universities in the United States provide counseling and treatment services for students, and nearly as many provide prevention services (for example, alcohol education) for freshmen or other at-risk groups [34]. Despite these efforts, the incidence of binge drinking among college students continues to rise. For example, Hingson [7] found that from 1984 when Congress passed the National Minimum Purchase Act to 2005, the number of students arrested and charged with driving while intoxicated increased from 2.3 million students to 2.8 million. Because the concentration of young people ages 18-25 years is much higher in colleges than anywhere else in society, the incident of alcohol binge

drinking-related risky sexual behavior may be much higher as well than reported. Recent data from the Center for Disease Control and Prevention (CDC) and independent research indicate that the spread of sexually transmitted disease is increasing on college campuses in the United States, especially at predominantly black colleges and universities [35, 36, 37, 38, 39, 40, 41, 42]. As the rate of HIV and other sexually transmitted infections continue to rise on campuses in the United States, recent research have focused on identifying socio-cognitive factors that contribute to risky sexual behavior among this particular group of college students. Using the Information-Motivation-Behavioral (IMB) skills model, these studies have found a lack of personal motivation to be a strong predictor of risky sexual behavior among college students [40, 41].

Research has shown that risky behavior prevention programs are more effective when they are based on research-driven empirical data targeted at specific audiences or groups [43, 44]. Numerous studies have been conducted on the antecedents of risky sexual behavior among colleges [42, 45, 46, 47, 48]. While these studied have substantially expanding our understanding of socio-cognitive variables that may contribute to risky sexual behavior, none of the studies that we know of have performed an assessment of the relative influence of excessive consumption of various types alcohol beverages, such as wine, beer, and hard liquor, and associated covariates on risky sexual behavior among Predominantly Black College (PBC) students.

Given the continued increase in sexually transmitted infection among this particular group of college students, the goal of this study was to begin the process of generating sound evidence-based data that could be relied upon to design effective alcohol-related STI prevention programs on PBC campuses. Specifically, the purpose of this study was to identify with precision the influence of excessive consumption of various types of alcohol (that is, beer, wine, and hard liquor) consumption on the sexual behavior of PBC students. The study addressed the following research question: What are the effects of excessive consumption of beer, hard liquor, and wine, gender, age, enrollment status, and academic class on risky sexual behavior among PBC students?

2. Materials and Methods

2.1. Research Design

This study employed a cross-sectional pre-experimental one-shot case study design [49]. A schematic representation of the design is displayed in Figure 1.

Treatment	Post-test
X	O2

Fig. 1. Pre-experimental one-shot case study design.

where X is a PBC student's types and level of alcohol consumption (i.e., beer, wine, and hard liquor), gender, age, enrollment status, and academic class. O_2 is the level of a student's risky sexual behavior. The limitations of this type of research design are outlined in the discussion section of this article.

2.2. Participants and Procedure

The Predominantly Black College selected for this study has a population of 6,217 college students enrolled who come from various states in the United States and foreign countries. A breakdown of the population by race/ethnicity shows that approximately 70% is African American, 17% is Caucasian, 4% is Hispanic, 1% is Native American and 4% is other racial/ethnic groups. The age distribution of the student population consists of 55% in the age range of 17-25 years old, 31% aged 26-40 years, and 14% is over 40 years. Most of the students (68%) are females, while 32% is males. The distribution of the population by academic class shows that 19% is freshman, 15% is sophomore, 18% is junior, 32% is senior, and 11% is graduate. Most of the students (66%) attending the university are enrolled as full-time students, while one-third are part-time students.

Participants in the study included a purposive convenient sample of students aged 18 years or older. After receiving Institutional Review Board's (IRB) approval, various professors were contacted and asked for permission to conduct the survey during a portion of their class time. A random sample 254 professors at the university were contacted by email requesting permission to administer the survey to their students. Of this total number of professors, 26 professors with a total class size of 609 students granted us permission to administer the surveys in their classes. Once the permission was granted, we met with the students during the class period and explained the purpose of the study to them. They were also informed that their participation was strictly voluntary and they may either opt not to participate in the study and leave or not provide a response to any of statements. In addition, the students were informed that no incentive will be provided for their participation in the study. The students who agreed to participate in the survey were provided with a consent form for them to read, sign and date. The consent form explained to the students that their participation was voluntary and would not affect their grade and their identity will be kept strictly confidential, and their names would not appear in any report. We adhered to all American Psychological Association research guidelines.

