

## Predictors of HIV Risk Among College Students: A CHAID Analysis.

By: Colleen DiIorio, [William N. Dudley](#), and Johanna Soet

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### **Abstract:**

The purpose of this study was to identify predictors of risk behaviors among college students and to determine how students differed in HIV risk practices. Participants were from six colleges and universities in a large southeastern metropolitan area. The present analysis was limited to participants who were 18 to 25 years of age; single; White, African American, or Asian; and reported initiation of sexual intercourse. The results demonstrated significant associations of gender and race with having sex within the past 3 months, number of partners, condom use, length of time one knew one's sexual partner, substance use, and asking one's partner about sexual history. Using Chi-Square Automatic Interaction Detection (CHAID), the strongest predictor of condom use was noted to be gender, and the strongest predictor of number of partners was race.

**Keywords:** HIV | sexual behavior | sexual risk | college students | biobehavioral research | race

### **Article:**

The Centers for Disease Control and Prevention (1997) report that over 20,000 adolescents and young adults have been diagnosed with AIDS and that the number of AIDS cases among individuals 13 to 24 years old is increasing. Despite recent advances in the treatment of opportunistic infections and promising research for the treatment of AIDS, currently, there is neither a cure for AIDS nor a vaccine to prevent HIV infection. To date, education that promotes the adoption of safer sex practices remains one of the strongest weapons against the spread of this deadly virus among young adults.

HIV prevention messages for college students are often based on the assumption that HIV risk factors are similar for all students. However, information gleaned from a number of studies suggests that college students are quite diverse in sexual behavior and attitudes and, thus, differ in their risk for contracting HIV. About 65% of students are sexually active upon admission to college (Dilorio, Parsons, Lehr, Adame, & Carlone, 1993a). Higher rates of sexual experience are recorded among sophomores, juniors, and seniors, suggesting that many students initiate sexual experience during their college years (Baldwin, Whiteley, & Baldwin, 1992; Butcher, Manning, & O'Neal, 1991; Johnson et al., 1994). Male and African American students tend to initiate sexual intercourse at younger ages than do women and White, Hispanic, and Asian students (Belcastro, 1985; Cochran, Mays, & Leung, 1991; Mott, Fondell, Hu, Kowaleski-lones, & Menaghan, 1996; Siegel, Lazarus, Krasnovsky, Durbin, & Chesney, 1991).

Of college students who are sexually active, only about one in four use condoms consistently (Butcher et al., 1991; Caron, Davis, Halteman, & Stickle, 1993; Joffe et al., 1992; Johnson et al., 1994; Kusseling, Wenger, & Shapiro, 1995; Latman & Latman, 1995; Wulfert & Wan, 1993). Younger students have reported using condoms more often and more consistently than older students. Butcher et al., for example, reported that 29% of freshman students consistently used condoms compared with 15%, 10%, and 7% of sophomore, junior, and senior students, respectively. Males are more consistent users of condoms than are females (Baldwin et al., 1992; Johnson et al., 1994), and although the findings of some studies suggest that the rates of condom use are similar among ethnic groups (Cochran et al., 1991), the bulk of evidence indicates that African American students are more consistent users than are White students (Baldwin et al., 1992; Beckman, Harvey, & Tiersky, 1996; Johnson et al., 1994; Peterson et al., 1992).

Although college students are well aware of the risk of HIV posed by having multiple partners (Adame, Taylor-Nicholson, Wang, & Abbas, 1991; Dilorio, Parsons, Lehr, Adame, & Carlone, 1993b), the literature indicates that having more than one partner may be the norm (Reinisch, Hill, Sanders, & Ziemba-Davis, 1995). Reinisch et al. reported a mean of eight lifetime partners for college men and six for women; Joffe et al. (1992) noted that women had a mean of four partners with 33% of women reporting more than five partners; and 40% of college males in Sawyer and Moss' (1993) study reported over seven lifetime partners. Number of sexual partners has also been associated with ethnicity, with African American college students, especially males, reporting more sexual partners than members of other ethnic groups (Belcastro, 1985).

