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Factors Associated with HIV Infection and Condom Use in the Armed Forces of the Democratic  
Republic of the Congo

A dissertation submitted in partial satisfaction of the  
requirements for the degree Doctor of Philosophy

in

Public Health (Epidemiology)

by

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2019

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Chair

University of California, San Diego

San Diego State University

2019

## **DEDICATION**

*To my extraordinary, loving, and supportive grandmother Ms. Deloris Ann Davis.*

## **EPIGRAPH**

Now, as a nation, we don't promise equal outcomes, but we were founded on the idea everybody should have an equal opportunity to succeed. No matter who you are, what you look like, where you come from, you can make it. That's an essential promise of America. Where you start should not determine where you end up.

Barack Obama

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## LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AUDIT	Alcohol Use Disorders Identification Test
FARDC	Armed Forces of the Democratic Republic of the Congo
HIV	Human Immunodeficiency Virus
SABERS	Seroprevalence and Behavioral Epidemiology Risk Survey
SAS	Statistical Analysis Software
SPSS	Statistical Package for Social Sciences
STI	Sexually Transmitted Infection
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNGASS	United Nations General Assembly Special Session



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Chapter 2, in part, is currently being prepared for submission for publication of the material. Shaffer, Richard; Garfein, Richard; Liu, Lin; Woodruff, Susan; Macera, Caroline. The dissertation author was the primary author of this material.

Chapter 3, in part, is currently being prepared for submission for publication of the material. Shaffer, Richard; Garfein, Richard; Liu, Lin; Woodruff, Susan; Macera, Caroline. The dissertation author was the primary author of this material.

Chapter 4, in part, is currently being prepared for submission for publication of the material. Shaffer, Richard; Garfein, Richard; Liu, Lin; Woodruff, Susan; Macera, Caroline. The dissertation author was the primary author of this material.

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## ABSTRACT OF THE DISSERTATION

Factors Associated with HIV Infection and Condom Use in the Armed Forces of the Democratic Republic of the Congo

by

Anthony De Shaun Lee Davis

Doctor of Philosophy in Public Health (Epidemiology)

University of California San Diego, 2019  
San Diego State University, 2019

Professor Caroline Macera, Chair

**Background:** HIV infection has been shown to be high among military personnel in sub-Saharan Africa. Furthermore, research has shown inconsistent condom use is common in African military populations. In an effort to determine the prevalence of HIV, quantify condom use, and investigate correlates of condom use, a cross-sectional seroprevalence study was implemented in the Armed Forces of the Democratic Republic of the Congo (FARDC). Recent condom use behaviors and correlates of low condom use were also assessed.

**Methods:** From October 2013-April 2014, 2,701 sexually-active FARDC soldiers, aged 19-83, participated in the study. Participants from 30 military sites were administered a survey via personal interview by a trained FARDC counselor. The survey collected information on demographics, military characteristics, and HIV risk behaviors such as condom use.

**Results:** The seroprevalence of HIV was 3.5%. After adjustment, primary risk factors associated with HIV infection included: not being married, multiple regular partners in the past 12 months, screening positive for PTSD, and testing positive for active syphilis infection ( $p < 0.05$ ). After stratification by region, participants in the Eastern region were found to have the highest HIV prevalence at 5.1%. HIV testing frequency was also found to be associated with HIV infection, with participants who reported  $\leq 1$  test since joining the military being more than three times more likely to test positive. Furthermore, 85% of male participants reported rarely/never using condoms. Lower condom use was associated with condom accessibility, reduced sexual pleasure, trust issues with condoms, negative attitudes towards condoms, and lower knowledge of HIV prevention and transmission.

**Conclusions:** The HIV prevalence in the FARDC is about three times higher than the general population, indicating a concentrated epidemic. HIV prevention interventions aimed at increasing condom use in the FARDC should address issues of accessibility and trust. The FARDC should consider providing scented condoms and reinforce the importance of correct and consistent condom use. Results suggest that a mental health program focused on PTSD and a syphilis awareness and treatment campaign would be beneficial to the FARDC. Routine HIV testing should also be implemented in the FARDC.



## **CHAPTER 1: INTRODUCTION**

## **HIV/AIDS Epidemic**

There are approximately 34 million people living with Human Immunodeficiency Virus (HIV) worldwide.<sup>1</sup> Sub-Saharan Africa remains the region most heavily afflicted, accounting for nearly 70% of infections.<sup>2</sup> While sub-Saharan Africa continues to bear the burden of the epidemic, HIV prevalence in West and Central Africa remains relatively low, with the prevalence among persons aged 15-49 years estimated at 2%.<sup>2</sup>

## **Democratic Republic of the Congo**

The Democratic Republic of the Congo (DRC) is one of the largest countries on the African continent, with a population of approximately 80 million people.<sup>3</sup> In 2014 the national adult HIV prevalence among those aged 15-49 was 1.2%, with an incidence rate of approximately 0.2 new infection per 1000 persons.<sup>3,4</sup> According to the 2014 Demographic and Health Survey (DHS), HIV prevalence was found to be higher among women (1.6%) than men (0.6%), and women age 40-44 were found to have the highest prevalence at 2.9%.<sup>3</sup> The DHS also found that HIV prevalence did not significantly change in DRC from 2007 to 2013. HIV prevalence remained the same in women, and decreased from 0.9% to 0.6% in men.<sup>3</sup>

## **Armed Forces of the Democratic Republic of the Congo**

The Armed Forces of the Democratic Republic of the Congo (Forces d'Armees de la Republique Democratique du Congo [FARDC]) is the official military of the DRC. The FARDC is comprised of three branches: Air Force, Army, and Navy, with a combined troop strength of over 130,000 soldiers.<sup>5</sup> The FARDC has a storied history of conflict, beginning with the country's first war (1996-1998), second war (1998-2003), and a war against rebels in the Eastern region (2004-2009).<sup>6</sup>

## **Military Personnel**

While the general population is at risk, studies have shown that military personnel are among those at highest risk for HIV and other sexually transmitted infections (STIs).<sup>7,8</sup> Soldiers are at an increased risk for HIV infection because they are predominately sexually active males, susceptible to peer pressure, and highly mobile.<sup>9,10</sup> Furthermore, to relieve stress, loneliness, and boredom during deployments, soldiers may engage in risky sexual behaviors, such as unprotected sex with commercial sex workers.<sup>11</sup> Prior research in the neighboring country of Angola found military men participated in high risk-taking behaviors known to be associated with HIV, including alcohol abuse and having more than one sexual partner.<sup>12</sup> A 2007 study conducted among soldiers in the Armed Forces of the Democratic Republic of Congo stationed in the capital city of Kinshasa found female service members, personnel who reported a symptomatic genital ulcer, and personnel reporting five or more partners in the past year to have an elevated risk of testing positive for HIV infection.<sup>14</sup>

## **Condoms**

Although studies show condom use is highly effective against HIV transmission and acquisition, studies also show condom use among military personnel is low and inconsistent. For example, a study conducted among Nigerian navy personnel found that nearly half of sailors who reported having sex with a sex worker did not use a condom the last time they had sex with that sex worker.<sup>11</sup> Another study conducted among Nigerian soldiers, found that only 21% of participants reported always using a condom with a casual partner.<sup>13</sup> A study conducted among the Botswana Defence Force showed consistent condom use 51% of the time, with reported reasons for not using condoms consistently including odor, lack of trust, and alcohol use.<sup>15</sup>

The findings of this dissertation are drawn from a cross-sectional study conducted in the FARDC from October 2013 to April 2014. Nine FARDC military regions were selected to participate. Individuals were eligible to participate if they were active-duty FARDC personnel, at least 18 years of age, and stationed within one of the nine selected regions. A total of 2,701 soldiers (93.3%), of an original target sample of 2,894, provided informed consent and had complete information (both a completed survey and an HIV rapid test result). Data was collected via a computer-assisted personal interview by a trained study counselor. Institutional review boards in the United States (Naval Health Research Center and San Diego State University, San Diego, California) and the Democratic Republic of the Congo (Kinshasa School of Public Health, Kinshasa, Democratic Republic of the Congo) approved this study.

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**CHAPTER 2: SEROPREVALENCE OF HUMAN IMMUNODEFICIENCY VIRUS AND  
ASSOCIATED RISK FACTORS IN THE ARMED FORCES OF THE DEMOCRATIC  
REPUBLIC OF THE CONGO**

## **Abstract**

**Background:** HIV infection has been shown to be high among military personnel in sub-Saharan Africa. HIV negatively impacts force readiness and combat preparation, and can destabilize national security due to troop morbidity and mortality. Our objective was to determine the seroprevalence of HIV and investigate risk factors associated with HIV infection.

**Methods:** This cross-sectional study examined a representative sample of 2701 active-duty troops from the Armed Forces of the Democratic Republic of the Congo (FARDC). This study was conducted from October 2013 to April 2014 and assessed the seroprevalence of HIV via rapid testing following the Democratic Republic of Congo's national HIV testing algorithm. Computer-assisted personal interviews (CAPI) were utilized to collect demographics, military characteristics, and risk behaviors. Descriptive statistics and logistic regression models were used to identify risk factors associated with HIV infection.

**Results:** The mean age of participants was 41.3 years (SD=10.3), 95% were men, and 90.8% were married or living with a partner. The seroprevalence of HIV was 3.5%. After adjustment, being single, having four or more regular sex partners in the past 12 months, agreeing with the statement "I would use condoms more often if I had them when needed," screening positive for PTSD, testing positive for active syphilis infection, and being stationed in the East and Northeast regions of the Democratic Republic of the Congo were all associated with HIV infection ( $p<0.05$ ).

**Conclusions:** The prevalence of HIV in the FARDC is much higher than the general population estimate of DRC (3.5% vs. 1.2%). Several key risk factors were found to be associated with HIV infection in the FARDC. Prevention interventions such as a condom distribution program and an active syphilis treatment campaign should be considered to reduce the risk of HIV



infection in the FARDC. A further examination of Defense Zone 3 (East and Northeast regions) should also be completed due the unique characteristics of the region (e.g. conflict zones).

## **Introduction**

Human Immunodeficiency Virus (HIV), the virus that causes Acquired Immunodeficiency Syndrome (AIDS) is a leading cause of morbidity and mortality in Sub-Saharan Africa. Globally, there were approximately 36.7 million people living with HIV at the end of 2016, with an estimated 70% of this burden in Sub-Saharan Africa.<sup>1</sup>

While Sub-Saharan Africa continues to bear the burden of the pandemic, HIV prevalence specific to West and Central Africa remains relatively stable, with an adult prevalence estimated at 2.2% in 2016.<sup>2</sup> However, the fight against HIV/AIDS remains a priority for high-risk groups in many countries, regardless of the estimated prevalence of the general population. In the Democratic Republic of the Congo (DRC), the overall HIV prevalence among the adult population (age 15-49) was estimated at 1.2% according to the 2013-14 Demographic and Health Survey (DHS).<sup>3</sup> The general population may be at low risk of HIV infection, however studies have shown that military personnel are among those at highest risk for HIV and other sexually transmitted infections (STIs).<sup>4,5</sup> Soldiers are at an increased risk for HIV infection because they are predominately sexually active males, susceptible to peer pressure, and highly mobile.<sup>6,7</sup> Prior research in military personnel found soldiers are more likely to abuse alcohol, have multiple sexual partners, have sex with commercial sex workers, and inconsistently use condoms.<sup>8-10</sup> A 2007 HIV seroprevalence study conducted among the Armed Forces of the Democratic Republic of Congo (FARDC) personnel stationed in Kinshasa found gender (female soldiers) and self-reported genital ulcers (indicative of active syphilis infection) significantly associated with HIV infection.<sup>11</sup>

HIV prevalence data from military personnel are unavailable in many countries; however several surveys have reported higher prevalence among the military compared to the general population.<sup>12-14</sup> For example, a 2012 study in a sample of 150 Nigerian military personnel found a

prevalence of 14.7%, which is much higher than the general population (age 15-49) prevalence of 3.2%.<sup>13,14</sup> With regards to the FARDC, the aforementioned 2007 HIV study found an HIV prevalence of 3.8%, which is more than three times higher than the general population estimate of 1.2%.<sup>3,11</sup> These results suggest that the HIV epidemic in DRC is concentrated and research should be focused on high-risk groups such as the military. HIV/AIDS poses a significant threat to military effectiveness and can destabilize national, regional, and international security as a result of troop morbidity and mortality.<sup>15</sup> A strong and healthy military is necessary for national defense and security, political stability, and humanitarian relief activities. High rates of HIV infection in military populations diminish the number of qualified, experienced personnel readily available for duty, and compromise a nation's ability to protect its citizens.<sup>4</sup> Of additional concern is that military members may subsequently infect their families. Government funds are then directed toward rising healthcare costs of infected military members and their families, leaving limited resources for military and defense operations.<sup>4</sup>

The FARDC considers containment of HIV/AIDS to be a top priority for force readiness and combat preparation. The FARDC does not enroll candidates who test positive for HIV during recruitment screening. Active-duty soldiers who test positive for HIV during service are not excluded from service post-enrollment. These individuals continue to serve in the military; however their job duties may be modified to accommodate their current health status. Treatment is provided by the FARDC free of charge to all soldiers who test positive for HIV. Continued surveillance of HIV infection in the FARDC is very important. Results of this study will provide updated data on HIV and syphilis prevalence and evaluate risk factors associated with HIV infection. Ultimately, the goal of this research is to inform current HIV prevention programs

among FARDC personnel and to provide specific areas for improvement in combatting the HIV epidemic.

## **Methods**

### Study Description

From October 2013 to April 2014, a cross sectional study from soldiers stationed across the Democratic Republic of the Congo was conducted to determine the seroprevalence of HIV and associated risk factors for infection. The FARDC is composed of approximately 133,000 troops, and to obtain a representative sample for this cross sectional study, nine military regions were randomly sampled taking their size in proportion to the military into account. Participants who consented to take part in the study responded to a computer-assisted personal interview performed by a trained study counselor and were then tested for HIV.

### Study Sample

Male and female FARDC active-duty members 18 years of age and older stationed at the selected study sites were eligible to participate in the study. To ensure a representative sample, military units were randomly selected from a list of military bases from each defense zone. All units had an equal chance of being selected to take part in the study. All available women and senior officers (e.g., Captain, Major, and Colonel) from each site were invited to participate to ensure sufficient sample sizes for analysis.

### HIV Testing

All biological rapid testing was conducted using blood from a finger prick. HIV rapid testing followed the DRC national HIV rapid test algorithm, a serial approach utilizing the Alere Determine™ HIV-1/2 assay followed by the Trinity Biotech Uni-Gold™ Recombigen® HIV ½ assay. Only participants reactive to both tests were considered HIV positive. If a participant was reactive to the Determine HIV test, but not the Uni-Gold HIV test, they were retested a third time

using a parallel approach with both Determine and Uni-Gold tests simultaneously. If the results were concordant and the samples reacted to both or neither test, participants were considered positive or negative respectively. Samples that reacted to only one test were considered indeterminate. All participants with positive or indeterminate HIV test results were referred to a military health facility for follow-up testing, treatment, and counseling services.

