

# Factors Influencing the Willingness to Use Sexual Protection Measures among University Students in the Border Regions of Yunnan

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## Abstract

**Objective:** This study explored the correlation between HIV/AIDS knowledge and condom use intention, and their influencing factors, among 923 freshmen at a Yunnan border university, to provide targeted recommendations for local HIV prevention and sexual health education. **Methods:** Using cluster sampling, an anonymous questionnaire survey was conducted among 923 college students at a university in a border region from November 2024 to February 2025. R 4.3.0 software was employed to perform chi-square tests and binary logistic regression analysis. **Results:** The HIV awareness rate among college students at a university in a frontier region was 65.87%, while the rate of unwillingness to use condoms was 33.15%. Univariate analysis revealed statistically significant differences ( $P < 0.05$ ) in condom usage willingness based on factors including gender, HIV knowledge awareness, proactive acquisition of HIV knowledge, receipt of HIV education, freshman status, and history of same-gender intercourse. Multivariate logistic regression analysis indicates that female gender ( $OR = 3.85$ , 95%  $CI$ : 2.881 - 5.156) and knowledge of AIDS ( $OR = 28.18$ , 95%  $CI$ : 19.498~40.722) are positively associated with condom use; lack of proactive HIV/AIDS knowledge acquisition ( $OR = 0.07$ , 95%  $CI$ : 0.040 -

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0.124) and not having received AIDS health education ( $OR = 0.06$ , 95%  $CI$ : 0.032 - 0.117) were negatively associated factors for condom use. **Conclusion:** The awareness rate of AIDS among college students in borderland universities is relatively low, and multiple factors influence the willingness to use condoms. It is necessary to strengthen the dissemination of AIDS-related knowledge and sexual health education, with particular attention paid to male students and populations with limited awareness.

## Keywords

Border Regions, University Students, AIDS/HIV, Willingness to Use Condoms

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## 1. Introduction

Data from the World Health Organization (WHO) indicate a rising trend in HIV infections among young people in recent years, with the situation among university students being particularly concerning [1]. Research from the U.S. Centers for Disease Control and Prevention (CDC) confirms that consistent and correct condom use significantly reduces the risk of HIV transmission [2]. As a sexually active population, university students' sexual health behaviors are crucial for the prevention and control of HIV and other sexually transmitted infections (STIs). Correct condom use is one of the most effective measures for preventing HIV and other STIs [3]. However, studies from various countries have shown that university students' willingness to use condoms is influenced by multiple factors, such as gender, sexual attitudes, HIV knowledge [4], and educational experiences [5]. Due to cultural, geographical, and other factors, sexual health issues among university students in borderland regions may have unique characteristics, yet related research remains limited [6]. This study, involving 923 university students from a borderland region, aims to conduct an in-depth analysis of the factors influencing their willingness to use condoms. The findings are expected to provide a scientific basis for targeted sexual health education and effective HIV prevention and control in universities in borderland areas, thereby contributing to the improvement of university students' sexual health.

## 2. Objects and Methods

### 2.1. Research Subjects

A total of 923 college students from a university in the border area were selected as the research subjects, and all participants provided informed consent to take part in the study.

### 2.2. Method

#### 2.2.1. Research Methodology/Content

A cluster sampling method was employed. With reference to the "Key Messages

for HIV/AIDS Prevention and Education” [7], a self-administered questionnaire was designed and subsequently reviewed and revised by two public health experts. The questionnaire covered demographic characteristics, HIV knowledge, willingness to use condoms, and sexual health behaviors. Adequate HIV knowledge was defined as correctly answering  $\geq 75\%$  of the relevant questions [8]. The questionnaires were distributed and collected via the Questionnaire Star platform. After investigators explained the purpose of the survey and instructions for completing the questionnaire, participants self-administered the questionnaire anonymously upon providing informed consent. Only one submission per IP address was allowed. Upon collection, questionnaires were checked for completeness and logical consistency, and invalid questionnaires were excluded.

