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Michael P. Anastario

Julie Dabreo

Jackie Morris

Rachel Hallum-Montes

Gricel Arredondo

Alisha Creel

Lisa Cowan

Helen Chun



Naval Health Research Center

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*Naval Health Research Center
140 Sylvester Road
San Diego, California 92106-3521*

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Michael P. Anastario · Julia Dabreo · Jackie Morris ·
Rachel Hallum-Montes · Gricel Arredondo · Alisha Creel ·
Lisa Cowan · Helen Chun

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Abstract Worldwide, military personnel have been recognized as a population at elevated risk for sexually transmitted infections and HIV. However, few evidence based behavioral interventions for the prevention of HIV and STIs have been rigorously evaluated in military personnel. We adapted the Popular Opinion Leaders (POL) intervention and piloted the adapted program with the Barbados Defence Force at one military base in Barbados. Popular Opinion Leaders were selected and trained to focus conversations on condom use. Behavioral questionnaires were administered using audio computer-assisted self interview at baseline ($n = 256$) and 6-month follow-up ($n = 303$). Mid-point focus groups were conducted with a sample of 15 POLs at a 3 month mid-point assessment. Quantitative data showed moderate increases in condom use at 6-months, and significant uptake of condom use during oral-genital contact in female personnel. A subgroup analysis suggests that this change was partially

mediated by post-intervention changes in injunctive norms surrounding condom use in women. Focus groups revealed that POLs were heavily focusing on condom demonstrations, condom provision within social networks, speaking with coworkers about pleasure associated with condom use, and that the most common venues for conversations included those where alcohol was consumed. During the intervention, POLs dispersed from the intervention site as a result of normal personnel movement across bases, resulting in our having to use a pre and post intervention design across the population. It is likely that larger effect sizes would be observed in efforts that account for the natural dispersion of personnel across bases.

Keywords Popular Opinion Leader · HIV · Condom use · Barbados · Military

Introduction

Worldwide, military personnel have been recognized as a population at elevated risk for sexually transmitted infections and HIV [1–4]. However, few evidence-based interventions for the prevention of HIV and STIs have been rigorously evaluated in military personnel. In 2010, the Barbados Defence Force (BDF) was initiating behavior change and communications programming in concordance with the strategies and objectives of the Barbados National AIDS Programme. As part of this endeavor, we evaluated of an adapted pilot of the Popular Opinion Leaders (POL) intervention to examine how the POL intervention functioned in the military environment, and if it exhibited effects on condom use in the BDF population.

The POL intervention was originally designed to reduce sexual risk behavior in community settings by using

M. P. Anastario (✉)
New York University, New York, NY, USA
e-mail: manastario@gmail.com

J. Dabreo · J. Morris
The Barbados Defence Force, St. Ann's Fort, Barbados

R. Hallum-Montes · G. Arredondo
Cicatelli Associates Inc., New York, NY, USA

A. Creel
Survey and Evaluation Research Center, ICF International,
Bethesda, MD, USA

L. Cowan · H. Chun (✉)
The Department of Defense HIV/AIDS Prevention Program,
San Diego, CA, USA
e-mail: Helen.Chun@med.navy.mil

popular individuals to change norms that are implicated in specific behavioral outcomes [5, 6]. Core elements of the POL program include identifying leading opinion leaders, training opinion leaders to disseminate endorsement messages within their networks, and supporting and reinforcing successive waves of opinion leaders to reshape norms [5–7]. The POL intervention draws upon social diffusion theory to explain how changes in norms are disseminated throughout a population. Under the guidelines of the POL intervention, the social status of the POL delivering the behavior change message is of pivotal importance in order to change norms within a population.

The uniformed services are increasingly becoming recognized as an at-risk population for HIV/AIDS [1, 8]. Currently, some military HIV prevention programs are training *peer educators* as part of larger behavior change and communication strategies. However, peer educator interventions do not explicitly capitalize upon interpersonal relationships to disseminate specific messages or to change specific norms. Peer (horizontal) cohesion [9] is a specific occupational-specific mechanism in the uniformed services through which dissemination of messages and norms can occur. For this applied program, we drew upon the POL model to capitalize on the close relationships that form within a military occupational structure in order to increase condom use in the BDF.