### Syphilis Testing

Participants were tested for syphilis using the Chembio DPP® Syphilis Screen and Confirm Assay. The test was able to distinguish between active/untreated and past or treated cases. Samples reactive to both treponemal and non-treponemal antigens were considered positive, as this suggests active and untreated disease. All invalid or indeterminate tests were repeated with a new testing device. All participants who tested positive for syphilis were referred to a military health facility for follow-up care and treatment.

### Data Collection

The self-report questionnaire was developed by epidemiologists at the Department of Defense HIV/AIDS Program (DHAPP), and was adapted from several studies conducted in African militaries with input from FARDC leadership. The questionnaire surveyed demographics such as age, sex, and marital status, military characteristics (specifically rank, branch, and years in the military), and deployments of more than six months in the past two years. The region where participants were stationed (Defense Zone 1, 2, or 3) was also collected from the survey. Defense Zone 1 consists of soldiers stationed in the West, Northwest, and Kinshasa regions; Defense Zone 2 consists of soldiers stationed in the South and Southeast regions, and Defense Zone 3 consists of soldiers stationed in the East and Northeast regions.

The survey also evaluated sexual behaviors, utilization and access to HIV testing services, condom use, HIV testing history, HIV knowledge, alcohol use, and post-traumatic stress disorder (PTSD). Sexual intercourse was defined as vaginal and/or anal sex and did not include oral sex. Participants provided information on the number of sexual partners they had in the past 12 months, partner types in the past 12 months (regular, casual, and/or sex workers), number of lifetime sexual partners, transactional sex in the past 12 months defined as trading money, food, or goods for sex, and their partner(s) HIV status (HIV-positive, HIV-negative, or don't know). Condom use at last sex (yes/no) was ascertained for all three partner types. To assess attitudes surrounding condoms and condom use, participants were asked if they agreed or disagreed with statements about condoms. This included statements such as: "Condoms can be used more than once" and "I would use condoms more often if I had them when I needed one." Alcohol use was assessed with the Alcohol Use Disorders Identification Test (AUDIT)<sup>16</sup> and categorized as none (score of 0), low use (scores 1-7) and harmful or hazardous use (scores  $\geq 8$ ). The four-item Primary Care Post-Traumatic Stress Disorder Screen (PC-PTSD)<sup>17</sup> was used to screen participants for potential PTSD. Affirmative responses to three or more of the following individual questions constituted a positive PTSD screen: "In your life, have you ever had any experience that was so frightening, horrible, or upsetting that in the past month, you":

1. Have had nightmares about it or thought about it when you did not want to?
2. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it?
3. Were constantly on guard, watchful, or easily startled?
4. Felt numb or detached from others, activities, or your surroundings?

## Statistical Analysis

Participants with indeterminate HIV status, or missing core demographic information such as age were excluded from the HIV analysis. Frequencies for categorical variables and means/standard deviations for continuous variables were calculated for all participants and stratified by sex and HIV status. Chi-square or Fisher's exact tests were used to compare categorical variables, and two-sample t-tests or Wilcoxon's rank-sum tests were used to compare continuous variables between men and women or between HIV positive and HIV-negative subjects. Univariable and multivariable logistic regression models were used to identify factors associated with HIV-infection. Variables associated with HIV infection at  $p < 0.10$  in univariate analysis were included in the multivariable logistic regression model. Statistical significance was set at a p-value less than 0.05. Data analysis was conducted using both SPSS software, version 24 (IBM Corp., Armonk, NY, USA) and SAS software, version 9.4 (SAS Institute Inc., Cary, NC, USA).

## Ethical Considerations

All participants enrolled in the study provided informed consent. To ensure participants understood all aspects of the study including the purpose, procedures, risks, and benefits, the consent form was reviewed in detail in either French or Lingala (a local dialect) by a team counselor. All participants had the right to accept or decline participation and could stop the survey at any time without any negative consequences. As mentioned earlier, all participants who tested positive for HIV or syphilis were immediately referred to a military health facility for further medical assessment, care, and treatment. This research was conducted in compliance with all federal and local regulations and was approved by institutional review boards in San Diego, CA, USA (Naval Health Research Center and San Diego State University) and Kinshasa, Democratic Republic of the Congo (Kinshasa School of Public Health).

## Results

### Demographic and Military Characteristics of the Study Sample

The mean age of participants was 41.3 years (SD=10.3), with men being significantly older than women (41.5 vs. 37.3;  $p<0.001$ ). Men tended to be married or living with a partner, had higher rank, spent more time in the military, and had been on a local deployment of more than 6 months in the past two years compared to women (Table 2.1).

### HIV and Syphilis Prevalence

Table 2.2 presents the seroprevalence of HIV and syphilis of the study participants by age group. The overall prevalence of HIV was 3.5%; with 95 participants testing positive for HIV infection. A total of 425 (15.7%) participants tested positive for active syphilis infection. The highest HIV prevalence was observed in the 40-44 age group (5.2%) ( $p=0.16$ ), while the highest syphilis prevalence was observed in the 50 and older age group (23.6%) ( $p<0.001$ ). Interestingly, the HIV and syphilis co-infection rate was low with only 26 participants (1.0%, data not shown) testing positive for both infections. All co-infected participants were men.

HIV prevalence was higher among men (91/2565, 3.5%) compared to women (4/136, 2.9%, Table 2.3), however this difference was not statistically significant ( $p=1.00$ , data not shown). Syphilis prevalence was higher among women (16.9%) compared to men (15.6%), however this difference was not statistically significant ( $p=0.69$ , data not shown).

### HIV Prevalence by Region (Defense Zone)

HIV prevalence stratified by region is presented in Figure 2.1. Participants stationed in the East and Northeast regions which comprise Defense Zone 3 had the highest HIV prevalence (5.1%). The regional HIV prevalence of FARDC study participants stationed in Defense Zone 3 was more than twice that of Defense Zone 1 (2.4%) and Defense Zone 2 (2.5%) ( $p=0.001$ ).



## Demographic Characteristics and HIV Risk Factors by HIV Status

Demographic characteristics and other risk factors including: age, sex, marital status, military rank, years of military service, number of regular partners, number of HIV tests since joining the military, PTSD status, active syphilis infection, and defense zone are presented by HIV status in Table 2.3.

Participants who reported four or more regular partners in the past 12 months were almost three times more likely to be HIV-positive (OR 2.74, 95% CI 1.27-5.90;  $p=0.028$ ) compared to those who reported zero or one regular partner in the past 12 months. Participants who agreed with the statement “I would use condoms more often if I had them when needed” were nearly twice as likely to be HIV-positive (OR 1.82, 95% CI 2.26-2.86;  $p=0.01$ ) compared to those who disagreed or reported “don’t know” to the statement. The number of HIV tests since joining the military was also associated with testing positive for HIV. Participants who reported four or more tests since joining the military were nearly 70% less likely to be HIV-positive (OR 0.31, 95% CI 0.15-0.65;  $p=0.019$ ) compared to participants who weren’t tested for HIV since joining the military. PTSD status, active syphilis infection, and defense zone were also associated with testing positive for HIV. Participants who screened positive for potentially having PTSD via the PC-PTSD screener were nearly twice as likely to test positive for HIV (OR 1.84, 95% CI 1.06-3.19;  $p=0.03$ ) compared to those without a positive PTSD status. Participants with an active syphilis infection were more than twice as likely to test positive for HIV (OR 2.08, 95% CI 1.31-3.31;  $p=0.0019$ ) compared to participants who tested negative for active syphilis. Lastly, participants stationed in Defense Zone 3 [East and Northeast regions] were more than twice as likely to test positive for HIV (OR 2.14, 95% CI 1.38-3.31;  $p=0.0019$ ) than participants stationed in Defense Zone 1 [West, Northwest, and Kinshasa regions].

The final adjusted multivariable logistic regression model is presented in Table 2.4 and includes age, sex, marital status, number of regular partners in the past 12 months, the statement “I would use condoms more often if I had them when I needed one,” PTSD status, active syphilis infection, and defense zone. Participants who: reported being single, had four or more regular partners in the past 12 months, agreed they would use condoms more often if they had them when needed, had no HIV tests since joining the military, screened positive for PTSD, had an active syphilis infection, and those stationed in Defense Zone 3 all had a significantly higher odds of testing positive for HIV infection.

## **Discussion**

This is the first cross-sectional study to quantify the seroprevalence of HIV (3.5%) and syphilis (15.7%) in a representative sample of FARDC personnel stationed throughout the Democratic Republic of the Congo. The only other study to examine HIV and syphilis in the FARDC performed a single-stage 30-cluster sample among active FARDC personnel stationed only in the capital city of Kinshasa.<sup>11</sup> The estimated HIV prevalence our study found in the military is much higher than the 1.2% estimated prevalence in the general population, and is consistent with the previous FARDC HIV study.<sup>3,11</sup> The prevalence of HIV among men was slightly higher than women (3.54% vs. 2.94%). Previous reports have shown women to have a higher prevalence of HIV in the FARDC,<sup>11,16</sup> however our study examined previously unstudied military sites and may reflect the true epidemic in the FARDC. The age trend in the FARDC was consistent with previous literature,<sup>3</sup> with middle aged participants (40-44 years) having the highest prevalence of HIV infection (5.2%).

The odds of HIV infection significantly increased with the number of regular partners in the past 12 months. FARDC personnel who reported four or more regular partners in the past 12

months had almost three times the odds of testing positive for HIV infection compared to those who reported one or fewer partners in the past 12 months. This finding is consistent with previous research which has shown that the risk of HIV increases as the number of sexual partners increases.<sup>17</sup> Consistent with the known risk of HIV infection and multiple partners, FARDC personnel who were single had higher odds of testing positive for HIV infection compared to those who were married or living with a partner.

The majority of participants (69.3%) reported that they did not know their regular partner's HIV status at last sex (data not shown), however only 1.5% (n=39) reported "always" using condoms in the past 3 months. This finding underscores the importance of partner testing and disclosure. Disclosure of HIV status to and from sexual partners should be encouraged and supported. Lack of disclosure, although a personal right, hinders HIV prevention especially given the low condom use in the military. The limited use of condoms in conjunction with the lack of awareness of a regular partner's HIV status may facilitate HIV transmission and acquisition.

Participants were asked to "agree", "disagree", or respond "don't know" to the following statement: "I would use condoms more often if I had them when I needed one". Our final regression model showed increased odds of testing positive for HIV if a participant responded "agree" compared to those who responded "disagree" or "don't know". This empirical evidence suggests that participants at the highest risk of HIV are unable to conveniently access condoms.

Our research also found FARDC personnel who screened positive for PTSD according to the PC-PTSD screen<sup>18</sup> had nearly twice the odds of testing positive for HIV when compared to those who did not screen positive for PTSD. PTSD has been shown to be associated with elevated rates of substance use, thrill seeking, aggression, and risky sexual practices.<sup>19</sup> These behaviors are

associated with HIV infection and negatively impact military readiness,<sup>19</sup> therefore mental health interventions addressing the burden of potential PTSD are needed in the FARDC.

This study estimated the prevalence of syphilis at 15.7% in the FARDC. This estimate is more than 30% higher than the 11.8% estimate found in the FARDC study conducted in Kinshasa.<sup>11</sup> We found no significant difference in syphilis infection between men (15.6%) and women (16.9%, data not shown), however a higher proportion of HIV-positive participants had syphilis infection compared to negatives (27.4% vs. 15.3%;  $p=0.001$ ). Adjusted OR for syphilis infection was significantly associated with HIV infection, with those testing positive for active syphilis having over two times the odds of HIV infection compared to those who tested negative for active syphilis infection. Estimates of syphilis infection in other high-risk DRC populations such as: Congolese child soldiers (3.4%),<sup>20</sup> displaced women in Eastern DRC (4%),<sup>21</sup> and women in antenatal clinics in Kinshasa (2.0%),<sup>22-23</sup> are much lower than estimates in the FARDC. While coinfection of HIV and syphilis was low (1.0%), risk behaviors for syphilis transmission and acquisition are similar to HIV. Furthermore, genital ulcerations that result from syphilis have been associated with an increased risk of acquiring HIV.<sup>24</sup> The FARDC can benefit from a mass syphilis awareness and treatment campaign. Infected individuals can be easily treated with the well tolerated antibiotic penicillin.

#### Strengths and Limitations

This study had several strengths to validate its findings. First, random sampling at all accessible military sites throughout the entire country resulted in a representative sample that increased the applicability of the findings to the entire FARDC. We also performed a sensitivity analysis to account for the potential effects of clustering by region. Our analysis did not find any significant differences between regions, which strengthens the external validity of the study findings. Next, the use of computer-assisted personal interviews assisted with translation issues,

as all counselors were fluent in English, French, and Lingala. Furthermore the personal interviews may have increased data quality since counselors were properly trained on the CAPI system.

The cross sectional nature of this study was the primary limitation. As causality cannot be determined by a cross-sectional study, it is unclear when HIV seropositive participants became infected (before or after enlistment). However, the practice of testing potential recruits for HIV at enlistment and excluding them from service if they test positive has only been an FARDC policy since 2007.<sup>11</sup> Also, while this study did include a representative sample of FARDC military personnel, the small sample of women (n=136) is not representative of all FARDC women, and is likely too small to detect significant differences.

The prevalence of HIV in DRC has remained low and is steadily decreasing; however, the prevalence of HIV among FARDC military personnel is more than three times the estimated national prevalence. The HIV/STI prevalence in high-risk populations especially among military personnel must be continually monitored in DRC. Unique military risk factors such as mobility, multiple sexual partnerships,<sup>25</sup> and PTSD have the potential to negatively impact the HIV epidemic in DRC. This study should be repeated with an increased sample size, especially among women. Sustainable military interventions focusing on condom use, PTSD, and syphilis are critical in combating the HIV epidemic among the FARDC.