The survey was anonymous in that no identifying information was connected to individuals, or included in the data set. Participants completed the survey during class time and returned them before leaving the class. Non-participants were asked to remain quiet or were dismissed from the class early. The survey took less than 10 minutes to complete. A total of 210 students participated in the survey.

2.3. Measures

The items on the survey instrument used in this study were obtained from previous studies on alcohol consumption [50, 51, 16, 4, 19], and validated using exploratory and confirmatory factor analytic procedures. The survey instrument includes items measuring the alcohol consumption and involvement in risky sexual behavior of a student, as well as general demographic information of the respondents. Alcohol consumption was classified into three categories: beer consumption, wine consumption, and hard liquor consumption. Overall, the structural model of the study consisted of seven exogenous variables and one endogenous latent construct. The exogenous latent variables were beer consumption, wine consumption, hard liquor consumption, age, academic class, gender, and enrollment status of a student. The endogenous latent construct was risky sexual behavior.

Alcohol consumption: This exogenous latent construct was operationalized using a battery of 10 items obtained from previous research [50, 51] with four items measuring beer consumption; four items measuring wine consumption; and two items measuring hard liquor consumption. Beer consumption was measured by the following four items: (1) How often do you drink a can of beer? (2) What is the usual number of can(s) of beer do you drink per occasion? (3) What is the maximum number of cans of beer do you drink on any one occasion? (4) How often do you drink this maximum number of cans of beer? Wine consumption was measured by the following four items: (1) What is the usual number of glasses of wine do you drink per occasion? (2) How often do you drink a glass of wine? (3) What is the maximum number of glasses of wine do you drink on any one occasion? (4) How often do you drink this maximum number of glasses of wine? Hard liquor consumption was measured by the following two items: (1) What is the usual number of shots of hard liquor do you drink per occasion? (2) What is the maximum number of shots of hard liquor do you drink per occasion? The eight items measuring beer and wine consumption were scored on a 5-point Likert scale ranging from 0=never to 5=very often. Meanwhile, the two items measuring liquor consumption were scored on a 4-point Likert scale ranging from 0=0 shot to 4=over 4 shots. *Age* was measured as an interval level variable. *Academic class* was measured at the ordinal level with 1=freshman, 2=sophomore, 3=junior, and 4=senior.

Enrollment status was measured at the nominal level with 1=part-time and 2=full-time.

Risky sexual behavior was measured by four items scored on a 4-point ordinal level Likert scale ranging from 1=never at all to 4=very often [16, 19]. The items are: (1) How often have engaged in sex after a brief encounter? (2) How often have you engaged in a one-night stand? (3) How often have you engaged in sexual intercourse without the use of a condom? (4) How many sexual partners have had in the last 6 months?

2.4. Statistical Analysis

Latent variable structural equation modeling analysis was performed to assess the influence of beer consumption, wine consumption, and hard liquor consumption, gender, age, enrollment status, and academic class on risky sexual behavior using AMOS 21.0 [52]. Specifically, exploratory factor analysis (EFA) was performed to determine the factorability of the each of the latent constructs. Internal consistency of the constructs was assessed by Cronbach's Alpha test with alpha of .07 considered to be adequate internal consistency. Once the factorability was determined, confirmatory factor analysis (CFA) was performed to assess the fit of model to the data, and to estimate the magnitude and significance of the effect of each of the exogenous constructs (i.e., beer consumption, wine consumption, and liquor consumption, gender, age, enrollment status, and academic class) on the endogenous latent construct, risky sexual behavior. To make full use of the available data, full maximum information likelihood (FIML) estimation procedure was used. A number of indices were used to evaluate the goodness of fit of the five-factor orthogonal alcohol-related risky sexual behavior (ARSB) structural model. The model absolute fit was assessed using chi-square statistics, χ^2, with low χ^2 considered good fit [53]. Incremental fit was evaluated using the Root Mean Square Errors of Approximation (RMSEAs) with a value less than 0.06 indicating a relatively good fit, along with Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) with values of .95 or greater considered desirable [53, 54, 55, 56]. The likelihood that the model's parameter estimates from the original sample will cross-validate across in future samples was assessed by examining Akaike's [57] Information Criterion (AIC) and Bozdogen's [58] consistent version of the AIC (CAIC) with lower values of the hypothesized model compared to the independent and saturated models considered to be appropriate fit. The likelihood that the model cross-validates across similar-sized samples from the same population was determined by examining the Expected