We adapted the POL intervention as an improvement to the peer educator model in the context of the BDF's ongoing prevention efforts. Our adapted intervention did not adhere to all standards of the POL model due to issues of feasibility and ease of implementation. Namely, the intervention did not include logos, symbols, or other devices as conversation starters to avoid confusion of additional materials with the BDF's existing HIV messaging campaigns. Further, we operated on the assumption that personal networks would already exist within an occupational population (vs. voluntary social arrangement), and we encouraged POLs to focus on their personal contacts within the BDF. While not adherent to the original components of the POL intervention program, these adapted elements made the intervention feasible and realistic to implement in the context of the BDF environment. We broadly hypothesized that condom use would increase among BDF personnel as a result of the intervention.

We took advantage of this pilot to not only examine potential impacts of the POL intervention on condom use among BDF personnel, but also to examine how a POL intervention functioned as part of ongoing prevention strategies in the military occupational setting. An analysis of the implementation of the intervention itself, as well as its effects on condom use, directly informs future HIV and STI prevention programs that aim to utilize peers in the military setting.

Methods

For this study, we used a mixed quantitative and qualitative analytic approach to examine the course and relative impact of the intervention on condom use outcomes.

Quantitative Methods

The BDF is comprised of approximately 620 personnel located throughout three military bases. For this pilot test, we identified and recruited POLs from one military base only (St. Ann's Fort) in September and October of 2010. The 21 individuals identified were trained as POLs in November 2010 at St. Ann's Fort.

No POL-related activity was conducted at the other two bases, and thus personnel working at these other sites served as natural control populations. Over the follow-up period, however, POLs that were originally located and trained at the St. Ann's Fort site dispersed to control sites as part of the usual personnel movement that occurs in the military. This methodological quandary was identified during the midpoint focus group and follow-up periods, leading us to forgo the control/intervention design and to only examine pre and post outcomes across all bases, albeit forfeiting the 15 % coverage criteria of the POL intervention. In order to test for changes in condom use in the BDF population, we sampled the BDF population at baseline (November 2010) and at a 6-month follow-up (June 2011).

The entire BDF population was systematically sampled at baseline and separately at follow-up. Personnel were systematically sampled, stratified by rank, in order to provide a more representative estimate of the population. In the pre-intervention assessment, we aimed to sample 318 individuals, and in the post-intervention assessment, we aimed to sample 319 individuals.

Military personnel of at least 18 years of age were invited to participate in the study. All participants provided their verbal consent prior to participation. Personnel were assigned a random study number which was not linked back to their personal identity. Thus, longitudinal changes (within-individuals) could not be tracked over time. The study was approved by the institutional review board at the University of the West Indies and well as the Western IRB in the United States.

Structured Interviews

Respondents were administered behavioral questionnaires through audio computer-assisted self-interview (ACASI) using QDS™ version 2.6 Software (NOVA Research Company, Bethesda, Maryland, USA) installed on Windows platform Netbook computers. Using ACASI can be

more efficient than paper-based surveys because it eliminates the cost of printing and data entry, and it may be a more effective method for collecting highly sensitive information [10], making it a suitable questionnaire administration modality to use when screening military personnel for sexual behaviors. Respondents were provided headphones to self-administer the interview. Questions were posed to the respondent in text on the computer screen and through audio on headphones, with a 500-ms pause programmed between questions/screens. Respondents were given the option to skip any question, as well as to return to a previous question. If respondents encountered difficulties with a question and desired assistance, a study team member provided assistance.

Measures

The ACASI included questions measuring respondent demographics, detailed questions regarding specific sexual behaviors and condom use, alcohol abuse, and psychosocial measurements relevant to HIV/AIDS prevention.

Measurement for sexual risk behaviors and condom use was drawn from the Risk Behavior Assessment (RBA) [11]. The RBA items included 30-day recall measures specific to insertive/receptive vaginal sex, oral-genital contact, and insertive/receptive anal sex. For each act/partner pairing, respondents who screened positive for a given behavior during the past 30 days (>0 acts reported) were then asked “Of these times, how many times did you use a condom, latex, or other barrier protection?” To assess condom use, a condom use ratio was developed which was calculated as the number of protected sexual acts divided by the number of sexual acts.

We measured alcohol abuse using the Rapid Alcohol Problems Screen 4-Quantity Frequency (RAPS4-QF), a short screening instrument that has shown high sensitivity to alcohol abuse [12]. We classified respondents as having probable alcohol abuse for a score of 1 or greater on the 6-item RAPS4-QF, and probable alcohol dependency for a score of 1 or greater on the 4-item RAPS4 [12].

