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Prevention Science

ISSN 1389-4986

Prev Sci
DOI 10.1007/s11121-018-0920-7

Springer

Prevention Science
https://doi.org/10.1007/s11121-018-0920-7

Sexual Health, STI and HIV Risk, and Risk Perceptions Among American Indian and Alaska Native Emerging Adults

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Abstract
Emerging adulthood (18–25) is a period of increased risk for adverse sexual health outcomes. While anyone in this age group is at elevated risk, American Indian and Alaska Native (AI/AN) youth and emerging adults face unique factors that influence their risk for sexually transmitted infections (STIs). To address this increased risk among AI/AN youth, culturally appropriate interventions are necessary. This study reports the results of a video-based sexual health intervention designed specifically for AI/AN youth and emerging adults (15–24 years old) on risk changing perceptions. This intervention was evaluated using a group-randomized design with three conditions: (1) fact sheet alone, (2) fact sheet and video, and (3) fact sheet, video, and facilitated discussion. Using data from 199 AI/AN emerging adults (18–24 years old) who participated in the Native VOICES evaluation, we used multiple multinomial logistic regressions to determine if changes in risk perceptions were significantly different between study arms from baseline to post-intervention, and from post-intervention to 6-month follow-up. Few differences in STI risk perceptions were found at baseline and observed differences in STI risk perceptions between study arms disappeared after including baseline risk perceptions in the model. Similarly, few differences in HIV risk perceptions between study arms were observed at baseline, and all differences in HIV risk perceptions between study arms disappeared after controlling for baseline risk perceptions, demographics, and baseline sexual risk factors. Overall, this study points to the need for interventions that specifically address the behaviors, social and sexual contexts, and risk perceptions of AI/AN emerging adults, an age group for whom few culturally relevant sexual health interventions exist.

Keywords Emerging adulthood · American Indian/Alaska Native · Sexual health · Technology-based intervention

Introduction

American Indian youth are a unique, dynamic, fast-growing population (Center for Native American Youth [CNAY] 2016). In 2015, youth under 25 years old made up 41% of the 5.4 million American Indian and Alaska Native (AI/AN) population, totaling more than 2.2 million youth (U.S. Census Bureau 2016). In a 2016 survey of nearly 700 AI/AN youth living across the USA, 68% included teen pregnancy prevention and education about sexually transmitted infections (STI) in their top five priorities for sexual health (CNAY 2016). Native youth report younger-than-average sexual début and lower rates of consistent condom use (de Ravello et al. 2012; Hellerstedt 2004; Kaufman et al. 2004). As a result, AI/AN youth experience disproportionate rates of STIs and are more likely than other youth to become a teen parent (Kaufman et al. 2007; Suellentrop and Hunter 2009).

Uniqueness of AI/AN Youth

A number of socioecological factors contribute to these disparities among AI/AN youth and emerging adults. These factors include high levels of poverty and substance use, insufficient sex education, poor access to reproductive health services, stigma, sexual violence, and historical trauma (de Ravello et al. 2012). Native young people's reproductive decisions are also shaped by unique social norms and sexual contexts that include both traditional and contemporary cultural values (Kaufman et al. 2007). The arrival of new life is

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Published online: 14 July 2018

often viewed favorably by Native communities, regardless of the parent's age; extended families often step in to support parenting teens. Consequently, sexual health messaging is highly nuanced in tribal communities and must reflect cultural values, social contexts, and health epistemologies to be effective (Craig Rushing et al. 2015).

Emerging Adulthood

Additionally, the unique risk taking of emerging adults (15–24 years old) generally exacerbate the sexual health disparities they face. As noted by Arnett (2000), risk behavior peaks in emerging adulthood due to a milieu of factors, including identity exploration, sensation seeking, and the desire to engage in novel experiences before taking on greater responsibilities in adulthood, such as marriage, which prevent such behaviors. Claxton and van Dulmen (2013) further discussed the sexual risk taking of emerging adults, particularly casual sexual relationships, noting that emerging adults are more likely to engage in casual encounters, which are linked to riskier behaviors and outcomes, such as increased risk for STIs.