Mixing alcohol and drugs with sex, although not a direct HIV risk practice, is a background variable that contributes to risk by compromising sexual decision-making (Butcher et al., 1991; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). A significant proportion of college students report engaging in alcohol-associated sexual activity (Butcher et al., 1991; Meilman, 1993). Many of those who combine alcohol with sex abandon safer sex practices as a result (Meilman, 1993). Females are slightly less likely to engage in alcohol-related sex. However, when they are under the influence, they are more likely than males to participate in risky sexual practices and are more vulnerable than males to unwanted and unprotected sexual intercourse

(Johnson et al., 1994; Meilman, 1993; Wechsler et al., 1994). Finally, alcohol use is more often reported by White students than by African American students (Johnson et al., 1994).

This study, part of a larger study on HIV risk practices, had two aims. The first aim was to investigate how demographic groups (race, gender, and academic status) differed on risk factors that have been identified in the literature (HIV knowledge, age at first intercourse, condom use, multiple sex partners, and the use of drugs and alcohol). In addition, group differences in other risk factors not yet well articulated in the literature (type and length of relationship with current sex partner and discussion of sexual histories) were studied. These group differences were examined using contingency table analysis. The second aim was to describe how the sample differed on two major HIV risk behaviors (condom use and multiple partners). For this aim, a CHAID (Chi-Square Automatic Interaction Detection; Kass, 1980) analysis was employed to examine the complex associations among personal characteristics-gender, ethnicity, academic status, and alcohol and drug use-and two HIV risk behavior outcomes-number of partners and frequency of condom use. Although examples of the use of CHAID can be found in the marketing literature (Baron & Phillips, 1994) and health services (Hill, Delaney, & Ronca!, 1997), its potential utility in attitudinal research has not been well-exploited (Baron & Phillips, 1994). The use of CHAID here may aid in the identification of segments of the population that differ in HIV risk practices. This could be useful in the development and implementation of educational programs tailored to the needs of specific groups of students.

## Method

### Procedures

Participants for this study were randomly selected from the registrars' lists of six colleges and universities in a large southeastern metropolitan area. The colleges/universities selected for this study were alike in that each offered courses of study leading to baccalaureate degrees and each admitted 1,000 or more students per term. Six of the seven eligible institutions granted Institutional Review Board (IRB) approval and provided names and addresses of students. Students were sent a questionnaire through the mail and were asked to return it by mail to the project office. A \$5 bill was included as an incentive in the first mail-out. All students received a reminder postcard 1 week later, and students who did not return a questionnaire within 2 weeks were sent a second questionnaire. Follow-up phone calls were made to nonrespondents at those institutions for which IRB approval had been obtained (four of the six colleges) approximately 6 weeks after the first mail-out. Of the 5,893 questionnaires mailed, 2,468 were returned, representing a 48% nonadjusted response rate.

### Sample

For the present study, analysis was limited to participants who were 18 to 25 years of age; single; White, African American, or Asian American; and reported initiation of sexual intercourse. The mean age for the sample of 1,611 participants was 20.3 years ( $SD = 1.75$ ). Slightly more than

half (51.9%) were female, 60.8% were African American, 35.5% were White, and 3.7% were Asian American. The participants were about equally divided across academic status, with 25.5% freshmen, 22.9% sophomores, 24.2% juniors, and 27.4% seniors.

## Measures

The assessment instrument was a 15-page booklet that included items measuring personal characteristics, HIV/AIDS-related attitudes, and sexual behaviors. A similar assessment instrument was used in the previous year for collecting data from a different sample of college students. Only those measures that met standards for acceptable reliability (alpha coefficients above .70) were included in the survey for the second year. The survey instrument took about 30 min to complete. For the present analysis, the following information was used.

**Background and behavioral characteristics.** Participants were asked to indicate their gender, ethnic group, and year in school. They were asked to indicate the age when they first willingly had vaginal, anal, and oral sex. Alcohol use, drug use, and condom use were measured by responses to the following items: (a) "On the average, how often in the past 3 months have you had any wine, beer, or liquor?" (b) "How often do you drink alcohol before you have sex?" (c) "On the average, how often in the past 3 months have you use any marijuana, cocaine, crack, IV, or other drugs?" (d) "How often do you use drugs before you have sex?" and (e) "When you have sex, how often do you use a condom?" Each item was rated on a 5-point scale with higher scores corresponding to greater frequency of the behavior.