### 2.2.2. Statistical Methods

Microsoft Excel 2010 was used to create the database. Statistical analyses, including descriptive statistics, the chi-square test, and binary logistic regression analysis, were performed using R 4.3.0. The significance level ( $\alpha$ ) was set at 0.05.

## 3. Results

### 3.1. Demographic Characteristics

Out of 1017 questionnaires collected in this survey, 923 were valid. In terms of gender, there were 424 male students (45.9%) and 499 female students (54.1%). Regarding ethnicity, 528 were Han Chinese (57.2%) and 395 were ethnic minorities (42.8%). Concerning residential areas, 484 were from urban areas (52.4%) and 439 were from rural areas (47.6%). Regarding HIV-related situations, 292 students (31.6%) had not received HIV-related education, while 631 students (68.4%) had received such education. Additionally, 414 students (44.9%) had experience with HIV testing and counseling at medical institutions, while 509 students (55.1%) did not have such experience (See **Table 1**).

**Table 1.** Sociodemographic characteristics of the study participants (N = 923).

Characteristic	Projects	n	Percentage/%
Gender			
	man	424	45.9
	woman	499	54.1
Ethnic group			
	han	528	57.2
	ethnic minorities	395	42.8
Residence			
	urban	484	52.4
	rural	439	47.6

**Continued**

Have you received education related to AIDS?	yes	631	68.4
	no	292	31.6
Have you ever had an experience of HIV testing and counseling in a medical and health institution?	yes	414	44.9
	no	509	55.1

**3.2. HIV/AIDS Knowledge Awareness**

Among the 923 college students, the overall HIV knowledge awareness rate was 65.87% (608 students). The question with the lowest awareness rate concerned the main transmission routes of HIV, with an awareness rate of only 45.7%. Other questions with relatively low awareness rates included: awareness that sharing meals with HIV-infected individuals does not transmit HIV (80.7%); awareness that studying in the same classroom with HIV patients for extended periods does not transmit HIV (83.5%); and awareness that hugging or shaking hands with HIV-infected individuals does not transmit HIV (83.7%) (See **Table 2**).

**Table 2.** HIV/AIDS-related knowledge awareness rates.

AIDS-related knowledge	Number of people who know	Awareness rate/%
You can't get HIV from eating with someone who has it.	745	80.7%
It is not possible to be infected with HIV by studying in the same classroom for a long time with someone who has HIV.	771	83.5%
Sharing syringes with people infected with AIDS can lead to HIV infection.	791	85.6%
Hugging or shaking hands with an AIDS patient will not lead to the transmission of AIDS.	773	83.7%
Having sexual relations with an AIDS patient may lead to the transmission of AIDS.	793	85.9%
The main mode of transmission of AIDS	422	45.7%

**3.3. Univariate Analysis of Condom Use Intention among College Students**

Gender, HIV knowledge, proactive acquisition of HIV knowledge, receipt of HIV education, freshman status, and history of same-gender sexual behavior were all associated with condom use intention ( $P < 0.05$ ). Among the participants, 289 students (31.31%) had a history of same-gender sexual behavior, while 634 (68.69%) did not. A total of 584 students (63.27%) had proactively acquired HIV

knowledge, while 339 (36.73%) had not. Furthermore, 631 students (68.36%) had received HIV education, while 292 (31.64%) had not (See **Table 3**, **Figure 1**).

**Table 3.** Univariate analysis of condom use intention.

Projects	n	Willing	Unwilling	$\chi^2$ value	P value
Gender				86.78	<0.001
man	424	217	207		
woman	499	400	99		
Ethnic group				1.634	0.201
han	528	362	166		
ethnic minorities	395	255	140		
Residence				0.601	0.438
urban	484	318	166		
rural	439	299	140		
HIV/AIDS Knowledge				411.106	<0.001
aware	608	544	64		
unaware	315	73	242		
Are you a freshman?				4.801	0.028
yes	364	228	136		
no	559	389	170		
Is it related to the medical field?				1.008	0.315
yes	470	307	163		
no	453	310	143		
Have you ever had sexual intercourse with someone of the same sex?				3.949	0.047
yes	289	180	109		
no	634	437	197		
Do you have multiple sexual partners?				1.393	0.238
yes	293	188	105		
no	630	429	201		
Have you ever engaged in sexual intercourse without using a condom?				1.703	0.192
yes	413	276	137		
no	233	140	93		
no sexual experience	277	201	76		

