

Internet Study about Risk Factors Associated with HIV among Heterosexuals in Puerto Rico

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Objective: Heterosexual intercourse is the main mode of HIV transmission among heterosexual women in Puerto Rico and the third for men. We conducted an Internet-based study of heterosexual young adults in Puerto Rico to explore their sexual practices, beliefs and decision-making skills for HIV prevention. Data presented in this study will help to understand the factors that contribute to the sexual transmission of HIV among heterosexuals within the Puerto Rican context.

Method: We administered an online-based survey to a sample of 618 young adult heterosexual men and women. Data were collected using Perseus Survey Solutions software.

Results: Overall, most participants expressed they had the same sexual partner in the previous six months, never or almost never used male condoms with their main partner and did not perceive themselves at-risk of contracting HIV (have a low HIV risk perception). Men reported using male condoms more frequently than women (e.g. male condom on their male partner) during vaginal sex, in particular single and younger men. Women expressed more positive attitudes toward male condoms than men.

Conclusion: Results confirm the need to implement interventions that increases the sense of vulnerability among heterosexuals, as well as skills and use of male condoms. This study contributes additional data on sexual practices and attitudes to encourage the identification of new or current changes in HIV protective or risk factors, specifically for an understudied population of Heterosexuals in Puerto Rico. [P R Health Sci J 2021;40:26-32]

Key words: Sexual practices, Condom use, Alcohol use, Internet, Heterosexuals

Puerto Rico has been disproportionately affected by the HIV/AIDS epidemic with 50,223 cases reported by July 31, 2020 (1). By 2018, the island had one of the highest HIV incidence rates (13.6 per 100,000 population) and was tenth in the diagnosis of HIV infection, when compared with any US state or territory (2). Heterosexual transmission is the main mode of HIV infection among women (68%) and the third mode of infection among men (16%). These data signal an urgent need to identify and alter the factors that make heterosexual women more vulnerable to infection.

Research shows that many heterosexuals are sexually active (3), but few use condoms (4). This includes the practice of unprotected anal sex (5). Excluding the desire for pregnancy, reasons for not using male condoms among heterosexuals are diverse. Some include low-risk perception (6–8); unequal power relationships (9,10); partner type which limit male condom use for casual partners (11,12); male circumcision (13); having multiple sex partners (14); intimate partner violence (15); alcohol use (16); and poverty (17).

A careful exploration of the individual and social contexts associated with HIV has been of extreme importance,

particularly those that may explain heterosexual risk sexual behaviors and attitudes. This has led to the development and implementation of cutting-edge research. One example is the use of the Internet to recruit participants (18). In Puerto Rico, the Internet is a useful tool, given the youth and adult population's widespread access to the web. In 2006, nearly 36% of Puerto Rico's population had access to the Internet. By 2008 over 40% had access. In 2017, over 70.6% of the residents of Puerto Rico had Internet access, representing over 2.3 million people (19). Considering the usefulness of the Internet as a data collection source, and as a mean to attract the interest of a potential participants, we decided to use it as our main tool to conduct this study.

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We administered a survey through to identify the demographic, motivational and behavioral factors that contribute to the sexual transmission of HIV among heterosexuals within the Puerto Rican context. Identifying these factors is crucial to develop multi-dimensional prevention approaches that help decrease the likelihood of HIV infection.

Materials and Methods

Study Design

This study was approved by the Institutional Review Board (IRB 0000944) of the University of Puerto Rico, Río Piedras Campus (Protocol # 9900-028). Participants' demographics are presented in Table 1. A total of 618 Internet users met the inclusion criteria and completed the survey; 408 (66%) were women and 210 men (34%) with an average age of 29. Inclusion

criteria included: 1) self-identifying as heterosexual; 2) having between 21-45 years of age; and 3) self-report being sexually active in the last three months. Visitors of the website of the major local newspaper on the island (*El Nuevo Día Interactivo*) were invited to complete the survey. A small banner link to the survey was placed on the website of the newspaper for 30 days inviting participants to complete a survey about sex. Participants who met the inclusion criteria were directed to a consent form that explained the survey, benefits, and risks. Once they agreed to participate and provided consent, they were granted access to the survey.

Measures

We administered a short version of a survey used in a previous study (20,21). In Table 2 we present the measures used with their interpretation and internal consistency index.