Participants were also asked how many different sex partners they had in the past year, the relationship to their most recent sexual partner, how long they had known their last sex partner, and on how many occasions they had had sexual intercourse in the past 3 months. Finally, they were asked how often they ask potential sexual partners about their sexual histories.

**HIV knowledge.** The awareness of factors associated with HIV transmission and preventive practices was measured using two different measures. The first measure was a 5-item, true or false scale (sample item: "A person can get AIDS from a mosquito bite"). In the second measure, respondents were asked to indicate if each of seven items represented safe sex practices or not safe sex practices (sample item: "Using a lambskin condom when having sex").

## Analysis

As mentioned earlier, two types of analyses were employed in this study. In the contingency tables analysis, the demographic variables of race and gender were combined to form a single race/gender variable with six levels: White males, White females, African American males, African American females, Asian males, or Asian females. Participants were also classified by academic status as freshmen, sophomores, juniors, or seniors. For the second stage of analysis, CHAID was used. Condom use and number of partners were dichotomized and used in separate

analyses as the dependent variables. Gender, ethnic group, alcohol use, drug use, and academic status served as the independent variables in both analyses.

CHAID is a statistical technique designed to partition a sample into mutually exclusive groups and subgroups based on a single categorical or ordinal outcome and several categorical or ordinal predictors. The analysis proceeds in a stepwise fashion in which the predictor that is most significant is used to partition the entire sample into two or more mutually exclusive subgroups. For example, suppose that, in the first step, gender was the most significant predictor of consistent condom use. This would result in two subgroups: males and females. In the second step, the analysis is performed on each subgroup in turn. The cases in a given subgroup are partitioned by the next most significant predictor of the original outcome. For instance, in the second step, race may be the most significant predictor for males but, for females, academic status is the most significant predictor. In this case, males would be partitioned by race, and females would be partitioned by academic status. In this way, the most significant predictor variable may differ from one subgroup to the next. Once the subgroups at a given level have been partitioned, the process begins again with all newly partitioned subgroups in the identical stepwise process. The results of the analysis are presented in a tree diagram, which allows for easy interpretation of very complex interactions.

For the current analysis, important aspects of the process should be noted. First, given the large number of comparisons that were performed, we employed a Bonferroni adjustment to control for Type I error. Second, we allowed the program to collapse across categories for race and academic status based on level of significance. Third, we did not force the order of entry, rather, we relied on the automated stepwise process.

## Results

Table I shows the percentage of participants by gender and ethnicity who answered items on the HIV knowledge questionnaire correctly. For the most part, students responded to the items correctly. However, there were three items on which the participants demonstrated some misconceptions. More than 10% of participants believed that AIDS could be transmitted through a mosquito bite, that having oral sex without a barrier was safe, and that using a lambskin condom was a safe practice. These misconceptions were more prevalent among Asian participants. In particular, although all groups scored lower on this item than other items, only 50% of Asian males knew that lambskin condoms are not safe. African American males were also more likely than African American females and Whites to believe that mosquitoes can transmit AIDS, and African American females were more likely to believe that lambskin condoms are safe. A similar analysis was conducted comparing knowledge among participants by academic status. Participants, as a group, scored lower on the same three items noted above, but no significant differences were noted among participants of different class standings.

Analyses were also conducted to test for associations between the gender/race classification and practices that increase the risk of contracting HIV. Table 2 shows that for all risky practices, significant differences exist based on one's gender/race classification. First, there was a significant association between the gender/race classification and having sex within the past 3 months. Standardized residuals (Statistical Package for the Social Sciences, 1993) indicated that White males and Asian males were slightly less likely than other groups to report not having sex within the past 3 months. A significant association was also found between the gender/race classification and number of partners. White males and females and Asian females were slightly more likely to report one partner, and African American males were more likely to report two or more sexual partners in the past year. In regard to condom use, African American males were more likely to use condoms than other groups of respondents, and White females were less likely to have sex with partners who used condoms.