Psychosocial measurements included questions regarding norms, communication and attitudes surrounding condom use. *Descriptive norms* were conceptualized as statements describing a behavioral practice with regard to a specific reference group (for example, *How many BDF personnel do you think use condoms all the time?*), with a 4-point Likert scale ranging from *none* to *all*. For this study, we identified reference groups as military personnel and friends. *Injunctive norms* were conceptualized as beliefs about the judgment of the reference group toward specific behaviors (for example, *If I were having sex with someone other than my regular partner, my coworkers in the BDF would think that I should use condoms all the time.*) A 4-point Likert scale was

used to assess level of agreement with the statement, ranging from *strongly disagree* to *strongly agree*. *Interpersonal communication* included questions regarding the relative frequency of communication with coworkers about issues pertinent to HIV/AIDS, with 4-point Likert scale response sets (ranging from never to many times). *Attitudes about condoms* included statements regarding condoms, and were assessed using a 4-point Likert scale ranging from strongly disagree to strongly agree.

Qualitative Methods

Focus Groups

In total, 15 POLs (4 females, 11 males) participated in midpoint focus groups held with the first author (2 groups, $n = 6$ and $n = 9$). Focus group participants were asked a series of questions regarding their experiences as POLs. Focus groups participants provided verbal consent prior to participation. Each focus group was recorded using a digital tape recorder. The taped focus group interviews were completely rescanned and coded by the principal investigator. Following scanning and transcription of select elements, the tapes were destroyed to maintain the confidentiality of respondents.

Data Analysis

Quantitative data were analyzed using STATA 10 statistical software [13]. Simple means and frequencies were examined to determine trends between pre- and post-observation periods. We used the general linear model (GLM) to adjust for potential confounders when testing for differences in outcomes with continuous distributions between pre and post periods. Statistical significance was established at $p < 0.05$.

We used a grounded theoretical framework to guide our focus group analysis [14, 15]. The principal investigator first reviewed notes from the focus group setting and created a guiding set of open codes. Then, every recorded minute was scanned and open codes were assigned to audio segments. Following the development of open codes, axial codes were then developed based on emergent themes in the data. Finally, axial codes were combined to formulate theoretical codes detailed in the Results section of this manuscript.

Results

Quantitative Findings

A total of 256 respondents were sampled at baseline (response rate of 80.5 %), and 303 at follow-up (response

Table 1 Demographic characteristics of respondents in the Barbados Defence Force at baseline and 6-month follow-up

Respondent characteristics	Baseline	Follow-up	<i>p</i> value
	(<i>n</i> = 256)	(<i>n</i> = 303)	
Gender	88.7 %	85.1 %	0.221
Age	29.0 (8.4)	29.04 (8.7)	0.96
Single	52.2 %	52.1 %	0.998
Less than high school education	5.1 %	5.0 %	0.95
Enlisted	92.9 %	91.4 %	0.76
Number of years in the military	7.4 (7.7)	7.8 (7.9)	0.48
Christian/Catholic	75.0 %	74 %	0.841
Number of children	0.82 (1.1)	0.98 (1.3)	0.1326
Income	2,533.6 (1009.8)	2,524.6 (1105.2)	0.922

rate of 95 %) (Table 1). Respondent demographics did not show any appreciable variation between baseline and follow-up data collection periods (Table 1). On average, respondents were 87 % male, 29 years of age, 52 % single, 5 % with less than a high school education, 92 % enlisted, had served an average 7.6 years in the military, were 75 % Christian/Catholic, had an average 0.9 children, and made an average income of 2,529 Barbados dollars.

Changes in the condom use ratio during specified sexual acts are exhibited in Table 2. In men, there were slight (but insignificant increases) in condom use during insertive vaginal sex (34.1 % of acts protected vs. 36.1 % at follow-up), during insertive oral sex with a male partner (0–50 %), and during oral-genital contact with a female partner (23–32 %).

In women, a significant increase in the condom use ratio was observed for those receiving oral-genital contact (0 % at baseline vs. 42 % at follow-up, $p = 0.029$), and a trend level increase in the condom use ratio during receptive oral sex with a male partner (1 vs. 17 % at follow-up, $p = 0.181$). Slight but insignificant increases in the condom use ratio were observed for receptive vaginal sex (52 vs. 63 %) and oral-genital contact with a female partner (50 % at baseline, 83 % at follow-up).