Statistical Analysis

The data was collected during the months of April and May of 2003 using Perseus Survey Solutions software, version 6 (1997-2002). We established a control with the IP address to prevent the survey from being completed from the same computer or device more than once. The statistical analyses were conducted using R statistical software (22). We used Q-Q plots to examine whether the distribution of the knowledge about HIV, sexual decision-making skills, attitudes toward male condom use, male sexual beliefs, female sexual beliefs, social support for condom use, and sexual negotiation variables meet the parametric test assumptions. After visually inspecting the data with several Q-Q plots, we observed that none of the variables met the normality assumption. Therefore, we used non-parametric tests, as well as other robust methods to analyze the data such as Mann-Whitney and Kruskal Wallis tests as non-parametric alternatives to the T Test and One-way ANOVA. The Kendall rank correlation coefficient was used to examine the relationships between the variables of interest. The regression and simple mediation analyzes were corrected for normality using the bootstrap non-parametric resampling technique.

Table 1. Demographics (N = 618)

	n	%
Sex		
Men	210	34.0
Women	408	66.0
Civil Status		
Married or coexisting	307	49.7
Single, divorced or widow	311	50.3
Employment Status		
Full-time job	415	67.2
Part-time job	81	13.1
Unemployed	122	19.7
Family Income (monthly)		
\$500 - \$2,000	310	50.2
\$2,001 or more	308	49.8
Education		
High school or less	100	16.2
More than high school	518	83.8
Religion		
Catholic	382	61.8
Protestant	149	24.1
Other	87	14.1

Table 2. Measures used.

Measure	Interpretation	Cronbach's Alpha
"Knowledge about HIV"	5-point Likert scale from 1 (Definitely true) to 5 (Definitely false). Higher scores indicate better knowledge about HIV.	.74
"Sexual Decision-Making Skills"	5-point Likert scale from 1 (Definitely true) to 5 (Definitely false). Higher scores indicate better sexual decision-making skills.	.64
"Attitudes toward Male Condom Use"	5-point Likert scale from 1 (Totally agree) to 5 (Totally disagree). Higher scores indicate better attitudes toward male condom use.	.81
"Male Sexual Beliefs"	5-point Likert scale from 1 (Totally agree) to 5 (Totally disagree). Higher scores indicate better male sexual beliefs.	.67
"Female Sexual Beliefs"	5-point Likert scale from 1 (Totally agree) to 5 (Totally disagree). Higher scores indicate better female sexual beliefs.	.77
"Social Support for Condom Use"	5-point Likert scale from 1 (Never) to 5 (Always). Higher scores indicate a better social support for condom use.	.88
"Sexual Negotiation"	5-point Likert scale from 1 (Definitely no) to 5 (Definitely yes). Higher scores indicate a better sexual negotiation.	.86

For continuous variables, we identified the median and the interquartile range. We performed cross-tabulations between the nominal variables using the Chi-Square test (χ^2). Using the Mann-Whitney Wilcoxon test and the Chi-Square test, we conducted a comparison analysis with some variables to determine if relationship stability and gender are variables that contribute to HIV prevention. A Kruskal-Wallis test was conducted to compare the effect of alcohol use on the attitudes toward male condom use. We used the chi-squared test to examine the associations between the demographic and sexual practice variables with HIV risk perception and examined the Kendall rank correlation coefficients between the variables of interest and knowledge about HIV. Finally, we examined several regression models and a simple mediation model to establish the degree to which a causal variable, X, influences a criterion variable, Y, through a mediating variable (23).

Results

Sexual Practices

Most participants ($n=476$; 77%) expressed they had the same sexual partner in the previous six months. From those who had the same sexual partner, 15.7% ($n=97$) indicated they did not have sex with that person in the previous six months.

Male Condom Use

Most of the participants ($n=369$; 59.7%) reported they never or almost never used condoms with their main partner during the last three months. Only a fifth of the participants ($n=136$; 22%) expressed that they used condoms always or almost always. Of these, 65.4% ($n=89$) were single. Of those participants who had sex with other partners, 43.9% ($n=73$) reported they never or almost never used condoms and 48.8% ($n=81$) reported always or almost always using condoms. Men used condoms more frequently than women during vaginal sex with other women ($X^2(2, N = 166) = 9.50, p < .01$). Single men used male condoms more frequently during vaginal sex ($X^2(2, N = 544) = 39.96, p < .001$) and anal sex ($X^2(2, N = 239) = 12.56, p < .01$) than those who reported being married or cohabitating. We also found that those participants who had different sexual partners in the previous six months used male condoms more frequently for vaginal sex than those with a steady partner ($X^2(2, N = 544) = 10.73, p < .01$). When examining the relationship between male condom use and age, we found a significant relationship, $X^2(2, N = 544) = 34.39, p < .001$. Participants between 21-30 years of age used male condoms more often than those between 31-45.