Continued

Have you ever actively sought out information about AIDS?			247.897	<0.001
	yes	584	499	85
	no	339	118	221
Have you received any education related to AIDS?			95.969	<0.001
	yes	631	487	144
	no	292	130	162

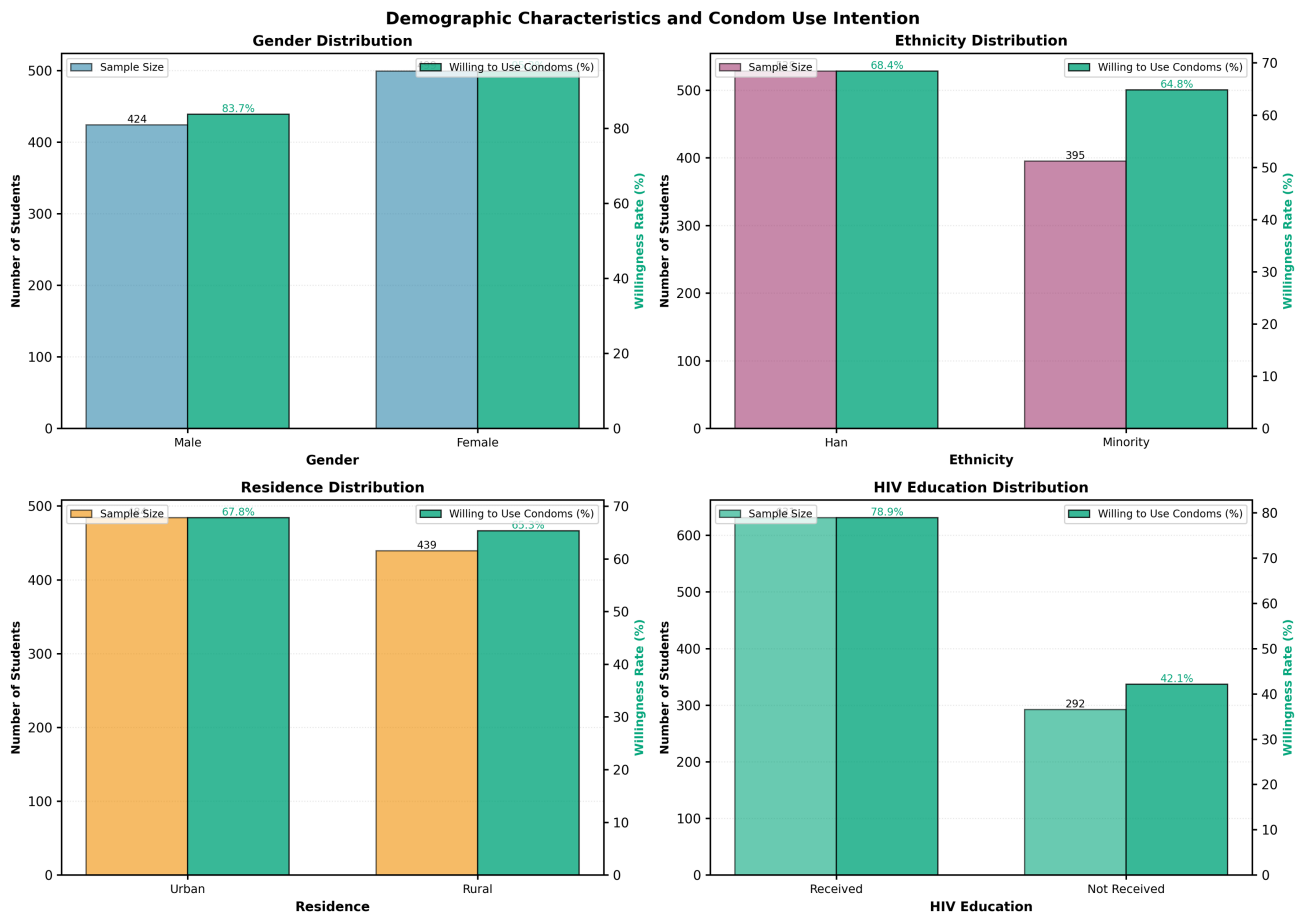


Figure 1. Demographic characteristics and condom use intention.