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Table 2.1 Demographic and military characteristics of 2701 study participants by sex

Variable	Total (n=2701) n (%)	Men (n=2565) n (%)	Women (n=136) n (%)	P value
<u>Age, years</u>				<0.001
Mean (SD)	41.3 (10.3)	41.5 (10.3)	37.3 (9.0)	
Median (Range)	39 (19-83)	40 (19-83)	36 (22-61)	
<u>Marital status</u>				<0.001
Married or living with a partner	2451 (90.8)	2360 (92.0)	91 (66.9)	
Not Married, not living with a partner	250 (9.2)	205 (8.0)	45 (33.1)	
<u>Rank</u>				0.004
Recruit	225 (8.3)	211 (8.2)	14 (10.3)	
Corporal	186 (6.9)	168 (6.5)	18 (13.2)	
Sergeant	732 (27.2)	689 (26.9)	43 (31.6)	
Adjutant	392 (14.5)	370 (14.4)	22 (16.2)	
Lieutenant	625 (23.1)	605 (23.6)	20 (14.7)	
Captain/Major/Colonel/Gen.	541 (20.0)	522 (20.3)	19 (14.0)	
<u>Years of Military Service</u>				<0.001
Mean (SD)	20.0 (9.8)	20.2 (9.9)	16.1 (8.0)	
Median (Range)	17 (0-55)	17 (0-55)	15 (1-43)	
<u>Local Deployment, &gt;6 mo in past 2 years</u>				0.015
Yes	533 (19.8)	517 (20.2)	16 (11.8)	
No	2168 (80.2)	2048 (79.8)	120 (88.2)	

Table 2.2 Seroprevalence of HIV and syphilis of study participants by age group

Age Group	Total	HIV+ <sup>a</sup>		Syphilis+ <sup>b</sup>	
		n	(%)	n	(%)
19-24	84	1	(1.2)	8	(9.5)
25-29	183	7	(3.8)	21	(11.5)
30-34	423	10	(2.4)	52	(12.3)
35-39	666	27	(4.1)	79	(11.9)
40-44	482	25	(5.2)	76	(15.8)
45-49	309	11	(3.6)	58	(18.8)
50+	554	14	(2.5)	131	(23.6)
Total	2701	95	(3.5)	425	(15.7)

<sup>a</sup>p=0.16

<sup>b</sup>p<0.001

Table 2.3 Demographic characteristics and HIV risk factors by HIV status of study participants

Variable	Total (n=2701) n (%)	HIV Positive (n=95) n (%)	HIV-Negative (n=2606) n (%)	OR (95% CI)	P Value
<u>Age, years</u>				1.00 (0.98-1.02)	0.88
Mean (SD)	41.3 (10.3)	41.1 (8.8)	41.3 (10.3)		
Median (Range)	39 (19-83)	40 (23-70)	39 (19-83)		
<u>Sex</u>					0.71
Men	2565 (95.0)	91 (95.8)	2474 (94.9)	1.00	
Women	136 (5.0)	4 (4.2)	132 (5.1)	0.82 (0.30-2.28)	
<u>Marital status</u>					0.06
Married or living with a partner	2451 (90.8)	81 (85.3)	2370 (90.9)	1.00	
Single	250 (9.2)	14 (14.7)	236 (9.1)	1.74 (0.97-3.11)	
<u>Rank</u>					0.36
Captain/Major/Colonel/Gen.	541 (20.0)	12 (12.6)	529 (20.3)	1.00	
Recruit	225 (8.3)	6 (6.3)	219 (8.4)	1.21 (0.45-3.26)	
Corporal	186 (6.9)	8 (8.4)	178 (6.8)	1.98 (0.80-4.93)	
Sergeant	732 (27.2)	25 (26.3)	707 (27.1)	1.56 (0.78-3.13)	
Adjutant	392 (14.5)	16 (16.8)	376 (14.4)	1.88 (0.88-4.01)	
Lieutenant	625 (23.1)	28 (29.5)	597 (22.9)	2.07 (1.04-4.11)	
<u>Years of Military Service</u>				1.00 (0.98-1.02)	0.76
Mean (SD)	20.0 (9.8)	19.7 (7.6)	20.0 (9.9)		
Median (Range)	17 (0-55)	17 (1-48)	17 (0-55)		
<u>Local Deployment, &gt;6 months in past 2 years</u>					0.17
No	2168 (80.3)	71 (74.7)	2097 (80.5)	1.00	
Yes	533 (19.7)	24 (25.3)	509 (19.5)	1.39 (0.87-2.23)	



Table 2.3 Demographic characteristics and HIV risk factors by HIV status of study participants, Continued

Variable	Total (n=2701) n (%)	HIV Positive (n=95) n (%)	HIV-Negative (n=2606) n (%)	OR (95% CI)	P Value
<u>No. regular partners, past 12 months</u>					0.028
0-1	1963 (72.7)	61 (64.2)	1902 (73.0)	1.00	
2-3	639 (23.7)	26 (27.4)	613 (23.5)	1.32 (0.83-2.11)	
4+	99 (3.7)	8 (8.4)	91 (3.5)	2.74 (1.27-5.90)	
<u>Condom use, past 3 months<sup>a</sup></u>					0.76
Always	39 (1.6)	2 (2.4)	37 (1.6)	1.00	
Sometimes	324 (13.2)	12 (14.6)	312 (13.2)	0.71 (0.15-3.30)	
Rarely/Never	2087 (85.2)	68 (82.9)	2019 (85.2)	0.62 (0.15-2.64)	
<u>Would use condoms more often if I had them when needed</u>					0.01
Disagree / Don't know	1120 (41.4)	27 (28.4)	1093 (41.9)	1.00	
Agree	1581 (58.6)	68 (71.6)	1513 (58.1)	1.82 (1.16-2.86)	
<u>No. of HIV tests since joining the military</u>					0.019
0	760 (28.1)	37 (39.0)	723 (27.7)	1.00	
1	510 (18.9)	19 (20.0)	491 (18.8)	0.76 (0.43-1.33)	
2-3	854 (31.6)	30 (31.6)	824 (31.6)	0.71 (0.44-1.16)	
4+	577 (21.4)	9 (9.5)	568 (21.8)	0.31 (0.15-0.65)	

Table 2.3 Demographic characteristics and HIV risk factors by HIV status of study participants, Continued

Variable	Total (n=2701) n (%)	HIV Positive (n=95) n (%)	HIV-Negative (n=2606) n (%)	OR (95% CI)	P Value
<u>PTSD status</u>					0.03
No	2426 (89.8)	79 (83.2)	2347 (90.1)	1.00	
Yes	275 (10.2)	16 (16.8)	259 (9.9)	1.84 (1.06-3.19)	
<u>Active syphilis infection</u>					0.0019
No	2276 (84.3)	69 (72.6)	2207 (84.7)	1.00	
Yes	425 (15.7)	26 (27.4)	399 (15.3)	2.08 (1.31-3.31)	
<u>Defense Zone<sup>b</sup></u>					0.0019
1	1357 (50.2)	33 (34.7)	1324 (50.8)	1.00	
2	236 (8.8)	6 (6.3)	230 (8.8)	1.05 (0.43-2.53)	
3	1108 (41.0)	56 (59.0)	1052 (40.4)	2.14 (1.38-3.31)	

<sup>a</sup>Excludes those who reported no sexual activity in the past 3 months (n=249) or missing responses (n=2).

<sup>b</sup>Defense Zone 1 consists of soldiers stationed in the West, Northwest, and Kinshasa regions; Defense Zone 2 consists of soldiers stationed in the South and Southeast regions; Defense Zone 3 consists of soldiers stationed in the East and Northeast regions.

OR, odds ratio;

CI, confidence interval

Table 2.4 Adjusted odds of HIV Infection among study participants

Variable	AOR (95% CI)	P Value
<u>Marital status</u>		0.018
Single vs. Married or living with partner	2.27 (1.17-4.42)	
<u>Number of regular partners, past 12 months</u>		<0.0001
2-3 vs. 0-1	1.37 (0.78-2.40)	
4+ vs. 0-1	2.67 (1.70-4.19)	
<u>Would use condoms more often if I had them when needed</u>		0.002
Agree vs. Disagree/Don't know	1.97 (1.31-2.97)	
<u>No. of HIV tests since joining the military</u>		0.032
1 vs. 0	0.73 (0.47-1.15)	
2-3 vs. 0	0.74 (0.51-1.06)	
4+ vs. 0	0.30 (0.13-0.68)	
<u>PTSD status</u>		0.05
Yes vs. No	1.85 (1.00-3.48)	
<u>Active syphilis infection</u>		0.001
Yes vs. No	2.04 (1.35-3.09)	
<u>Defense Zone<sup>a</sup></u>		0.026
2 vs. 1	1.04 (0.42-2.59)	
3 vs. 1	2.01 (1.19-3.41)	

<sup>a</sup>Defense Zone 1 consists of soldiers stationed in the West, Northwest, and Kinshasa regions; Defense Zone 2 consists of soldiers stationed in the South and Southeast regions; Defense Zone 3 consists of soldiers stationed in the East and Northeast regions.

AOR, adjusted odds ratio (adjusted for age, sex, and all variables listed in the model);

CI, confidence interval

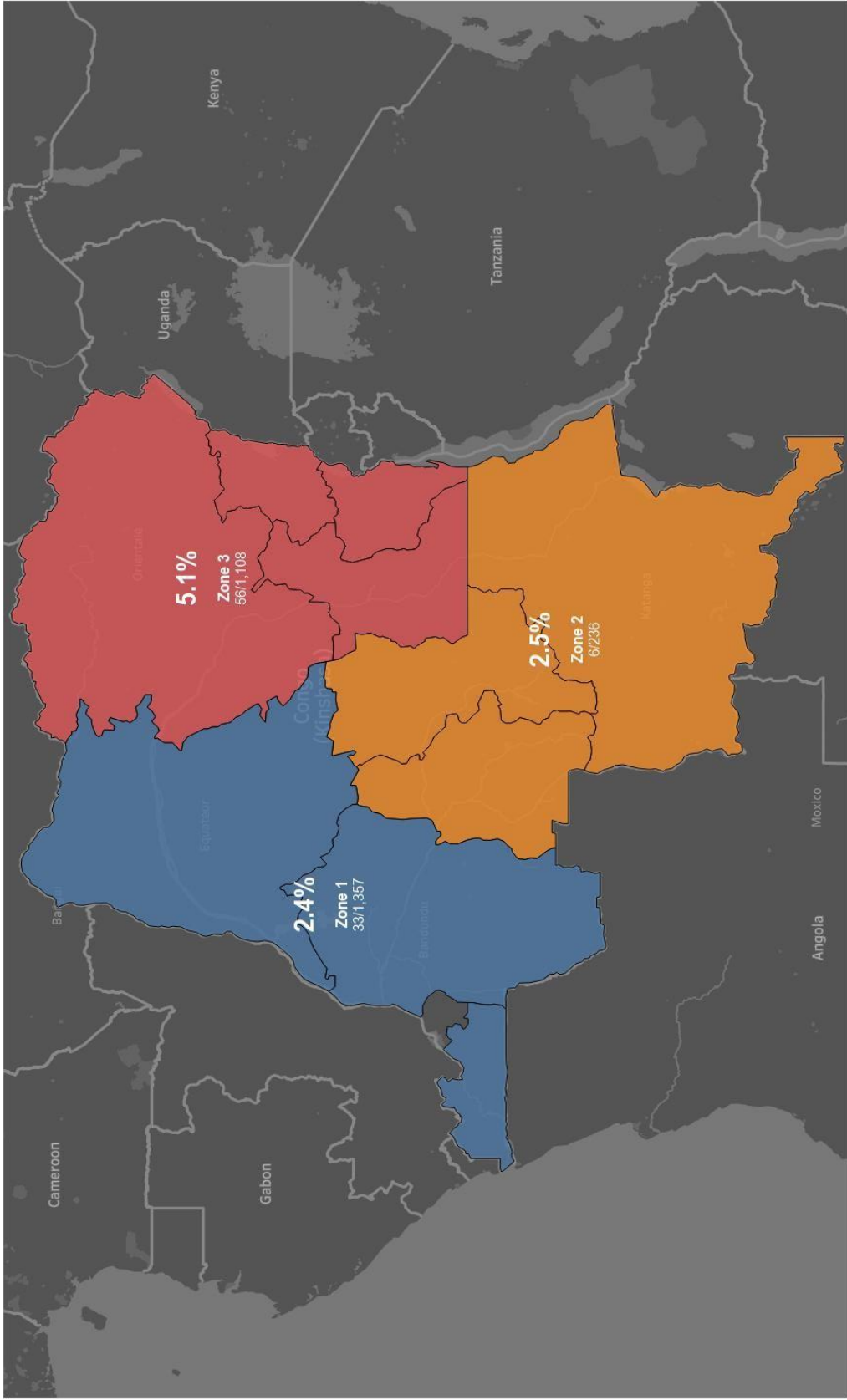


Figure 2.1 HIV seroprevalence of study participants by defense zone (N=2701)

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**CHAPTER 3: CORRELATES OF CONDOM USE IN THE ARMED FORCES OF THE  
DEMOCRATIC REPUBLIC OF THE CONGO**



## **Abstract**

**Background:** Preventing sexually transmitted infections (STIs) including HIV is a top priority for militaries worldwide, due to force readiness and combat preparation. STI research is necessary to maximize prevention resources, develop useful and innovative interventions, and to monitor and modify existing programs. Correct and consistent condom use is one of the most effective ways to prevent STI transmission and acquisition. However, condom use in military personnel has consistently been reported to be low. This study examines correlates of condom use in the Armed Forces of the Democratic Republic of the Congo (FARDC).

**Methods:** Analyses were performed on 2232 male personnel, aged 19-83, who completed a cross-sectional survey that collected data for an HIV seroprevalence and behavioral risk study.

**Results:** Consistent condom use was very low use in this population; 1.5% of participants reported always using condoms, 13.6% reported sometimes using condoms, and 84.9% reported rarely/never using condoms. Condom use varied by partner type and was higher among casual partners compared to regular partners. After adjustment for age, marital status, and partner type, factors associated with decreased condom use included: condom accessibility, several reported reasons for not using condoms (reduced sexual pleasure, lubricant/texture/smell, and not trusting condoms), numerous negative attitudes and opinions towards condom use, and lower knowledge of HIV prevention and transmission.

**Conclusions:** Interventions for increasing condom use in the FARDC should focus on making condoms available at all barracks, addressing the presentation, scent, issues of trust, and perceptions about condoms, and increasing HIV knowledge.

## Introduction

The Democratic Republic of the Congo (DRC) has an HIV prevalence estimated at 1.2% among adults aged 15-49 according to the 2013-14 Demographic and Health Survey (DHS).<sup>1</sup> While the HIV prevalence in DRC is relatively low, the HIV prevalence among active-duty members of the Armed Forces of the Democratic Republic of the Congo (FARDC) according to a 2007 study is estimated at 3.8%,<sup>2</sup> a more than three-fold increase. Furthermore, active, untreated syphilis prevalence was estimated to be 11.9% in this population.<sup>2</sup> This research supports the notion that the HIV epidemic in DRC is concentrated, and key populations such as the military require further study. Several studies have shown that military personnel may be particularly vulnerable and at increased risk for sexually transmitted infections (STIs) including HIV, due to unique military characteristics such as mobility<sup>3</sup>, risky sexual behaviors (i.e. unprotected sex with sex workers) to relieve stress and loneliness<sup>4</sup>, multiple sex partners<sup>5,6</sup>, and alcohol abuse.<sup>7</sup>

There is strong evidence that condoms are highly effective in preventing STIs if used correctly and consistently.<sup>8-10</sup> However, condom use among military personnel has consistently been reported to be low. A study conducted among the Botswana Defence Force showed consistent condom use 51% of the time<sup>11</sup>, and a study in the Nigerian military showed consistent condom use was only reported by 20% of participants.<sup>7</sup> Furthermore, among those who reported sex with a sex worker, 46% of Angolan military men<sup>6</sup>, 41% of Nigerian military men<sup>4</sup>, and 24% of Rwandan military men<sup>12</sup> did not use a condom the last time they had sex with a sex worker.