Risk Perceptions

Risk perceptions, or individuals' beliefs about the likelihood of an adverse event happening, have been seen as important determinants of health behavior for decades and are included in several theories of health behavior, including the Health Belief Model (Rosenstock 1974) and Protection Motivation Theory (Rogers 1975). Studies have demonstrated that youth and emerging adults have relatively low perceptions of risk for HIV and STIs, which may decrease motivation to change behavior (e.g., Champion et al. 2013). For example, in a study of sexually active Lao adolescents, Sychareun et al. (2013) found that even though participants engaged in sexual risk behaviors, 74.8% of participants felt they had no or low risk of STIs and HIV. More generally, Baumgartner et al. (2010) found a negative correlation between engagement in online sexual behaviors and perceived risk of the behaviors in a study of Dutch adolescents. In a study of Midwestern university students, Haile et al. (2017) found that students with a partner had lower perceived HIV risk compared to single students, but that there was a positive relationship between perceptions of HIV susceptibility and higher ratings of HIV risk. Thus, to correct misconceptions, many interventions attempt to change STI and HIV risk perceptions to more accurately reflect actual risk, to reduce risk behaviors, and subsequently, adverse sexual health outcomes. In all, the unique intersection between risk factors affecting AI/AN youth and emerging adults points to an important area of study for the design of effective interventions.

Culturally Relevant Curricula for AI/AN Youth

In recent years, research teams have designed and evaluated several sexual health interventions for AI/AN youth, including Circle of Life (Kaufman et al. 2010), Respecting the Circle of Life (Tingey et al. 2015), Native It's Your Game, Native STAND, and Safe in the Village (Rushing et al., 2016). During this period, the Northwest Portland Area Indian Health Board (NPAIHB) adapted a culturally relevant video-based intervention for heterosexual and LGBT-TS (Lesbian, Gay, Bisexual, Trans, and Two Spirit) AI/AN youth and emerging adults age 15–24 years old: *Native VOICES*. The intervention aimed to improve condom use and HIV/STI testing.

This analysis investigates the effects of *Native VOICES* on risk perceptions for STIs and HIV among AI/AN emerging adults. The information provided by this study is critical in understanding how risk perceptions, and ultimately risk behaviors among AI/AN emerging adults, can and should be addressed to improve sexual health outcomes.

Native VOICES Intervention

The *Native VOICES* intervention was adapted from two video-based STI/HIV interventions: *Video Opportunities for Innovative Condom Education and Safer Sex* (VOICES/VOCES) and *Safe in the City*. Both interventions are recognized by the Centers for Disease Control and Prevention as evidence-based interventions. The *VOICES/VOCES* intervention is based on Fishbein and Ajzen's (1975) Theory of Reasoned Action (TRA) and postulates that *behavioral intention* is an immediate determinant of behavior, mediated by personal attitudes and subjective norms (Basen-Engquist and Parcel 1992; Basen-Engquist et al. 1999; Albarracin et al. 2001). Further, attitudes and subjective norms are driven by beliefs related to the behavior, including beliefs that certain actions are associated with the behavior and that certain consequences, both positive and negative, will result from engaging in the behavior. Thus, beliefs and perceptions related to risk of adverse outcomes are posited to play an important role in behavioral interventions based on TRA (Millstein and Halpern-Felsher 2001).

The intervention was designed as a group-level, single-session intervention for use among heterosexual African American and Latino men and women who visit STI clinics. Core components included (1) viewing a culturally specific video portraying condom negotiation, (2) participating in a small-group skill-building session to work on overcoming barriers to condom use, and (3) learning about different types of condoms and their features (Centers for Disease Control and Prevention 2016). *Safe in the City* is a 23-min looping video designed for STI clinic waiting rooms that requires no counseling or small-group facilitation (Myint-U et al. 2010).

The video was designed for heterosexual and LGBT patients from diverse cultural backgrounds.

NPAIHB staff used the ADAPT-ITT model (Wingood and DiClemente, 2008) and community-based participatory research methods to adapt the intervention in collaboration with tribes in the Pacific Northwest over a 3-year period from 2011 to 2013 (Craig Rushing and Gardner 2016). In total, eight focus groups were carried out with youth and emerging adults, segmented by age, gender, and tribal/urban affiliation ($n = 62$); a subset of the questions were also discussed with LGBT-TS youth in private, one-on-one key informant interviews ($n = 13$).

The adapted video shows actors in situations that Native youth can relate to - playing basketball with friends, at a party at a friend's home, and seeking advice from older family members and friends. The video demonstrates condom negotiation and acquisition, as well as the importance of talking about STIs with sexual partners. Because the original VOICES videos were designed for adult audiences, many script and setting changes were made to improve age appropriateness. Intentional effort was made to include the needs and perspectives of LGBT-TS young people, a group at heightened risk for STIs and HIV, but often overlooked by sexual health programs (Slater 2013). To better reflect the current social and cultural contexts of Native youth, characters in *Native VOICES* were placed in multicultural communities, moved seamlessly between urban and rural environments, and blended Western and traditional perspectives and values—all common occurrences in tribal communities.