Sexual Negotiation

There was a significant difference in the score for men ($Mdn = 12.5, IQR = 6$) as compared to women ($Mdn = 15, IQR = 3$), $p < .001$. Women perceived themselves more capable of negotiating safer sex. When comparing differences between those who were married or cohabitating and those single, we found a marginally

significant difference in the score for those married ($Mdn = 14, IQR = 4.5$) and single ($Mdn = 15, IQR = 3$), $p = .08$. People who were single showed a trend toward perceiving themselves more capable of negotiating safer sex.

Attitudes toward Male Condom Use

Regarding gender, there was a significant difference in the score for men ($Mdn = 18, IQR = 9$) as compared to women ($Mdn = 21, IQR = 8$), $p < .001$. Women expressed more positive attitudes toward male condoms. Regarding religion, there was a significant difference in the score for those who believed that religion was not important ($Mdn = 18.5, IQR = 9.8$) and those who believed it was important ($Mdn = 21, IQR = 9$), $p < .01$. People who reported that religion was important had more positive attitudes toward male condoms.

HIV Risk Perception

Most of the participants ($n=524$; 84.8%) either did not perceived themselves at-risk or had a low HIV risk perception. Only 2.1% ($n=13$) expressed having a high-risk perception. We explored the association between risk perception and having sex with other partners and found that those participants reporting not having the same sexual partner in the previous six months had a higher risk perception than those reporting having the same sexual partner ($X^2(3, N = 616) = 18.59, p < .001$). We also found that those who had sex with other partners in the previous three months perceived themselves at higher risk of HIV infection ($X^2(1, N = 616) = 24.35, p < .001$). On the other hand, those that considered religion to be important (or very important) had a lower risk perception than those that considered it was not ($X^2(3, N = 616) = 12.35, p < .01$).

Alcohol Use

We found that 45% ($n=278$) of participants reported consuming alcohol several times a week or a month. A quarter of the sample ($n=141$; 22.8%) reported never consuming alcohol. We also found that men reported alcohol use more frequently than women ($X^2(4, N = 618) = 26.74, p < .001$). We compared alcohol use among those who work full-time, part-time and those who were unemployed and found that working full or part-time used alcohol more frequently than those unemployed ($X^2(4, N = 618) = 15.40, p < .01$). Results also showed that those who considered religion as important drank alcohol less often than those who considered it not important ($X^2(4, N = 618) = 29.01, p < .001$).

Single men reported using alcohol more frequently than those who were married or cohabitating ($X^2(4, N = 618) = 21.33, p < .001$). We also found that men and women reporting not having the same sexual partner in the previous six months consumed alcohol more often than those with a steady partner ($X^2(4, N = 618) = 29.27, p < .001$). More alcohol consumption was also reported among those with steady partners, but who had sex with other partners ($X^2(4, N = 476) = 14.80, p < .01$).

When comparing the effect of alcohol use on the attitudes toward male condom use we found that the effect of alcohol use on the attitudes toward male condoms was significant, $H(2) = 14.6, p < .001$. People who consumed alcohol more frequently had poorer attitudes toward male condoms, when compared with those that drank alcohol less frequently or never.

Associations Between the Demographic and Sexual Practice Variables with HIV Risk Perception

We found a significant association between having the same main partner for the past six months and HIV risk perception, $\chi^2(3) = 18.59, p < .001$. People who have been with another partner report higher HIV risk perception, when compared to those who had the same partner. We also found a significant association between the importance of religion and HIV risk perception, $\chi^2(3) = 12.35, p < .01$. Those who believe that religion is very important perceive more often that they are not at risk of contracting HIV, when compared to those who consider religion as not important.

There was a significant association between alcohol use and HIV risk perception, $\chi^2(6) = 18.02, p < .01$. Participants who never consumed alcohol showed a lower HIV risk perception, when compared to participants who drank alcohol frequently or very frequently.