Subgroup Analysis: Female Personnel

The increase in the condom use ratio observed among female personnel prompted us to more closely examine other changes within the female-only subgroup. Among women sampled during the baseline ($n = 29$) and follow-up ($n = 45$) periods, we observed trend-level changes in psychosocial correlates of behavior. This included a significant decline in the overall level of agreement with the injunctive norm “My coworkers in the BDF think that it’s OK if I don’t use condoms all the time” (from a mean of 38–28, $p = 0.014$), a decrease in the level of agreement with the statement “Condoms that are given out for free are

not of good quality” (30–18, $p = 0.07$), and an increase in the overall frequency of communication with coworkers in the BDF about condoms (67–78, $p = 0.13$).

Qualitative Findings

Focus group discussions broadly centered on POL activities conducted since training. Based on a grounded theoretical analysis of the focus group data, emergent themes included starting conversations with peers, focusing conversations on condoms, POLs as condom distributors, and problems encountered while implementing the intervention. Each theme is described further below.

Conversation Starters

POLs reported several innovative ways to begin conversations with peers in their networks regarding condoms. These conversations were started in “more natural” contexts, such as talking about a recent sports game where a girlfriend/sex partner was present, using the latest movies to begin discussions, talking about events that happened at recent parties, using oneself and one’s own recent sexual experiences to begin a conversation, and in some cases, personnel directly approaching POLs to ask for advice given recently risky behavior. As one POL described:

When you’re talking in groups, it doesn’t appear like you are a POL, you’re just really in conversation with the rest, cause people don’t like to be lectured. People don’t like you to come with the flip charts—people don’t like that. But if you’re having a conversation, you can always write down notes after. Just be a part of the conversation...we just get a lot, a lot of information when we’re in the shower, when we’re in the barrack room, you get a lot of information when you’re upstairs in the barracks cause people are more relaxed. Like if all of these private soldiers or lance

Table 2 Condom use ratio in the Barbados Defence Force at baseline and 6-month follow-up by sex and sexual act

Sexual activity	Condom use ratio (# times condom used/# sexual acts)		
	Baseline (n = 256)	Follow-up (n = 303)	p value
Reported by men			
Insertive vaginal sex, n = 385	34.1 %	36.1 %	0.658
Insertive oral sex with a female partner, n = 273	27.5 %	21.8 %	0.547
Insertive oral sex with a male partner, n = 4	0.0 %	50.0 %	0.317
Insertive anal sex with a female partner, n = 34	30.0 %	25.4 %	0.746
Insertive anal sex with a male partner, n = 3	100.0 %	50.0 %	–
Receptive oral sex with a male partner, n = 3	0 %	50 %	0.564
Mouth-to-genital contact with a female partner, n = 268	23.2 %	32.4 %	0.626
Receptive anal sex, n = 2	100.0 %	100.0 %	–
Reported by women			
Receptive vaginal sex with a male partner, n = 22	52.4 %	63.3 %	0.520
Receptive oral sex with a male partner, n = 27	1.1 %	16.7 %	0.181
Mouth-to-genital contact with a female partner, n = 5	50.0 %	83.3 %	0.699
Receptive anal sex with a male partner, n = 3	0.0 %	0.0 %	–
Received mouth-to-genital contact, n = 35	0.0 %	42.2 %	0.029

corporals were together...we could talk in a comfortable environment.

There was a wide consensus that beginning conversations about sex and condoms was most easily done in bars, during happy hours, and/or over drinking. Drinking venues were also described as the locations in which the topic of sex most easily arose and in which norms surrounding condom use could readily be addressed.

Conversations About Condoms

In addition to conducting condom demonstrations, POLs emphasized that they spent time speaking with peers about condom use—namely different types of condoms and the pleasure associated with different styles of condoms. In many circumstances, POLs used personal experiences to describe the sensation of particular types of condoms, particularly when speaking with individuals of the opposite sex (e.g., what condom use feels like from the male vs. female perspective), and discussing the ways in which various types of condoms could bring different individuals varying degrees of pleasure during sex. POLs described both demonstrating and emphasizing the usefulness of the female condom as a more pleasurable type of condom to use in contrast to the male condom.

In addition, POLs focused on changing norms surrounding women's self-efficacy with regard to condom use. This included focusing on women purchasing condoms and women having condoms available for sexual encounters. POLs described how the norm surrounding women

carrying condoms is changing: while women were once viewed as “promiscuous” for carrying condoms, it is now more acceptable. One focus group member reiterated:

That's true...Females bring the equipment to the job now. It is a norm.