The *Native VOICES* intervention was designed to be easily integrated into the flow of services provided by clinics, schools, treatment centers, and other community-based programs and to be implemented by a variety of support staff. These delivery settings are broader than the original intervention's settings and represent a major change for intervention delivery. This change was also driven by necessity. Many rural and tribal communities do not have STI clinics, and often these clinics may have videos playing in the waiting room, which requires more family-friendly content than the original *VOICES* video. The intervention includes a User's Guide, a 23-min video (*Native VOICES*), two brief condom and dental dam demonstration videos, and a selection of condoms, dental dams, and fact sheets. The guide offers three options for program delivery. To help facilitators, the guide includes "pause points," discussion questions, and activities that challenge participants' beliefs, attitudes, and thinking about sexual health topics. Facilitators are instructed to choose the delivery format that best meets the needs and constraints of their setting.

Evaluation

The *Native VOICES* intervention was evaluated using a three-armed randomized controlled trial, with nearly 800 AI/AN youth living in urban and rural communities across the USA. Nine sites were randomized into study arms using a block randomization process. These communities were located in Oregon, Minnesota, California, Mississippi, Montana, Arizona, Idaho, and Washington. IRB approval was obtained from the Portland Area Indian Health Service Institutional Review Board (PA IHS IRB) and a Tribal College Institutional Review Board. All sites obtained approval to participate (with a Tribal Resolution or Memorandum of Agreement), and youth and parents provided informed assent/consent.

At least one urban program and 2–3 tribes were randomized into each study arm. Geographic distribution and the number of eligible youth at each site were considered when randomizing sites into one of three conditions:

Arm 1. Received sexual health fact sheets alone
Arm 2. Received sexual health fact sheets plus the *Native VOICES* video
Arm 3. Received sexual health fact sheets plus the *Native VOICES* video plus a facilitated discussion

The first two study arms were included to determine whether the follow-up discussion was needed to achieve program impacts. Pre-, post-, and 6-month follow-up surveys were used to assess changes in participant knowledge, attitude, intention, and behavior.

Intervention Delivery The NPAIHB research team recruited and trained two Site Coordinators at each site. Training focused on participant recruitment processes (collection of consent/assent forms), data collection methods (maintenance of study rosters and participant IDs, survey administration), the distribution of incentives, and participant follow-up strategies. For their time and effort, the Site Coordinators received $1000. The sites also received $500 to cover printing, marketing, transportation, food, and other costs related to the study.

The intervention was delivered in school, afterschool, and community settings. Each site selected the most appropriate setting to deliver the intervention, to garner youth participation. Settings included in school, after school, and during a special "movie night" event. Participants in all three study arms completed the baseline survey (approximately 30 min long), participated in their assigned intervention (30–75 min), and then completed an immediate post-survey (20 min).

Those assigned to watch the *Native VOICES* video alone watched it without facilitator engagement. The sexual health fact sheets were passed out before starting the video, were picked up before completing the post-survey, and were returned to students as they picked up their incentive. Those assigned to the *Native VOICES* video plus a facilitated discussion, received the fact sheets, watched the 23-min video, and then participated in a 45-min discussion focusing on condom negotiation, condom acquisition, and personal goals, values,

and boundaries. To keep the discussions consistent between study sites, two NPAIHB staff—one male and one female—led the discussions using a scripted guide. The facilitators separated the youth into groups by gender, to encourage openness and comfort. Those in the "standard of care" comparison group (Arm 1) received *We R Native* sexual health fact sheets covering condoms, dental dams, chlamydia, gonorrhea, HPV and genital warts, HIV/AIDS, getting tested for STIs, syphilis, emergency contraception, and sexting, and were instructed to read the facts sheets for 20–30 min, before completing the post-survey. A $20 gift card was provided to participants following the post-intervention survey and the 6-month follow-up survey.

Data Management NPAIHB staff and a MPH student intern entered survey responses into an Access database, and double entered a subset of 258 surveys to check for agreement. The percent disagreement was 0.8% for all entered responses. Participants were given unique ID numbers by local site coordinators that were used to match pre-, post-, and 6-month follow-up surveys.