### 3.4. Multivariate Logistic Regression Analysis of Condom Use Intention among College Students

Variables with  $P < 0.05$  from the univariate analysis were included in a binary logistic regression model to examine their association with condom use intention. The results are presented in Table 4 and Figure 2. Gender, level of AIDS knowledge, whether participants had actively acquired AIDS-related information, and whether they had received AIDS-related education were all statistically associated

with condom use intention (all  $P < 0.001$ ). Specifically, females showed a significantly higher intention to use condoms than males ( $OR = 3.85$ , 95%  $CI$ : 2.881 - 5.156), indicating that females were 3.85 times more likely to intend to use condoms. Participants who were knowledgeable about AIDS had a higher intention to use condoms compared to those with insufficient knowledge ( $OR = 28.18$ , 95%  $CI$ : 19.498 - 40.722). Those who had not actively sought related knowledge had a lower intention to use condoms ( $OR = 0.07$ , 95%  $CI$ : 0.040 - 0.124), and individuals who had not received AIDS-related education exhibited an even lower intention ( $OR = 0.06$ , 95%  $CI$ : 0.032 - 0.117). In addition, no significant statistical associations were found between condom use intention and academic year (freshman or higher) or same gender sexual experience (all  $P > 0.05$ ).

**Table 4.** Multivariate logistic regression analysis of condom use intention.

Feature	$\beta$	SE	$\chi^2$	$P$	$OR$	95% $CI$
Gender						
man (reference group)					1.00	
woman	1.349	0.148	82.588	<0.001	3.85	2.881 - 5.156
Knowledge of AIDS						
Unaware (reference group)					1.00	
aware	3.339	0.188	315.800	<0.001	28.18	19.498 - 40.722
Have you ever actively sought out information about AIDS?						
yes (reference group)					1.00	
no	-2.647	0.286	85.682	<0.001	0.07	0.040 - 0.124
Have you received any education related to AIDS?						
yes (reference group)					1.00	
no	-2.787	0.328	72.119	<0.001	0.06	0.032 - 0.117

Note: Only variables with  $P < 0.05$  in the multivariate logistic regression analysis are shown.