There was a significant association between the frequency of male condom use during oral sex with the main partner and HIV risk perception, $\chi^2(6) = 16.20, p < .05$. People who always used a condom during oral sex with their main partner were more likely to report that they were not at risk of contracting HIV.

There was a significant association between the frequency of male condom use during vaginal sex with another partner and HIV risk perception, $\chi^2(6) = 13.68, p < .05$. Contrary to expectations, people who never used a condom during vaginal sex with another partner were more likely to report a low HIV risk perception, when compared to participants who used condoms sometimes or always. The associations between demographic and sexual practices variables with HIV risk perception are summarized in Table 3.

Kendall Rank Correlation Coefficients

The Kendall rank correlation coefficients between the variables of interest and knowledge about HIV are presented in Table 4.

Regression Models

After examining the Kendall rank correlation coefficients, four regression models were proposed (Table 5). Knowledge about HIV was predicted by sexual decision-making skills. Knowledge about HIV was predicted by sexual decision-making skills and female sexual

beliefs. Knowledge about HIV was predicted by sexual decision-making skills, female sexual beliefs, and male sexual beliefs. Knowledge about HIV was predicted by sexual decision-making skills, female sexual beliefs, male sexual beliefs, and sexual negotiation. The confidence intervals of the estimates were corrected for normality using 10,000 non-parametric bootstrap samples.

The simple linear regression model of HIV knowledge regressed on sexual decision-making skills was significant, $b = 0.17, 95\% \text{ CI } [0.09, 0.25], R^2 = .03$. Equally important, the second model of HIV knowledge regressed on sexual decision-making skills ($b = 0.13, 95\% \text{ CI } [0.05, 0.21]$) and female sexual beliefs ($b = 0.10, 95\% \text{ CI } [0.04, 0.16]$) had an improved fit, compared to the first model, $R^2 = .04, \Delta R^2 = 0.02, p < .01$. In contrast, the third and fourth models failed to significantly improve the fit of the model, both $\Delta R^2 = .00, p > .05$. Therefore, the second model clearly does the best job at predicting knowledge about HIV with a minimum number of predictor variables.

Simple Mediation Model

Based on the second regression model identified, a simple mediation model was tested to examine the mediating role of female sexual beliefs in the relationship between sexual decision-making skills and knowledge about HIV. The functions of the lavaan package (24) were used to examine the mediation model. The parameters of the regression coefficients were estimated using the maximum likelihood method (25). The results show that sexual decision-making skills exerts a significant indirect effect on knowledge about

Table 3. Chi-square values of the associations between demographic and sexual practices variables with HIV risk perception.

Variable	Chi-square	DF*	p
Having the same sexual partner	18.59	3	< .001
Importance of religion	12.35	3	< .01
Frequency of alcohol use	18.02	6	< .01
Condom use during oral sex with main partner	16.20	6	< .05
Condom use during vaginal sex with another partner	13.68	6	< .05

Note. *DF* represents the degrees of freedom.

Table 4. Medians, interquartile ranges, and Kendall rank correlation coefficients.

Variable	Mdn	IQR	1	2	3	4	5	6
1. Knowledge about HIV	21	7.00						
2. Sexual decision-making skills	21	7.00	.14**					
3. Attitudes toward male condom use	20	8.75	.04	.20**				
4. Male sexual beliefs	25	7.00	.14**	.20**	.23**			
5. Female sexual beliefs	16	8.00	.11**	.20**	.28**	.37**		
6. Social support for condom use	21	9.00	.00	-.01	-.09*	-.01	.00	
7. Sexual negotiation	15	4.00	.09*	.22**	.32**	.20**	.24**	-.06

Note. *Mdn* and *IQR* are used to represent median and interquartile range, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Table 5. Regression results using knowledge about HIV as the criterion.