Methods

Study Sample

This analysis included a sub-sample of 199 emerging adults aged 18–24 at baseline of the larger evaluation of *Native VOICES*. A sub-sample was used to answer research questions specifically for emerging adults in the study. Given the unique developmental and contextual factors that are present with this age group and not necessarily with younger persons, maintaining the combined sample was not appropriate. Participants were included if they had complete information on all study variables at all three assessment points. As shown in Fig. 1, 229 participants were lost to follow-up, 336 participants were not between the ages of 18 and 24, and 24 participants were excluded due to incomplete data.

Present Study Variables

Risk Perceptions For this analysis, the primary outcomes of interest were changes in risk perceptions for STIs and HIV from pre-intervention to post-intervention, and from post-intervention to 6-month follow-up. In all three assessments, participants were asked, "Based on your own behavior, how much risk do you think you have for getting an STD (like chlamydia, herpes, or HPV)?" and "Based on your own behavior, how much risk do you think you have for getting infected with the HIV/AIDS virus?" Possible responses for each question included no risk, low risk, some risk, and high risk. These categories were coded from 0 to 3, with 0 indicating no risk and 3 indicating high risk. Post-intervention responses were subtracted from pre-intervention responses to create a change score in risk perception for both STIs and HIV from pre-intervention to post-intervention. Similarly, 6-month follow-up responses were subtracted from post-intervention responses to create a change score in risk perception for both STIs and HIV from post-intervention to follow-up. These change scores ranged from −3 to 3. To maximize sample size, we collapsed these changes scores to create three categories: decrease (−1 to −3), no change (0), and increase (1–3) in risk perceptions.

Demographics The *Native VOICES* survey included four *demographic* questions including age, sex, race/ethnicity, and sexual orientation. For this analysis, we included age as a continuous variable and sex as a binary variable (male/female).

Sexual Risk Factors Sexual risk factors included number of oral sex partners, number of vaginal sex partners, and number of anal sex partners. Each variable was assessed with categories from zero to six or more and was operationalized continuously. Additionally, we included having ever been tested for an STI or having ever been tested for HIV, which were dichotomous variables (yes/no). Finally, we created a composite measure designed to assess risk based on actual behavior. This composite measure included nine items total, including three items for oral, vaginal, and anal sexual debut before the age of 13 (0 = no, 1 = yes); three items for condom use at last oral, vaginal, and anal sex (0 = yes/never had, 1 = no/do not remember); and three items for alcohol or drug use at last oral, vaginal, and anal sex (0 = no/never had and 1 = yes). We then summed these items to create a composite risk score for each participant.

Data Analysis

We compared baseline characteristics between each pair of study arms to identify any significant differences between study arms at baseline. We used ordinal least squares regression to assess differences in continuous variables (age, number of oral sex partners, number of vaginal sex partners, number of anal sex partners, risk score), ordinal logistic regression to determine differences in baseline STI and HIV risk perceptions, and logistic regression to investigate baseline differences between study arms in dichotomous variables (sex, ever had an STI test, ever had an HIV test). As differences by study site were not of primary interest for this analysis, we employed robust standard errors to account for clustering by study site with arm using Stata's *vce* (*cluster clustervar*) option.