While numerous studies have examined correlates of condom use among military personnel<sup>6, 11, 13, 14</sup>, additional research is needed in other militaries. In addition to vast differences in military operations and overall functionality, additional research is necessary to evaluate the effectiveness of existing HIV prevention programs, modify best practices and approaches to HIV

prevention, and report current attitudes towards condom use. This study examines correlates of decreasing condom use in the FARDC, which to date has not been investigated.

## **Methods**

The data used for this cross-sectional analysis were based on an HIV seroprevalence and behavioral risk survey conducted among the FARDC in 2013-2014. Participants were male FARDC personnel who reported having sex in the past three months, were at least 18 years of age, and stationed at one of the 30 military sites located throughout DRC. Soldiers were selected based on defense zone, region, and branch to ensure the sample reflected the structure of the military. All participants were given detailed information about the study objectives and procedures by a trained counselor, and provided electronic informed consent. A total of 2,611 men (96.7%), of a target sample size of 2,700 consented to participate in the study. Participants missing key variables (i.e. age) or reported no sexual activity in the past 3 months were excluded from the analysis (n=379), leaving a final sample size of 2,232. This study was approved by institutional review boards in San Diego, USA (Naval Health Research Center and San Diego State University) and the Democratic Republic of the Congo (School of Public Health, Kinshasa, Democratic Republic of the Congo).

### **Study Procedures**

Trained FARDC counselors briefed interested soldiers on the procedures of the study and conducted the electronic informed consent process. Counselors then conducted a computer-assisted personal interview (CAPI) in a private setting. To ensure comprehension, all questions were read by a counselor in the participants' language of choice (English, French, or Lingala). The survey collected demographic information, as well as data on sexual history, condom use, attitudes and behaviors towards condoms, HIV knowledge, and alcohol use.

## Correlates of Interest

Potential correlates of condom use included sexual history (age at sexual debut, number of lifetime partners, and number of regular, casual, and sex worker partners in the past 12 months). Condom accessibility (availability of free condoms at the barracks) and reported reasons for not using condoms (makes sex less enjoyable, I don't like lubricant/texture/smell, and I don't trust condoms) were also examined.

Participants were asked to provide their opinions (agree, disagree, or don't know) about condom use on eight statements. Due to the nature of the questions (we were interested in whether participants agreed or not), participants who responded "disagree" and "don't know" were combined into one category.

Alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT), which has been validated in several populations worldwide<sup>15</sup>, including African military personnel.<sup>6, 11, 12</sup> The AUDIT consists of 10 questions that measure alcohol use, harmful and hazardous drinking (problematic drinkers), and alcohol dependence. Responses to each AUDIT question were scored and those with an AUDIT score of 0 were classified as non-drinkers, those with a score of 1-7 were classified as mild drinkers and those with a score of 8 or higher were considered problematic drinkers, indicating harmful or hazardous use.

Participants were tested on HIV prevention, transmission, and general knowledge with five questions based on the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS core indicators.<sup>16</sup> The HIV knowledge score was calculated as a percentage of the five HIV knowledge questions answered correctly.

## Outcome Measures

The outcome for this analysis was condom use in the past three months categorized as: always, sometimes, or rarely/never using condoms. Always was defined as 100% condom use, sometimes was defined as 26%-99% condom use, and rarely/never was defined as 0%-25% condom use. These three categories were coded for an ordinal regression model to assess frequency of condom use in the FARDC.

## Statistical Analysis

Descriptive statistics were computed for all variables, including frequencies and percentages for categorical variables and means and standard deviations, or medians and ranges for continuous variables. Unadjusted analyses were performed to examine the association of each correlate of interest with condom use frequency, defined as the odds of decreased condom use, using ordinal logistic regression. Correlates with  $p \leq 0.15$  in unadjusted analysis were further examined in multivariable ordinal logistic regression model. Backwards elimination was used for removing insignificant variables from the model. Only variables with  $p < 0.05$  were retained in the final multivariable model. The final model was also adjusted for age, marital status, and partner type. The proportional odds assumption was also assessed and satisfied for the final model. All statistical analyses were performed using SAS statistical software version 9.4 (SAS Institute, Cary, NC).

## Results

Demographic, military, and sexual history characteristics are presented in Table 3.1. The mean age of participants was 41.6 years (SD = 9.9) and ranged from 19-83, and the majority (94.9%) were married or living with a partner. Sergeants, lieutenants, and captains or above made up the majority of the ranks at 27.6%, 24.3%, and 20.6% respectively. The mean years of military service was 20.4 years (SD = 9.4), and most participants (80%) had not been on a local deployment

of greater than six months in the past two years. The mean age of sexual debut was 17.8 years (SD = 3.5). The mean number of lifetime partners was 28.8 (SD = 35.7), and the mean number of regular partners in the past 12 months was 1.5 (SD = 1.5). The mean number of casual partners and sex workers in the past 12 months was approximately 1 (SD = 2.4, 3.9, respectively).

Condom use correlates are presented in Table 3.2. When asked about accessibility to free condoms within their military, nearly a quarter (21.7%) reported free condoms are not available at their barracks. Furthermore, 12.1% reported condoms make sex less enjoyable. To assess attitudes towards condoms, soldiers were asked to agree or disagree with a series of questions. Approximately half agreed: they would use a condom more often if they had one when needed (58.7%), it is alright for a married man to use a condom with his wife (47.4%), and it is alright for a married woman to ask her husband to use a condom (45.7%). Additionally, nearly 20% reported condoms can be used more than once (21.7%), a man would lose respect for a woman if she suggested condom use (20.3%), and a woman would lose respect for a man if he suggested condom use (20.2%). Fifteen percent of the participants were defined as problem drinkers according to their AUDIT score. Only 32.7% responded correctly to all five UNGASS HIV knowledge questions, however correct responses to individual questions ranged from (54%-80.1%).

Condom use frequency in the past 3 months is presented in Figure 3.1. The majority of participants (84.9%) reported rarely/never using condoms, 13.6% reported using condoms sometimes, and 1.5% reported always using condoms.

Table 3.3 presents the results of bivariate analysis to identify correlates of condom use frequency. Significant correlates of decreasing condom use ( $p \leq 0.05$ ) included: condom accessibility (free condoms are not available at my barracks), reasons for not using condoms (condoms makes sex less enjoyable, I don't like lubricant/texture/smell, I don't trust condoms),

opinions about condoms (those who disagreed with the following statements: “I would use a condom more often if I had one when needed,” “it is alright for a married man to use a condom with his wife,” “it is alright for a married woman to ask her husband to use a condom,” and “it is the man’s responsibility to have a condom when needed”). Furthermore, participants who agreed with the following statements: “A man would lose respect for a woman if she suggested condom use,” and “a woman would lose respect for a man if he suggested condom use,” were also significantly correlated with decreasing condom use. Lastly, lower alcohol use, those who did not score 100% on the UNGASS HIV knowledge questions, and those who disagreed with “there is something a person can do to avoid getting HIV,” were also significantly correlated with decreasing condom use.

Adjusted odds ratios (AORs) are presented for the results for the final multivariable model in Table 3.4. After adjusting for age, marital status, partner type, and all variables in the model, condom accessibility, three reported reasons for not using condoms, several opinions about condoms, and HIV knowledge were found to be associated with lower frequency of condom use. The odds of decreasing condom use were 1.52 times higher among those who reported free condoms were not available at their barracks compared to those who reported free condoms were available (95% CI = 1.05-2.21). The odds of decreasing condom use were 2.75 times higher among participants who indicated condoms make sex less enjoyable (95% CI = 1.63-4.63), 3.61 times higher among participants who reported they did not like the lubricant, texture, and/or smell (95% CI = 1.06-12.30), and 4.54 times higher among participants who reported they did not trust condoms (95% CI 1.08-19.02). Several opinions about condoms statements were significantly associated with decreased condom use. The odds of decreasing condom use were more than five times higher among participants who disagreed that they would use a condom more often if they

had one when needed (AOR = 5.04, 95% CI = 3.42-7.42). Additionally, the odds of decreasing use were 1.53 times higher among participants who disagreed with the statement “it is alright for a married man to use a condom with his wife” (95% CI = 1.16-2.01), and 1.41 times higher among participants who disagreed with the statement “it is the man’s responsibility to have a condom when needed” (95% CI = 1.08-1.84). The odds of decreasing condom use were almost two times higher among participants who agreed “a man would lose respect for a woman if she suggested he use a condom” (AOR 1.94, 95% CI = 1.29-2.92). Lastly, HIV knowledge was associated with decreasing condom use. The odds of decreasing condom use were 1.75 times higher among those who did not answer all five UNGASS HIV knowledge questions correctly compared to those who did (95% CI = 1.34-2.29).

## **Discussion**

Correct and consistent condom use is vital for preventing STI transmission. Condoms have been reported to be one of the least expensive and most accessible methods for STI prevention.<sup>11</sup> However, several factors have been shown to contribute to low condom use among military personnel including: religious beliefs<sup>17</sup>, the belief condoms are ineffective or unreliable<sup>17, 18</sup>, and trust issues.<sup>19</sup> Results from this study show that consistent condom use in the FARDC was very low, with only 1.5% of participants reporting always using condoms. Similar to several other studies<sup>6, 11, 21, 22</sup>, consistent condom use was higher with casual partners than regular partners (5.4% vs. 0.6%; data not shown). However of the 661 participants who reported sex with a casual partner, the vast majority (94.6%) of participants did not report consistent condom use. Furthermore, 20.5% of the participants reported more than one partner type in the past 6 months (n=458; data not shown). Military personnel in multiple sexual partnerships who are not consistently using condoms put themselves and their partners at higher risk for STIs.<sup>11</sup>



Several factors were strongly associated with lower condom use, including condom accessibility and several reasons for not using condoms. Participants who reported free condoms were not available at their barracks were less likely to use condoms. Over the last several years, mass condom distribution campaigns have been ongoing in the FARDC with assistance from the Department of Defense HIV/AIDS Prevention Program (DHAPP) <sup>20</sup>, while these programs have provided free condoms to many health facilities in targeted provinces, these programs should continue to monitor the condom distribution channels and ensure all soldiers have accessibility to free condoms at their barracks. Participants who reported that “condoms make sex less enjoyable”, they “didn’t like the lubricant/texture/smell”, or they “didn’t trust condoms” were significantly less likely to use them. Other studies have reported that putting on a condom dampens sexual mood, skin-to-skin contact is preferred, and condoms may cause sexual discomfort.<sup>17,18</sup> Furthermore, a study of condom use correlates in the Botswana Defence Force found that free condoms are sometimes not used because of an unpleasant odor.<sup>11</sup> The FARDC should consider several intervention strategies, including providing condoms that are appealing to their military members, educating their members on the safety and importance of condoms to build trust, and surveying focus groups to gather qualitative data on why condoms reduce sexual pleasure and make sex less enjoyable in this population.

This study found significant associations between opinions surrounding condom use and lower condom use, and is consistent with many other studies.<sup>11, 21, 22</sup> Elevated odds of decreased condom use were observed in participants who disagreed they would use a condom more often if they had one when needed, disagreed that it is alright for a married man to use a condom with his wife, and disagreed it is the man’s responsibility to have a condom when needed. Elevated odds of decreased condom use were also observed in participants that agreed a man would lose respect

for a woman if she suggested condom use. These findings show that some members of the FARDC have negative attitudes towards condoms. These opinions towards condoms should be further examined among the FARDC, as they adversely influence consistent condom usage.

Lastly, lower levels of HIV prevention and transmission knowledge were found to be associated with decreased condom use, which is consistent with several other studies.<sup>11, 23, 24</sup> Low to moderate levels of HIV knowledge are an indication that FARDC HIV education programs are not reaching all service members. The FARDC should expand their HIV education campaigns to all members, and couple HIV knowledge messaging with information on correct and consistent condom use.

The primary limitations of this study were its cross-sectional design, and the lack of information on female service members. However, this study has several strengths to validate its findings. First, a large random sample of active-duty military men from all accessible military sites throughout the country was utilized. This resulted in a representative sample and increased the applicability of the finding to the entire male population of the FARDC. Furthermore, despite the fact that participants could skip any questions they weren't comfortable answering, we had very little missing data. This allowed for a more comprehensive analysis, as numerous correlates of condom use were examined.

In conclusion, this study thoroughly examined correlates of condom use and decreasing condom use frequency, highlighted approaches to increase condom use, and supported existing research on condom use in military populations.

## **Acknowledgments**

Chapter 3, in part, is currently being prepared for submission for publication of the material. Shaffer, Richard; Garfein, Richard; Liu, Lin; Woodruff, Susan; Macera, Caroline. The dissertation author was the primary author of this material.

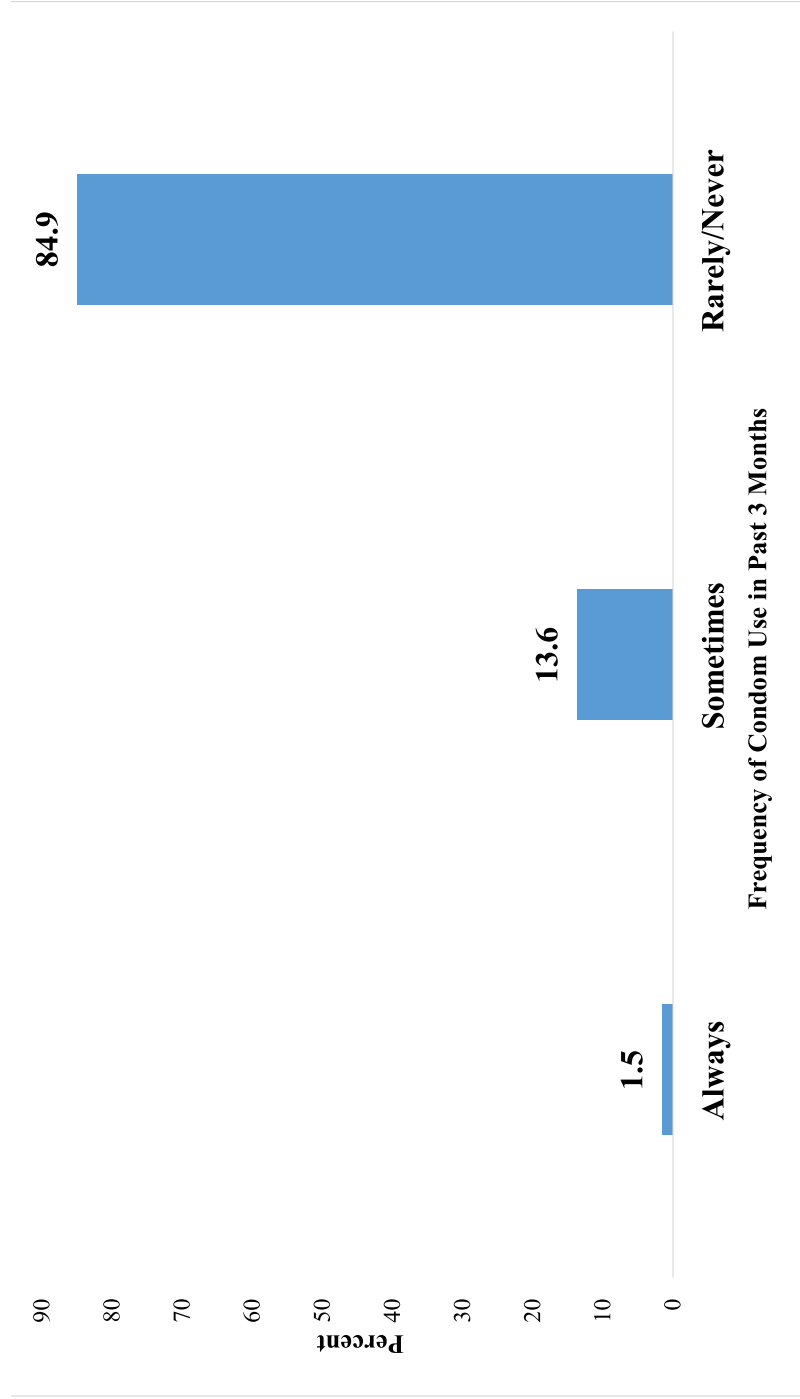


Figure 3.1 Male study participants reported condom use frequency in the past 3 months ( N = 2232)