Cross-Validation Index (ECVI) with an ECVI value for the hypothesized model lower compared to both the independent and saturated models considered to represent the best fit to the data. Finally, Hoelter's [59] Critical N (CN) was examined to determine if the study's sample size was sufficient to yield an adequate model fit for a χ^2 test [60] with a value in excess of 200 for both .05 and .01 CN indicative of the structural model's adequacy in representing the sample data [61].

Normality of the distribution of the model's variables was assessed by Mardia's [62, 63] normalized estimate of multivariate kurtosis with a value of 5 or less reflexive of normal distribution. Multivariate outliers were detected by computation of the squared Mahalanobis distance (D^2) for each case with D^2 values standings distinctively apart from all the other D^2 values as indicative of an outlier.

The magnitude of effect of beer consumption, wine consumption, and hard liquor consumption latent constructs on risky sexual behavior latent construct was determined by estimating the standardized regression coefficients (Beta coefficients (β) or factor loadings), with β's below .05 too small to be considered meaningful influences on risky sexual behavior, even when they are statistically significant; those between .10 to .25 were considered moderate influences on risky sexual behavior; and those above .25 considered large effects on risky sexual behaviour [64].

3. Results

Table 1 contains the standardized parameter coefficients with factor loadings of latent variables onto measured variables, and Table 2 displays the direct effects within the structural portion of the tested alcohol-related risky sexual behavior causal model. Table 1 shows that standardized regression weights or factor loadings exceeded the acceptable lower bound (ranging from .81 to .97), and the items measuring each of the latent constructs are significant and fairly equivalent suggesting that items were equally good measures of their respective construct [64]. Hence, convergent validity of the measurement model as a whole is confirmed. The fit of the alcohol consumption-related risky sexual behavior model of this complexity was good ($\chi^2(53, N = 210) = 97.861$, $p < .01$; CFI = .97; TLI = .96; RMSEA = .06). The multivariate model as a whole explained 30% of the variance in alcohol consumption related risky sexual behavior among the sample of HBCU students. The AIC fit statistics is 229.861 for the hypothesized model is lower compared to the independent model (AIC=238.000) for the independent model or the saturated model (AIC=2,208.028), indicative of appropriate fit of the model to the data. Also, the ECVI for the model is lower (1.084) compared to the independent model (1.123) and the saturated model (10.415), suggesting that the model represent the best fit for the data. Hoetler's Critical N value for the model is 154 at .05 level and 173 at the .01 level, which is slightly below the acceptable level for structural causal model that adequately represent the sample data. Finally, Mardia's normalized estimate of multivariate kurtosis (C.R. value) is -1.015 which is reflexive of a normal distribution. The square Mahanalobis distance (D^2) values showed minimal evidence of multivariate outliers.

Table 1. Standardized estimate for Type of Alcohol Consumption Measure items.

HIV Prevention Measurement scale items	Estimate
Beer Consumption	
How often do you drink a can of beer? (B1)	.84
What is the usual number of can(s) of beer do you drink per occasion? (B2)	.95
What is the maximum number of can(s) of beer do you drink per occasion? (B3)	.97
Wine Consumption	
What is the usual number of glasses of wine you drink per occasion? (W5)	.98
What is the maximum number of classes of wine do you drink per occasion? (W6)	.94
How often do you drink a glass of wine? (W7)	.87
Hard Liquor Consumption	
What is the usual number of shots of hard liquor you drink per occasion? (HL9)	.82
What is the maximum number of shots of hard liquor you drink per occasion? (HL10) .82	

Table 2. Structural Equation Unstandardized and Standardized Regression Weights of Beer Consumption, Wine Consumption, Hard Liquor Consumption, Academic Class, Gender on Risky Sexual Behavior among Predominantly Black College Students.