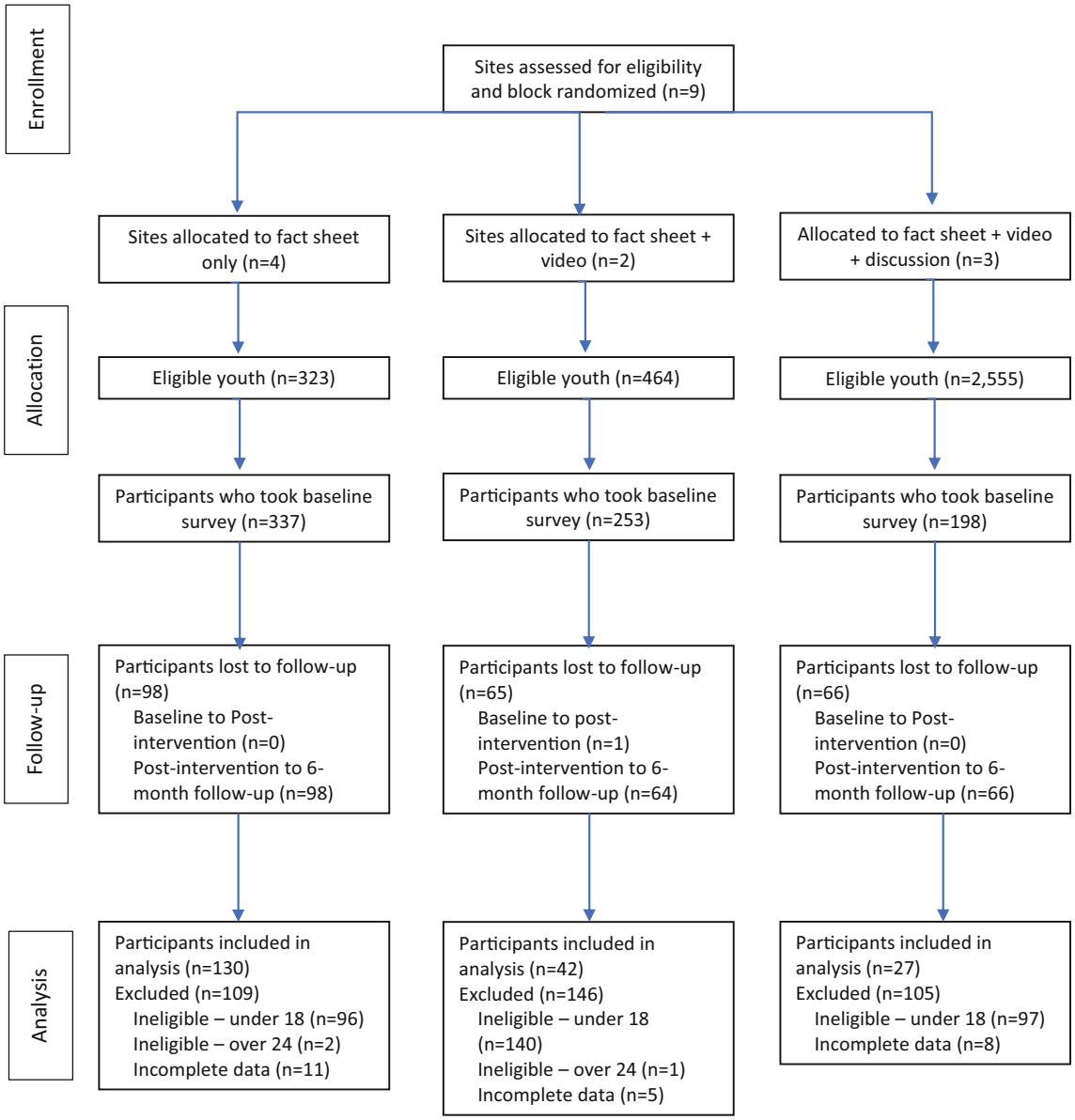

Fig. 1 Consort diagram depicting site and participant enrollment by study arm

To determine if the *Native VOICES* intervention impacted the likelihood of changes in risk perceptions between assessments, we employed multiple multinomial logistic regressions to compare pairs of study arms using "no change" in risk perceptions as the comparison outcome. We took a blockwise approach to model building. First, unadjusted models were run between pairs of study arms and changes in STI and HIV risk perceptions. For comparisons with significant results ($p < 0.05$), we then added baseline risk perceptions to the model. If results remained significant, we added demographic characteristics. Finally, we added sexual risk factors for any remaining significant comparisons. We again accounted for clustering by study site using the *vce* (*cluster clustervar*) option in Stata to provide robust standard errors and minimize the possibility of Type I error. All analyses were completed in Stata 12.0.

Results

Baseline Characteristics

Baseline characteristics for each study arm are shown in Table 1. At baseline, the largest proportion of participants in both Arms1 and 2 indicated "no risk" for STIs and HIV, while Arm 3's highest proportion of participants indicated "low risk." We found no significant differences between any of the groups in STI risk perceptions. For HIV risk perceptions, Arm 2 had significantly

Table 1 Baseline participant characteristics

Variable	Arm 1 ($N = 130$)				Arm 2 ($N = 42$)				Arm 3 ($N = 27$)			
	n	%	Mean	SD	*n*	%	Mean	SD	*n*	%	Mean	SD
STI risk												
No	52	40.00			22	52.38			9	33.33		
Low	41	31.54			11	26.19			12	44.44		
Some	35	26.92			9	21.43			5	18.52		
High	2	1.54			0	0.00			1	3.70		
HIV risk[a]												
No	67	51.54			31	73.81			13	18.15		
Low	46	35.38			6	14.29			11	40.74		
Some	15	11.54			4	9.52			2	7.41		
High	2	1.54			1	2.18			1	3.70		
Sex[b]												
Male	56	43.08			15	35.71			14	51.85		
Female	74	56.92			27	64.29			13	48.15		
Age			20.41	1.95			19.93	2.25			19.70	1.77
No. of oral sex partners			2.25	1.84			2.19	1.85			2.07	1.90
No. of vaginal sex partners			3.18	2.13			3.45	2.21			2.62	2.02
No. of anal sex partners			0.55	1.08			0.69	1.20			0.78	1.40
Risk score			2.23	1.71			2.19	1.29			2.14	1.66
STI test[a]												
Yes	67	51.54			27	64.29			14	51.85		
No	63	48.46			15	35.71			13	48.15		
HIV test												
Yes	56	43.08			24	57.14			15	55.56		
No	74	56.92			18	42.86			12	44.44		