Additional findings demonstrated that African American males were more likely than other groups to have known their partners less than 6 months, and White females were more likely to have known their partners for more than 6 months. White males and White females were more frequent users of alcohol than were other groups of participants. However, Asian males were similar to White males in the use of drugs, with both of these groups more likely to use drugs than the other participants. Mixing alcohol with sex was more common among White males and females than other groups and was least common among African American females. Combining drugs with sex showed a similar pattern for White males and females and African American females. However, Asian males were more likely than Asian females and African American men and women to mix drugs with sex. Finally, women, particularly African American women, were more likely than men to ask partners about their sexual histories, whereas African American males were least likely to do so.

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Similar comparisons were conducted to determine if differences in risky practices were evident by academic status (Table 3). Seniors were more likely than other participants to drink alcohol more than once per week and to combine alcohol with sex, whereas freshman were more likely than others to use drugs. Freshmen participants were more consistent condom users than participants of higher academic levels, but freshmen were also more likely to have two or more sexual partners in the past year and sophomores were more likely to report a friend, date, or acquaintance as their most recent sexual partner.

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Figure I shows the results of the CHAID analysis for condom use. (Note. In Figure I, the percent of inconsistent condom use is reported.) The strongest predictor of condom use was gender, with males being more likely to use condoms than females. Females were further differentiated by academic status, with freshmen women being more likely to report condom use than

sophomores, juniors, and seniors. The group of upper class women were then differentiated by ethnic group, with African American and Asian females being more likely than White females to use condoms. In contrast to the pattern for females, ethnic group was the strongest predictor of condom use among males; White males were less likely than African American and Asian males to use condoms. White males were further differentiated by alcohol use, with those who use alcohol frequently being more likely to use condoms.

Figure 2 shows the CHAID analysis for number of partners. Ethnic group was the most significant predictor of number of partners, with African American participants having significantly more partners than White and Asian participants. For African Americans, drug use was an important factor that differentiated them on risk, with those who used drugs being significantly more likely to have more than one partner in the last year. Among African Americans who did not use drugs, males were significantly more likely than females to have more than one partner. White and Asian participants were differentiated by alcohol use, with those who drank being significantly more likely to have more than one partner. White and Asian participants who used alcohol were further differentiated by drug use, with those using drugs most likely to report more than one partner.

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## Discussion

The purpose of this study was to determine if selected demographic and personal characteristics could be useful in distinguishing groups of students at risk for HIV infection. The results of this study show that college students are not homogeneous when it comes to HIV risk practices and that risk factors vary across subgroups. These findings are consistent with previous studies and suggest implications for the development and implementation of HIV prevention programs directed at college students.

The findings related to HIV I AIDS knowledge are consistent with the results of previous studies and demonstrate that, although students often have considerable understanding of HIV I AIDS, they tend to hold some misperceptions about HIV transmission. Misperceptions were particularly evident among Asian respondents. DiClemente, Zorn, and Temoshok ( 1987) also found that Asian teenagers knew less about HIV/AIDS transmission than African American and White students. They suggested that perhaps the Asian community was less concerned and less well-educated about HIV/AIDS since the epidemic had not as yet had a great impact on Asian Americans. Soet, Dilorio, and Adame ( 1997) found that Asian students raised abroad held more misperceptions than Asian students raised in the United States, suggesting that opportunities for HIV I AIDS education were not available or were missed. Another explanation is that students raised abroad were not as well-versed in the English language and simply did not know the meaning of terms such as "lambskin condom."

In regard to condom use, males reported using condoms more consistently than did females. Indeed, in the CHAID analysis, gender was the most significant variable differentiating participants on condom use. Johnson et al. ( 1994 ), who reported similar findings, suggested that lower rates of condom use among women may be due to men assuming the role of the primary decision-maker when condom use is an issue and/or to the acquiescence of women to condom use decisions made by their male partners. Some evidence that partners' attitudes regarding condom use have a significant bearing on actual condom use among women is found in a study by Harlow, Quina, Morokoff, Rose, and Grimley (1993). In comparing intrapersonal and interpersonal factors associated with condom use, Harlow et al. found that anticipated negative partner response was significantly correlated with unprotected vaginal intercourse. That is, women who perceived their partners to be accepting of condoms were more likely to report condom usage than women who reported negative partner attitudes. Additionally, interpersonal factors such as anticipated negative partner response, sexual unassertiveness, and victimization accounted for 10% more of the variance in unprotected sex than intrapersonal factors such as lack of confidence in using condoms and negative attitudes about sexual behavior.