Table 3.1. Demographic, military, and sexual history characteristics of 2232 male study participants

Variable	n (%)
<u>Age, years</u>	
Mean (SD)	41.6 (9.9)
Median (Range)	40 (19-83)
<u>Marital status</u>	
Never married, not living with partner	59 (2.6)
Married or living with a partner	2119 (94.9)
Widowed/divorced/separated	54 (2.4)
<u>Rank</u>	
Recruit	132 (5.9)
Corporal	143 (6.4)
Sergeant	617 (27.6)
Adjutant	338 (15.1)
Lieutenant	542 (24.3)
Captain/Major/Colonel/Gen.	460 (20.6)
<u>Years of Military Service</u>	
Mean (SD)	20.4 (9.4)
Median (Range)	17 (0-55)
<u>Local Deployment, &gt;6 mo in past 2 years</u>	
Yes	447 (20.0)
No	1785 (80.0)
<u>Sexual History</u>	
Age at first sexual debut in years, Mean (SD)	17.8 (3.5)
Number of lifetime partners, Mean (SD)	28.8 (35.7)
Number of regular partners in past 12 months, Mean (SD)	1.5 (1.5)
Number of casual partners in past 12 months, Mean (SD)	0.8 (2.4)
Number of sex workers in past 12 months, Mean (SD)	0.8 (3.9)

Table 3.2 Correlates of condom use of male study participants

Variable	n (%)
<u>Condom accessibility</u>	
Free condoms not available at barracks	484 (21.7)
<u>Reported reasons for not using condoms</u>	
Makes sex less enjoyable	270 (12.1)
I don't like lubricant/texture/smell	86 (3.9)
Forbidden in my religion	85 (3.8)
I don't trust them	72 (3.2)
<u>Opinions about condoms<sup>a</sup></u>	
I would use a condom more often if I had them when needed	1311 (58.7)
It is alright for a married man to use a condom with his wife	1059 (47.4)
It is alright for a married woman to ask her husband to use a condom	1019 (45.7)
It is the man's responsibility to have condoms when needed	788 (35.3)
Condoms can be used more than once	484 (21.7)
A man would lose respect for a woman if she suggested condom use	452 (20.3)
A woman would lose respect for a man if he suggested condom use	451 (20.2)
<u>Alcohol use</u>	
None/Low use (AUDIT<8)	1897 (85.0)
Harmful/hazardous use (AUDIT ≥ 8)	335 (15.0)
<u>HIV knowledge</u>	
Scored 100% on HIV knowledge questions <sup>b</sup>	729 (32.7)
There is something a person can do to avoid getting HIV	1955 (87.6)

AUDIT, Alcohol Use Disorders Identification Test

<sup>a</sup>Agreement with each statement

<sup>b</sup>Percentage of correct responses to all five UNGASS HIV knowledge questions: Having sex with only one faithful, uninfected partner reduces the risk of HIV transmission (79.7%), HIV cannot be transmitted from mosquito bites (54%), Using condoms reduces the risk of HIV transmission (85%), HIV cannot be transmitted by sharing a meal with someone who is infected (70.8%), A healthy-looking person can have HIV (80.1%)

Table 3.3 Unadjusted associations of condom use correlates with decreasing condom use

Variable	OR	(95% CI) <sup>a</sup>	P Value
<u>Condom accessibility</u>			
Free condoms not available at barracks Yes vs. No	1.88	(1.35-2.61)	<0.0001
<u>Reported reasons for not using condoms</u>			
Makes sex less enjoyable Yes vs. No	2.42	(1.51-3.88)	<0.0001
I don't like lubricant/texture/smell Yes vs. No	5.10	(1.60-16.25)	<0.001
Don't trust condoms Yes vs. No	6.42	(1.56-26.33)	<0.0001
<u>Opinions about condoms</u>			
Would use a condom more often if I had them when needed Disagree vs. Agree	7.53	(5.24-10.80)	<0.0001
It is alright for a married man to use a condom with his wife Disagree vs. Agree	2.15	(1.69-2.73)	<0.0001
It is alright for a married woman to ask her husband to use a condom Disagree vs. Agree	2.08	(1.64-2.64)	<0.0001
It is the man's responsibility to have condoms when needed Disagree vs. Agree	1.34	(1.06-1.69)	0.02
Condoms can be used more than once Agree vs. Disagree	0.83	(0.63-1.09)	0.18

Table 3.3 Unadjusted associations of condom use correlates with decreasing condom use, Continued

Variable	OR	(95 % CI)	P Value
A man would lose respect for a woman if she suggested condom use			
Agree vs. Disagree	2.43	(1.69-3.51)	<0.0001
A woman would lose respect for a man if he suggested condom use			
Agree vs. Disagree	2.12	(1.50-3.02)	<0.0001
<u>Alcohol use</u>			
Harmful use (AUDIT $\geq$ 8) vs. None/Low use (AUDIT<8)	0.72	(0.54-0.98)	0.04
<u>HIV knowledge</u>			
Scored 100% on HIV knowledge questions			
No vs. Yes	1.59	(1.26-2.02)	0.0001
There is something a person can do to avoid getting HIV			
Disagree vs. Agree	2.62	(1.62-4.24)	<0.0001

AUDIT, Alcohol Use Disorders Identification Test; CI, confidence interval; OR, odds ratio



Table 3.4 Multivariable ordinal regression model examining correlates of condom use and decreasing condom use

Variable	AOR <sup>a</sup>	(95% CI)	P Value
<u>Condom accessibility</u>			
Free condoms not available at barracks			
Yes vs. No	1.52	(1.05-2.21)	0.03
<u>Reported reasons for not using condoms</u>			
Makes sex less enjoyable			
Yes vs. No	2.75	(1.63-4.63)	0.0001
I don't like lubricant/texture/smell			
Yes vs. No	3.61	(1.06-12.30)	0.04
Don't trust condoms			
Yes vs. No	4.54	(1.08-19.02)	0.04
<u>Opinions about condoms</u>			
Would use a condom more often if I had them when needed			
Disagree vs. Agree	5.04	(3.42-7.42)	<0.0001
It is alright for a married man to use a condom with his wife			
Disagree vs. Agree	1.53	(1.16-2.01)	0.003
It is the man's responsibility to have condoms when needed			
Disagree vs. Agree	1.41	(1.08-1.84)	0.01
A man would lose respect for a woman if she suggested condom use			
Agree vs. Disagree	1.94	(1.29-2.92)	0.002

Table 3.4 Multivariable ordinal regression model examining correlates of condom use and decreasing condom use, Continued

Variable	AOR <sup>a</sup>	(95% CI)	P Value
<u>HIV knowledge</u>			
Scored 100% on HIV knowledge questions <sup>a</sup>			<0.0001
No vs. Yes	1.75	(1.34-2.29)	

AOR, adjusted odds ratio; CI, confidence interval

<sup>a</sup>Adjusted for age, marital status, partner type, and other variables in the model

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**CHAPTER 4: GEOGRAPHIC DIFFERENCES IN HIV INFECTION IN THE ARMED  
FORCES OF THE DEMOCRATIC REPUBLIC OF THE CONGO**

## **Abstract**

**Background:** Geography plays an important role in estimating HIV prevalence in sub-Saharan African countries including the Democratic Republic of the Congo (DRC). Regions with economic, social, and political factors including poverty and civil unrest tend to be disproportionately affected by the burden of HIV. Eastern DRC has been a conflict-afflicted and resource limited region for decades. This study examined the geographic differences between the correlates of HIV infection, and investigated their association with HIV seropositivity among Armed Forces of the Democratic Republic of the Congo (FARDC) military personnel.

**Methods:** This cross-sectional study investigated a representative sample of 1108 soldiers stationed in Eastern DRC who participated in the 2013-2014 HIV Seroprevalence and Behavioral Epidemiology Risk Survey (SABERS). Computer assisted personal interviews were utilized to collect risk behavior data and HIV rapid tests were performed to assess HIV seroprevalence. Descriptive statistics and logistic regression models were used to examine correlates of HIV infection and assess the relationship with HIV seropositivity.

**Results:** The seroprevalence of HIV was 5.1% in Defense Zones 3, which consists of the East and Northeast regions of the DRC. In the final adjusted model for participants stationed in Defense Zone 3, significant associations of HIV infection were not being married (aOR 5.57, 95% CI 2.49-12.44;  $p=0<0.0001$ ), having four or more regular partners in the past 12 months (aOR 3.54, 95% CI 1.38-9.05;  $p=0.027$ ), and testing positive for active syphilis infection (aOR 2.44, 95% CI 1.35-4.42;  $p=0.003$ ).

**Conclusion:** The prevalence of HIV in the FARDC is much higher in Defense Zone 3 than in Defense Zone 1 or 2. Several correlates of HIV infection were found to be associated with HIV seropositivity among troops stationed in the Eastern region of the DRC. Efforts to encourage

behavior change such as correct and consistent condom use, mandatory HIV testing, and a syphilis awareness and treatment program should be implemented in this population.

## Introduction

Research conducted in Armed Forces of the Democratic Republic of the Congo (FARDC) personnel stationed in the capital city of Kinshasa in 2007 found an HIV prevalence of 3.8%.<sup>1</sup> This prevalence estimate is more than three times higher than the 1.2% prevalence estimated in the general population of the Democratic Republic of the Congo (DRC) by the Demographic Health Survey (DHS).<sup>2</sup> Several unique military characteristics such as deployment and unprotected sex with commercial sex workers have been shown to be associated with HIV infection.<sup>3</sup> While these characteristics may help explain the discrepancy in prevalence between the military and general population, they may not completely account for such a vast difference in HIV prevalence estimates.

Geography has been shown to contribute to the HIV epidemic in several African countries. Past studies have found geographic factors such as: population mobility, migrant labor routes, and the proximity of rural populations to urban high transmission areas are associated with HIV infection.<sup>4-11</sup> Unfortunately, HIV surveillance data in the DRC is limited; however, prevalence estimates have suggested much higher rates of HIV in the Eastern regions of the country.<sup>12,13</sup>

Eastern DRC has been the epicenter of war and conflict in the country since the beginning of the HIV epidemic.<sup>12,13</sup> It is plausible that chaos, poverty, population displacement, and sexual violence would lead to higher rates of HIV transmission, however the prevalence of HIV in the DRC is low compared to most of sub-Saharan Africa.<sup>12</sup> Furthermore, several studies have found little or no association between HIV and conflict. A Lancet review article conducted among conflict-affected people in seven sub-Saharan African countries including the DRC found no relationship between HIV seroprevalence and conflict.<sup>14</sup> Another study surprisingly found no effect of sexual violence on HIV prevalence.<sup>15</sup> This study modeled widespread rape (15% of the



female population) in seven countries including the DRC, and suggested the overall HIV seroprevalence would only increase by 0.023%. However, two studies conducted in the DRC found that violence is associated with increased HIV seroprevalence in key populations such as refugees compared to the general population.<sup>16,17</sup>

Research on the association between conflict and HIV seroprevalence in sub-Saharan Africa has been inconsistent. Furthermore, no study has examined geographic differences in HIV prevalence among the FARDC. The purpose of this cross-sectional analysis is to investigate correlates of HIV infection in the different regions of the DRC. Specifically, the research will focus on the conflict-affected Eastern regions of the DRC and assess risk behaviors associated with HIV infection.

## **Methods**

### **Data**

This cross-sectional study used data from the 2013-2014 Armed Forces of the Democratic Republic of the Congo HIV Seroprevalence and Behavioral Epidemiology Risk Survey (SABERS), a military specific study led by the United States Department of Defense HIV/AIDS Prevention Program (DHAPP). The FARDC SABERS was conducted among active-duty military personnel to determine the prevalence of HIV and examine risk behaviors associated with HIV infection in the FARDC. Participants were selected using a proportional random sampling design. A representative sample was obtained by randomly selecting military units from a list of military bases from each region. Secluded military bases in rural areas were excluded from the study due to their small size and logistical challenges reaching them. After informed consent was obtained from the participants, trained FARDC counselors administered a detailed questionnaire via personal interview. Counselors were military personnel trained on proper interview techniques in

order to minimize interviewer and respondent biases. The survey collected information on demographics, risk behaviors, HIV testing frequency, and PTSD indicators. The analysis was performed on the sample of FARDC personnel who completed the questionnaire and were tested for HIV.

## Measures

**Dependent Variable:** The primary outcome is HIV infection based on the DRC national HIV rapid test algorithm. The algorithm utilizes a serial approach with the Alere Determine HIV-1/2 assay and the Trinity Biotech Uni-Gold Recombigen HIV 1/2 assay. Participants were only considered positive for HIV infection if their blood sample was reactive on both assays.

**Independent Variables:** Explanatory variables included demographics such as: age (18 and older), sex (male, female), and marital status (single [including widows], married [including those living with a partner]); military characteristics such as: rank (recruit-general), years of military service, and local deployments of greater than 6 months in the past 2 years (no, yes). Sexual history (number of regular, casual, and sex worker partners in the past 12 months), condom use in the last three months (less than always, always), HIV testing frequency (ever taken an HIV test, number of tests since joining the military), alcohol use (none/low, harmful/hazardous) based on the Alcohol Use Disorders Identification Test (AUDIT) scale,<sup>18</sup> post-traumatic stress disorder (PTSD) (no, yes) based on a published valid screener known as the Primary Care Post Traumatic Stress Disorder Screen (PC-PTSD),<sup>19</sup> and active syphilis infection (no, yes) based on the results of a Chembio DPP Syphilis Screen and Confirm Assay (sensitivity=99% ; specificity=96%) were also examined.

## Ethical Consideration

Ethical review and approval for the study was obtained from the Naval Health Research Center, San Diego, USA (Protocol: NHRC.2013.0024), San Diego State University, San Diego, USA, and the Kinshasa School of Public Health, Kinshasa, Democratic Republic of the Congo.