Predictor	<i>b</i>	<i>b</i> 95% CI [LL, UL]	<i>beta</i>	<i>beta</i> 95% CI [LL, UL]	<i>sr</i> ²	<i>sr</i> ² 95% CI [LL, UL]	<i>r</i>	Fit	Difference
(Intercept)	16.82**	[15.09, 18.50]							
Sexual decision- making skills	0.17**	[0.09, 0.25]	0.16	[0.08, 0.24]	.03	[.01, .06]	.16**		
								<i>R</i> ² = .026**	
								95% CI [.01, .06]	
(Intercept)	15.98**	[14.28, 17.76]							
Sexual decision- making skills	0.13**	[0.05, 0.21]	0.13	[0.05, 0.20]	.02	[.00, .04]	.16**		
Female sexual beliefs	0.10**	[0.04, 0.16]	0.13	[0.05, 0.21]	.01	[.00, .04]	.16**		
								<i>R</i> ² = .041**	$\Delta R^2 = .015^{**}$
								95% CI [.02, .08]	95% CI [.00, .04]
(Intercept)	15.13**	[13.13, 17.11]							
Sexual decision- making skills	0.12**	[0.04, 0.20]	0.12	[0.04, 0.20]	.01	[.00, .03]	.16**		
Female sexual beliefs	0.07*	[0.00, 0.14]	0.09	[0.00, 0.18]	.01	[.00, .02]	.16**		
Male sexual beliefs	0.06	[-0.01, 0.13]	0.07	[-0.01, 0.16]	.00	[.00, .02]	.15**		
								<i>R</i> ² = .045**	$\Delta R^2 = .004$
								95% CI [.02, .09]	95% CI [.00, .02]
(Intercept)	14.90**	[12.77, 16.99]							
Sexual decision- making skills	0.12**	[0.03, 0.20]	0.11	[0.03, 0.19]	.01	[.00, .03]	.16**		
Female sexual beliefs	0.07	[-0.01, 0.14]	0.08	[-0.01, 0.18]	.00	[.00, .02]	.16**		
Male sexual beliefs	0.06	[-0.01, 0.13]	0.07	[-0.01, 0.16]	.00	[.00, .02]	.15**		
Sexual negotiation	0.04	[-0.07, 0.15]	0.03	[-0.05, 0.12]	.00	[.00, .01]	.11**		
								<i>R</i> ² = .046**	$\Delta R^2 = .001$
								95% CI [.02, .09]	95% CI [.00, .01]

Note. A significant *b*-weight indicates the beta-weight and semi-partial correlation are also significant. *b* represents unstandardized regression weights. *beta* indicates the standardized regression weights. *sr*² represents the semi-partial correlation squared. *r* represents the zero-order correlation. *LL* and *UL* indicate the lower and upper limits of a confidence interval, respectively. * indicates *p* < .05. ** indicates *p* < .01.

HIV, through female sexual beliefs, *b* = 0.04, *BCa* 95% [0.01, 0.07]. This effect has a small practical importance, based on the Kappa squared effect size, $\kappa^2 = .03$. The model of sexual decision-making skills as predictor of knowledge about HIV, mediated by female sexual beliefs is illustrated in Figure 1.

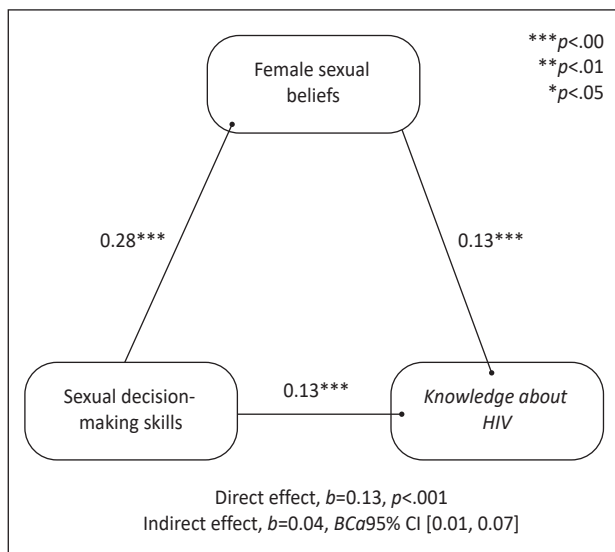


Figure 1. Model of sexual decision-making skills as predictor of knowledge about HIV, mediated by female sexual beliefs. The confidence interval for the indirect effect is a *BCa* 95% CI based on 10,000 samples. The standardized regression coefficients are reported in the diagram.

Discussion

This study contributes to the understanding of the risk factors associated with HIV infection in an understudied population of heterosexual young adults in Puerto Rico. While some results confirmed findings from other studies, others were much unexpected. It was not a surprise that male condoms are more frequently used by men and participants that are single, and with casual partners and casual sexual encounters. Similar findings have been reported in other studies (4,26). Furthermore, being in a steady relationship was directly related to a low perception of risk and affects adversely safer sex practices. Findings suggest that having sex with other partners increases the sense of vulnerability and may help explain why male condoms are more frequently used with secondary partners. Therefore, the fact that most participants do not perceive themselves at-risk of HIV infection could explain why they do not use male condoms.