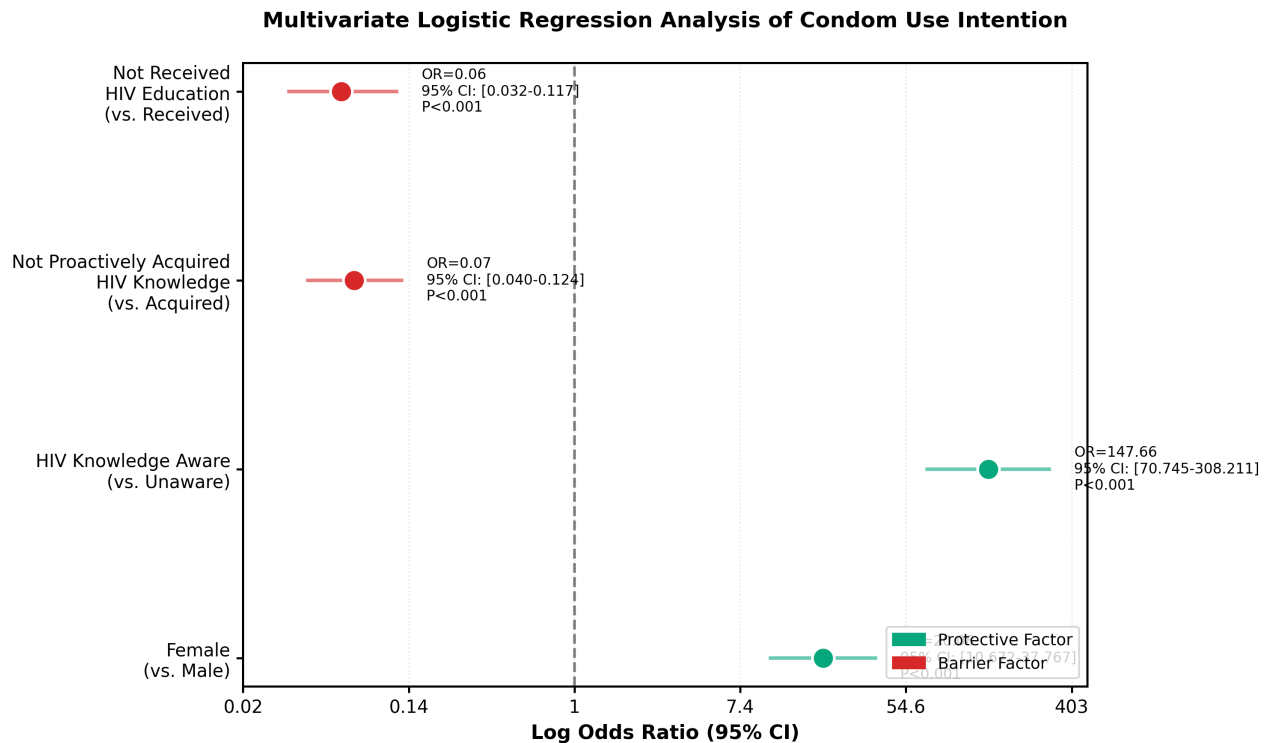
### 3.5. Interaction and Dose-Response Effects on Condom Use Willingness

**Figure 3** illustrates interactive and dose-response relationships between gender, HIV education, HIV knowledge, and condom use willingness.

#### 3.5.1. Gender $\times$ HIV Education Interaction (Figure 3(A))

A significant interaction was observed: without HIV education, males had a baseline willingness of 28.3%, while females showed substantially higher willingness (62.4%, +34.1 percentage points vs males). With HIV education, willingness increased to 75.8% ( $\Delta+47.5$ ) in males and 96.7% ( $\Delta+34.3$ ) in females. Non-parallel

trends confirmed a true interaction: both genders benefited from education, but males had a larger absolute gain (driven by their lower baseline).