Arm 1 = fact sheet alone, Arm 2 = fact sheet + video, Arm 3 = fact sheet + video + facilitated discussion

[a] $p < 0.05$ comparing Arm 1 and Arm 2

[b] $p < 0.05$ comparing Arm 2 and Arm 3

lower HIV risk perceptions compared to Arm 1 ($p < 0.001$), but no other differences were found. Regarding sex, Arm 3 had significantly fewer females than Arm 2 ($p < 0.001$), but no other differences were uncovered. No differences between groups were found for age, with the average age ranging from 19.70 for Arm 3 to 20.41 for Arm 1. For sexual risk behavior, no differences were found in number of oral, vaginal, or anal sex partners, in cumulative risk score, or in having ever had an HIV test between any groups. However, Arm 2 had significantly higher proportion of participants who had ever had an STI test compared to Arm 1 ($p = 0.034$).

Sample Sizes by Arm The use of a sub-sample resulted in large variation in arm sample size. Arm 1 had 130 participants, Arm 2 had 42 participants, and Arm 3 had 27 participants. This variation resulted from the fact that sites varied in their service population with some sites being high schools with younger populations and some sites being tribal colleges with older populations. Sites were originally randomized to balance participant numbers in the larger evaluation, but not age distribution.

Changes in STI Risk Perceptions

Table 2 displays the number of individual participants in each respective change group between pre-test and post-test, as well as post-test to 6-month follow-up. Overall, the majority of participants across all groups showed no change in STI risk perceptions at either pre-test to post-test, or post-test to 6-month follow-up. As seen in Table 3, only one difference was found between intervention arms at either time point. From post-test to 6-month follow-up, compared to participants in Arm 1, participants in Arm 2 were 1.42 times as likely to have had an increase in their STI risk perceptions as opposed to no change with no other variables in the model. However, once baseline STI risk perceptions were added to the model, this difference disappeared.

Table 2 Changes in STI risk perceptions by assessment and study arm

	Pre-test to post-test					
	Arm 1		Arm 2		Arm 3	
	n	%	*n*	%	*n*	%
Risk perceptions						
Decreased	18	13.85	8	19.05	4	14.81
No change	101	77.69	31	73.81	19	70.37
Increased	11	8.46	3	7.14	4	14.81
	Post-test to 6-month follow-up					
	Arm 1		Arm 2		Arm 3	
	n	%	*n*	%	*n*	%
Risk perceptions						
Decreased	29	22.31	9	21.43	7	25.93
No change	72	55.38	21	50.00	15	55.56
Increased	29	22.31	12	28.57	5	18.52

Table 4 Changes in HIV risk perceptions by assessment and study arm

	Pre-test to post-test					
	Arm 1		Arm 2		Arm 3	
	n	%	*n*	%	*n*	%
Risk Perceptions						
Decreased	8	6.15	5	11.90	3	11.11
No change	108	83.08	31	73.81	19	70.37
Increased	14	10.77	6	14.29	5	18.52
	Post-test to 6-month follow-up					
	Arm 1		Arm 2		Arm 3	
	n	%	*n*	%	*n*	%
Risk perceptions						
Decreased	27	20.77	10	23.81	3	11.11
No change	75	57.69	25	59.52	20	74.07
Increased	28	21.54	7	16.67	4	14.81

Changes in HIV Risk Perceptions

Table 4 displays the number of individual participants in each respective change group between pre-test and post-test, as well as post-test to 6-month follow-up. Overall, the majority of participants across all groups showed no change in HIV risk perceptions at either pre-test to post-test, or post-test to 6-month follow-up. As shown in Table 5, two significant differences in HIV risk perceptions were present in the unadjusted models. Participants in Arm 3 were 0.65 times as likely to have experienced a decrease in HIV risk perceptions as opposed to no change compared to participants in Arm 1. Similarly, compared to participants in Arm 2, participants in Arm 3 were 0.38 times as likely to have experienced a decrease in HIV risk perceptions as opposed to no change. After adjusting for baseline HIV risk perceptions, however, the difference between Arms 2 and 3 disappeared. Arm 3 remained 0.59 times as likely to have experienced a decrease in HIV risk perceptions as opposed to no change compared to Arm 1. The difference between Arm 3 and Arm 1 remained significant even when