### Statistical Analysis

Descriptive statistics (frequencies, percentages, means, and standard deviations) were used to summarize the demographics, military characteristics, and risk behaviors of the sample. Chi-square or Fisher's exact tests were performed to assess differences among categorical variables, and one-way analysis of variance was used to examine differences among the continuous variables between the defense zones. Univariate analyses were performed to examine the association of each correlate of interest with HIV infection, defined as the odds of HIV seropositivity, using logistic regression. Correlates with  $p < 0.15$  in unadjusted analysis were further examined in a multivariable logistic regression model. Backwards elimination was used to remove insignificant variables from the model. Variables with a significance of  $p < 0.05$  (in addition to age and sex) were retained in the final multivariable model. All statistical analyses were performed in SAS Version 9.4 (SAS Institute Inc., Cary, NC, USA).

## Results

### HIV Prevalence of East and Northeast Regions in FARDC

Participants stationed in the East and Northeast regions of the DRC comprised Defense Zone 3 and had the highest HIV prevalence at 5.1%. The HIV prevalence in Defense Zone 3 is more than double the 2.5% HIV prevalence of the other defense zones. Furthermore, the HIV prevalence of Defense Zone 3 is more than four times the HIV prevalence of the general population.

### Participants' Demographic and Military Characteristics

The mean age of participants was 41.2 years (SD=10.2) and ranged from 20-83. Most respondents were men (95%), married or living with a partner (94.7%), ranked sergeant or higher (84.8%), and had not been on a local deployment of greater than six months in the past two years (75.6%). The mean years of military service was 20 years, indicating an older force. Participants who were single were more likely to test positive for HIV (OR 4.45 95% CI 2.12-9.34;  $p < 0.0001$ ) compared to participants who were married or living with a partner. (Table 4.1)

#### Correlates of HIV-infection

The number of sexual partners in the past 12 months by partner type is presented in Table 4.1. Approximately a quarter of the participants reported having two or more regular partners and one or more casual partners in the past 12 months (27.2% and 26.9%, respectively). Furthermore, about 15% of the sample reported sex with at least one sex worker in the past 12 months. While there was no significant difference in HIV status for multiple casual and sex worker partners in the past 12 months, there was a significant difference for multiple regular partners in the past 12 months. Participants who reported four or more regular partners in the past 12 months were nearly three times more likely to be HIV-positive (OR 2.95 95% CI 1.18-7.38;  $p = 0.05$ ) compared to participants with less than two regular partners in the past 12 months. Furthermore, respondents reported very low recent condom use, as only 1% of the sample reported “always” using condoms in the past three months. In addition to sexual history and recent condom use, participants were also asked about their HIV testing frequency. Nearly a third (32%) of the participants had never taken an HIV test, and more than half (51.3%) had one or fewer HIV tests since joining the military. Participants who had never taken an HIV test were more than twice as likely to test positive for HIV (OR 2.14 95% CI 1.17-3.92;  $p = 0.036$ ) compared to those who were ever tested at a military facility. Harmful/hazardous alcohol use (AUDIT $\geq$ 8) was present in about 15% of the

participants, and more than 10% of the participants screened positive for potential post-traumatic stress disorder. Lastly, active syphilis infection was very high among the participants, with 20.6% testing positive. Participants who screened positive for active syphilis were 2.25 (95% CI 1.28-3.98;  $p=0.005$ ) times more likely to test positive for HIV infection compared to those who screened negative for active syphilis. (Table 4.1).

#### Risk Factors for HIV Infection

After controlling for age, sex, and the other variables shown in Table 4.2 using multivariable analysis, we found three factors associated with HIV infection: marital status, multiple regular partners in the past 12 months, and testing positive for active syphilis infection. Respondents who were not married or not living with a partner were more than five times more likely to test positive for HIV infection (aOR 5.57, 95% CI 2.49-12.44;  $p<0.0001$ ) compared to participants who were married or living with a partner. Participants who reported four or more regular partners in the past 12 months were more than three times more likely to test positive for HIV (aOR 3.54, 95% CI 1.38-9.05;  $p=0.027$ ) compared to those with one or fewer regular partners. Lastly, participants who tested positive for active syphilis infection had more than twice the adjusted odds of HIV infection (aOR 2.44, 95% CI 1.35-4.42) when compared to those who tested negative for active syphilis infection.

#### Discussion

This is the first study to examine regional geographic differences in HIV seropositivity in the FARDC. The regional HIV prevalence of FARDC study participants in East and Northeast DRC is more than twice that of study participants in the West, Northwest, and Kinshasa region and the South and Southeast region. Defense Zone 3 (which consists of the East and Northeast regions) had: the longest serving service members, the highest proportion of locally deployed

soldiers, the highest proportion of soldiers who reported multiple sexual partners in the past 12 months, the lowest proportion of soldiers that had ever taken an HIV test at a military facility, the highest proportion of soldiers who screened positive for PTSD, and the highest regional prevalence of active syphilis infection, all of which are known risk factors for HIV infection in military populations.<sup>1, 3, 20-23</sup>

Several correlates we examined were associated with HIV seropositivity among FARDC study participants stationed in Defense Zone 3. These included: not being married, multiple regular sexual partners in the past 12 months, and testing positive for active syphilis infection. The DRC has been slowly recovering from decades of civil unrest, war, and sexual violence, particularly in the eastern regions of the country. Studies have shown conflict-afflicted populations in the DRC have HIV prevalence estimates ranging from 3.1% to 6.7%.<sup>1, 14, 17</sup> The relationship between marital status and HIV infection is complex, and depends on various demographic factors and sex practices.<sup>24</sup> It is also plausible that some spouses of our participants could have died of HIV or related illnesses which further complicates the relationship between marital status and HIV infection, however our research is consistent with previous literature that shows not being married or not living with a partner is associated with HIV infection.<sup>24, 25</sup> Additionally, our study is consistent with other African military studies conducted in Sierra Leone and the DRC that showed soldiers with multiple regular sex partners have higher odds of HIV infection.<sup>1, 22</sup>

Our study did not find an association between recent condom use and HIV seropositivity in this sample. Potential confounders such as age, marital status, and partner type that may influence condom use behavior did not change the magnitude or direction of the association with HIV infection in this study (data not shown). While this finding does not support the majority of established literature on condom use and HIV status, it was not statistically significant and

warrants further investigation in this population. The FARDC should continue to emphasize the importance of consistent and correct condom use and ensure troops are educated about HIV prevention and transmission. Prior research has shown screening positive for PTSD is associated with elevated rates of substance use and risky sexual practices,<sup>23</sup> both of which may negatively affect force readiness, troop morbidity, and increase the likelihood of acquiring HIV. HIV risk-reduction strategies, targeting mental health and post-traumatic stress are encouraged for this population. This study found an alarmingly high seroprevalence of active syphilis infection (21%) among FARDC troops stationed in the eastern regions. It is apparent the FARDC can benefit from a syphilis awareness and treatment campaign. Furthermore, soldiers should be educated on the risk behaviors for acquiring syphilis and its association with HIV transmission and acquisition.

This study demonstrated that troops in the Eastern region of the DRC are more likely to test positive for HIV, most likely due to the unique characteristics (i.e. higher rate of deployment). However residual confounding is plausible due to the broad scope of our risk behavior survey, and further investigation is needed among troops stationed in Eastern DRC. In addition to the aforementioned recommendations, it is clear the FARDC could benefit from an increase in HIV testing services. More than half the participants in Defense Zone 3 reported less than two HIV test since joining the military, despite a median of 20 years of military service, which suggests HIV testing is not mandatory. An official HIV testing policy could benefit the FARDC by early detection of HIV infection and immediate linkage to care and treatment. Screening positive for PTSD was not associated with HIV seropositivity in Defense Zone 3. While surprising, this does not diminish the need for further investigation of factors of violence and conflict and their association with HIV infection in this population.

## Limitations

A number of limitations should be considered when interpreting these results. The cross-sectional design of this study does not allow us to infer causality between the covariates analyzed and the outcome of HIV seropositivity. Also, social desirability bias is plausible due to self-report and the personal interview methodology. This may have decreased the likelihood of finding an association between key risk factors and HIV infection. Residual confounding is also plausible, because we do not have information on important HIV risk factors such as stigma and discrimination surrounding attitudes and beliefs about HIV in this population. Nevertheless, this study has several strengths including the sampling of military personnel throughout the country, which resulted in a robust representative sample. Additionally, it is possible that active duty soldiers stationed in the Eastern region were not participating in conflict. Future studies in this population should assess if soldiers are participating in conflict and the severity of it. Furthermore, the use of computer-assisted personal interviews assisted with translation and literacy issues and increased data quality.<sup>22</sup>

## Conclusion

In summary, the regional HIV prevalence among FARDC military personnel stationed in the East and Northeast of the DRC are much higher than both the overall military and general population estimates. Defense Zone 3 should be targeted with HIV risk-reduction interventions, such as consistent condom use in the highest risk subsets of this defense zone (sexually active single troops, especially those who have multiple sexual partnerships). Mandatory HIV testing is lacking in the FARDC, and an official policy should be drafted and enforced to fully assess the HIV epidemic in the military. Furthermore, an active syphilis screening and treatment program should be implemented in the FARDC, as syphilis infection increases the likelihood of HIV



transmission and acquisition and is a marker of high-risk behaviors that could ultimately lead to HIV transmission.

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Chapter 4, in part, is currently being prepared for submission for publication of the material. Shaffer, Richard; Garfein, Richard; Liu, Lin; Woodruff, Susan; Macera, Caroline. The dissertation author was the primary author of this material.

Table 4.1. Characteristics of 1108 study participants stationed in East and Northeast Democratic Republic of the Congo

Variable	Total (n=1108) n (%)	HIV Positive (n=56) n (%)	HIV Negative (n=1052) n (%)	OR (95% CI)	P Value
<u>Age, years</u>				0.99 (0.97-1.02)	0.68
Mean (SD)	41.2 (10.2)	40.7 (8.8)	41.3 (10.3)		
Median (Range)	39 (20-83)	40 (23-67)	39 (20-83)		
<u>Sex</u>					0.69
Men	1056 (95.3)	54 (96.4)	1002 (95.3)	1.00	
Women	52 (4.7)	2 (3.6)	50 (4.7)	0.74 (0.18-3.13)	
<u>Marital status</u>					<0.0001
Married or living with a partner	1049 (94.7)	46 (82.1)	1003 (95.3)	1.00	
Single	59 (5.3)	10 (17.9)	49 (4.7)	4.45 (2.12-9.34)	
<u>Rank</u>					0.26
Captain/Major/Colonel/Gen.	162 (14.6)	5 (8.9)	157 (14.9)	1.00	
Recruit	70 (6.3)	5 (8.9)	65 (6.2)	2.42 (0.68-8.63)	
Corporal	99 (8.9)	6 (10.7)	93 (8.8)	2.03 (0.60-6.82)	
Sergeant	360 (32.5)	13 (23.2)	347 (33)	1.18 (0.41-3.36)	
Adjutant	177 (16.0)	14 (25.0)	163 (15.5)	2.70 (0.95-7.66)	
Lieutenant	240 (21.7)	13 (23.2)	227 (21.6)	1.80 (0.63-5.15)	
<u>Years of Military Service</u>				1.00 (0.97-1.03)	0.97
Mean (SD)	20.6 (9.0)	20.7 (7.8)	20.6 (9.1)		
Median (Range)	18 (1-55)	18 (9-48)	18 (1-55)		
<u>Local Deployment<sup>a</sup></u>					0.91
No	838 (75.6)	42 (75.0)	796 (75.7)	1.00	
Yes	270 (24.4)	14 (25.0)	256 (24.3)	1.04 (0.56-1.93)	

Table 4.1 Characteristics of 1108 study participants stationed in East and Northeast Democratic Republic of the Congo, Continued

Variable	Total (n=1108) n (%)	HIV Positive (n=56) n (%)	HIV Negative (n=1052) n (%)	OR (95% CI)	P Value
<u>No. regular partners in past 12 months</u>					0.05
0-1	806 (72.8)	39 (69.6)	767 (72.9)	1.00	
2-3	256 (23.1)	11 (19.6)	245 (23.3)	0.88 (0.45-1.75)	
4+	46 (4.2)	6 (10.7)	40 (3.8)	2.95 (1.18-7.38)	
<u>No. casual partners in past 12 months</u>					0.25
0	810 (73.1)	37 (66.1)	773 (73.5)	1.00	
1	98 (8.8)	9 (16.1)	89 (8.5)	2.11 (0.99-4.52)	
2-3	138 (12.5)	6 (10.7)	132 (12.6)	0.95 (0.39-2.29)	
4+	62 (5.6)	4 (7.1)	58 (5.5)	1.44 (0.50-4.18)	
<u>No. sex workers in past 12 months</u>					0.99
0	924 (83.4)	46 (82.1)	878 (83.5)	1.00	
1	36 (3.3)	2 (3.6)	34 (3.2)	1.12 (0.26-4.82)	
2-3	54 (4.9)	3 (5.4)	51 (4.9)	1.12 (0.34-3.73)	
4+	94 (8.5)	5 (8.9)	89 (8.5)	1.07 (0.42-2.77)	
<u>Condom use in the past three months<sup>b</sup></u>					0.50
Always	11 (1.0)	1 (2.0)	10 (1.0)	1.00	
Less than always	1049 (99.0)	49 (98.0)	1000 (99.0)	0.49 (0.06-3.90)	

Table 4.1 Characteristics of 1108 study participants stationed in East and Northeast Democratic Republic of the Congo, Continued

Variable	Total (n=1108) n (%)	HIV Positive (n=56) n (%)	HIV Negative (n=1052) n (%)	OR (95% CI)	P Value
<u>Ever taken an HIV test</u>					
Yes, at military facility	584 (52.7)	20 (35.7)	564 (53.6)	1.00	0.036
Yes, outside military facility	170 (15.3)	11 (19.6)	159 (15.1)	1.95 (0.92-4.16)	
No	354 (32.0)	25 (44.6)	329 (31.3)	2.14 (1.17-3.92)	
<u>No. of HIV tests since joining the military</u>					
0-1	568 (51.3)	34 (60.7)	534 (50.8)	1.00	0.06
2-3	316 (28.5)	18 (32.1)	298 (28.3)	0.95 (0.53-1.71)	
4+	224 (20.2)	4 (7.1)	220 (20.9)	0.29 (0.10-0.81)	
<u>Alcohol use<sup>c</sup></u>					
None/low (AUDIT <8)	938 (84.7)	49 (87.5)	889 (84.5)	1.00	0.55
Harmful/hazardous (AUDIT ≥8)	170 (15.3)	7 (12.5)	163 (15.5)	0.78 (0.35-1.75)	
<u>PTSD status<sup>d</sup></u>					
No	968 (87.4)	47 (83.9)	921 (87.6)	1.00	0.43
Yes	140 (12.6)	9 (16.1)	131 (12.4)	1.35 (0.65-2.81)	
<u>Active syphilis infection</u>					
No	880 (79.4)	36 (64.3)	844 (80.2)	1.00	0.005
Yes	228 (20.6)	20 (35.7)	208 (19.8)	2.25 (1.28-3.98)	

<sup>a</sup>Local Deployment >6 months in past 2 years

<sup>b</sup>Excluding those who did not have sex in the past three months (n=48)

<sup>c</sup>AUDIT, Alcohol Use Disorders Identification Test

<sup>d</sup>PC-PTSD score ≥3

Table 4.2 Adjusted odds of HIV seropositivity among study participants stationed in East and Northeast Democratic Republic of the Congo

Variable	AOR (95% CI)	P-Value
<u>Marital status</u>		<0.0001
Not Married vs. Married	5.57 (2.49-12.44)	
<u>No. of regular partners, past 12 months</u>		0.027
0-1	1.00	
2-3	0.98 (0.49-1.97)	
4+	3.54 (1.38-9.05)	
<u>Active syphilis infection</u>		0.003
Yes vs. No	2.44 (1.35-4.42)	

AOR: adjusted odds ratio (adjusted for age, sex, and all other variables in the model); CI: Confidence Interval

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## **CHAPTER 5: DISCUSSION AND CONCLUSIONS**

## **Overview**

The purpose of this dissertation was to estimate the prevalence of HIV in the Armed Forces of the Democratic Republic of the Congo (FARDC) and investigate correlates of HIV infection. This dissertation also served to examine condom use behaviors (specifically the frequency of correct and consistent use) and attitudes towards condom use. Lastly, this dissertation investigated geographic differences in HIV infection by examining risk factors for HIV infection in the conflict affected Eastern region of the Democratic Republic of the Congo (DRC).