For both males and females, condom use was more consistent among Asian and African American participants than among White participants. These results are similar to those of Johnson et al. ( 1994), who also found that African American, in contrast to White college students, used condoms more consistently. Together, these findings suggest that underlying cultural factors may play a role in determining condom use. Greater use of condoms in the African American community might be due, for example, to a greater reliance on condoms for birth control. Additional analysis of this data set provided some evidence to support this hypothesis. African American participants were less likely to use oral contraceptives and were more likely than White students to use condoms as a means of birth control.

For White male participants, alcohol use was an important predictor of condom use. We found that White men who drank were more likely to use condoms than those who did not drink. It may be that those respondents who do drink also place themselves in risky sexual situations. The participants may realize that there is a greater risk for STDs and HIV infection in these situations and, thus, may opt for using condoms. Evidence to support this view comes from a study that found that gay males who were at risk for contracting HIV were likely to use condoms consistently (Stall & Catania, 1994) and from a study that found that women who had multiple partners were more likely to use condoms than women with exclusive partners (Wagstaff et al., 1995). These results, along with our own, suggest that individuals are able to recognize some situations as being risky and respond accordingly. The same idea might explain why freshmen women were more likely to use condoms than upper classmen (Figure I). Freshmen, as a group, were more likely than other students to report using drugs and having more than one partner. Thus, their perception of being in a risky situation may have served as an impetus for use of condoms. Another explanation may be that the freshmen in the study represented a cohort that

has been sensitized to HIV risk factors and has adopted condom use as the norm. Longitudinal studies are needed to explore this phenomenon.

In regard to number of partners, the findings suggest differences among African American, Asian, and White participants. In the CHAID analysis, the most significant predictor of number of partners was race, with African Americans reporting a significantly greater likelihood of having had more than one partner in the last year than Asian and White participants combined. This finding is similar to Belcastro's (1985) and may be due to African Americans' greater number of years of sexual experience. For African Americans, drug use was also an important predictor, with only 10% of those who used drugs being likely to report only one partner. In contrast, both alcohol and drugs increased the risk of having more than one partner for Asian and White participants. So, while drugs are an important factor with all ethnic groups, alcohol seems to play a far greater role with Whites and Asians.

### Summary

The findings of this study indicate that HIV risk factors vary depending on a college student's ethnicity, gender, academic status, and substance use. Most importantly, African American men, particularly men who use drugs, and White and Asian men who use alcohol tend to report higher numbers of sexual partners. Females, particularly upperclass White females, and White men who do not use alcohol report infrequent condom use. These findings are useful for health educators who have begun to recognize the importance of considering the HIV risk factors of students and incorporating information related to these factors into HIV prevention programs. From the results of this study, we have several suggestions that health educators and researchers may want to consider when developing programs for college students:

1. Although students may not need extensive information about basic HIV facts, they may need reinforcement of the information. In particular, students need to be made aware that lambskin condoms do not offer protection against HIV transmission.
2. Females need to be encouraged and taught the skills to negotiate the use of and to actually use condoms. These skills need to be reinforced throughout college, particularly as women adopt other methods of birth control (i.e., the pill).
3. The general acceptance of condom use among African Americans and Asians may be a useful tool for the health educator. Promoting and reinforcing this norm and behavior, while addressing some of the other risk factors in these groups, may be a particularly effective approach to HIV prevention.
4. For White students whose condom use rates are lower, messages can include the use of condoms for STD and pregnancy protection. Messages for male students could include control over preventing pregnancy or sharing control for pregnancy prevention.

5. Couples often abandon using condoms when they feel they know each other "well enough." Some guidelines for when to give up condoms might also be given to provide couples with responsible and realistic directions for minimizing their risk when choosing to engage in unprotected sex. These guidelines would include HIV testing two times at least 6 months apart, no evidence of STDs in either partner, and a commitment of both partners to a monogamous relationship.
6. When addressing the number of sexual partners as a risk factor, African American men and women may hold the greatest potential for change, given the greater likelihood of multiple partners in these groups.
7. With respect to drug and alcohol use, health educators may want to include discussions about the influence of drugs (particularly for African American students) and alcohol (particularly for White and Asian students) on inhibiting logical decision-making as it relates to sexual intercourse.

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