It called our attention that women had more positive attitudes toward male condoms, but used condoms less frequently than men. Studies show that having positive attitudes toward male condoms increase the possibility of their use (27,28). Different authors have called our attention to the fact that women are immersed in unequal power dynamics that contribute to their vulnerability to HIV/STI infections and other risky behaviors such as intimate partner violence (29–31). This could explain why other prevention methods such as the female condom, microbicides, and cervical barriers have been or are currently

being developed because they can be controlled by women (32,33), compared to male condoms.

Our data confirmed findings from other studies that suggest that marriage is a protective factor for many health conditions, including alcohol use (34,35). We consider that the key in this discussion is not whether the individual is legally married, but engaged in a relationship where partners take care of each other in a mutually supportive relationship. This helps explain why we found that those respondents who reported being married or cohabitating feel more capable of negotiating safer sex.

An unexpected finding was that those who reported believing that religion was important and having a low HIV risk perception also had more positive attitudes toward male condom use. We are certain that this result can be explained by the fact that there is a difference between believing religion is important and attending religious activities or being an active participant in a religion's practice. It seems that for some people having religious beliefs serve as a protective factor, whether they practice these beliefs or not.

It was not a surprise to find that people who drink alcohol have poorer attitudes toward male condoms and reported using male condoms less often. This is consistent with studies that confirm this effect, not only in attitudes about male condoms, but toward male condom use (36,37). On the other hand, it was interesting to identify that those who reported drinking alcohol more frequently have a higher HIV risk perception even though they also reported using male condoms less often and showed poorer attitudes.

To the best of our knowledge, this is the first Internet-based study with heterosexual young adults in Puerto Rico that explores sexual practices and beliefs, and decision-making skills toward condom use. Results confirm the urgent need to design interventions that not only increase the sense of vulnerability to HIV/STI risk, but also increase intention to use, skills and actual use of condoms. Results also suggest the importance of continued epidemiological data collection, particularly for sexual practices, comparing rates, and identifying new or changes in protective factors for risk behaviors.

Resumen

Objetivo: Las relaciones sexuales son el principal modo de transmisión del VIH entre mujeres heterosexuales en Puerto Rico y el tercero para los hombres. Se llevó a cabo un estudio a través del Internet con adultos jóvenes heterosexuales en Puerto Rico para explorar las prácticas sexuales, las creencias y las habilidades de toma de decisiones para la prevención del VIH. Los datos presentados en este estudio ayudarán a comprender los factores que contribuyen a la transmisión sexual del VIH en personas heterosexuales en el contexto puertorriqueño. **Método:** Se administró un cuestionario en línea a una muestra de 618 hombres y mujeres heterosexuales adultos jóvenes. Los datos fueron recopilados utilizando el software Perseus Survey Solutions. **Resultados:** La mayoría de los participantes

expresaron tener la misma pareja sexual en los seis meses anteriores, y nunca o casi nunca haber usado condones masculinos con su pareja principal. La mayoría tampoco se percibía a riesgo de contraer el VIH. Los hombres informaron usar condones masculinos con más frecuencia que las mujeres durante el sexo vaginal. Las mujeres expresaron actitudes más positivas hacia los condones masculinos. **Conclusión:** Los resultados confirman la necesidad de implantar intervenciones que aumenten el sentido de vulnerabilidad, así como las destrezas y el uso de condones masculinos en esta población. Este estudio aporta datos adicionales sobre las prácticas y actitudes sexuales para fomentar la identificación de cambios nuevos o actuales en los factores de protección o de riesgo del VIH, específicamente para una población de Heterosexuales poco estudiada en Puerto Rico.