Results can be used to evaluate the effectiveness of existing HIV prevention programs, identify gaps in the programs, and develop HIV prevention policies targeted to FARDC military personnel.

## **HIV Prevalence and Correlates of HIV Infection in the FARDC**

Results from the analysis showed FARDC military personnel had an HIV prevalence nearly three times higher than the general population of the DRC (3.5% vs. 1.2%).<sup>1</sup> While our findings are consistent with the previous HIV seroprevalence study conducted among active-duty soldiers stationed in Kinshasa<sup>2</sup>, these observations are alarming and contribute to existing research that military populations are at higher risk of HIV infection.<sup>3-6</sup> Multiple sexual partnerships has been shown to be associated with HIV infection<sup>7</sup>, and more than a quarter (27.3%) of participants reported more than one regular partner in the past 12 months. Participants involved in multiple sexual partnerships who do not practice HIV prevention measures such as correct and consistent condom use may put themselves and their sexual partners at higher risk for HIV infection. Soldiers should be encouraged to limit their number of sexual partners and practice safe sex measures.

Routine HIV testing is also an important HIV prevention measure.<sup>2</sup> Our study found that nearly a third of the participants (28%), had never had an HIV test since joining the military. Given

that the mean age of participants was 41 years and the mean years of military service was 20 years, it is feasible that soldiers could unknowingly be infected with HIV for several years. Soldiers who undergo routine HIV testing typically receive HIV counseling on risk reduction strategies, and those who test positive are typically linked to care and treatment immediately thus reducing the risk of transmission. Routine HIV testing and counseling in military populations is usually best done by mandatory HIV testing policies, as soldiers are much more likely to follow a mandate than a suggested practice. The FARDC HIV testing program should be expanded to routine mandated testing in order to fully assess the HIV epidemic in the FARDC.

Post-traumatic stress disorder was present in about 10% of the overall study population. While the tool utilized in this study was just a screener for potential PTSD, those who screened positive were more likely to test positive. Further assessment of PTSD and mental health programs targeted to PTSD among military personnel are encouraged in the FARDC.

Active syphilis infection was very high in this population, with 15.7% of the sample testing positive. Active syphilis increases the likelihood of the transmission and acquisition of HIV, and is a marker of high risk sexual behaviors.<sup>2</sup> An active syphilis screening and treatment campaign is critical in the FARDC to help combat the HIV epidemic.

### **Condom Use Behaviors in the FARDC**

Results from the analysis show inconsistent condom use is very common among FARDC military personnel. Less than 2% of sexually active, male participants reported always using condoms with their sexual partners. Inconsistent condom use has been reported in several African military populations,<sup>5,6,8</sup> however it is of particular concern in the FARDC due to the high STI (HIV and syphilis) prevalence and the high percentage of participants reporting multiple sexual partnerships. Consistent with the aforementioned studies in African military populations, condom

use varied by partner type and was higher among casual partners compared to regular partners. However, only about 5% of participants who reported a casual sexual partner in the past 12 months reported they always used condoms with that partner. This data further reinforces the need for HIV prevention messaging on correct and consistent condom use.

Assessment of correlates of condom use showed nearly a quarter (21.7%) of male participants reported free condoms were not available at their barracks. Furthermore, more than half of the participants reported it was not alright to use a condom with their spouse. Approximately a quarter of the participants reported condoms can be used more than once, and a person would lose respect for their spouse if condom use was suggested. Furthermore, only a third of participants scored 100% on the UNGASS HIV knowledge questions. Condom inaccessibility, negative attitudes towards condoms, lack of HIV knowledge, and smell/texture of condom were all significantly associated with decreasing condom use in the final multivariable ordinal regression model. Convenient access to free condoms is paramount for utilization. The FARDC HIV prevention program should ensure all bases have a sufficient amount of free condoms for their soldiers. Further qualitative studies among FARDC military personnel should be conducted to better understand the dynamic relationship of condom use with a spouse, especially since multiple sexual partnerships are common in this population. Appropriate HIV prevention messages on beliefs about condom use (e.g. a condom cannot be used more than once) and HIV knowledge (e.g. a mosquito cannot spread HIV) should be disseminated to the FARDC military personnel. Lastly, the smell/texture/feel of condoms should be addressed in this population. Participants who reported they did not like the free condoms due to the smell/texture/feel were more likely to have decreased condom use. A qualitative assessment of condom likeability and preference in the FARDC may be beneficial in increasing condom use.

## **Geographic Differences in HIV Infection in the FARDC**

Eastern DRC has been plagued with conflict including war and violence since the beginning of the HIV epidemic. While HIV surveillance data in the DRC is lacking, prevalence estimates have suggested the Eastern conflict-affected region has higher rates of HIV.<sup>9,10</sup> Participants stationed in Defense Zone 3 which consists of the East and Northeast conflict regions had an HIV prevalence of 5.1%, which is twice as high as the other two defense zones, and nearly five times higher than the general population of the DRC. The longest serving service members, highest proportion of locally deployed, multiple sexual partnerships, PTSD, and active syphilis were all stationed in Defense Zone 3. While these risk factors for HIV infection were not statistically significant in the final multivariable model, it does not negate the need for further research of factors related to violence and conflict and their association with HIV in this population. Residual confounding pertaining to risk factors such as: stigma, discrimination, and violence are plausible and should be investigated. Multiple sexual partnerships and active syphilis infection had a stronger association with HIV infection among troops stationed in the Eastern region compared to soldiers stationed throughout the rest of the country. These findings support the urgency of condom accessibility, a comprehensive HIV prevention program, and an active syphilis screening and treatment campaign in the FARDC, especially for troops stationed in Defense Zone 3.

## **Conclusion**

In conclusion, this dissertation quantified HIV and active syphilis prevalence in the FARDC, and allowed us to better understand correlates of HIV infection and condom use behaviors. It also provided better insight regarding attitudes and beliefs towards condom use, and allowed us to identify condom accessibility issues. Furthermore, this dissertation investigated a

high-risk subset of FARDC military personnel stationed in the Eastern region of the country. This is the first study to examine a plethora of HIV risk factors in the conflict-afflicted regions of the DRC. We hope this dissertation will serve as a valuable tool for the FARDC, other militaries, and researchers who are engaged in the fight against HIV/AIDS among military personnel.

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## APPENDIX



Armed Forces of the Democratic Republic of Congo (FARDC) Seroprevalence and  
Epidemiology Risk Survey (SABERS)

## Module Section 1. Demographic Information

**Instructions to all participants: Check  the appropriate box or write your answer in the space provided.**

101. In what year were you born?

|\_|\_|||\_|\_| year of birth

(77) Don't know

102. What is your current rank in the military?

- (1) Recruit
- (2) Soldier
- (3) Corporal
- (4) Sergeant
- (5) Adjutant
- (6) Lieutenant
- (7) Captain
- (8) Major
- (9) Colonel
- (10) General

103. What is the highest level of military training that you have attended?

- (1) None
- (2) Instruction center
- (3) Military academy
- (4) Other, please specify \_\_\_\_\_

104. What branch of the military are you in?

- (1) Army
- (2) Navy
- (3) Air Force
- (4) Other

105. How many years have you been in the military? (enter 01 if less than 1 year)

|\_|\_| years

106. What is the highest education level that you have completed?

- (1) Did not attend school
- (2) Attended some primary school but not completed
- (3) Completed Primary school
- (4) Completed Secondary school
- (5) Completed High School
- (6) Completed College/University

107. What is your religion?

- (1) Christian
- (2) Muslim
- (3) Traditional
- (4) Kimbanguist
- (5) No religious affiliation
- (6) Other (non-Christian) → Please specify: \_\_\_\_\_

108. What is your current marital status? By “married” we mean by ceremonies that took place in a church, court of law, or in the village by a traditional leader.

- (1) Never married and not living with a partner
- (2) Not married but living with a partner
- (3) Married
- (4) Polygamous marriage
- (5) Widowed
- (6) Divorced/Separated

109. [Male]: All together, how many sexual partners do you live with now?

|\_|\_| partners

[Female]: Including yourself, how many wives or live-in partners does your partner have?

|\_|\_| partners

110. Have you been deployed in-country for more than 6 months in the past 2 years?

(1) Yes

(2) No

## Module Section 2. Sexual History

The next questions ask about HIV and sexual partners. Please answer honestly. Remember, your answers will remain strictly confidential.

201. Have you ever had sex? By sex, we mean vaginal, oral, or anal sex between two willing individuals.

(1) Yes

(2) No

202. Approximately how many sex partners have you had in your lifetime, including any current partners?

|\_|\_|\_| partners

(77) Don't know

(99) I have never had sex

203. Approximately how old were you the first time you had sex?

|\_|\_| years old

(77) Don't know

(99) I have never had sex

204. “**Regular partners**” include your spouse, boyfriend/girlfriend, or any person with whom you have a committed relationship.

In the past 12 months, how many regular partners did you have sex with? If you haven't had sex with any regular partners in the last 12 months, write 0.

|\_|\_|\_| regular partners

(77) Don't know

205. “**Casual partners**” includes any person with whom you have sex but did not have a committed relationship. This does not include your spouse, boyfriend/girlfriend, or regular partners.

In the past 12 months, how many casual partners did you have sex with? If you haven't had sex with any casual partners in the last 12 months, write 0.

|\_|\_|\_| casual partners

(77) Don't know

206. “**Commercial sex workers**” include any person with whom you have sex in exchange for money, shelter, food, drugs, favors, or gifts. This does not include your spouse, boyfriend/girlfriend, regular partners, or casual partners.

In the past 12 months, how many commercial sex workers did you have sex with? If you haven't had sex with any casual partners in the past 12 months, write 0.

|\_|\_|\_| commercial sex worker partners

(77) Don't know

207. Have you ever paid or received money, shelter, food, drugs, favors, or gifts in exchange for sex to a partner who is not a commercial sex worker? Check  all that apply.

(1) Yes, I've paid money, shelter, food, drugs, favors, or gifts in exchange for sex

(2) Yes, I've received money, shelter, food, drugs, favors, or gifts in exchange for sex

(3) No, I've never paid or received money, shelter, food, drugs, favors, or gifts in exchange for sex

208. Have you ever had sex with more than one partner in the same week?

- (1) Yes
- (2) No

**We would now like to collect information about any sexual partners you had during the last 6 months.**

**Answer the following questions about the last time you had sex with your regular partner. “Regular partners” include your spouse, boyfriend/girlfriend or any person with whom you have a committed relationship.**

209. Was a condom used the last time you had sex with this regular partner?

- (1) Yes
- (2) No
- (99) I did not have sex with a regular partner in the past 6 months

210. How often was a condom used when you had sex with a regular partner during the last 6 months?

- (1) Always (100%)
- (2) Almost always (75-99%)
- (3) Sometimes (25-74%)
- (4) Rarely/Never (0-24%)
- (99) I did not have a regular partner in the past 6 months

211. If you never use a condom with your regular partner, what might be the reason? Check  all that apply.

- (1) Our HIV status is negative

- (2) We are loyal to each other
- (3) Neither of us is sick
- (4) Other, please specify \_\_\_\_\_

212. Was this regular partner's status HIV-positive, HIV-negative or unknown?

- (1) HIV-positive
- (2) HIV-negative
- (77) Don't know
- (99) I did not have a regular partner in the past 6 months

213. Did you know your own HIV status the last time you had sex with your regular partner?

- (1) Yes
- (2) No
- (99) I did not have a regular partner in the past 6 months

214. What is the gender of this regular partner?

- (1) Male
- (2) Female
- (88) Prefer not to answer
- (99) I did not have a regular partner in the past 6 months

215. What type of sex did you have? Check  all that apply.

- (1) Genito-vaginal
- (2) Genito-anal
- (3) Genito-oral
- (4) Oral-anal
- (5) Oral-vaginal



- (88) Prefer not to answer
- (99) I did not have a regular partner in the past 6 months

**Answer the following questions about the last time you had sex with your casual partner.** “Casual partner” includes any person with whom you have sex but did not have a committed relationship. This does not include your spouse, boyfriend/girlfriend, or regular partners.

216. Was a condom used the last time you had sex with this casual partner?

- (1) Yes
- (2) No
- (99) I did not have a casual partner in the past 6 months

217. How often was a condom used with a casual partner in the last 6 months?

- (1) Always (100%)
- (2) Almost always (75-99%)
- (3) Sometimes (25-74%)
- (4) Rarely/Never (0-24%)
- (99) I did not have a casual partner in the past 6 months

218. Was your last casual partner’s status HIV positive, HIV negative, or unknown?

- (1) HIV positive
- (2) HIV negative
- (77) Don’t know
- (99) I did not have a casual partner in the past 6 months

219. Did you know your own HIV status the last time you had sex with your casual partner?

- (1) Yes

- (2) No
- (99) I did not have a casual partner in the past 6 months

220. What is the gender of this casual partner?

- (1) Male
- (2) Female
- (88) Prefer not to answer
- (99) I did not have a casual partner in the past 6 months

221. What type of sex did you have? Check  all that apply.

- (1) Genito-vaginal
- (2) Genito-anal
- (3) Genito-oral
- (4) Oral-anal
- (5) Oral-vaginal
- (88) Prefer not to answer
- (99) I did not have a casual partner in the past 6 months

**We would now like to collect information about your most recent local deployment and any sexual partners you had during your most recent deployment.**

222. During your most recent local deployment, how many total sexual partners did you have? If you have not had any sexual partners during your most recent local deployment, write 0.

\_\_\_\_|\_\_\_\_|\_\_\_\_| partners

(99) I have not been on a local deployment

223. What type of sexual partners did you have during your most recent local deployment? **“Regular partners”** include your spouse, boyfriend/girlfriend, or any person with whom you have a committed relationship. **“Casual partners”** includes any person with whom you have sex with but do not have a committed relationship. This does not include your spouse, boyfriend/girlfriend, or regular partners, but may include commercial sex workers or people you meet in your new deployed location. **“Commercial sex workers”** include any person who provides sex in exchange for money.