Exogenous Variable	*b*	S.E.	β	*t*	*P*
Beer Consumption	.23	.13	.28	3.106	.002
Wine Consumption	.01	.122	.01	-.027	.978
Hard Liquor Consumption	.19	.066	.25	2.926	.003
Gender	-.38	.129	-.22	-2.949	.003
Academic Class	-.12	.057	-.16	-2.121	.034
Enrollment Status	-.02	.338	-.01	-.051	.959
Age	.13	.074	.14	1.701	.089

Endogenous Construct: Risky Sexual Behavior
N=214; Squared multivariate correlation = 30.2%.

Table 2 displays the estimated standardized (β) coefficients associated with each of the exogenous variables in the alcohol-related risky behavior structural equation model. Beer consumption and hard liquor consumption had a large positive and significant effect on risky sexual behavior among HBCU students (β = .28, t = 3.106, $p < .01$ and β .25, t = 2.926, $p < .01$, respectively). Gender (coded 1=male; 2=female) and academic class (coded 1=freshman, 2=sophomore, 3=junior, 4=senior) had a moderate negative and significant effect on risky sexual behavior among the students (β = -.22, t = 2.949, $p < .01$ and β = -.16, t = 2.121, $p < .01$, respectively). Age had a moderate positive, but

insignificant influence on risky sexual behavior among the HBCU students (β = .14, t = 1.701, p >.01). Wine consumption and enrollment status had no meaningful effect (β< .05, p>.01) on risky sexual behavior.