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References

1. Puerto Rico Health Department. Puerto Rico HIV/AIDS Surveillance Summary: Cumulative HIV/AIDS Cases Diagnosed as of July 31, 2020. San Juan: HIV/AIDS Surveillance Program, Office of Epidemiology and Research; 2020.
2. Centers for Disease Control and Prevention. Diagnoses of HIV Infection in the United States and Dependent Areas, 2018 (Updated). Vol 31. Atlanta, GA: Centers for Disease Control and Prevention; 2018. <http://www.cdc.gov>.
3. Herbenick D, Reece M, Schick V, Sanders SA, Dodge B, Fortenberry JD. Sexual behavior in the United States: Results from a national probability sample of men and women ages 14-94. *J Sex Med.* 2010;7:255-265. doi:10.1111/j.1743-6109.2010.02012.x
4. Reece M, Herbenick D, Schick V, Sanders SA, Dodge B, Fortenberry JD. Condom use rates in a national probability sample of males and females ages 14 to 94 in the United States. *J Sex Med.* 2010;7:266-276. doi:10.1111/j.1743-6109.2010.02017.x
5. O'Leary A, DiNenno E, Honeycutt A, et al. Contribution of anal sex to HIV prevalence among heterosexuals: A modeling analysis. *AIDS Behav.* 2017;21:2895-2903. doi:10.1007/s10461-016-1635-z
6. Herbenick D, Schick V, Reece M. Characteristics of condom and lubricant use among a nationally representative probability sample of adults ages 18-59 in the United States. *J Sex Med.* 2013;10:474-483.