Finally, there was a focus on POLs questioning their ability to adequately engage individuals who described same-sex (male-to-male or female-to-female) sexual contact. However, POLs tended to approach this subject as an area where they could use improvement or additional training. One POL in particular reported that as a result of the intervention, he became comfortable enough where he was able to provide counseling to men who have sex with men on the use of the female condom during anal sex.

Recognition that BDF Personnel Began Requesting Condoms from POLs

POLs reported that BDF personnel within their networks began requesting condoms from the POL. In particular, POLs described personnel as approaching them to request specific styles of condoms (e.g., studded) or specific types of lubricant. While condoms were available at the medical unit, POLs were being approached as “access points” for condoms. Further, personnel would approach POLs for condoms before crucial moments/time periods in which they could use a condom, such as before traveling or going out at night. Several POLs noted that more access points for condoms on base (outside of the medical unit) would

increase distribution to BDF personnel, including placing condoms in the barracks, and encouraging the POLs to obtain larger stocks of condoms from the medical unit so that they could distribute condoms within their networks.

Problem Areas Identified

POLs provided various suggestions to improve the POL program in the BDF. These suggestions included increasing access to condoms through social networks, discomfort talking about certain subjects, and the need to meet regularly as a group to troubleshoot issues as they arise and to maintain motivation. In particular, POLs acknowledged that they have come across various situations that they have been unable to deal with, such as speaking about prevention in the context of individuals with same-sex partners. POLs suggested that being better acquainted with the network of POLs would allow the POL to refer individuals to other POLs who were better equipped for certain situations and topics. Further, POLs noted that regular meetings among the POLs would help them stay motivated, so that they could discuss problems they encountered and ways to troubleshoot difficult situations. In addition, there was mention that regular meetings would help remind them of their responsibility when their “attention starts to fade.” There was consensus that meetings every 6 weeks among POLs would be beneficial.

Discussion and Conclusions

In this pilot test of the POL intervention with the BDF, we documented moderate increases in condom use, with a significant uptake of condom use during oral-genital contact among women. The observed dispersion of POLs to the natural “control” sites was a by-product of implementing the intervention in a military setting, and it was most likely related to the attenuated significance of the effects presented here. These results have several implications for the use of peers in HIV prevention efforts and behavioral interventions with military personnel.

First, we found that condom use increased during oral-genital contact, particularly among women. The uptake in condom use during oral-genital contact was not a particular focus of the POL training, and this gender-differentiated finding is an interesting and unexpected finding. Survey data illustrated that changes in communication and injunctive norms surrounding condom use most likely underlie this observed change. Focus groups illustrated that changes in norms surrounding female self-efficacy (carrying condoms) were salient during the intervention period. A corresponding trend-level increase in the use of condoms among women during receptive oral sex was also observed.

Taken together, it appears that the POL intervention (through communication and changes in norms) may have altered a taboo regarding females carrying condoms. Among migrant market vendors in China, a community POL intervention was associated with lower rates of STI infection at 24 months in women and high-risk individuals [16]. It is possible that POL efforts may “break” some binary gender norms, particularly in social circumstances where women there is stigma surrounding women carrying condoms.

Second, we found that POLs came to be treated as “access points” for condoms within their networks. Again, this was not a focus of the training for POLs, yet it emerged organically as part of the intervention. In the context of the military occupational setting, POLs starting conversations surrounding condom use most likely increases their identification (among peers) as individuals associated with local HIV prevention efforts and condoms. While unexpected, this outcome can be capitalized upon so as to increase condom accessibility by increasing distribution points within the force. At the time of the intervention, the BDF currently supplied personnel with a variety of condoms, however, condoms were only available through the medical unit. As a result of the POL intervention, some POLs are now distributing condoms.

In addition, we highlighted the importance and challenge of adequately training 15 % of personnel in a given target population [5], and ensuring the existence of an occupationally-relevant mechanism by which to enable regular POL meetings. Training 15 % of a military population in HIV prevention is a difficult endeavor, and maintaining that 15 % coverage can be difficult in the context of an occupational environment, even when there is a relatively large amount of attention given to HIV prevention, such as in the BDF environment. Given that military personnel are likely to be administratively relocated and/or deployed throughout their career, it is admittedly difficult to make and monitor a sustained effort across the entire defense force population. In the context of this intervention, individual POLs who were relocated to other bases may have automatically served as “bridging actors” between the intervention and control sites [17]. In addition, the intra-occupational heterogeneity of military personnel could potentially be responsible for a failure of the intervention to reach individuals [17]. While POLs were recruited across ranks, age groups, and sex, we did not systematically stratify POLs by these criteria—which may affect social network involvement. The movement of military personnel across bases should be accounted for in planning future POL efforts with military personnel.