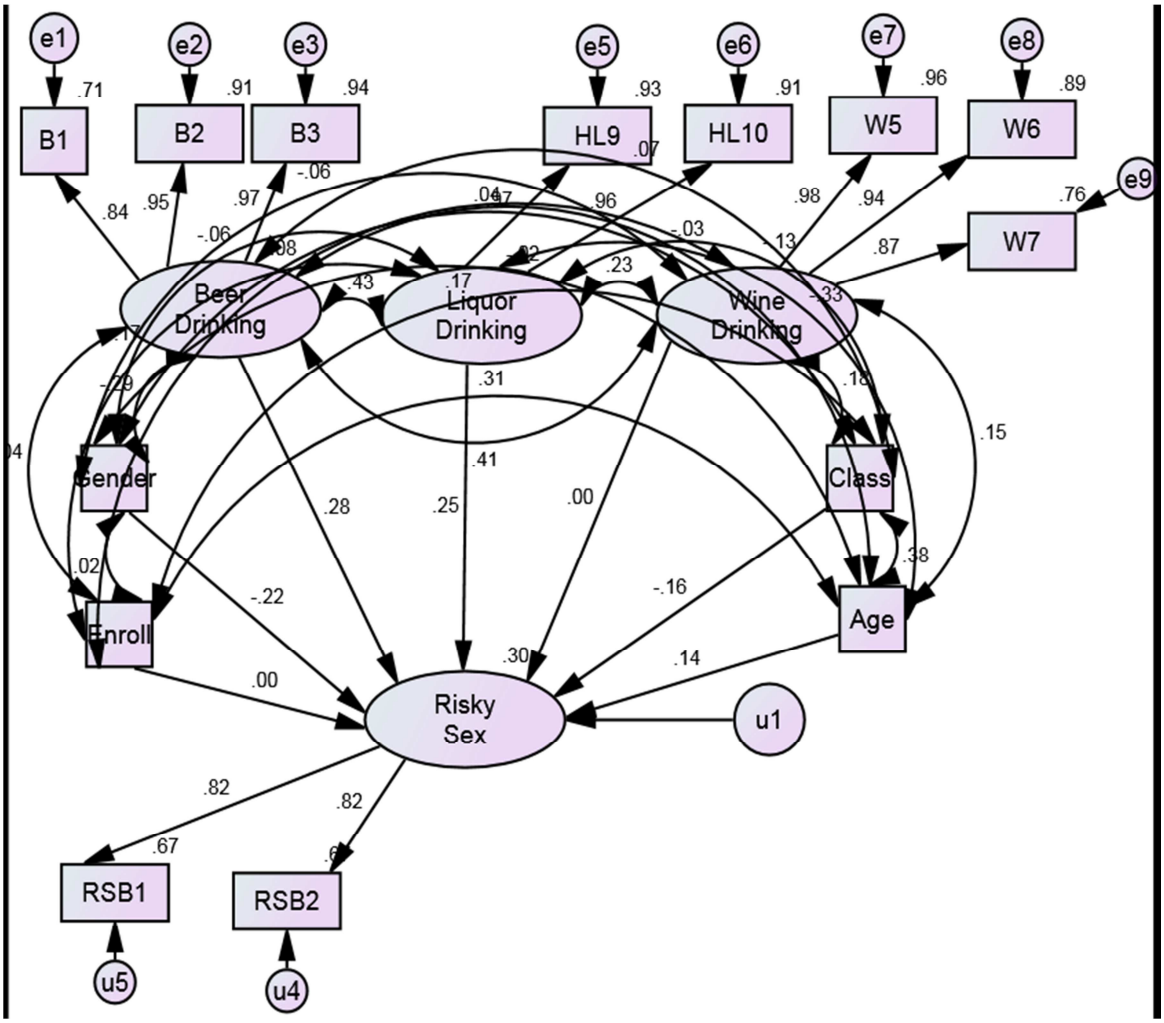

Figure 2. Alcohol-related Risky Sexual Behavior CFA Structural Model for Predominantly Black College Students.

4. Discussion

This study was aimed determining the influence of alcohol consumption, age, gender, academic class and enrollment status on risky sexual behavior among Predominantly Black College (PBC) students. Three types of alcohol beverages were examined in this study—beer, hard liquor and wine. Using structural equation modeling (SEM), a causal model was developed from theory and previous research consisting of a total of three exogenous latent constructs (i.e., beer consumption, hard liquor consumption, wine consumption), and demographic variables (i.e., gender, academic class, age, and enrollment status of the student); and an endogenous latent construct, risky sexual behavior.

The study found that beer and hard liquor consumption behaved as expected in that they had a moderate to large positive influence on risky sexual behavior among the PBC students. Female and lower class students were more likely to engage in alcohol-related risky sexual behavior than their male and upper class counterparts, respectively. These findings are consistent with previous studies [27, 28, 29, 65, 31]. Surprisingly, alcohol-related risky sexual behavior was found to increase with age among the students. This finding deviates from the findings of previous studies [3]. Wine consumption and enrollment status of the students had no meaningful effect on alcohol-related risky sexual behavior.

5. Conclusion

Collectively, the findings of this study suggest that of the three exogenous latent constructs and four common cause variables in our structural model, only wine and enrollment status were found not to have any influence on alcohol-related risky sexual behavior; while female, older and lower class PBC students were likely to engage in alcohol-related risky sexual behavior. Hence, the focus of alcohol-related

risky sexual behavior prevention programs at PBC campuses may be on reducing beer and hard liquor consumption among male, lower class and older students attending these institutions of higher learning.

This study has some limitations that should be acknowledged. While the findings of this study provide an insight into the influence of various types of alcohol consumption, gender, age, academic class, and enrollment status on alcohol-related risky sexual behavior among PBC students, the external validity of the findings remains questionable. Although the predictive fit indices (AIC and ECVI) indicate the adequacy of the model to be applicable across future samples and samples of the same population, future studies should expand the validation process to multi-group tests of equivalence of the alcohol-related risky sexual behavior measurement and causal structure. Finally, as a contribution to theory-building, we recommend that future studies should be conducted at other Predominantly Black College campuses to determine the consistency of our findings.

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