7. Herbst JH, Kay LS, Passin WF, Lyles CM, Crepaz N, Marin B V. A systematic review and meta-analysis of behavioral interventions to reduce HIV risk behaviors of Hispanics in the United States and Puerto Rico. *AIDS Behav.* 2007;11:25-47.
8. Rodríguez-Díaz CE, Collazo E, Dodge B, et al. "Sexplorando": Sexual practices and condom use among an internet-based sample of men and women in Puerto Rico. *J Sex Med.* 2014;11:2385-2395.
9. Noar SM, Webb E, Van Stee S, et al. Sexual partnerships, risk behaviors, and condom use among low-income heterosexual African Americans: A qualitative study. *Arch Sex Behav.* 2012;41:959-970. doi:10.1007/s10508-011-9890-6
10. VanDevanter N, Duncan A, Burrell-Piggott T, et al. The influence of substance use, social sexual environment, psychosocial factors, and partner characteristics on high-risk sexual behavior among young Black and Latino men who have sex with men living with HIV: A qualitative study. *AIDS Patient Care STDS.* 2011;25:113-121. doi:10.1089/apc.2010.0100
11. Noar SM, Zimmerman RS, Atwood KA. Safer sex and sexually transmitted infections from a relationship perspective. In: Harvey JH, Wenzel A, Sprecher S, eds. *The Handbook of Sexuality in Close Relationships.* Mahwah, NJ: Lawrence Erlbaum Associates Publishers; 2004:519-544.
12. Rosengard C, Adler NE, Gurvey JE, Ellen JM. Adolescent partner-type experience: Psychosocial and behavioral differences. *Perspect Sex Reprod Health.* 2005;37:141-147. doi:10.1363/psrh.37.141.05
13. Lei JH, Liu LR, Wei Q, et al. Circumcision status and risk of HIV acquisition during heterosexual intercourse for both males and females: A meta-analysis. *Tang JW, ed. PLoS One.* 2015;10:e0125436. doi:10.1371/journal.pone.0125436
14. Sabogal F, Catania JA. HIV risk factors, condom use, and HIV antibody testing among heterosexual Hispanics: The National AIDS Behavioral Surveys (NABS). *Hispanic J Behav Sci.* 1996;18:367-391. doi:10.1177/07399863960183007
15. Were E, Curran K, Delany-Moretlwe S, et al. A prospective study of frequency and correlates of intimate partner violence among African heterosexual HIV serodiscordant couples. *AIDS.* 2011;25:2009-2018. doi:10.1097/QAD.0b013e32834b005d
16. Malunguza NJ, Hove-Musekwa SD, Musuka G, Mukandavire Z. Investigating alcohol consumption as a risk factor for HIV transmission in heterosexual settings in sub-Saharan African communities. *Bull Math Biol.* 2012;74:2094-2124. doi:10.1007/s11538-012-9747-8
17. Bowleg L, Raj A. Shared communities, structural contexts, and HIV risk: Prioritizing the HIV risk and prevention needs of black heterosexual men. *Am J Public Health.* 2012;102:S173-S177. doi:10.2105/AJPH.2011.300342
18. Bowen AM, Horvath K, Williams ML. A randomized control trial of Internet-delivered HIV prevention targeting rural MSM. *Health Educ Res.* 2007;22:120-127. doi:10.1093/her/cyl057
19. Statista. Percentage of population using the internet in Puerto Rico between 2010 and 2017. <https://www.statista.com/statistics/1055505/internet-penetration-puerto-rico/>. Published 2020. Accessed August 24, 2020.
20. Pérez-Jiménez D, Seal DW, Ronis DL. A pilot intervention to promote safer sex in heterosexual Puerto Rican couples. *Couple Fam Psychol Res Pract.* 2014;3:193-206. doi:10.1037/cfp0000022
21. Pérez-Jiménez D, Varas-Díaz N, Serrano-García I, Cintrón-Bou FN, Cabrera-Aponte M del C. *Instrumento de Información, Motivación y Conductas-Español (IIMC-E).* 2004.
22. R Core Team. R: A language and environment for statistical computing. R foundation for statistical computing. 2019. <https://www.r-project.org/>.
23. Hayes A. *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach.* Guildford Press; 2018.
24. Rosseel Y. lavaan: An R Package for Structural Equation Modeling. *J Stat Softw.* 2012;48:1-36.
25. Hair J, Black W, Babin B, Anderson R. *Multivariate Data Analysis.* 7th ed. Pearson Education Limited; 2014.
26. Hock-Long L, Henry-Moss D, Carter M, et al. Condom use with serious and casual heterosexual partners: Findings from a community venue-based survey of young adults. *AIDS Behav.* 2013;17:900-913. doi:10.1007/s10461-012-0177-2
27. Prati G, Mazzoni D, Zani B. Perceived behavioural control, subjective norms, attitudes and intention to use condom: A longitudinal cross-lagged design. *Psychol Health.* 2014;29:1119-1136. doi:10.1080/08870446.2014.913043
28. Teva I, Bermúdez MP, Ramiro MT. Satisfacción sexual y actitudes hacia el uso del preservativo en adolescentes: Evaluación y análisis de su relación con el uso del preservativo. *Rev Latinoam Psicol.* 2014;46:127-136.
29. Pettifor A, Macphail C, Anderson AD, Maman S. "If I buy the Kellogg's then he should [buy] the milk": Young women's perspectives on relationship dynamics, gender power and HIV risk in Johannesburg, South Africa. *Cult Health Sex.* 2012;14:477-490. doi:10.1080/13691058.2012.667575
30. Saleem HT, Surkan PJ, Kerrigan D, Kennedy CE. Application of an ecological framework to examine barriers to the adoption of safer conception strategies by HIV-affected couples. *AIDS Care.* 2016;28:197-204. doi:10.1080/09540121.2015.1074652
31. Ulibarri MD, Strathdee SA, Lozada R, et al. Intimate partner violence among female sex workers in two Mexico-U.S. border cities: Partner characteristics and HIV risk-behaviors as correlates of abuse. *Psychol Trauma Theory, Res Pract Policy.* 2010;2:318-325. doi:10.1037/a0017500
32. Alexander KA, Coleman CL, Deatrick JA, Jemmott LS. Moving beyond safe sex to women-controlled safe sex: A concept analysis. *J Adv Nurs.* 2012;68:1858-1869. doi:10.1111/j.1365-2648.2011.05881.x
33. Schuyler AC, Masvawure TB, Smit JA, et al. Building young women's knowledge and skills in female condom use: Lessons learned from a South African intervention. *Health Educ Res.* 2016;31:260-272. doi:10.1093/her/cyw001
34. Kretsch N, Harden KP. Marriage, divorce, and alcohol use in young adulthood: A longitudinal sibling-comparison study. *Emerg Adulthood.* 2014;2:138-149. doi:http://dx.doi.org/10.1177/2167696813513260
35. Miller-Tutzauer C, Leonard KE, Windle M. Marriage and alcohol use: A longitudinal study of "maturing out". *J Stud Alcohol.* 1991;52:434-440.
36. Davis KC, Masters NT, Eakins D, et al. Alcohol intoxication and condom use self-efficacy effects on women's condom use intentions. *Addict Behav.* 2014;39:153-158. doi:10.1016/j.addbeh.2013.09.019
37. Walsh JL, Fielder RL, Carey KB, Carey MP. Do alcohol and marijuana use decrease the probability of condom use for college women? *J Sex Res.* 2014;51:145-158. doi:10.1080/00224499.2013.821442