Finally, the original POL intervention calls for regular meetings between POLs. In highly structured occupations such as the uniformed services, the POL intervention

cannot rely upon POLs to initiate and facilitate POL meetings. This remains a challenge given that regular meetings must be administratively built into personnel scheduling, making it slightly different from environments that mobilize community structures. For this program, POLs relied upon defense force leadership to allocate their meeting times and training times, and thus it would be important for future endeavors to integrate POL training into administrative regimens which explicitly carve out time slots so that elements of the POL intervention (such as ongoing meetings and the ongoing recruitment and training of POLs) can be implemented and sustained. The overall buy-in necessary to sustain an ongoing POL endeavor, like other prevention strategies, is likely to be somewhat dependent upon the overall threat of the disease facing the population.

Limitations

This study has several limitations. First, it is only generalizable to personnel in the Barbados Defence Force. The variable response rate between pre and post intervention periods is most likely due to increased sensitization of the population to the study endeavor. Second, while the changes in condom use among women were triangulated with qualitative focus group findings that POLs focused on women's self-efficacy in carrying condoms, it is always possible that this change may have been due to unobserved spurious factors. A more rigorous control/intervention group design was attempted but became infeasible to implement given the nature of working with a functional military. Third, social desirability bias is always an issue in survey research, particularly when surveying military personnel about their sexual behavior [18]. However, our use of ACASI provides a greater degree of privacy, produces no paper record, and reduces social desirability biases attributable to a human interviewer. Further, we adapted the intervention to make it feasible for the BDF; thus, we could not adhere to all of the core components indicated in the original POL design. However, this in and of itself is a data element illustrating how a POL intervention may be adapted for use in uniformed settings as an improvement over standard peer education programs.

Conclusion

In this military-adapted pilot of the POL intervention with the BDF, we documented moderate increases in condom use at 6-months, and significant uptake of condom use during oral-genital contact, particularly among female personnel. POL dispersion across sites is an issue to be

considered with when implementing the POL intervention in a uniformed population. POLs appeared to change norms and condom use behaviors in women, and POLs became identified as condom distributors in this specifically occupational environment.

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6. AUTHORS
Anastario, Michael P.; Julia Dabreo, Jackie Morris, Rachel Hallum-Montes, Grisel Arredondo, Alisha Creel, Lisa Cowan, & Helen Chun

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Commanding Officer
Naval Health Research Center
140 Sylvester Rd
San Diego, CA 92106-3521

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Commanding Officer	Chief, Bureau of Medicine and Surgery
Naval Medical Research Center	7700 Arlington Blvd
503 Robert Grant Ave	Falls Church, VA 22042
Silver Spring, MD 20910-7500	

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13. SUPPLEMENTARY NOTES
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14. ABSTRACT

Worldwide, military personnel have been recognized as a population at elevated risk for sexually transmitted infections (STIs) and HIV. However, few evidence-based interventions for the prevention of HIV and STIs have been rigorously evaluated in military personnel. We adapted the Popular Opinion Leader (POL) intervention and piloted the adapted program with the Barbados Defence Force at one military base in Barbados. POLs were selected and trained to focus conversations on condom use. Behavioral questionnaires were administered using audio computer-assisted self-interview at baseline ($n = 256$) and a 6-month follow-up ($n = 303$). Midpoint focus groups were conducted with 15 POLs at a 3 month midpoint assessment. Quantitative data showed moderate increases in condom use at 6 months, and significant uptake of condom use during oral-genital contact in female personnel. A subgroup analysis suggests that this change was partially mediated by postintervention changes in injunctive norms surrounding condom use in women. Focus groups revealed that POLs were heavily focusing on condom demonstrations, condom provision within social networks, speaking with coworkers about pleasure associated with condom use, and identifying the most common venues for conversations included those where alcohol was consumed. During the intervention, POLs dispersed from the intervention site as a result of normal personnel movement across bases, resulting in our using a pre- and post-intervention design across the population. It is likely that larger effect sizes would be observed in efforts that account for the natural dispersion of personnel across bases.

15. SUBJECT TERMS
Popular Opinion Leaders, HIV, condom use, Barbados, military

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