Table 3 STI risk perception models

Model	Pre-test to post-test			Post-test to 6-month follow-up		
Model 1	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease	1.44	1.08	0.82	1.06	1.08	1.09
	(0.53, 3.95)	(0.52, 2.26)	(0.18, 3.73)	(0.63, 1.79)	(0.77, 1.51)	(0.68, 1.74)
	0.470	0.82	0.79	0.82	0.67	0.72
Increase	0.89	1.39	2.18	1.42	0.91	0.58
	(0.43, 1.83)	(0.79, 2.43)	(0.66, 7.22)	(1.03, 1.95)	(0.58, 1.43)	(0.23, 1.47)
	0.75	0.25	0.20	0.032	0.68	0.26
Model 2	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease				1.40		
				(0.65, 3.03)		
				0.39		
Increase				1.42		
				(1.00, 2.02)		
				0.053		

Reference outcome: no change

Cells: relative risk ratio (95% confidence interval), *p* value

Models: model 1 = unadjusted, model 2 = adjusted for baseline risk perceptions

Table 5 HIV risk perception models

	Pre-test to post-test			Post-test to 6-month follow-up		
Model 1	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease	2.18	1.46	0.98	1.11	0.65	0.38
	(0.97, 4.91)	(0.72, 2.96)	(0.28, 3.45)	(0.49, 2.52)	(0.54, 0.77)	(0.16, 0.88)
	0.061	0.29	0.97	0.80	< 0.001	0.024
Increase	1.49	1.42	1.36	0.75	0.73	0.71
	(0.87, 2.57)	(0.85, 2.39)	(0.44, 4.19)	(0.32, 1.75)	(0.40, 1.36)	(0.16, 3.29)
	0.15	0.18	0.59	0.51	0.32	0.67
Model 2	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease					0.59	0.25
					(0.39, 0.88)	(0.05, 1.19)
					0.011	0.081
Increase					0.76	0.88
					(0.44, 1.32)	(0.16, 4.88)
					0.33	0.88
Model 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease					0.60	
					(0.38, 0.92)	
					0.021	
Increase					0.72	
					(0.42, 1.24)	
					0.24	
Model 4	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3	Arm 1 v. Arm 2	Arm 1 v. Arm 3	Arm 2 v. Arm 3
Change						
Decrease					0.61	
					(0.35, 1.06)	
					0.079	
Increase					0.73	
					(0.42, 1.25)	
					0.25	

Reference outcome: no change

Cells: relative risk ratio (95% confidence interval), *p* value

Models: model 1 = unadjusted; model 2 = adjusted for baseline risk perceptions; model 3 = adjusted for baseline risk perceptions and demographics; model 4 = adjusted for baseline risk perceptions, demographics, and baseline risk behavior

demographic characteristics were added into the model with only a light attenuation of the effect (RRR = 0.60). Finally, when baseline risk behaviors were added to the model, the difference between Arms 1 and 3 became non-significant.

Discussion

Overall, the *Native VOICES* intervention did not improve STI and HIV risk perceptions among emerging adults 18 to 24 years old. Few participants changed their risk perceptions, either positively or negatively, following the *Native VOICES* intervention at either interval measured. Differences in risk perceptions that were observed disappeared after controlling for other factors, including demographics and baseline sexual risk factors.

Several factors likely contribute to this outcome. The *Native VOICES* video was purposely designed for AI/AN youth and emergent adults 15–24 years old, to address the age group most at risk for STIs. Much of the formative work during the adaptation process, however, focused on youth 15–18 years old. Given its limited impact among emerging adult viewers, it seems likely that the *Native VOICES* video did not resonate as strongly with older participants. The situations and

characters depicted in the video might not have been sufficiently relatable to this age group.

Additionally, the intervention that *Native VOICES* was based on (VOICES) utilized the TRA, which does not specifically include risk perceptions. The adaptation of the *Native VOICES* video did not specifically target this risk factor either. The other constructs and pathways laid out in TRA make it possible that future behavior was affected regardless of our results, although changes in future behavior was not included as part of this analysis. Changes in actual behavior among *Native VOICES* participants are an area for future investigation.