**Figure 2.** Forest plot of subgroup analysis for condom use willingness.

### 3.5.2. Gender × HIV Knowledge Interaction (Figure 3(B))

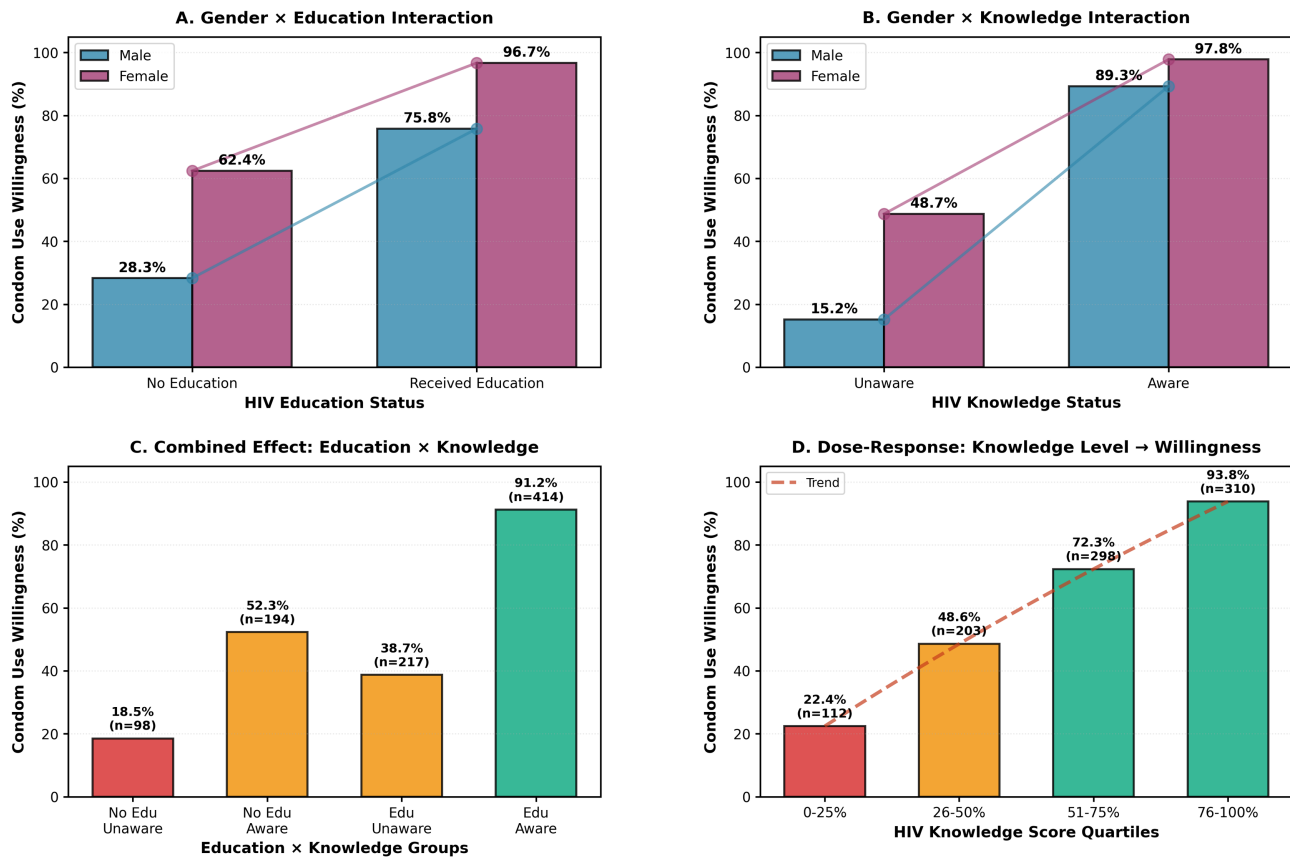
Gender modified the effect of HIV knowledge: males without knowledge had extremely low willingness (15.2%, high-risk subgroup), compared with 48.7% in females (threefold higher). With HIV knowledge, willingness rose to 89.3% ( $\Delta+74.1$ ) in males and 97.8% ( $\Delta+49.1$ ) in females. Males gained more from knowledge, but females maintained a higher baseline without knowledge—suggesting a protective gender effect.

### 3.5.3. HIV Education × Knowledge Combined Effect (Figure 3(C))

Education and knowledge acted synergistically: the ‘no education + unaware’ subgroup had the lowest willingness (18.5%,  $n = 98$ ). Knowledge alone (no education + aware) increased willingness to 52.3% ( $\Delta+33.8$ ), while education alone (education + unaware) doubled the baseline (38.7%). The “education + aware” subgroup had the highest willingness (91.2%,  $n = 414$ ;  $\Delta+72.7$  vs baseline), exceeding additive predictions (72.5%)—confirming positive synergy.

### 3.5.4. Dose-Response: HIV Knowledge vs Willingness (Figure 3(D))

A clear gradient was observed: willingness rose from 22.4% (0% - 25% knowledge,  $n = 112$ ) to 48.6% (26% - 50%,  $n = 203$ ), 72.3% (51% - 75%,  $n = 298$ ), and 93.8% (76% - 100%,  $n = 310$ ). The near-linear trend supports the reasonable causal pathway of “knowledge enhancement  $\rightarrow$  increased willingness.”



**Figure 3.** Interactive and dose-response effects on condom use willingness among college students. Panels A - B: Interaction effects of gender with HIV education (A) and HIV knowledge (B), showing subgroup differences in condom use willingness (%). Panels C: Combined effects of HIV education and knowledge, with sample sizes (n) for each subgroup. Panel D: Dose-response gradient between HIV knowledge score quartiles and condom use willingness, with 95% CIs (error bars in Panel D). Data are from a cross-sectional study of college students at a remote Chinese university.