Check  all that apply.

(1) Regular Partner(s)

(2) Casual Partner(s)

(3) Commercial sex worker(s)

(4) I had no partner on deployment

(99) I have not been on a local deployment

224. Have you been deployed to any of the following foreign locations for more than 6 months in the past 2 years? Check  all that apply.

(99) I have not been on a foreign deployment in the past 2 years

(1) Republic of Congo

(2) Angola

(3) Morocco

(4) South-Sudan

(5) United States of America

(6) China

(7) Egypt

- (8) Central African Republic
- (9) Belgium
- (10) Gabon
- (11) France
- (12) Other → Please specify: \_\_\_\_\_

225. During your most recent foreign deployment, how many total sex partners did you have? If you have not had any sexual partners during your most recent foreign deployment, write 0.

|\_|\_|\_| partners

- (99) I have not been on a foreign deployment

226. What type of sex partners did you have during your most recent foreign deployment?

**“Regular partners”** include your spouse, boyfriend/girlfriend, or any person with whom you have a committed relationship. **“Casual partners”** includes any person with whom you have sex with but do not have a committed relationship. **“Commercial sex workers”** includes any person who provides sex in exchange for money. This does not include your spouse, boyfriend/girlfriend, or regular partners.

Check  all that apply.

- (1) Regular Partner(s)
- (2) Casual Partner(s)
- (3) Commercial sex worker(s)
- (4) I had no partner on deployment
- (99) I have not been on a foreign deployment

### Module Section 3. Condom Use and Accessibility

301. How often did you use a condom when you had sex in the last three months?

- (1) Always (100%)
- (2) Almost always (75-99%)
- (3) Sometimes (25-74%)
- (4) Rarely/Never (0-24%)
- (99) I did not have sex during the last 3 months

302. Where could you obtain a **free** condom, if you wanted one, within your military? Check  all that apply.

- (99) Free condoms are not available at my barracks, unit, or base
- (1) Barrack
- (2) Toilet/Bathroom
- (3) Rollcall
- (4) Guard security post
- (5) Military medical facility, clinic, or hospital
- (6) Peer educator/ counselor
- (7) Other (specify) \_\_\_\_\_
- (77) Don't know

303. How easy or difficult is it for you to get **free** condoms?

- (99) Free condoms are not available at my barracks, unit, or base
- (98) I don't try to get free condoms
- (1) Very easy
- (2) Easy
- (3) Difficult

(4) Very difficult

304. If you do not use condoms, what are the reasons you don't use them? Check  all that apply.

(1) Free condoms are not available at my barracks, unit, or base

(2) I don't like the lubricant

(3) I don't like the texture

(4) I cannot ejaculate while using a condom

(5) it decreases the feeling/orgasm

(6) It is forbidden to use in my religion

(7) The lubricant is dangerous (risk of cancer or AIDS)

(8) I don't like the smell

(9) I don't trust them

(10) They don't have the right brand

(11) Location of free condoms is not convenient

(12) Insufficient quantity of free condoms

(13) It is embarrassing to take free condoms from the available sources (e.g. clinics, condom dispensers, etc.)

(14) The hours of availability aren't convenient

(15) Other (specify) \_\_\_\_\_

(99) Does not apply, I use condoms

305. The last time I had sex, I

(1) Did not use a condom

(2) Put the condom on BEFORE we started sex and kept it on until the end

(3) Put the condom on BEFORE sex but removed it before the end

(3) Put the condom on AFTER we started sex

306. What did you do the last time you used a condom and it broke?

- (1) I put on another one
- (2) I did not change it and I did not take any other action
- (3) I noticed this after sex
- (4) Does not apply, A condom has never broke while I was using it

**Please answer each of the following questions by indicating if you agree with the statement, if you disagree with the statement, or if you don't know.**

307. Condoms can be used more than once.

- (1) Agree
- (2) Disagree
- (77) Don't Know

308. A woman would lose respect for a man if he suggested that they use a condom.

- (1) Agree
- (2) Disagree
- (77) Don't Know

309. A man would lose respect for a woman if she asked him to use a condom.

- (1) Agree
- (2) Disagree
- (77) Don't Know

310. It is all right for a married woman to ask her husband to use a condom.

- (1) Agree
- (2) Disagree
- (77) Don't Know

311. It is all right for a married man to use a condom with his wife.

- (1) Agree
- (2) Disagree
- (77) Don't Know

312. I would use condoms more often if I had them when I needed one.

- (1) Agree
- (2) Disagree
- (77) Don't Know

313. It is the man's responsibility to have condoms when needed.

- (1) Agree
- (2) Disagree
- (77) Don't Know



314. Youth should be given education about condoms.

- (1) Agree
- (2) Disagree
- (77) Don't Know

315. If you did not have a condom what else could you use? Check  all that apply.

- (1) Plastic bag
- (2) Leaves
- (3) Cotton
- (4) Microbicide
- (5) Other (please specify)\_\_\_\_\_

#### **Module Section 4. Utilization and Access to HIV Testing**

401. Have you ever taken an HIV test before today?

- (1) Yes, at a military facility
- (2) Yes, outside of a military facility
- (3) No
- (77) Don't Know

402. If you have previously taken an HIV test, did you go back to get your results?

- (1) Yes
- (2) No
- (88) Prefer not to answer
- (99) I have not taken an HIV test

403. How many times have you ever been tested for HIV after joining the military?

If you have never been tested for HIV, write 00.

|\_|\_| times

- (77) Don't know

404. How long ago was your last HIV test?

- (1) Within the last 6 months
- (2) More than 6 months ago
- (77) Don't know

(99) I have never taken an HIV test

405. If you were to take an HIV test and wanted to share your results, who would you tell your results to? Check  all that apply.

(1) Spouse(s)

(2) Sexual partner(s) other than spouse

(3) Other family members

(4) Colleagues/friends

(5) Commander

(6) Other → Please specify: \_\_\_\_\_

(7) I would not want anyone to know my test results

(77) Don't know

406. If HIV Testing and Counseling (HTC) services are available on your base, have you been tested for HIV there?

(1) Yes

(2) No

(99) No HTC services available on base

407. If you have HTC services on your base and you do not use them, why do you not use them? Check  all that apply.

(98) Not applicable, no HTC services on my base

(99) Not applicable, I use the HTC services on base

(1) I don't have transportation

(2) Services are too far away

- (3) I don't have time
- (4) Not open during my free time/infrequent hours
- (5) I don't know where to find HTC services
- (6) Only available to certain ranks or personnel
- (7) No HTC supplies available when I go
- (8) I don't feel comfortable/trust the counselors there
- (9) I don't want to know my status
- (10) I do not have money (or not enough) to pay for services
- (11) Other → Please specify: \_\_\_\_\_

## Module Section 5. Gender-Based Violence.

**Other people have made the following comments listed below. Please indicate if you agree or disagree with these statements.**

501. It is all right for a man to use physical force to get a woman to have sex when she does not want to.

- (1) Agree
- (2) Disagree
- (77) Don't know/unsure

502. It is all right for a man to threaten or coerce a woman to have sex when she does not want to.

- (1) Agree
- (2) Disagree
- (77) Don't know/unsure

503. When a woman is forced to have sex against her will, it is usually because of things she said or did.

- (1) Agree
- (2) Disagree
- (77) Don't know/unsure

504. A woman should not withhold sex when a man desires it.

- (1) Agree

- (2) Disagree
- (77) Don't know/unsure

505. Have you had sex when you didn't want to because you were verbally threatened, physically forced, or were afraid to refuse?

- (1) Yes
- (2) No
- (88) Prefer not to answer

506. If you were verbally threatened or physically forced to have sex, was the person a military member?

- (99) I have never been verbally threatened or physically forced to have sex
- (1) Yes
- (2) No
- (77) Don't know
- (88) Prefer not to answer

507. If you have ever felt obligated to have sex with a military superior, why?

Check  all that apply.

- (99) I have not felt obligated to have sex with any of my military superiors
- (1) I wanted a promotion or other favor (such as avoiding deployment or a better assignment)
- (2) I was verbally threatened/physically forced
- (3) Other → Please specify: \_\_\_\_\_
- (88) Prefer not to answer

## Module Section 6. Alcohol Use

601. How often during the last year did you have a drink containing alcohol?

- (0) Never
- (1) Monthly or less
- (2) 2-4 times a month
- (3) 2-3 times a week
- (4) 4 or more times a week

602. Thinking about the last year, how many drinks containing alcohol did you have on a typical day when you were drinking?

- (0) 1 or 2
- (1) 3 or 4
- (2) 5 or 6
- (3) 7 to 9
- (4) 10 or more

603. Thinking about the last year, how often did you have 6 or more drinks on one occasion?

- (0) Never
- (1) Less than monthly
- (2) Monthly
- (3) Weekly
- (4) Daily or almost daily

604. How often during the last year have you found that you were not able to stop drinking once you had started?

- (0) Never
- (1) Less than monthly
- (2) Monthly
- (3) Weekly
- (4) Daily or almost daily

605. How often during the last year have you failed to do what was normally expected of you because of drinking?

- (0) Never
- (1) Less than monthly
- (2) Monthly
- (3) Weekly
- (4) Daily or almost daily

606. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session from the previous day or night?

- (0) Never
- (1) Less than monthly
- (2) Monthly



- (3) Weekly
- (4) Daily or almost daily

607. How often during the last year have you had a feeling of guilt or remorse after drinking?

- (0) Never
- (1) Less than monthly
- (2) Monthly
- (3) Weekly
- (4) Daily or almost daily

608. How often during the last year have you been unable to remember what happened the night before because of your drinking?

- (0) Never
- (1) Less than monthly
- (2) Monthly
- (3) Weekly
- (4) Daily or almost daily

609. Have you or someone else been injured because of your drinking?

- (0) No
- (2) Yes, but not in the last year
- (4) Yes, during the last year

610. Has a relative, friend, doctor or other health care worker been concerned about your drinking or suggested you cut down?

- (0) No
- (2) Yes, but not in the last year
- (4) Yes, during the last year

611. In the last three months, did drinking alcohol influence your decision about or prevent you from using condoms or using condoms correctly?

- (1) Yes
- (2) No
- (99) I did not have sex and/or I did not drink alcohol in the last three months

612. In the last three months, did you ever have unintended sex, as a result of drinking alcohol?

- (1) Yes
- (2) No
- (99) I did not have sex and/or I did not drink alcohol in the last 3 months

## Module Section 7. HIV Knowledge

701. Can having sex with only one faithful, uninfected partner reduce the risk of HIV transmission?

- (1) Yes
- (2) No
- (77) Don't Know

702. Can a person get HIV from mosquito bites?

- (1) Yes
- (2) No
- (77) Don't Know

703. Can using condoms reduce the risk of HIV transmission?

- (1) Yes
- (2) No
- (77) Don't Know

704. Can a person get HIV by sharing a meal with someone who is infected?

- (1) Yes
- (2) No
- (77) Don't Know

705. Can a healthy-looking person have HIV?

- (1) Yes
- (2) No
- (77) Don't Know

706. I would be willing to share my quarters with someone from my platoon who is infected with HIV

- (1) Yes
- (2) No
- (77) Don't Know

707. Can people reduce their chances of getting HIV by not having sex at all?

- (1) Yes
- (2) No
- (77) Don't Know

708. Can people get HIV because of witchcraft or other supernatural means?

- (1) Yes
- (2) No
- (77) Don't Know

709. Can the virus that causes HIV be transmitted from a mother to a child?

- a. During pregnancy?
  - (1) Yes

(2) No

(77)

Don't

Know

b. During delivery?

(1) Yes

(2) No

(77) Don't Know

c. Through breastfeeding?

(1) Yes

(2) No

(77) Don't Know

710. Can you get HIV through tattooing or ritual scarring?

(1) Yes

(2) No

(77) Don't Know

711. Would you buy food from a vendor who has the HIV virus?

(1) Yes

(2) No

(77) Don't Know

712. Can HIV/AIDS be cured?

(1) Yes

(2) No

(77) Don't Know

713. Are there drugs that people infected with the HIV virus can get from a doctor or a nurse to help them live longer?

(1) Yes

(2) No

(77) Don't Know

714. Is there anything a person can do to avoid getting the virus that causes HIV?

(1) Yes

(2) No

(77) Don't Know

715. What are the chances that you yourself may get HIV?

(99) Already HIV positive

(1) Not at all likely

(2) Somewhat likely

(3) Highly likely

(77) Don't know/Not sure

## Module Section 8. Drug Use

801. Have you ever injected drugs?

- (1) Yes, but not in the last 12 months
- (2) Yes, in the last 12 months
- (3) No, I have never injected drugs
- (88) Prefer not to answer

802. Have you ever shared syringes/needles or other injection equipment for drug use?

- (1) Yes, but not in the last 12 months
- (2) Yes, in the last 12 months
- (3) No, I have never injected drugs
- (88) Prefer not to answer

803. In the past 12 months, have you injected any prescription products with a shared syringe/needle?

- (1) Yes
- (2) No

804. In the last three months, did you use any of the following that influenced your decision to use condoms or use condoms correctly? Check  all that apply.

- (1) Alcohol
- (2) Marijuana/Djamba
- (3) Heroin/Lopipi
- (4) 36 Birds
- (5) Gasoline/Paint
- (6) Grass
- (7) Rush/Roomies
- (8) Other → Please specify: \_\_\_\_\_
- (99) I did not have sex in the last three months

805. In the last three months, did you ever have unintended sex, as a result of using the following?  
Check  all that apply

- (1) Alcohol
- (2) Marijuana/Djamba
- (3) Heroin/Lopipi
- (4) 36 Birds
- (5) Gasoline/Paint
- (6) Grass
- (7) Rush/Roomies
- (8) Other → Please specify: \_\_\_\_\_
- (99) I did not have sex in the last three months



## Module Section 9. Posttraumatic Stress

In your life have you ever had any experience that was so frightening, horrible, or upsetting that, in the past month you...

901. Have had nightmares about it or thought about it when you did not want to?

(1) Yes

(2) No

902. Tried hard not to think about it or went out of your way to avoid situations that reminded you of it?

(1) Yes

(2) No

903. Were constantly on guard, watchful, or easily startled?

(1) Yes

(2) No

904. Felt numb or detached from others, activities, or your surroundings?

(1) Yes

(2) No

## Module Section 10. Depression

Over the last 2 weeks, how often have you been bothered by any of the following problems?

1001. Little interest or pleasure in doing things?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1002. Feeling down, depressed, or hopeless?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1003. Trouble falling or staying asleep or sleeping too much?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1004. Feeling tired or having little energy?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1005. Poor appetite or overeating?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1006. Feeling bad about yourself—or that you are a failure or have let yourself or your family down?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1007. Trouble concentrating on things?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1008. Moving or speaking so slowly that other people may have noticed OR the opposite—being so fidgety or restless that you have been moving around more than usual?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

1009. Thoughts that you would be better off dead or of hurting yourself in some way?

- (0) Not at all
- (1) Several days
- (2) More than half of the days
- (3) Nearly every day

END OF SURVEY