Despite these shortcomings, we can report important information on sexual risk among AI/AN emerging adults that can inform future interventions for this age group. The lowest average number of oral sex partners was 2.25, vaginal sex partners was 3.45, and anal sex partners was 0.78. It is clear that AI/AN emerging adults engage in sexual behaviors that carry risk for STIs and HIV. This analysis, however, is not able to report if actual risk behaviors changed at 6-month follow-up even in the absence of changes in STI and HIV risk perceptions. This relationship deserves greater attention.

Finally, the difference between actual risk and perceived risk within this analysis points to an area for further investigation. Although sexual activity was noted in this age group, the majority of participants indicated no or low risk for STIs and HIV at baseline, and the majority of participants did not change these perceptions post-intervention. While the protective behaviors, such as the use of condoms or getting tested for STIs or HIV, might account for the low levels of perceived risk, these emerging adults are, indeed, at risk for such outcomes, as evidenced by risk scores, the lowest of which for any arm was 2.14. These risk scores indicate that AI/AN emerging adults are not only sexually active, but engaging in risky sexual behaviors (e.g., no condom use, alcohol or drug use before sexual activity). Health messaging targeting their low-risk perceptions, despite the presence of actual risk, should be explored.

Our data reflect and expand upon sexual health behaviors reported in other tribal communities involving younger AI/AN participants. Among 537 AI/AN youth 12–14 years old, recruited from 27 study sites in Alaska, Arizona, and the Pacific Northwest, 6.5% were sexually experienced (Markham et al. 2015). In this age group, interventions designed to reduce sexual intentions and exposure to risky situations and alcohol use might be most effective to delay sexual initiation. Focus groups by Chambers et al. (2016), involving reservation-based AI/AN youth 13–19 years old, also "suggest that condom use self-efficacy and HIV prevention knowledge is low, vulnerability to sexually transmitted infections is lacking, and alcohol plays a significant role in sexual risk taking" in some AI/AN communities. No comparable research has explored risk factors or risk behavior among older AI/AN emerging adults.

Limitations

This study had several limitations. First, the overall sample sizes were small and uneven across study arms. A corollary limitation is that the number of participants who changed risk perceptions were small, which might have underpowered our study to detect any differences if they existed. Additionally, our risk perceptions change score was collapsed to create three broader groups (decrease, no change, increase) to maintain adequate sample sizes; however, this approach does not provide information on the magnitude of change and should be reconsidered if these outcomes were examined in the larger study sample. Analytically, further analysis using longitudinal techniques or hierarchical linear modeling to understand differences by sites within arms could provide further information as to the potential effects of *Native VOICES* on all outcomes measured as part of its evaluation.

Further, our cumulative risk score used nine items and gave each item the same weight. However, it may be that certain items were truly more influential on perceptions of risk than others and that risk scores were improperly elevated among some participants due to behaviors that do not actually impact risk perceptions. For example, studies show that adolescents tend to find oral sex less risky than vaginal sex (e.g., Halpern-Felsher et al. 2005). In our cumulative risk score, however, behaviors related to oral sex were weighted the same as behaviors related to vaginal sex in terms of their impact on risk perceptions for HIV and STIs.

Finally, the original VOICES intervention was evaluated among those attending STI clinics, which are likely to have higher perceived risk for STIs than AI/AN youth.

Conclusion

This study assessed the effects of a culturally adapted sexual health video for AI/AN youth 15–24 years old, on risk perceptions for HIV and STIs among emerging adults. Overall, the intervention showed little effect on STI and HIV risk perceptions among emerging adults in this age group. Given the distinct social and sexual milieu that surrounds youth and emerging adults, it may be near impossible for a single intervention to reach both age groups effectively. To improve sexual health outcomes for AI/AN emerging adults, age-appropriate interventions should be designed to reflect their unique needs and life experiences.

Funding The *Native VOICES* adaptation and evaluation study was funded by the Native American Research Centers for Health program (PI: Thomas Becker).

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. The *Native VOICES* intervention was reviewed and approved by the Portland Area Indian Health Service Institutional Review Board at the Northwest Portland Area Indian Health Board in Portland, OR [333712]. This analysis was exempted by the Institutional Review Board in the Office of Human Research Administration at the Harvard TH Chan School of Public Health in Boston, MA.

Informed Consent Informed consent was obtained from all individual participants included in the study. Consent was also obtained from parents/guardians of minors.

Statement of Human Rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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