## 4. Discussion

The results of this study indicate that the overall level of HIV/AIDS-related knowledge among college students at a borderland university is inadequate, with an awareness rate of only 65.87%. This is far below the work target of “prevention and treatment awareness rate of key populations and those at risk of HIV infection reaching over 95%” set in the “China’s Plan for Containment and Prevention of HIV/AIDS (2024-2030)” [9]. Additionally, the proportion of students unwilling to use condoms at this university reached 33.15%, which is higher than similar research results from universities in inland cities such as Shanghai [10]. This phenomenon suggests that there is still considerable room for improvement in HIV knowledge dissemination among college students in borderland regions, and awareness of sexual health protection urgently needs to be strengthened. The underlying reasons may be closely related to the uneven distribution of sexual education resources in borderland regions and insufficient coverage of systematic HIV prevention education. Meanwhile, the traditional cultural taboo surrounding sexual topics has, to a certain extent, hindered the effective dissemination and

popularization of sexual health knowledge.

Gender is a key factor influencing college students' willingness to use condoms. The results of this study show that female students' willingness to use condoms is significantly higher than that of male students ( $OR = 3.85$ ), meaning that females are 3.85 times more willing to use condoms than males. This finding is consistent with multiple similar studies both domestically and internationally [11]. This difference may be closely related to the characteristics of sexual attitudes and risk perception among male groups. On one hand, males generally have more open sexual attitudes and lower vigilance regarding the risks of unprotected sexual behavior [12]. On the other hand, the constraints of traditional gender concepts lead some males to associate condom use with sexual capability, leading to resistance and weakening risk prevention awareness [13]. Furthermore, some males overly focus on the immediate experience of sexual behavior, mistakenly believing that using condoms reduces sensory sensitivity and disrupts behavioral continuity, which is also an important reason for their resistance to use [14]. In response to these issues, universities need to strengthen targeted sexual health interventions for male students. This can include offering male-specific sexual health seminars, inviting experts from medical and psychological fields to systematically analyze the potential health risks of unprotected sexual behavior using real cases. At the same time, through scenario simulations and interactive discussions, male students should be guided to establish equal and responsible sexual attitudes, clarifying that using condoms is not only respect and protection for their partners' health but also a core protective measure for maintaining their own health [15].

Students unaware of HIV knowledge show lower willingness to use condoms, suggesting that knowledge deficiency directly weakens individuals' protective motivation and behavioral compliance. Therefore, it is necessary for universities to establish a systematic and comprehensive HIV health education system. Beyond setting up required courses during freshman orientation, relevant knowledge should be organically integrated into daily teaching and campus cultural activities [16].

Proactive acquisition of HIV/AIDS knowledge and prior exposure to relevant education were found to be associated with increased condom use, potentially reflecting the latent role of health education in guiding healthy behaviors. Research data indicate a statistically significant correlation between educational background and students' tendency to assess risks in sexual situations, their level of understanding regarding the protective value of condoms, and their willingness to use them [10]. Higher education institutions may consider multiple strategies to encourage students to proactively seek knowledge. These include combining thematic lectures with interactive discussions to heighten student interest, or implementing peer education programs to promote interactive learning [17]. Concurrently, integrating campus radio, bulletin boards, WeChat public accounts, and other media platforms can widely disseminate HIV prevention knowledge and correct condom usage methods, fostering a campus culture attentive to sexual

health. This approach may help enhance students' acceptance and prioritization of condom use [18].

## 5. Summary

In summary, college students in border-area universities have a low condom use rate, with relevant influencing factors including gender, HIV/AIDS knowledge mastery, initiative in knowledge acquisition, and prior related educational experience. Universities are advised to address the gender-specific sexual health needs of students, with a focus on strengthening targeted health education for male students; deepen HIV/AIDS knowledge popularization, stimulate students' enthusiasm for independent learning through diverse promotional channels, and thereby enhance their willingness to use condoms, consolidating the campus defense against HIV/AIDS.

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## Conflicts of Interest

All authors declare that they have no conflicts of interest.

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